RM

VOLUME 1 OF 2

COMMONWEALTH OF MASSACHUSETTS

CONTRACT DOCUMENTS AND SPECIAL PROVISIONS

PROPOSAL NO.	608163-128112
P.V. =	$12,204,000.00
PLANS	YES

FOR

Federal Aid Project No. STP/HSI-0032(043)X
Reconstruction & Improvements on Monson Road,
from the Monson T.L. to Reed Hill Road (1.5 Miles)

in the Town of

WALES

In accordance with the STANDARD SPECIFICATIONS
for HIGHWAYS and BRIDGES dated 2024

This Proposal to be opened and read: **WEDNESDAY, NOVEMBER 13, 2024 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 Bid Express 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 Bid Express.

WEDNESDAY, NOVEMBER 13, 2024 at 2:00 P.M. **
WALES

Federal Aid Project No. STP/HSI-0032(043)X
Reconstruction & Improvements on Monson Road, from the Monson T.L. to Reed Hill Road (1.5 Miles)

****Date Subject to Change**

PROJECT VALUE = $12,204,000.00

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.

Plans will be on display and information will be available at the MassDOT Boston Office and at the District Office in NORTHAMPTON.

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 $575.00 per ton, Portland cement $425.53 per ton, diesel fuel $2.559 per gallon, and gasoline $2.385 per gallon, and Steel Base Price Index 409.2. 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, SEPTEMBER 14, 2024

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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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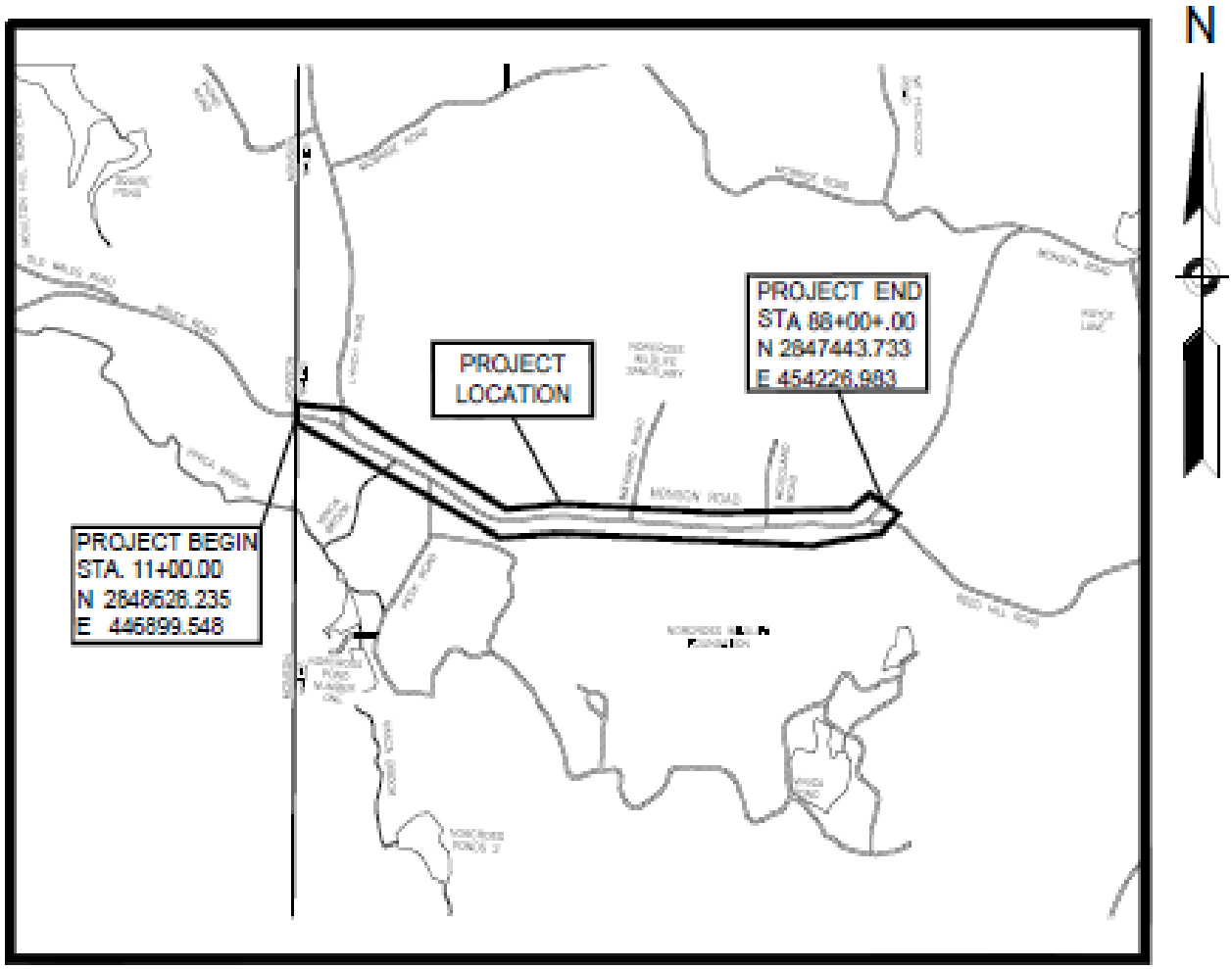
DOCUMENT 00331

LOCUS MAP

WALES

Federal Aid Project No. STP/HSI-0032(043)X
Reconstruction & Improvements on Monson Road,
from the Monson T.L. to Reed Hill Road (1.5 Miles)



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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: _____

_____

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WORK NOT COMPLETED WITHIN SPECIFIED TIME: _____

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Revised: 04/28/17

*** END OF DOCUMENT ***

DOCUMENT 00710
GENERAL CONTRACT PROVISIONS
Revised: 05/06/24

NOTICE OF AVAILABILITY

The STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES dated 2024, the SUPPLEMENTAL SPECIFICATIONS, the 1996 METRIC CONSTRUCTION AND TRAFFIC STANDARD DETAILS, the 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS; the 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING and the 2017 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

JUNE 30, 2024

The 2024 *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 4: SCOPE OF WORK

Subsection 4.06: Increased or Decreased Contract Quantities
Replace the second paragraph with the following.

Where the actual quantity of a pay item varies by more than 25% above or below the estimated quantity stated in the Contract, an equitable adjustment in the Contract Price for that pay item shall be negotiated upon demand of either party regardless of the cause of the variation in quantity. A demand for an equitable adjustment must be submitted to the other party within 30 days after beginning the work of the affected item that is greater than 25% above the bid quantity or within 30 days after completing the work when the actual quantity is 25% less than the bid quantity.

DIVISION II

CONSTRUCTION DETAILS

DIVISION II: Construction Details
Replace M4.02.15 Cement Mortar with M4.04.0 Grout, Mortar, and Concrete Products where encountered, including in Subsections 230.40, 485.40, 501.40, 685.40, 940.40A and 983.40.

SECTION 100: EARTHWORK, GRADING, DEMOLITION, RODENT CONTROL AND BORINGS

SUBSECTION 150: EMBANKMENT

Subsection 150.62: Embankment Construction with Materials Other Than Rock
Replace the fourth paragraph with the following.

The embankment materials shall be compacted to not less than 95% of the maximum dry density of the embankment material as determined by AASHTO T 99, Method C. If required, a correction for oversized particles shall be in accordance with Annex A of AASHTO T 99. If the material retained on the ¾-in. sieve is 30% or more of the total sample, this test shall not apply and the material shall be compacted to the target density. The target density shall be established by determining the number of passes of a roller required to produce a constant and uniform density, after conducting a series of tests using either AASHTO T 310, *In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)*, AASHTO T 191, *Density of Soil In-Place by the Sand-Cone Method*, or *ASTM D 8167 Standard Test Method for In-Place Bulk Density of Soil and Soil-Aggregate by a Low-Activity Nuclear Method (Shallow Depth)*. The Contractor shall, without additional compensation, employ whatever measures may be necessary to adjust the natural water content of the suitable embankment material to permit the placement and compaction as hereinbefore specified.

SUBSECTION 160: CONTROLLED LOW-STRENGTH MATERIAL

Subsection 160: Controlled Low-Strength Material
Add this new subsection.

DESCRIPTION

160.20: General

Controlled Low-Strength Material shall be installed in accordance with the relevant provisions of Subsection 150: Embankment, Section 901: Cement Concrete and in accordance with the procedures described herein.

Controlled Low Strength Materials (CLSM) shall be a self-compacting, self-leveling, flowable, excavatable or non-excavatable, low strength, rigid setting, and unshrinkable material, used as an alternative to compacted granular fills, including backfill, structural fill, utility fill, pavement base, subgrade, subbase, base course, conduit bedding, erosion control, and void filling.

MATERIALS

160.40: General

Material for controlled low-strength material shall meet the requirement specified of M4.08.0 Controlled Low-Strength Material. The material shall be specified by the Engineer as one of the following types;

CLSM – Manual Excavatable (≤100 psi)

CLSM – Mechanical Excavatable (101-300 psi)
CLSM – Structural Non Excavatable (> 300 psi)

Permeability testing as specified in Table M4.08.0-2 shall be required when the material is placed outside of roadway areas or footings for concrete structures, or as directed by the Engineer.

CONSTRUCTION METHODS

160.60: General

The Contractor shall submit a placement plan for Controlled Low-Strength Material (CLSM). The plan shall include the type of CLSM, detailed descriptions of methods used for placing and containing the controlled density fill and the set time to strength.

The Contractor shall remove all debris prior to placing the fill. Fill shall not be placed against any structural elements or utilities unless approved by the Engineer.

CLSM shall be poured in lifts not exceeding 4 feet to insure stability under the fluid effects of the pour. Care shall be taken to ensure the integrity of the forms or other means of supporting the material until the material sets up.

COMPENSATION

160.80: Method of Measurement

Controlled Low-Strength Material shall be measured by the cubic yard in place to the neat lines established on the plans or specified by the Engineer. When backfilling pipes the horizontal neat lines shall be not greater than 3.0 ft. greater than the rated inside diameter of the pipe and vertically from the top of the crushed stone foundation material, if any, or 6 in. below the pipe invert whichever is less to the specified top elevation. A deduction shall be made for the volume of the pipe or conduit encased.

160.81: Basis of Payment

Payment under this item shall constitute full compensation for the placement, testing, and all material, equipment and labor to complete the work.

160.82: Payment Items

160.1	Controlled Low-Strength Material - Manual Excavatable (≤ 100 PSI)	Cubic Yard
160.2	Controlled Low-Strength Material – Mechanical Excavatable (101-300 PSI)	Cubic Yard
160.3	Controlled Low-Strength Material (>300 PSI)	Cubic Yard

SECTION 200: DRAINAGE

SUBSECTION 201: BASINS, MANHOLES AND INLETS

Subsection 201.40: General
Replace "Cement Mortar ..... M4.02.15" with "Mortar ..... M4.04.0".

SECTION 400: SUB-BASE, BASE COURSES, SHOULDERS, PAVEMENTS AND BERMS

SUBSECTION 401: GRAVEL SUB-BASE

Subsection 401.60: Gravel Sub-base
Replace the last sentence of the first paragraph with the following.

The specific density of the Gravel Sub-base shall be maintained by determining the number of passes of a roller required to produce a constant and uniform density, after conducting a series of tests using a nuclear device or the sand/volume method in accordance with AASHTO T310, AASHTO T 191, or ASTM D 8167.

SUBSECTION 402: DENSE GRADED CRUSHED STONE FOR SUB-BASE

Subsection 402.61: Spreading and Compacting
Replace the last sentence of the first paragraph with the following.

The specified density of the Dense Graded Crushed Stone shall be maintained by determining the number of passes of a roller are required to produce a constant and uniform density, after conducting a series of tests using a nuclear device or the sand/volume method in accordance with AASHTO T310, AASHTO T 191, or ASTM D 8167.

SUBSECTION 403: RECLAIMED PAVEMENT FOR BASE COURSE AND/OR SUB-BASE

Subsection 403.64: Compaction and Dust Control
Replace the second paragraph with the following.

The reclaimed base course shall be tested for compaction and smoothness and accuracy of grade in accordance with the applicable provisions of 401.60: Gravel Sub-base. The required density shall be measured by using a nuclear device or the sand/volume method in accordance with AASHTO T310, AASHTO T 191, or ASTM D 8167. If any portions are found to be unacceptable by the Engineer, such portions shall be reprocessed, regraded, and recompacted until the required smoothness and accuracy are obtained.

SUBSECTION 404: RECLAIMED PAVEMENT BORROW MATERIAL

Subsection 404.60: General
Replace the second sentence with the following.

The specified density of the Reclaimed Pavement Borrow Material shall be maintained by determining the number of passes of a roller that are required to produce a constant and uniform density, after conducting a series of tests using a nuclear device or the sand/volume method in accordance with AASHTO T310, AASHTO T 191, or ASTM D 8167

SUBSECTION 450: HOT MIX ASPHALT PAVEMENT

Subsection 450.40: General
Add the following paragraph to the end of this subsection.

Prior to placing hot mix asphalt the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, HMA tonnage, the type of mix, the mix provider and plant location.

SUBSECTION 460: HOT MIX ASPHALT PAVEMENT FOR LOCAL ROADS

Subsection 460.40: General
Add the following paragraph to the end of this subsection.

Prior to placing hot mix asphalt the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, HMA tonnage, the type of mix, the mix provider and plant location.

SUBSECTION 466: STRESS ABSORBING MEMBRANE & STRESS ABSORBING MEMBRANE INTERLAYER

Subsection 466.40: General
Replace this subsection with the following.

Prior to placing stress absorbing membrane the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, tonnage, the type of mix, the mix provider and plant location. Stress absorbing membrane and stress absorbing membrane interlayer shall be constructed as specified herein.

SUBSECTION 470: HOT MIX ASPHALT PAVEMENT BERM

Subsection 470.40: General
Replace this subsection with the following.

Prior to placing hot mix asphalt the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, HMA tonnage, the type of mix, the mix provider and plant location. The Contractor shall obtain HMA berm material of the type specified.

SUBSECTION 472: TEMPORARY ASPHALT PATCHING

Subsection 472.40: General
Add the following paragraph to the beginning of this subsection.

Prior to placing hot mix asphalt the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, HMA tonnage, the type of mix, the mix provider and plant location.

SUBSECTION 486: ULTRATHIN BONDED OVERLAY

Subsection 486.40: General
Add the following paragraph to the end of this subsection.

Prior to placing ultrathin bonded overlay the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, tonnage, the type of mix, the mix provider and plant location.

SECTION 600: HIGHWAY GUARD, FENCES AND WALLS

SUBSECTION 690: WALLS REMOVED AND RESET

Subsection 403.64: General
Replace the last sentence with the following.

Mortar shall meet the requirement of M4.04.0: Grout, Mortar, and Concrete Products.

SECTION 700: INCIDENTAL WORK

SUBSECTION 702: HOT MIX ASPHALT SIDEWALKS AND DRIVEWAYS

Subsection 702.40: General
Add the following paragraph to the end of this subsection.

Prior to placing hot mix asphalt the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, HMA tonnage, the type of mix, the mix provider and plant location.

SECTION 800: TRAFFIC CONTROL DEVICES

SUBSECTION 825: RECTANGULAR RAPID FLASHING BEACONS

Subsection 825: Rectangular Rapid Flashing Beacons
Add this new subsection.

DESCRIPTION

825.20: General

This work shall consist of furnishing and installing a solar-powered, actuated, Rectangular Rapid Flashing Beacon (RRFB) system at the location(s) shown in the Plans.

MATERIALS

825.40: General

Rectangular Rapid-Flashing Beacons shall meet the requirements specified in the following Subsections of Division III, Materials:

Cement Concrete.....M4.02.00
Signal Posts and Bases.....M10.05.1
APS Pushbuttons.....M10.09.1
RRFB Assemblies.....M10.11.0

An RRFB system shall include the following items (quantities shown in the Major Items List found in the Plans):

- Cement Concrete Foundation
- Signal Post and Pedestal Base
- APS Pushbutton
- Light Bar
- Signage
- Enclosure for Controller, Activation Unit, and Battery System
- Solar Panel
- All mounting and supporting hardware and wiring necessary to complete a working system

The Contractor shall supply cement concrete foundations per the Plans.

The Contractor shall supply Schedule 80 aluminum signal posts with a brushed or spun finish and square, pedestal aluminum bases with a natural finish unless otherwise shown in the Plans or Special Provisions.

Each Light Bar shall have a pair of yellow beacons facing one or both directions of traffic, as shown in the Plans.

All sign designs shall conform to the MUTCD. Sign panel information, including dimensions, shall be per the Plans.

The warning signs (MUTCD code W11-2, W11-15, or S1-1 signs – see Plans for sign type), and the diagonal downward arrow sign (W16-7P) signs shall be on Type A substrate, conforming to 828.42: Panels. The sign sheeting shall be fluorescent yellow-green, conforming to ASTM D4956 Type IX.

An R10-25 sign, conforming to the MUTCD, shall be mounted above the APS Pushbutton on a Type A substrate or may be integral to the button assembly.

The solar panel and battery system may be integrated into a single unit or housed separately, per the manufacturer's design. These may also be co-housed with the Light Bar and/or the Controller and Activation Unit.

The solar panel and battery system shall be sized appropriately to accommodate 300 actuations per day, 365 days a year, for the duration of the repeating flashing sequence shown in the Plans. The sizing calculations shall be based upon solar and temperature conditions for a typical December-January in Massachusetts. The system shall have a minimum autonomy of 5 days.

Each assembly shall be rated for wind speeds of up to 90 mph.

Any proprietary software required for the programming and/or operation of the system during its lifetime shall be included at no additional cost.

825.41: Shop Drawings

Within 30 days from the Notice to Proceed the Contractor shall submit shop drawings for the RRFB system, including cutsheets for all components to show conformance with M10.05, M10.09.1, and M10.11.0 and these specifications.

Shop drawings shall include all solar and battery sizing calculations. These calculations shall have Contractor- or manufacturer-supplied, site-specific shading factors applied.

825.42: Material Warranties

All RRFB components shall include a minimum 1-year manufacturer's replacement warranty for manufacturing or installation defects starting at the date of acceptance by the Engineer. A battery shall be considered defective should it not retain 80% of its original capacity within the warranty period.

CONSTRUCTION METHODS

825.60: General

RRFBs shall be installed on new foundations at the locations as shown in the Plans. Bases shall be secured to the foundation in accordance with the manufacturer's specifications.

All systems shall be installed per the manufacturer's instructions.

The location and orientation of the system shall be per the Plans.

The arrow on each APS pushbutton shall be aligned parallel to the direction of travel of the crosswalk.

The Light Bar(s) shall be oriented towards the incoming lane(s).

Solar panels shall be oriented to maximize sunlight gain.

SYSTEM OPERATION

825.70: APS Pushbuttons

APS Pushbuttons shall actuate the RRFB system. Upon actuation, an audible speech message shall be broadcast from each pushbutton in the system that says, "Warning lights are flashing," shall be stated twice. This message shall be repeated upon each actuation. No other messages shall be allowed.

While the system is in dark mode, the APS Pushbuttons shall broadcast a locator tone. The locator tone shall have a duration of 0.15 seconds or less and shall repeat at 1-second intervals at all times that the system is in dark mode. The locator tone shall be set 2 to 5 dBA above ambient sound, shall automatically adjust intensity, but cap at a maximum volume of 100 dBA.

APS Pushbuttons shall have all other vibrotactile and percussive indications disabled.

825.71: Light Bar

The Light Bar shall remain dark until actuated.

Upon actuation, all Light Bars in the system shall be activated simultaneously for a predetermined repeating flash sequence. The flashing rate shall be 75 flashing sequences per minute.

The left and right yellow beacons shall operate using the following sequence:

A. The yellow beacon on the left-hand side shall be illuminated for approximately 50 milliseconds.
B. Both yellow beacons shall be dark for approximately 50 milliseconds.
C. The yellow beacon on the right-hand side shall be illuminated for approximately 50 milliseconds.
D. Both yellow beacons shall be dark for approximately 50 milliseconds.
E. The yellow beacon on the left-hand side shall be illuminated for approximately 50 milliseconds.
F. Both yellow beacons shall be dark for approximately 50 milliseconds.
G. The yellow beacon on the right-hand side shall be illuminated for approximately 50 milliseconds.
H. Both yellow beacons shall be dark for approximately 50 milliseconds.
I. Both yellow beacons shall be illuminated for approximately 50 milliseconds.
J. Both yellow beacons shall be dark for approximately 50 milliseconds.
K. Both yellow beacons shall be illuminated for approximately 50 milliseconds.
L. Both yellow beacons shall be dark for approximately 250 milliseconds.

The flash rate of each individual RRFB indication, as applied over the full flashing sequence, shall not be more than 5 flashes per second, to avoid frequencies that might cause seizures.

The sequence shall then be repeated until the duration time has been met and then all yellow beacons shall return to dark mode simultaneously. The duration time shall be per the Plans.

The predetermined repeating flash sequence shall be immediately initiated every time a pushbutton detector is actuated. If the RRFBs are already flashing and an actuation is received, it shall restart the duration time. There shall be no delay time programmed between actuations.

COMPENSATION

825.80: Method of Measurement

RRFBs will be measured as a single system, 2-Post Assembly or 3-Post Assembly, furnished and installed.

825.81: Basis of Payment

The work will be paid for at the contract price each under the respective item for a 2-Post Assembly System or 3-Post Assembly System. Any additional wiring, mounting equipment, or other materials or labor required to for an operating system per the Plans and Specifications shall be considered as incidental to the construction and be included in the contract price.

825.82: Payment Item

825.2	RRFB (2-Post Assembly System)	Each
825.3	RRFB (3-Post Assembly System)	Each

SECTION 900: STRUCTURES

Subsection 922: Elastomeric Bearing Pads
Add this new subsection.

SUBSECTION 922: ELASTOMERIC BEARING PADS

DESCRIPTION

922.20: General

This specification consists of the construction requirements for elastomeric bearing pads. Elastomeric bearing pads shall consist of plain or laminated bearings consisting of layers of elastomers restrained at their interfaces by bonded steel laminates.

MATERIALS

922.40: General

Elastomeric bearing pads shall meet the following requirements:

Elastomeric Bearing Pads M9.14.5

Anchor bolts M8.01.5

CONSTRUCTION METHODS

922.50: Submittals

The Contractor shall submit the following to the Engineer for approval:

1. Prior to fabrication:
    a. Written notification 30 days prior to the start of bearing production. The notification shall include the contract number, quantity, type, and size of bearing being produced, manufacturer's name, and the name of the independent testing lab.
    b. Shop drawings for approval in accordance with Subsection 5.02, 14 days prior to the start of bearing production.
2. At the time of bearing pad delivery:
    a. A certificate of compliance (COC) certifying that the elastomeric bearing pads meet the requirements of the contract specifications. The COC shall be accompanied by:
        - A mill certificate for steel laminates used in bearings, where applicable.
        - Fabricator QC test reports.
    b. Independent test results as required under Subsection 922.62.

922.51: Fabricators

Fabricators shall be in accordance with Subsection M9.14.5D.

922.52: Fabrication

Fabrication shall be in accordance with Subsection M9.14.5E.

In addition to the number of bearing pads required for the contract the Contractor shall order additional bearing pads as defined in Subsection M9.14.5G, in order to allow the Engineer to randomly select a bearing pad for testing in accordance with 922.72.

922.53: Packaging, Handling, & Storage

The bearing pads shall be packaged, handled, and stored in accordance with Subsection M9.14.5F.

All bearing devices and components shall be stored on the project in an area that provides protection from environmental and physical damage. When installed, bearings shall be clean and free of all foreign substances.

922.54 Installation

Bearing pads shall be installed only on concrete bridge seat bearing areas that have been prepared in accordance with Subsection 901.65A(3).

Bearing pads shall be installed by qualified personnel to the positions, elevations, and slopes shown on the plans and to the dimensions and offsets prescribed by the manufacturer. The bearing pads shall be adjusted, as necessary, to take into account the ambient temperature at installation and future movements of the bridge due to temperature changes, release of falsework, and shortening due to post-tensioning.

Elastomeric bearings shall be placed directly on the concrete surface provided that it is flat within the bearing area to within a tolerance of 0.005 times the smallest nominal dimension of the bearing as measured by a

straight edge from peak to valley. Bearings shall be placed on surfaces that do not deviate from the specified bridge seat slope in any direction by more than 0.01 rad.

Any bearing areas that exceed these tolerances shall be brought into compliance by grouting or use of shims as directed by the Engineer before the weight of the structure acts on the bearing.

Bearings that have an internal tapered load plates shall be marked with an arrow that points up-station in order to properly align the slope of the internal tapered load plate with the centerline of the bridge.

Sole plates that sit on the bearing shall not be welded to the beam flange in the field unless at least 1.5 in. of the steel exists between the weld and the elastomer. In no case shall the elastomer or the bond be subjected to temperatures higher than 400°F.

No beams shall be erected until the bearings have been accepted by the Engineer.

CONTRACTOR QUALITY CONTROL

922.60: General

The Contractor shall provide a Quality Control System (QC System) to ensure that all materials and workmanship meet the required specifications.

922.61: Quality Control Inspection

The Contractor shall perform QC inspection of all work items addressed under this specification. Inspection activities during placement may be performed by qualified production personnel. The Contractor's QC personnel shall have overall responsibility for the QC inspection. The Contractor shall not rely on the results of the Engineer's Acceptance inspection for QC purposes. The Engineer shall be provided with the opportunity to monitor and witness all QC inspections.

QC inspection activities must address the following three primary components:

a. Materials
b. Environmental Conditions
c. Workmanship

The minimum frequency of QC inspection activity shall be in accordance with the requirements below.

Table 922.61-1 - Minimum QC Inspection of Elastomeric Bearing Pads

Inspection Component	Inspection Attribute	Minimum Inspection Frequency	Point of Inspection	Inspection Method
Materials	Bearing Pad	Each Delivery	Bearing Pad	Check COC
	Geometry and Surface	Each Bearing Pad	Bearing Pad Surface	Visual Check & Check Measurement
Environmental Conditions	Temperature of Air	1 per Day	At Project Site	Check Measurement
Workmanship	Bridge Seat	Each Bearing Location	Bearing Pad Location	Visual Check
	Elevation	Each Bearing Pad	Bearing Pad Location	Check Measurement
	Orientation	Each Bearing Pad	Bearing Pad Location	Check Measurement

922.62: Quality Control Sampling and Testing Requirements

The Contractor shall have each Lot of bearing pads sampled and tested in accordance with Subsection M9.14.5G. This shall include both QC and compliant independent laboratory test results.

DEPARTMENT ACCEPTANCE

922.70: General

The Department shall sample and test bearing pads as part of its Acceptance activities. Independent testing shall also be used to supplement its testing.

922.71: Acceptance Inspection

The Engineer will perform Acceptance inspection to ensure that materials and completed work are in conformance with the contract requirements. Acceptance inspection is intended to visually assess the quality of each Lot produced and placed and will address only the inspection components of materials and workmanship in support of the Department's final Acceptance determination. All Acceptance inspection activities by the Department will be performed independent of the Contractor's QC inspection.

Table 922.71-1 – Department Acceptance Inspection of Elastomeric Bearing Pads

Inspection Component	Inspection Attribute	Minimum Inspection Frequency	Point of Inspection	Inspection Method
Materials	Bearing Pad	1 Per Bearing Pad	Bearing Pad Surface	Check COC
	Geometry and Surface	1 Per Bearing Pad	Bearing Pad Surface	Visual Check & Check Measurement
Workmanship	Elevation	1 per Bearing Pad	Bearing Pad Location	Check Measurement
	Orientation	1 per Bearing Pad	Bearing Pad Location	Check Measurement

922.72: Acceptance Sampling and Testing Requirements

For Acceptance samples taken by the Engineer at the project, the sampling rate shall be in accordance with Subsection M9.14.5G. Bearing pads shall be tested by the Department in accordance with Table M9.14.5-1.

922.73: Lot Acceptance Determination Based on Inspection Results

The Engineer's Acceptance inspection results will be used in the final Acceptance determination for all Lots. Prior to final Acceptance of each Lot produced and placed, the Engineer will evaluate all Acceptance inspection information for the Lot. The materials and product workmanship for the completed work will be evaluated for conformance with the plans and the requirements specified in Subsections 922.60, 922.61, and 922.62.

When the Acceptance information identifies deficiencies in either material quality or product workmanship, the location will be isolated and further evaluated by the Engineer through additional Acceptance inspection. Depending upon the findings of the additional Acceptance inspection activity, the Engineer will determine the disposition of the nonconforming work in accordance with Division I, Subsection 5.03, Conformity with Plans and Specifications.

922.74: Lot Acceptance Determination Based on Testing Data

Prior to final Acceptance of each Lot, the Engineer will evaluate all available QC, independent, and Acceptance testing data for the Lot to determine conformance with the minimum requirements in Subsection M9.14.5G and Table M9.14.5-1.

If a test result does not meet the minimum requirement, the Contractor and Engineer will further assess the quality to determine whether the material can remain in place.

If the Engineer's assessment determines that the material quality is not sufficient to permit the bearing pad to remain in place, the pad shall be removed and replaced. When a nonconforming bearing pad is corrected or replaced, the Engineer will perform Acceptance testing of the replacement bearing pad and evaluate the test results for conformance with the minimum requirements.

922.75: Final Lot Acceptance Determination

For each Lot produced and placed, the Engineer will evaluate all Acceptance inspection and testing data for the Lot. The final review and visual inspection shall be conducted jointly by the Contractor and Engineer. Any items that do not meet the requirements of the specifications and plans shall be addressed at this time, at no additional cost to the Department.

After each Lot is complete, including any corrective action, the Engineer will perform a final evaluation of all Acceptance data for the Lot. The Engineer will accept the Lot if the evaluation of all inspection and testing data for the Lot is in conformance with this specification and the contract documents.

When the above requirements have been met, the Engineer will accept all completed bearing pads.

COMPENSATION

922.80: Method of Measurement

Laminated Elastomeric Bearing Pads will be measured by each pad installed. Plain Elastomeric Bearing Pads will be measured by the square foot installed. The measured quantities do not include the additional bearings required for conformance and destructive testing.

922.81: Basis of Payment

Payment under this item shall be at the contract unit price. This price will include all materials, equipment, tools and labor, additional bearing pads for testing and all required testing necessary to complete the work.

922.82: Payment Items

921.	Laminated Elastomeric Bearing Pad with Anchor Bolts	Each
922.	Laminated Elastomeric Bearing Pad without Anchor Bolts	Each
923.	Laminated Sliding Elastomeric Bearing Pad with Anchor Bolts	Each
933.	Plain Elastomeric Bearing Pad	Square Foot

SECTION 970: DAMP-PROOFING

Subsection 970.30: General
Add the following material to this subsection.

Mortar..... M4.04.0

Subsection 970.40: General
Replace the second sentence in the second paragraph with the following.

All holes in concrete surfaces shall be satisfactorily filled with mortar before damp-proofing is applied.

SUBSECTION 983: REVETMENT

Subsection 983.64 Special Slope Paving Under Bridges
Replace the last sentence under B. Quarry Stone or Precast Concrete Blocks. with the following.

Mortar shall then be placed in the joints to the top of the paved surface.

Subsection 983.65 Channel Paving and Grouted Channel Paving
Replace the last sentence with the following.

The grout shall conform to M4.04.0: Grout, Mortar, and Concrete Products.

DIVISION III

MATERIALS SPECIFICATIONS

SECTION M4: CEMENT AND CEMENT CONCRETE MATERIALS

Subsection M4.02.00 Cement Concrete
Add the following to the end of this subsection.

Alkali Silica Reactivity - Resistant Portland Cement Concrete

All cement concrete and precast/prestressed concrete products shall be alkali silica reactivity-resistant. Proportion Portland cement concrete mixes to include materials that meet either the aggregate requirement or Alkali-Silica Reactivity (ASR) mitigation criteria listed below. Provide cement mill test reports from certified laboratories that show the materials' source, composition and the cement alkali content expressed as sodium oxide equivalent(s) not to exceed 1.4%. Certified test reports according to test procedures as specified in Table A will be required to be submitted with the trial batch submission to RMS for approval every year or whenever the source of material is changed.

Select non-reactive aggregates that meet all the criteria of Table M4.02.00-2. Mitigate the mix as described below when nonreactive aggregates are unavailable. If non-reactive aggregates are used for portland cement concrete mix, 15% by weight of the cementitious content shall be fly ash meeting AASHTO M 295, Type F.

Select a material or a combination of materials that meet the criteria shown in Table M4.02.00-3 to mitigate ASR when concrete mixes must be proportioned with reactive aggregates. Perform verification test according to AASHTO T 303 and ASTM C295 to determine the effectiveness of the resulting mix design against ASR. Use the same proportion of cement and pozzolan for each test mixture as that proposed for the actual mix design. Provide the Department with certified documentation of the mixtures' effectiveness to control ASR.

Table M4.02.00-2: Tests and Criteria for Proposed Aggregates

Procedure	Description	Limits
AASHTO T 303: Accelerated Detection of Potentially Deleterious Expansion of Mortar Bars Due to Alkali-Silica Reaction	Mean mortar bar expansion at 14 days. Perform a polynomial fit (1) of 4, 7, 11, and 14 days to determine reliability of results	0.08% maximum metamorphic aggregate; 0.10% maximum all other aggregates. Repeat AASHTO T 303 if r^2 is less than 0.95.
ASTM C295: Petrographic Examination of Aggregates for Concrete	Optically strained, microfractured, or microcrystalline quartz	5.0% maximum (2)
	Chert or chalcedony	3.0% maximum (2)
	Tridymite or cristobolite	1.0% maximum (2)
	Opal	0.5% maximum (2)
	Natural volcanic glass	3.0% maximum (2)

(1) Use a second order polynomial of $\%Exp = A^o + A^1 SQRT(t) + A^2t$. See publication SD92-04-F.
(2) Based on the total aggregate sample.

Table M4.02.00-3: Mitigation Methods for ASR in Portland Cement Concrete

Material	Specification	Cementitious Material Percentage (1)
Low alkali cement (2)	AASHTO M 85	100%
Fly ash - Class F	AASHTO M 295	15% minimum to 30% (4) maximum
Silica Fume (5)	AASHTO M 307	6% ± 1% (6)
Slag Grade 100 and 120	AASHTO M 302	25% minimum to 50% maximum

(1) Measure this minimum content of cementitious material as percent by weight of cement plus pozzolan.
(2) This single criterion is not effective in all cases in remediating ASR. Low alkali cement (0.60% maximum (3)) must be used in combination with other pozzolanic materials in Table B.
(3) Na_2O equivalent = $\%Na_2O + 0.658\ (\%K_2O)$
(4) Fly ash, Type F, shall replace 15% by weight of the design cement content, and any additional fly ash will be considered as fine aggregate.
(5) Silica fume shall only be used in silica fume cement concrete.
(6) The total amount of Type F fly ash and silica fume shall constitute 20% by weight of the design cement content, and any additional fly ash shall be considered as fine aggregate.

Subsection M4.02.15 Cement Mortar
Delete this subsection.

Subsection M4.04.0: Grout, Mortar and Concrete Products
Replace this subection with the following.

M4.04.0: Grout, Mortar, and Concrete Products

Grout, cementitious mortar, and concrete products shall be packaged, dry, and preblended with preformulated constituent materials (excluding mixing water) to produce a material with acceptable quality characteristics and material properties, including time of set, compressive strength, flexural strength, slant shear bond strength, resistance to alkali silica reaction, freezing/thawing, and de-icing cycles, shrinkage, expansion, and sulfate reaction.

Mortar products shall be defined as products containing aggregate of which less than 5% by mass of the total mixture is retained on the 3/8 in. sieve. Mortar products for concrete repairs shall be used only on repair depths of 2 in. or less. Concrete products shall be defined as products containing aggregate of which 5% or more by mass of the total mixture is retained on the 3/8 in. sieve. Concrete products for concrete repairs shall be used only on repair depths greater than 2 in.

The aggregate sources included in the prepackaged product or extended into the product shall meet Section M4.02.02: Aggregates. Grout, cementitious mortar, and concrete products shall only be applied per the requirements provided on the product's technical data sheet. Grout, cementitious mortar, and concrete products shall maintain valid listing on the MassDOT Qualified Construction Materials List (QCML). Grout, cementitious mortar, and concrete products shall meet requirements specified herein.

A. Technical Data Sheet.

The Manufacturer shall submit the product's technical data sheet to the Department for review. At a minimum, the product's technical data sheets shall include:

(a) Product Name
(b) Manufacturer, including address and contact information
(c) Packaging
(d) Yield
(e) Product Description, including an overview of the product and its intended application(s) and use(s).
(f) Technical Data, including quality characteristics and corresponding performance criteria with the AASHTO and/or ASTM standard test methods identified.

(g) Recommended Equipment
(h) Instructions, including surface preparation, mixing, forming, placing, finishing, curing, and protection from adverse conditions, such as precipitation, cold conditions, and hot conditions.
(i) Limitations
(j) Storage and Shelf Life
(k) Safety

B. Mix Design Formulation.

Products that are extended with aggregate not included in the original product packaging shall be formulated per the product's technical data sheet and evaluated through Department mix design evaluation and verification testing. Producers shall report and submit proposed mix design formulations onto the Department issued mix design sheet. The Producer shall select an AASHTO accredited independent laboratory to conduct verification testing. The sampling and testing conducted by the independent laboratory shall be witnessed by the Department.

C. Product Verification Testing.

Verification test results shall be within the limits specified herein.

M4.04.1: Conventional Grout, Cementitious Mortar, and Concrete Products

Conventional grout, cementitious mortar, and concrete products shall meet the requirements of Section M4: Cement and Cement Concrete Materials, performance criteria of the product's technical data sheet, and the requirements specified herein.

M4.04.2: Rapid Hardening Cementitious Mortar and Concrete Products

Rapid hardening cementitious mortar and concrete products shall meet the requirements and performance criteria of the product's technical data sheet, ASTM C928 Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs, and Table M4.04.2-2.

Table M4.04.2-1: Types of Rapid Hardening Cementitious Products for Concrete Repairs

Type	Description	Application
R1	General Rapid Hardening	Vertical and Overhead Repairs
R2	Medium Rapid Hardening	Vertical and Overhead Repairs
R3	Very Rapid Hardening	Horizontal, Vertical, and Overhead Repairs

Table M4.04.2-2: Verification Testing Requirements

Property	Method	Quality Characteristic		Limits					
				R1		R2		R3	
				Min.	Max.	Min.	Max.	Min.	Max.
Setting	T 197	Initial Set (min.)		Technical Data Sheet					
		Final Set (min.)		Technical Data Sheet					
Strength	T 97[1]	Flexural Strength (psi)	24 Hours	–	–	–	–	650	–
			7 Days	–	–	–	–	–	–
Durability	T 358	Surface Chloride Ion Penetration Resistance (kΩ-cm)	28 Days	21	–	21	–	21	–
	T 161 (A)	Relative Durability Factor		90	–	90	–	90	–
		Mass Loss (%)		–	6.0	–	6.0	–	6.0
[1] Not applicable to vertical and overhead repair applications.									

M4.04.3: Mortar Products for Unit Masonry

Mortar products for unit masonry shall meet the requirements and performance criteria of the product's technical data sheet and Type M specified in ASTM C270 Standard Specification for Mortar for Unit Masonry. Field proportioned cement mortar for laying brick and block shall be composed of 1 part Portland cement and 2 parts of fine aggregate by volume with a sufficient amount of water to form a workable mixture, while still achieving the properties specified herein.

M4.04.4: Grout Products for Unit Masonry

Grout products for unit masonry shall meet the requirements and performance criteria of the product's technical data sheet and ASTM C476 Standard Specification for Grout for Masonry.

M4.04.5: Non-Shrink Grout Products

Non-shrink grout products are intended for use under applied load, including supporting a structure, transfer medium between load-bearing members, shear keys, and other non-shrink applications, where a change in height below initial placement height is to be avoided. Non-shrink grout products shall meet the requirements and performance criteria of the product's technical data sheet and ASTM C1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

SECTION M5: PIPE, CULVERT SECTIONS AND CONDUIT

Subsection M5.01.0: Joint Material for Pipe
Replace M4.02.15 Cement Mortar with M4.04.0 Grout, Mortar, and Concrete Products in paragraph B.

SECTION M8: METALS AND RELATED MATERIALS

Subsection M8.18.1: Traffic Signal Supports
Delete the heading Posts and the two paragraphs under it. Delete the heading Bases and the three paragraphs under it.

SECTION M9: MISELLANEOUS MATERIALS

Subsection M9.14.5: Elastomeric Bridge Bearing Pads
Replace this subsection with the following:

M9.14.5: Elastomeric Bearing Pads

A. General Requirements

Elastomeric bearing pads shall be plain or laminated. They shall meet the applicable requirements of AASHTO M 251, the MassDOT Bridge Manual, and the AASHTO LRFD Bridge Design and Construction Specifications. The type of bearing will be specified on the plans.

Laminated elastomeric bearing pads consist of layers of elastomers restrained at their interfaces by bonded metal laminates.

B. Material Requirements

Plain elastomeric bearing pads shall consist of elastomer.

Laminated elastomeric bearing pad shall consist of:

- Elastomer
- Internal Steel Laminates
- Tapered Internal Load Plates (if used)

The components of the elastomeric bearing pad shall conform to AASHTO M 251 and the following:

- The elastomer compound shall be 100% virgin neoprene and classified as being of low-temperature grade 3.
- The steel laminates shall meet the requirements of ASTM A 1011 Grade 36 or higher

C. Material Qualification

Elastomeric bearing pads shall be approved on a project basis. The Contractor shall furnish to the Research and Materials Section certified independent test reports demonstrating conformance. All testing shall be performed by the same independent lab in accordance with Subsection M9.14.5G.

D. Fabricators

Bearing shall be fabricated by a fabricator listed on the MassDOT Qualified Construction Materials List (QCML).

E. Fabrication

Fabrication shall not begin until the shop drawings have been approved and the Department has an inspector at the fabricator's facility.

The shop drawings shall specify bearing dimensions as shown on the plans and, where applicable, shall include:

- Elastomer thickness and edge cover,
- Number and thickness of steel reinforcing laminates,
- Dimensions of load plates (if any),
- Design shear modulus of the elastomer shall be as shown on the Plans.

Plain elastomeric bearing pads shall be fabricated and tested in accordance with the "Method A" design outlined in the AASHTO LRFD Bridge Design Specifications.

Laminated elastomeric bearing pads shall be fabricated and tested in accordance with the "Method B" design outlined in the AASHTO LRFD Bridge Design Specifications.

The manufacturer shall designate the bearings in each Lot, as described in Subsection M9.14.5G, and certify that each bearing in the Lot was manufactured in a reasonably continuous manner from the same batch of elastomer and cured under the same conditions. In addition, the manufacturer shall certify that each bearing in the Lot satisfies the requirements of this specification, AASHTO M 251, the AASHTO LRFD Bridge Construction Specifications, and the contract plans and documents.

The tolerances on the overall dimensions for the bearings shall be according to Table 2 of AASHTO M 251, except that the tolerance on the overall vertical dimension shall be limited to 0, +1/8" regardless of the design thickness.

All steel included in the final bearing product must conform to Buy America Requirements.

F. Packaging, Handling, & Storage

The bearing pads shall be packaged, handled, and stored as specified below:

Prior to shipment from the point of manufacture, bearings shall be packaged in such a manner to ensure that during shipment and storage the bearings will be protected against damage from handling, weather, or any normal hazard. Each completed bearing shall have its components clearly identified, be securely bolted, strapped, or otherwise fastened to prevent any relative movement, and be marked on it top as to location and orientation in each structure in the project in conformity with the contract documents.

Each elastomeric bearing shall be marked in indelible ink or flexible paint. The marking shall consist of the order number, lot number, bearing identification number, and elastomer type and grade per AASHTO M 251. For bearing pads fabricated with a tapered internal load plate, a 1/32" deep direction arrow shall be inscribed into the bearing which will allow the bearing to be aligned with the up-station direction. All marks shall be permanent and be visible after the bearing is installed.

G. Testing Requirements

Quality Control System

Fabricators shall perform Quality Control (QC) testing in accordance with their quality system. QC test reports shall accompany the bearing pads when delivered to the project.

Acceptance System

MassDOT will evaluate the fabricator's quality system and QC test reports. It will also perform its own testing and verify the independent laboratory's test reports, if applicable.

Lot Sizes

Sampling of bearing pads for testing shall be random and performed on a Lot basis. A Lot of bearings shall be a group of 100 or fewer bearings that are:

- For a single contract,
- Cured under the same conditions,
- The same size and configuration,
- Manufactured in a reasonably continuous manner from the same batch of elastomer.

Testing of Plain Bearings

Testing Laboratory

Plain elastomeric bearing pads shall be tested by both an independent laboratory and MassDOT:

- Independent testing shall be performed by a nationally recognized third-party laboratory approved by the Research & Materials Section.
- Acceptance testing shall be performed by the Research and Materials.

Sampling Frequency

Each Lot of plain bearings shall be randomly sampled for testing. The Contractor shall ensure that the fabricator produces the additional bearings required for testing.

Samples for independent testing shall be selected by the fabricator. The sampling rate for the independent

testing shall be as follows:

- Lot sizes less than 10 bearings – One full-size bearing per Lot.
- Lot sizes greater than or equal to 10 bearings – Two full-size bearings per lot.

Samples for Acceptance testing shall be selected by the Engineer. The sampling rate for Acceptance testing shall be one bearing pad per lot.

Testing Requirements

The laboratory shall test the bearings in accordance with Sections 8 and 9 of AASHTO M 251 as specified below:

1. Dimensions per Section 8.4.
2. Elastomer per Section 8.6.
    - The hardness, tensile strength, and ultimate elongation shall be in accordance with Table 1 of AASHTO M 251.
3. Test procedures per Section 8.9.
    - Heat resistance per Section 8.9.3.

Testing of Laminated Bearings

Testing Laboratory

Laminated elastomeric bearing pads shall be tested by both an independent laboratory and MassDOT:

- Independent testing shall be performed by a nationally recognized third-party laboratory approved by the Research & Materials Section.
- Acceptance testing shall be performed by the Research and Materials.

Sampling Frequency

Each Lot of laminated bearings shall be randomly sampled for testing. The Contractor shall ensure that the fabricator produces the additional bearings required for testing.

Samples for independent testing shall be selected by the fabricator. The sampling rate for the independent testing shall be as follows:

- Lot sizes less than 10 bearings – One full-size bearing per Lot.
- Lots sizes greater than or equal to 10 bearings:
    - One full-size bearing per every twenty per lot, or a minimum of two bearings.
    - The number of laminated bearings to sample shall be determined by taking the Lot size divided by 20. If the integer part of this calculation is 0 or 1, then two bearings shall be sampled. For example, if the lot size is 58 laminated bearings, two bearings shall be sampled; if the lot size is 65, three bearings shall be sampled; and if the lot size is 22, two bearings shall be sampled.

Samples for Acceptance testing shall be selected by the Engineer. The sampling rate for Acceptance testing shall be one bearing pad per lot.

Testing Requirements

Testing of the bearings shall be in accordance with Sections 8 and 9 of AASHTO M 251 as specified below:

1. Dimensions per Section 8.4.
2. Elastomer per Section 8.6.
    - The hardness, tensile strength, and ultimate elongation shall be in accordance with Table 1 of AASHTO M 251.
3. Compressive strain at the maximum design dead plus live service compressive load per Section 8.8.1.1.

- The compressive deflection, as determined per Section 9.1., between the two loadings for each bearing tested shall not exceed 10%.

4. Bond via Compressive Load per Section 8.8.2.2.
5. Shear Modulus of the elastomer per Section 8.8.3.
    - Shear modulus shall meet the requirements on the plans.
6. Test procedures per Section 8.9.
    a. Additional Low Temperature Shear Modulus testing per Section 8.9.1.
    b. Heat resistance per Section 8.9.3.
    c. Compression set per Section 8.9.4.
    d. Creep per Section 8.9.5.
        - The percent creep shall be less than 35%.
    e. Long Term Compression per Section 8.9.6.

Table M9.14.5-1: Department Acceptance Testing of Elastomeric Bearing Pads

Quality Characteristic	**Test Method**	**Requirement**
Hardness	ASTM D2240	From Independent Test Results ± 5 Pts
Tensile Strength	ASTM D412	≥ 2250 psi
Ultimate Elongation	ASTM D412	Minimum Elongation Based on Durometer according to AASHTO M 251 Table 1
Shear Modulus (see Note 1)	ASTM D4014	Specified Value ± 15%
After Heat Aging for 70 Hours at 100°C (Maximum Change from Unaged Testing)		
Hardness	ASTM D573	Hardness + 15 Pts
Tensile Strength	ASTM D573	Tensile Strength - 15%
Ultimate Elongation	ASTM D573	Ultimate Elongation - 40%
Note 1: Test is only required for laminated elastomeric bearing pads.		

SECTION M10: TRAFFIC CONTROL DEVICES

Subsection M10.05.0: Traffic Signal Structures (General)
Add this new subsection.

M10.05.0: Traffic Signal Structures (General)

The bases of all Traffic Signal Structures shall be supplied with a bonding lug.

Subsection M10.05.1: Signal Posts and Bases
Add this new subsection.

M10.05.1: Signal Posts and Bases

All Signal Posts shall be one-piece 4-in. diameter, Schedule 40 or Schedule 80, and machine-threaded.

Signal Posts may be fabricated from aluminum with a brushed or spun finish or from steel with a galvanized finish.

The interior of Signal Posts shall be coated as specified in Underwriters Laboratories UL-6 for enameled conduit, or aluminum conduit conforming to M5.07.1: Electrical Conduit-Rigid Metallic (Type RM), Paragraph C.

Signal Posts Bases shall be fabricated to accept the threads from the Signal Post and locked into place with set screws.

Signal Post Bases shall be fabricated from aluminum with a natural or anodized finish or galvanized cast iron.

Signal Post Bases shall be square or octagonal.

Signal Posts and Bases conform to Table M10.05.1-1.

Table M10.05.1-1: Signal Post and Base Material Requirements

Component	Material	Specification
Signal Post	Aluminum	6063-T6 (ASTM B221, B429 or B241)
Signal Post	Steel	ASTM A53, Grade A or B
Signal Post Base	Aluminum	356.0-T6 (ASTM B26, B108)
Signal Post Base	Cast Iron	AASHTO M 105

Subsection M10.11.0: RRFB Assemblies
Add this new subsection.

M10.11.0: RRFB Assemblies

Rectangular Rapid Flashing Beacon (RRFB) Assemblies shall consist of a Light Bar and an enclosure for the Controller and Activation Unit.

Light Bar

The Light Bar shall consist of two rapidly-flashed rectangular-shaped yellow indications, each with an LED-array based pulsing light source. The size of each RRFB indication shall conform to the Construction Standard Details.

The light intensity of the yellow indications during daytime conditions shall meet the minimum specifications for Class 1 yellow peak luminous intensity in the publication "Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles J595," 2005, Society of Automotive Engineers (SAE). A photocell or equivalent device shall be included to reduce the brilliance of the LED beacons during nighttime conditions.

Controller and Activation Unit

The enclosure for the Controller and Activation Unit shall be NEMA rated for outdoor use and protection against rain and sleet.

The Controller and Activation Unit shall be powered by a DC battery/solar array system or a 120 VAC service connection.

The Controller and Activation Unit shall be actuated by a pedestrian pushbutton, a passive pedestrian detection device, or both.

Communications between multiple units within the same system shall be via a 900MHz or 2.4 GHz frequency hopping spread spectrum with a minimum range of 200 ft. Multiple channels shall be available to prevent cross-communication between multiple systems located close to each other.

The Controller shall be programmable via an on-board user interface or a no-fee wireless (Wi-Fi, Bluetooth®, etc.) connection and application.

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

END OF SUPPLEMENTAL SPECIFICATIONS

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)

Section: Page 00719-

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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 **14 %**
(*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

September 18, 2024

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	$0.63
2	ASTM A27 (AASHTO M103) Steel Castings, H-Pile Points & Pipe Pile Shoes (See Note (8) below.)	$0.87
3	ASTM A668 / A668M (AASHTO M102) Steel Forgings	$0.87
4	ASTM A108 (AASHTO M169) Steel Forgings for Shear Studs	$0.90
5	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Plate	$0.96
6	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Shapes	$0.89
7	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Plate	$0.96
8	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Shapes	$0.89
9	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Plate	$1.00
10	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Shapes	$0.90
11	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W 345W Structural Steel Plate	$1.00
12	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W or 345W Structural Steel Shapes	$0.90
13	ASTM A709/A709M Grade HPS 50W / AASHTO M270M/M270 Grade HPS 50W or 345W Structural Steel Plate	$1.04
14	ASTM A709/A709M Grade HPS 70W / AASHTO M270M/M270 Grade HPS 70W or 485W Structural Steel Plate	$1.11
15	ASTM A514/A514M-05 Grade HPS 100W / AASHTO M270M/M270 Grade HPS 100W or 690W Structural Steel Plate	$1.71
16	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Plate	$1.00
17	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Shapes	$0.90
18	ASTM A276 Type 316 Stainless Steel	$5.10
19	ASTM A240 Type 316 Stainless Steel	$5.10
20	ASTM A148 Grade 80/50 Steel Castings (See Note (8) below.)	$1.76
21	ASTM A53 Grade B Structural Steel Pipe	$1.11
22	ASTM A500 Grades A, B, 36 & 50 Structural Steel Pipe	$1.11
23	ASTM A252, Grades 240 (36 KSI) & 414 (60 KSI) Pipe Pile	$0.88
24	ASTM 252, Grade 2 Permanent Steel Casing	$0.88
25	ASTM A36 (AASHTO M183) for H-piles, steel supports and sign supports	$0.94
26	ASTM A328 / A328M, Grade 50 (AASHTO M202) Steel Sheetpiling	$1.68
27	ASTM A572 / A572M, Grade 50 Sheetpiling	$1.68
28	ASTM A36/36M, Grade 50	$0.96
29	ASTM A570, Grade 50	$0.94
30	ASTM A572 (AASHTO M223), Grade 50 H-Piles	$0.96
31	ASTM A1085 Grade A (50 KSI) Steel Hollow Structural Sections (HSS), heat-treated per ASTM A1085 Supplement S1	$1.11
32	AREA 140 LB Rail and Track Accessories	$0.58

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.

*** END OF DOCUMENT ***

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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: 128112 **Project No.** 608163 **Federal Aid No.:** STP/HSI-0032(043)X

Location: WALES

Project Description: Reconstruction & Improvements on Monson Road, from the Monson T.L. to Reed Hill Road (1.5 Miles)

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.

*** END OF DOCUMENT ***

DOCUMENT 00861

STATE PREVAILING WAGE RATES

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Proposal No. 608163-128112

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

Prevailing Wage Rates

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

MAURA HEALEY
Governor

KIM DRISCOLL
Lt. Governor

LAUREN JONES
Secretary

MICHAEL FLANAGAN
Director

Awarding Authority: MassDOT Highway

Contract Number: 128112 **City/Town:** WALES

Description of Work: WALES: Federal Aid Project No. STP/HSI-0032(043)X Reconstruction & Improvements on Monson Road, from the Monson T.L. to Reed Hill Road (1.5 Miles)

Job Location: Along Monson Rd

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 within90 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.

Issue Date: 10/07/2024 **Wage Request Number:** 20241007-003

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2024	$39.95	$15.07	$18.67	$0.00	$73.69
	12/01/2024	$39.95	$15.07	$20.17	$0.00	$75.19
	01/01/2025	$39.95	$15.57	$20.17	$0.00	$75.69
	06/01/2025	$40.95	$15.57	$20.17	$0.00	$76.69
	12/01/2025	$40.95	$15.57	$21.78	$0.00	$78.30
	01/01/2026	$40.95	$16.17	$21.78	$0.00	$78.90
	06/01/2026	$41.95	$16.17	$21.78	$0.00	$79.90
	12/01/2026	$41.95	$16.17	$23.52	$0.00	$81.64
	01/01/2027	$41.95	$16.77	$23.52	$0.00	$82.24
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2024	$40.02	$15.07	$18.67	$0.00	$73.76
	12/01/2024	$40.02	$15.07	$20.17	$0.00	$75.26
	01/01/2025	$40.02	$15.57	$20.17	$0.00	$75.76
	06/01/2025	$41.02	$15.57	$20.17	$0.00	$76.76
	12/01/2025	$41.02	$15.57	$21.78	$0.00	$78.37
	01/01/2026	$41.02	$16.17	$21.78	$0.00	$78.97
	06/01/2026	$42.02	$16.17	$21.78	$0.00	$79.97
	12/01/2026	$42.02	$16.17	$23.52	$0.00	$81.71
	01/01/2027	$42.02	$16.77	$23.52	$0.00	$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2024	$40.14	$15.07	$18.67	$0.00	$73.88
	12/01/2024	$40.14	$15.07	$20.17	$0.00	$75.38
	01/01/2025	$40.14	$15.57	$20.17	$0.00	$75.88
	06/01/2025	$41.14	$15.57	$20.17	$0.00	$76.88
	12/01/2025	$41.14	$15.57	$21.78	$0.00	$78.49
	01/01/2026	$41.14	$16.17	$21.78	$0.00	$79.09
	06/01/2026	$42.14	$16.17	$21.78	$0.00	$80.09
	12/01/2026	$42.14	$16.17	$23.52	$0.00	$81.83
	01/01/2027	$42.14	$16.77	$23.52	$0.00	$82.43
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$35.30	$9.65	$17.07	$0.00	$62.02
	12/02/2024	$36.50	$9.65	$17.07	$0.00	$63.22
	06/02/2025	$37.75	$9.65	$17.07	$0.00	$64.47
	12/01/2025	$39.00	$9.65	$17.07	$0.00	$65.72
	06/01/2026	$40.30	$9.65	$17.07	$0.00	$67.02
	12/07/2026	$41.60	$9.65	$17.07	$0.00	$68.32
	06/07/2027	$43.00	$9.65	$17.07	$0.00	$69.72
	12/06/2027	$44.40	$9.65	$17.07	$0.00	$71.12
	06/05/2028	$45.90	$9.65	$17.07	$0.00	$72.62
	12/04/2028	$47.40	$9.65	$17.07	$0.00	$74.12
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
AIR TRACK OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2024	$35.30	$9.65	$15.06	$0.00	$60.01
	12/01/2024	$36.50	$9.65	$15.06	$0.00	$61.21
	06/01/2025	$37.75	$9.65	$15.06	$0.00	$62.46
	12/01/2025	$38.99	$9.65	$15.06	$0.00	$63.70
	06/01/2026	$40.29	$9.65	$15.06	$0.00	$65.00
	12/01/2026	$41.58	$9.65	$15.06	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
ASBESTOS WORKER (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)*	06/01/2024	$37.62	$14.50	$10.55	$0.00	$62.67
	12/01/2024	$38.52	$14.50	$10.55	$0.00	$63.57
	06/01/2025	$39.42	$14.50	$10.55	$0.00	$64.47
	12/01/2025	$40.32	$14.50	$10.55	$0.00	$65.37
ASPHALT RAKER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$34.80	$9.65	$17.07	$0.00	$61.52
	12/02/2024	$36.00	$9.65	$17.07	$0.00	$62.72
	06/02/2025	$37.25	$9.65	$17.07	$0.00	$63.97
	12/01/2025	$38.50	$9.65	$17.07	$0.00	$65.22
	06/01/2026	$39.80	$9.65	$17.07	$0.00	$66.52
	12/07/2026	$41.10	$9.65	$17.07	$0.00	$67.82
	06/07/2027	$42.50	$9.65	$17.07	$0.00	$69.22
	12/06/2027	$43.90	$9.65	$17.07	$0.00	$70.62
	06/05/2028	$45.40	$9.65	$17.07	$0.00	$72.12
	12/04/2028	$46.90	$9.65	$17.07	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2024	$34.80	$9.65	$15.06	$0.00	$59.51
	12/01/2024	$36.00	$9.65	$15.06	$0.00	$60.71
	06/01/2025	$37.25	$9.65	$15.06	$0.00	$61.96
	12/01/2025	$38.49	$9.65	$15.06	$0.00	$63.20
	06/01/2026	$39.79	$9.65	$15.06	$0.00	$64.50
	12/01/2026	$41.08	$9.65	$15.06	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
AUTOMATIC GRADER-EXCAVATOR (RECLAIMER) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER OPERATOR *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$34.80	$9.65	$17.07	$0.00	$61.52
	12/02/2024	$36.00	$9.65	$17.07	$0.00	$62.72
	06/02/2025	$37.25	$9.65	$17.07	$0.00	$63.97
	12/01/2025	$38.50	$9.65	$17.07	$0.00	$65.22
	06/01/2026	$39.80	$9.65	$17.07	$0.00	$66.52
	12/07/2026	$41.10	$9.65	$17.07	$0.00	$67.82
	06/07/2027	$42.50	$9.65	$17.07	$0.00	$69.22
	12/06/2027	$43.90	$9.65	$17.07	$0.00	$70.62
	06/05/2028	$45.40	$9.65	$17.07	$0.00	$72.12
	12/04/2028	$46.90	$9.65	$17.07	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BATCH/CEMENT PLANT - ON SITE *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2023	$39.03	$13.78	$15.15	$0.00	$67.96
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$35.30	$9.65	$17.07	$0.00	$62.02
	12/02/2024	$36.50	$9.65	$17.07	$0.00	$63.22
	06/02/2025	$37.75	$9.65	$17.07	$0.00	$64.47
	12/01/2025	$39.00	$9.65	$17.07	$0.00	$65.72
	06/01/2026	$40.30	$9.65	$17.07	$0.00	$67.02
	12/07/2026	$41.60	$9.65	$17.07	$0.00	$68.32
	06/07/2027	$43.00	$9.65	$17.07	$0.00	$69.72
	12/06/2027	$44.40	$9.65	$17.07	$0.00	$71.12
	06/05/2028	$45.90	$9.65	$17.07	$0.00	$72.62
	12/04/2028	$47.40	$9.65	$17.07	$0.00	$74.12
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2024	$35.30	$9.65	$15.06	$0.00	$60.01
	12/01/2024	$36.50	$9.65	$15.06	$0.00	$61.21
	06/01/2025	$37.75	$9.65	$15.06	$0.00	$62.46
	12/01/2025	$38.99	$9.65	$15.06	$0.00	$63.70
	06/01/2026	$40.29	$9.65	$15.06	$0.00	$65.00
	12/01/2026	$41.58	$9.65	$15.06	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2024	$48.12	$7.07	$20.60	$0.00	$75.79

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$31.28	$7.07	$13.22	$0.00	$51.57
2	65	$31.28	$7.07	$13.22	$0.00	$51.57
3	70	$33.68	$7.07	$14.23	$0.00	$54.98
4	75	$36.09	$7.07	$15.24	$0.00	$58.40
5	80	$38.50	$7.07	$16.25	$0.00	$61.82
6	85	$40.90	$7.07	$17.28	$0.00	$65.25
7	90	$43.31	$7.07	$18.28	$0.00	$68.66
8	95	$45.71	$7.07	$19.32	$0.00	$72.10

Notes:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)*	08/01/2024	$52.06	$11.49	$21.46	$0.00	$85.01
	02/01/2025	$53.36	$11.49	$21.46	$0.00	$86.31
	08/01/2025	$55.51	$11.49	$21.46	$0.00	$88.46
	02/01/2026	$56.86	$11.49	$21.46	$0.00	$89.81
	08/01/2026	$59.06	$11.49	$21.46	$0.00	$92.01
	02/01/2027	$60.46	$11.49	$21.46	$0.00	$93.41

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Springfield/Pittsfield*

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.03	$11.49	$21.46	$0.00	$58.98
2	60	$31.24	$11.49	$21.46	$0.00	$64.19
3	70	$36.44	$11.49	$21.46	$0.00	$69.39
4	80	$41.65	$11.49	$21.46	$0.00	$74.60
5	90	$46.85	$11.49	$21.46	$0.00	$79.80

Effective Date - 02/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.68	$11.49	$21.46	$0.00	$59.63
2	60	$32.02	$11.49	$21.46	$0.00	$64.97
3	70	$37.35	$11.49	$21.46	$0.00	$70.30
4	80	$42.69	$11.49	$21.46	$0.00	$75.64
5	90	$48.02	$11.49	$21.46	$0.00	$80.97

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/POWER SHOVEL/TREE SHREDDER /CLAM SHELL*OPERATING*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
ENGINEERS LOCAL 98						
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN	06/01/2024	$46.63	$9.65	$18.22	$0.00	$74.50
LABORERS - FOUNDATION AND MARINE	12/01/2024	$48.10	$9.65	$18.22	$0.00	$75.97
	06/01/2025	$49.60	$9.65	$18.22	$0.00	$77.47
	12/01/2025	$51.10	$9.65	$18.22	$0.00	$78.97
	06/01/2026	$52.65	$9.65	$18.22	$0.00	$80.52
	12/01/2026	$54.15	$9.65	$18.22	$0.00	$82.02
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER	06/01/2024	$45.48	$9.65	$18.22	$0.00	$73.35
LABORERS - FOUNDATION AND MARINE	12/01/2024	$46.95	$9.65	$18.22	$0.00	$74.82
	06/01/2025	$48.45	$9.65	$18.22	$0.00	$76.32
	12/01/2025	$49.95	$9.65	$18.22	$0.00	$77.82
	06/01/2026	$51.50	$9.65	$18.22	$0.00	$79.37
	12/01/2026	$53.00	$9.65	$18.22	$0.00	$80.87
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN	06/01/2024	$45.81	$9.65	$18.22	$0.00	$73.68
LABORERS - FOUNDATION AND MARINE	12/01/2024	$47.28	$9.65	$18.22	$0.00	$75.15
	06/01/2025	$48.78	$9.65	$18.22	$0.00	$76.65
	12/01/2025	$50.28	$9.65	$18.22	$0.00	$78.15
	06/01/2026	$51.83	$9.65	$18.22	$0.00	$79.70
	12/01/2026	$53.33	$9.65	$18.22	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$34.80	$9.65	$17.07	$0.00	$61.52
	12/02/2024	$36.00	$9.65	$17.07	$0.00	$62.72
	06/02/2025	$37.25	$9.65	$17.07	$0.00	$63.97
	12/01/2025	$38.50	$9.65	$17.07	$0.00	$65.22
	06/01/2026	$39.80	$9.65	$17.07	$0.00	$66.52
	12/07/2026	$41.10	$9.65	$17.07	$0.00	$67.82
	06/07/2027	$42.50	$9.65	$17.07	$0.00	$69.22
	12/06/2027	$43.90	$9.65	$17.07	$0.00	$70.62
	06/05/2028	$45.40	$9.65	$17.07	$0.00	$72.12
	12/04/2028	$46.90	$9.65	$17.07	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS LOCAL 336 - HAMPDEN HAMPSHIRE FRANKLIN*	09/01/2024	$42.36	$7.91	$18.15	$0.00	$68.42
	03/01/2025	$43.26	$7.91	$18.15	$0.00	$69.32
	09/01/2025	$44.21	$7.91	$18.15	$0.00	$70.27
	03/01/2026	$45.11	$7.91	$18.15	$0.00	$71.17
	09/01/2026	$46.06	$7.91	$18.15	$0.00	$72.12
	03/01/2027	$46.96	$7.91	$18.15	$0.00	$73.02

Apprentice - *CARPENTER - Local 336 Hampden Hampshire Franklin*

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$19.06	$7.91	$1.40	$0.00	$28.37
2	45	$19.06	$7.91	$1.40	$0.00	$28.37
3	55	$23.30	$7.91	$2.76	$0.00	$33.97
4	55	$23.30	$7.91	$2.76	$0.00	$33.97
5	70	$29.65	$7.91	$15.39	$0.00	$52.95
6	70	$29.65	$7.91	$15.39	$0.00	$52.95
7	80	$33.89	$7.91	$16.77	$0.00	$58.57
8	80	$33.89	$7.91	$16.77	$0.00	$58.57

Effective Date - 03/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$19.47	$7.91	$1.40	$0.00	$28.78
2	45	$19.47	$7.91	$1.40	$0.00	$28.78
3	55	$23.79	$7.91	$2.76	$0.00	$34.46
4	55	$23.79	$7.91	$2.76	$0.00	$34.46
5	70	$30.28	$7.91	$15.39	$0.00	$53.58
6	70	$30.28	$7.91	$15.39	$0.00	$53.58
7	80	$34.61	$7.91	$16.77	$0.00	$59.29
8	80	$34.61	$7.91	$16.77	$0.00	$59.29

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARPENTER WOOD FRAME *CARPENTERS-ZONE 3 (Wood Frame)*	10/01/2024	$26.65	$7.02	$4.80	$0.00	$38.47
	10/01/2025	$27.75	$7.02	$4.80	$0.00	$39.57
	10/01/2026	$28.85	$7.02	$4.80	$0.00	$40.67

All Aspects of New Wood Frame Work

Apprentice - *CARPENTER (Wood Frame) - Zone 3*

Effective Date - 10/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$15.99	$7.02	$0.00	$0.00	$23.01
2	60	$15.99	$7.02	$0.00	$0.00	$23.01
3	65	$17.32	$7.02	$1.00	$0.00	$25.34
4	70	$18.66	$7.02	$1.00	$0.00	$26.68
5	75	$19.99	$7.02	$4.80	$0.00	$31.81
6	80	$21.32	$7.02	$4.80	$0.00	$33.14
7	85	$22.65	$7.02	$4.80	$0.00	$34.47
8	90	$23.99	$7.02	$4.80	$0.00	$35.81

Effective Date - 10/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$16.65	$7.02	$0.00	$0.00	$23.67
2	60	$16.65	$7.02	$0.00	$0.00	$23.67
3	65	$18.04	$7.02	$1.00	$0.00	$26.06
4	70	$19.43	$7.02	$1.00	$0.00	$27.45
5	75	$20.81	$7.02	$4.80	$0.00	$32.63
6	80	$22.20	$7.02	$4.80	$0.00	$34.02
7	85	$23.59	$7.02	$4.80	$0.00	$35.41
8	90	$24.98	$7.02	$4.80	$0.00	$36.80

Notes:
% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $18.52/ 3&4 $21.07/ 5&6 $28.70/ 7&8 $31.26

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)*	01/01/2024	$44.68	$12.90	$18.66	$1.25	$77.49

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CEMENT MASONRY/PLASTERING - Springfield/Pittsfield*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.34	$12.90	$15.86	$0.00	$51.10
2	60	$26.81	$12.90	$18.66	$1.25	$59.62
3	65	$29.04	$12.90	$18.66	$1.25	$61.85
4	70	$31.28	$12.90	$18.66	$1.25	$64.09
5	75	$33.51	$12.90	$18.66	$1.25	$66.32
6	80	$35.74	$12.90	$18.66	$1.25	$68.55
7	90	$40.21	$12.90	$18.66	$1.25	$73.02

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$34.80	$9.65	$17.07	$0.00	$61.52
	12/02/2024	$36.00	$9.65	$17.07	$0.00	$62.72
	06/02/2025	$37.25	$9.65	$17.07	$0.00	$63.97
	12/01/2025	$38.50	$9.65	$17.07	$0.00	$65.22
	06/01/2026	$39.80	$9.65	$17.07	$0.00	$66.52
	12/07/2026	$41.10	$9.65	$17.07	$0.00	$67.82
	06/07/2027	$42.50	$9.65	$17.07	$0.00	$69.22
	12/06/2027	$43.90	$9.65	$17.07	$0.00	$70.62
	06/05/2028	$45.40	$9.65	$17.07	$0.00	$72.12
	12/04/2028	$46.90	$9.65	$17.07	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.78	$15.15	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CRANE OPERATOR *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$43.06	$13.78	$15.15	$0.00	$71.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 3*	07/01/2024	$57.26	$9.95	$23.95	$0.00	$91.16
	01/01/2025	$58.46	$9.95	$23.95	$0.00	$92.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.63	$9.95	$0.00	$0.00	$38.58
2	55	$31.49	$9.95	$6.66	$0.00	$48.10
3	60	$34.36	$9.95	$7.26	$0.00	$51.57
4	65	$37.22	$9.95	$7.87	$0.00	$55.04
5	70	$40.08	$9.95	$20.32	$0.00	$70.35
6	75	$42.95	$9.95	$20.93	$0.00	$73.83
7	80	$45.81	$9.95	$21.53	$0.00	$77.29
8	90	$51.53	$9.95	$22.74	$0.00	$84.22

Effective Date - 01/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$29.23	$9.95	$0.00	$0.00	$39.18
2	55	$32.15	$9.95	$6.66	$0.00	$48.76
3	60	$35.08	$9.95	$7.26	$0.00	$52.29
4	65	$38.00	$9.95	$7.87	$0.00	$55.82
5	70	$40.92	$9.95	$20.32	$0.00	$71.19
6	75	$43.85	$9.95	$20.93	$0.00	$74.73
7	80	$46.77	$9.95	$21.53	$0.00	$78.25
8	90	$52.61	$9.95	$22.74	$0.00	$85.30

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 3 (BUILDING & SITE)*	06/10/2024	$45.53	$9.65	$18.40	$0.00	$73.58
	12/02/2024	$47.00	$9.65	$18.40	$0.00	$75.05
	06/02/2025	$48.50	$9.65	$18.40	$0.00	$76.55
	12/01/2025	$50.00	$9.65	$18.40	$0.00	$78.05
	06/01/2026	$51.55	$9.65	$18.40	$0.00	$79.60
	12/07/2026	$53.05	$9.65	$18.40	$0.00	$81.10
	06/07/2027	$54.65	$9.65	$18.40	$0.00	$82.70
	12/06/2027	$56.25	$9.65	$18.40	$0.00	$84.30
	06/05/2028	$57.93	$9.65	$18.40	$0.00	$85.98
	12/04/2028	$59.60	$9.65	$18.40	$0.00	$87.65

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: BACKHOE/LOADER/HAMMER OPERATOR	06/10/2024	$46.53	$9.65	$18.40	$0.00	$74.58
LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2024	$48.00	$9.65	$18.40	$0.00	$76.05
	06/02/2025	$49.50	$9.65	$18.40	$0.00	$77.55
	12/01/2025	$51.00	$9.65	$18.40	$0.00	$79.05
	06/01/2026	$52.55	$9.65	$18.40	$0.00	$80.60
	12/07/2026	$54.05	$9.65	$18.40	$0.00	$82.10
	06/07/2027	$55.65	$9.65	$18.40	$0.00	$83.70
	12/06/2027	$57.25	$9.65	$18.40	$0.00	$85.30
	06/05/2028	$58.93	$9.65	$18.40	$0.00	$86.98
	12/04/2028	$60.60	$9.65	$18.40	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS	06/10/2024	$46.28	$9.65	$18.40	$0.00	$74.33
LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2024	$47.75	$9.65	$18.40	$0.00	$75.80
	06/02/2025	$49.25	$9.65	$18.40	$0.00	$77.30
	12/01/2025	$50.75	$9.65	$18.40	$0.00	$78.80
	06/01/2026	$52.30	$9.65	$18.40	$0.00	$80.35
	12/07/2026	$53.80	$9.65	$18.40	$0.00	$81.85
	06/07/2027	$55.40	$9.65	$18.40	$0.00	$83.45
	12/06/2027	$57.00	$9.65	$18.40	$0.00	$85.05
	06/05/2028	$58.68	$9.65	$18.40	$0.00	$86.73
	12/04/2028	$60.35	$9.65	$18.40	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER	06/10/2024	$46.53	$9.65	$18.40	$0.00	$74.58
LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2024	$48.00	$9.65	$18.40	$0.00	$76.05
	06/02/2025	$49.50	$9.65	$18.40	$0.00	$77.55
	12/01/2025	$51.00	$9.65	$18.40	$0.00	$79.05
	06/01/2026	$52.55	$9.65	$18.40	$0.00	$80.60
	12/07/2026	$54.05	$9.65	$18.40	$0.00	$82.10
	06/07/2027	$55.65	$9.65	$18.40	$0.00	$83.70
	12/06/2027	$57.25	$9.65	$18.40	$0.00	$85.30
	06/05/2028	$58.93	$9.65	$18.40	$0.00	$86.98
	12/04/2028	$60.60	$9.65	$18.40	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR	06/10/2024	$46.28	$9.65	$18.40	$0.00	$74.33
LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2024	$47.75	$9.65	$18.40	$0.00	$75.80
	06/02/2025	$49.25	$9.65	$18.40	$0.00	$77.30
	12/01/2025	$50.75	$9.65	$18.40	$0.00	$78.80
	06/01/2026	$52.30	$9.65	$18.40	$0.00	$80.35
	12/07/2026	$53.80	$9.65	$18.40	$0.00	$81.85
	06/07/2027	$55.40	$9.65	$18.40	$0.00	$83.45
	12/06/2027	$57.00	$9.65	$18.40	$0.00	$85.05
	06/05/2028	$58.68	$9.65	$18.40	$0.00	$86.73
	12/04/2028	$60.35	$9.65	$18.40	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: WRECKING LABORER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/10/2024	$45.53	$9.65	$18.40	$0.00	$73.58
	12/02/2024	$47.00	$9.65	$18.40	$0.00	$75.05
	06/02/2025	$48.50	$9.65	$18.40	$0.00	$76.55
	12/01/2025	$50.00	$9.65	$18.40	$0.00	$78.05
	06/01/2026	$51.55	$9.65	$18.40	$0.00	$79.60
	12/07/2026	$53.05	$9.65	$18.40	$0.00	$81.10
	06/07/2027	$54.65	$9.65	$18.40	$0.00	$82.70
	12/06/2027	$56.25	$9.65	$18.40	$0.00	$84.30
	06/05/2028	$57.93	$9.65	$18.40	$0.00	$85.98
	12/04/2028	$59.60	$9.65	$18.40	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$68.70	$9.40	$23.12	$0.00	$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$73.60	$9.40	$23.12	$0.00	$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) *DRAWBRIDGE - SEIU LOCAL 888*	07/01/2020	$26.77	$6.67	$3.93	$0.16	$37.53
ELECTRICIAN (Including Core Drilling) *ELECTRICIANS LOCAL 7*	06/30/2024	$50.01	$13.00	$14.86	$0.00	$77.87
	12/29/2024	$51.06	$13.25	$15.06	$0.00	$79.37
	06/29/2025	$52.16	$13.50	$15.21	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$15.36	$0.00	$82.37
	06/28/2026	$54.41	$14.00	$15.46	$0.00	$83.87
	01/03/2027	$55.56	$14.25	$15.56	$0.00	$85.37

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELECTRICIAN - Local 7*

Effective Date - 06/30/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$20.00	$7.20	$0.60	$0.00	$27.80
2	45	$22.50	$7.20	$0.68	$0.00	$30.38
3	50	$25.01	$13.00	$7.40	$0.00	$45.41
4	55	$27.51	$13.00	$7.48	$0.00	$47.99
5	65	$32.51	$13.00	$9.64	$0.00	$55.15
6	70	$35.01	$13.00	$11.06	$0.00	$59.07

Effective Date - 12/29/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$20.42	$7.35	$0.61	$0.00	$28.38
2	45	$22.98	$7.35	$0.69	$0.00	$31.02
3	50	$25.53	$13.25	$7.47	$0.00	$46.25
4	55	$28.08	$13.25	$7.54	$0.00	$48.87
5	65	$33.19	$13.25	$9.74	$0.00	$56.18
6	70	$35.74	$13.25	$11.19	$0.00	$60.18

Notes:
Steps 1-2 are 1000 hrs; Steps 3-6 are 1500 hrs.

Apprentice to Journeyworker Ratio:2:3****

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 41*	01/01/2024	$61.98	$16.18	$20.96	$0.00	$99.12
	01/01/2025	$62.83	$16.28	$21.36	$0.00	$100.47
	01/01/2026	$63.68	$16.38	$21.76	$0.00	$101.82
	01/01/2027	$64.53	$16.48	$22.16	$0.00	$103.17

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 41*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.99	$16.18	$0.00	$0.00	$47.17
2	55	$34.09	$16.18	$20.96	$0.00	$71.23
3	65	$40.29	$16.18	$20.96	$0.00	$77.43
4	70	$43.39	$16.18	$20.96	$0.00	$80.53
5	80	$49.58	$16.18	$20.96	$0.00	$86.72

Effective Date - 01/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.42	$16.28	$0.00	$0.00	$47.70
2	55	$34.56	$16.28	$21.36	$0.00	$72.20
3	65	$40.84	$16.28	$21.36	$0.00	$78.48
4	70	$43.98	$16.28	$21.36	$0.00	$81.62
5	80	$50.26	$16.28	$21.36	$0.00	$87.90

Notes:
Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 41*	01/01/2024	$43.39	$16.18	$20.96	$0.00	$80.53
	01/01/2025	$43.98	$16.28	$21.36	$0.00	$81.62
	01/01/2026	$44.58	$16.38	$21.76	$0.00	$82.72
	01/01/2027	$45.17	$16.48	$22.16	$0.00	$83.81
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2024	$34.80	$9.65	$15.06	$0.00	$59.51
	12/01/2024	$36.00	$9.65	$15.06	$0.00	$60.71
	06/01/2025	$37.25	$9.65	$15.06	$0.00	$61.96
	12/01/2025	$38.49	$9.65	$15.06	$0.00	$63.20
	06/01/2026	$39.79	$9.65	$15.06	$0.00	$64.50
	12/01/2026	$41.08	$9.65	$15.06	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FIELD ENG.INST/ROD-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$18.84	$4.80	$4.10	$0.00	$27.74
FIELD ENG.PARTY CHIEF:BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$21.33	$4.80	$4.10	$0.00	$30.23
FIELD ENG.SURVEY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$22.33	$4.80	$4.10	$0.00	$31.23
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 7*	06/30/2024	$50.01	$13.00	$14.86	$0.00	$77.87
	12/29/2024	$51.06	$13.25	$15.06	$0.00	$79.37
	06/29/2025	$52.16	$13.50	$15.21	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$15.36	$0.00	$82.37
	06/28/2026	$54.41	$14.00	$15.46	$0.00	$83.87
	01/03/2027	$55.56	$14.25	$15.56	$0.00	$85.37
For apprentice rates see "Apprentice- ELECTRICIAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING *ELECTRICIANS LOCAL 7*	06/30/2024	$50.01	$13.00	$14.86	$0.00	$77.87
	12/29/2024	$51.06	$13.25	$15.06	$0.00	$79.37
	06/29/2025	$52.16	$13.50	$15.21	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$15.36	$0.00	$82.37
	06/28/2026	$54.41	$14.00	$15.46	$0.00	$83.87
	01/03/2027	$55.56	$14.25	$15.56	$0.00	$85.37
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.78	$15.15	$0.00	$67.96

Apprentice - *OPERATING ENGINEERS - Local 98 Class 3*

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.42	$13.78	$15.15	$0.00	$52.35
2	70	$27.32	$13.78	$15.15	$0.00	$56.25
3	80	$31.22	$13.78	$15.15	$0.00	$60.15
4	90	$35.13	$13.78	$15.15	$0.00	$64.06

Notes:
Steps 1-2 are 1000 hrs.; Steps 3-4 are 2000 hrs.

Apprentice to Journeyworker Ratio:1:6

FLAGGER & SIGNALER (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2024	$27.01	$9.65	$15.06	$0.00	$51.72
	12/01/2024	$27.01	$9.65	$15.06	$0.00	$51.72
	06/01/2025	$28.09	$9.65	$15.06	$0.00	$52.80
	12/01/2025	$28.09	$9.65	$15.06	$0.00	$52.80
	06/01/2026	$29.21	$9.65	$15.06	$0.00	$53.92
	12/01/2026	$29.21	$9.65	$15.06	$0.00	$53.92
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE III*	09/01/2024	$42.36	$7.91	$18.15	$0.00	$68.42
	03/01/2025	$43.26	$7.91	$18.15	$0.00	$69.32
	09/01/2025	$44.21	$7.91	$18.15	$0.00	$70.27
	03/01/2026	$45.11	$7.91	$18.15	$0.00	$71.17
	09/01/2026	$46.06	$7.91	$18.15	$0.00	$72.12
	03/01/2027	$46.96	$7.91	$18.15	$0.00	$73.02

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *FLOORCOVERER - Local 2168 Zone III*

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.18	$7.91	$1.38	$0.00	$30.47
2	55	$23.30	$7.91	$1.38	$0.00	$32.59
3	60	$25.42	$7.91	$2.76	$0.00	$36.09
4	65	$27.53	$7.91	$2.76	$0.00	$38.20
5	70	$29.65	$7.91	$15.39	$0.00	$52.95
6	75	$31.77	$7.91	$15.39	$0.00	$55.07
7	80	$33.89	$7.91	$16.77	$0.00	$58.57
8	85	$36.01	$7.91	$16.77	$0.00	$60.69

Effective Date - 03/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.63	$7.91	$1.38	$0.00	$30.92
2	55	$23.79	$7.91	$1.38	$0.00	$33.08
3	60	$25.96	$7.91	$2.76	$0.00	$36.63
4	65	$28.12	$7.91	$2.76	$0.00	$38.79
5	70	$30.28	$7.91	$15.39	$0.00	$53.58
6	75	$32.45	$7.91	$15.39	$0.00	$55.75
7	80	$34.61	$7.91	$16.77	$0.00	$59.29
8	85	$36.77	$7.91	$16.77	$0.00	$61.45

Notes: Steps are 750 hrs.
% After 10/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
Step 1&2 $26.72.24/ 3&4 $32.11/ 5&6 $50.75/ 7&8 $56.14

Apprentice to Journeyworker Ratio:1:1

FORK LIFT *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.25	$13.78	$15.15	$0.00	$68.18
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATORS/LIGHTING PLANTS *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$35.80	$13.78	$15.15	$0.00	$64.73
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 1333*	06/01/2020	$39.18	$10.80	$10.45	$0.00	$60.43

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *GLAZIER - Local 1333*

Effective Date - 06/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.59	$10.80	$1.80	$0.00	$32.19
2	56	$22.04	$10.80	$1.80	$0.00	$34.64
3	63	$24.49	$10.80	$2.45	$0.00	$37.74
4	69	$26.94	$10.80	$2.45	$0.00	$40.19
5	75	$29.39	$10.80	$3.15	$0.00	$43.34
6	81	$31.83	$10.80	$3.15	$0.00	$45.78
7	88	$34.28	$10.80	$10.45	$0.00	$55.53
8	94	$36.73	$10.80	$10.45	$0.00	$57.98

Notes:

Apprentice to Journeyworker Ratio:1:3

GRADER/TRENCHING MACHINE/DERRICK *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 63*	07/01/2024	$40.98	$12.20	$18.74	$2.13	$74.05
	01/01/2025	$42.23	$12.20	$18.74	$2.13	$75.30
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 7*	06/30/2024	$50.01	$13.00	$14.86	$0.00	$77.87
	12/29/2024	$51.06	$13.25	$15.06	$0.00	$79.37
	06/29/2025	$52.16	$13.50	$15.21	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$15.36	$0.00	$82.37
	06/28/2026	$54.41	$14.00	$15.46	$0.00	$83.87
	01/03/2027	$55.56	$14.25	$15.56	$0.00	$85.37
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 63*	07/01/2024	$40.98	$12.20	$18.74	$2.13	$74.05
	01/01/2025	$42.23	$12.20	$18.74	$2.13	$75.30
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PLUMBERS & PIPEFITTERS LOCAL 104*	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PLUMBERS & PIPEFITTERS LOCAL 104*	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2024	$35.30	$9.65	$15.06	$0.00	$60.01
	12/01/2024	$36.50	$9.65	$15.06	$0.00	$61.21
	06/01/2025	$37.75	$9.65	$15.06	$0.00	$62.46
	12/01/2025	$38.99	$9.65	$15.06	$0.00	$63.70
	06/01/2026	$40.29	$9.65	$15.06	$0.00	$65.00
	12/01/2026	$41.58	$9.65	$15.06	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)*	09/01/2024	$45.54	$14.75	$19.61	$0.00	$79.90
	09/01/2025	$48.27	$14.75	$19.61	$0.00	$82.63
	09/01/2026	$51.01	$14.75	$19.61	$0.00	$85.37

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Springfield*

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.77	$14.75	$14.32	$0.00	$51.84
2	60	$27.32	$14.75	$15.37	$0.00	$57.44
3	70	$31.88	$14.75	$16.43	$0.00	$63.06
4	80	$36.43	$14.75	$17.49	$0.00	$68.67

Effective Date - 09/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.14	$14.75	$14.32	$0.00	$53.21
2	60	$28.96	$14.75	$15.37	$0.00	$59.08
3	70	$33.79	$14.75	$16.43	$0.00	$64.97
4	80	$38.62	$14.75	$17.49	$0.00	$70.86

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (SPRINGFIELD AREA)*	03/16/2024	$40.66	$8.25	$22.70	$0.00	$71.61

Apprentice - *IRONWORKER - Local 7 Springfield*

Effective Date - 03/16/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$24.40	$8.25	$22.70	$0.00	$55.35
2	70	$28.46	$8.25	$22.70	$0.00	$59.41
3	75	$30.50	$8.25	$22.70	$0.00	$61.45
4	80	$32.53	$8.25	$22.70	$0.00	$63.48
5	85	$34.56	$8.25	$22.70	$0.00	$65.51
6	90	$36.59	$8.25	$22.70	$0.00	$67.54

Notes:

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$34.80	$9.65	$17.07	$0.00	$61.52
	12/02/2024	$36.00	$9.65	$17.07	$0.00	$62.72
	06/02/2025	$37.25	$9.65	$17.07	$0.00	$63.97
	12/01/2025	$38.50	$9.65	$17.07	$0.00	$65.22
	06/01/2026	$39.80	$9.65	$17.07	$0.00	$66.52
	12/07/2026	$41.10	$9.65	$17.07	$0.00	$67.82
	06/07/2027	$42.50	$9.65	$17.07	$0.00	$69.22
	12/06/2027	$43.90	$9.65	$17.07	$0.00	$70.62
	06/05/2028	$45.40	$9.65	$17.07	$0.00	$72.12
	12/04/2028	$46.90	$9.65	$17.07	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$34.55	$9.65	$17.07	$0.00	$61.27
	12/02/2024	$35.75	$9.65	$17.07	$0.00	$62.47
	06/02/2025	$37.00	$9.65	$17.07	$0.00	$63.72
	12/01/2025	$38.25	$9.65	$17.07	$0.00	$64.97
	06/01/2026	$39.55	$9.65	$17.07	$0.00	$66.27
	12/07/2026	$40.85	$9.65	$17.07	$0.00	$67.57
	06/07/2027	$42.25	$9.65	$17.07	$0.00	$68.97
	12/06/2027	$43.65	$9.65	$17.07	$0.00	$70.37
	06/05/2028	$45.15	$9.65	$17.07	$0.00	$71.87
	12/04/2028	$46.65	$9.65	$17.07	$0.00	$73.37

Apprentice - *LABORER - Zone 3 Building & Site*

Effective Date - 06/03/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$20.73	$9.65	$17.07	$0.00	$47.45
2	70	$24.19	$9.65	$17.07	$0.00	$50.91
3	80	$27.64	$9.65	$17.07	$0.00	$54.36
4	90	$31.10	$9.65	$17.07	$0.00	$57.82

Effective Date - 12/02/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$21.45	$9.65	$17.07	$0.00	$48.17
2	70	$25.03	$9.65	$17.07	$0.00	$51.75
3	80	$28.60	$9.65	$17.07	$0.00	$55.32
4	90	$32.18	$9.65	$17.07	$0.00	$58.90

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2024	$34.55	$9.65	$15.06	$0.00	$59.26
	12/01/2024	$35.75	$9.65	$15.06	$0.00	$60.46
	06/01/2025	$37.00	$9.65	$15.06	$0.00	$61.71
	12/01/2025	$38.24	$9.65	$15.06	$0.00	$62.95
	06/01/2026	$39.54	$9.65	$15.06	$0.00	$64.25
	12/01/2026	$40.83	$9.65	$15.06	$0.00	$65.54

Apprentice - *LABORER (Heavy & Highway) - Zone 3*

Effective Date - 06/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$20.73	$9.65	$15.06	$0.00	$45.44
2	70	$24.19	$9.65	$15.06	$0.00	$48.90
3	80	$27.64	$9.65	$15.06	$0.00	$52.35
4	90	$31.10	$9.65	$15.06	$0.00	$55.81

Effective Date - 12/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$21.45	$9.65	$15.06	$0.00	$46.16
2	70	$25.03	$9.65	$15.06	$0.00	$49.74
3	80	$28.60	$9.65	$15.06	$0.00	$53.31
4	90	$32.18	$9.65	$15.06	$0.00	$56.89

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$34.55	$9.65	$17.07	$0.00	$61.27
	12/02/2024	$35.75	$9.65	$17.07	$0.00	$62.47
	06/02/2025	$37.00	$9.65	$17.07	$0.00	$63.72
	12/01/2025	$38.25	$9.65	$17.07	$0.00	$64.97
	06/01/2026	$39.55	$9.65	$17.07	$0.00	$66.27
	12/07/2026	$40.85	$9.65	$17.07	$0.00	$67.57
	06/07/2027	$42.25	$9.65	$17.07	$0.00	$68.97
	12/06/2027	$43.65	$9.65	$17.07	$0.00	$70.37
	06/05/2028	$45.15	$9.65	$17.07	$0.00	$71.87
	12/04/2028	$46.65	$9.65	$17.07	$0.00	$73.37

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: CEMENT FINISHER TENDER	06/03/2024	$34.55	$9.65	$17.07	$0.00	$61.27
LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2024	$35.75	$9.65	$17.07	$0.00	$62.47
	06/02/2025	$37.00	$9.65	$17.07	$0.00	$63.72
	12/01/2025	$38.25	$9.65	$17.07	$0.00	$64.97
	06/01/2026	$39.55	$9.65	$17.07	$0.00	$66.27
	12/07/2026	$40.85	$9.65	$17.07	$0.00	$67.57
	06/07/2027	$42.25	$9.65	$17.07	$0.00	$68.97
	12/06/2027	$43.65	$9.65	$17.07	$0.00	$70.37
	06/05/2028	$45.15	$9.65	$17.07	$0.00	$71.87
	12/04/2028	$46.65	$9.65	$17.07	$0.00	$73.37
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER	06/03/2024	$34.47	$9.65	$17.20	$0.00	$61.32
LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2024	$35.67	$9.65	$17.20	$0.00	$62.52
	06/02/2025	$36.92	$9.65	$17.20	$0.00	$63.77
	12/01/2025	$38.17	$9.65	$17.20	$0.00	$65.02
	06/01/2026	$39.47	$9.65	$17.20	$0.00	$66.32
	12/07/2026	$40.77	$9.65	$17.20	$0.00	$67.62
	06/07/2027	$42.17	$9.65	$17.20	$0.00	$69.02
	12/06/2027	$43.57	$9.65	$17.20	$0.00	$70.42
	06/05/2028	$45.07	$9.65	$17.20	$0.00	$71.92
	12/04/2028	$46.57	$9.65	$17.20	$0.00	$73.42
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER	06/03/2024	$37.55	$9.65	$17.07	$0.00	$64.27
LABORERS - ZONE 3 (BUILDING & SITE)	12/02/2024	$38.75	$9.65	$17.07	$0.00	$65.47
	06/02/2025	$40.00	$9.65	$17.07	$0.00	$66.72
	12/01/2025	$41.25	$9.65	$17.07	$0.00	$67.97
	06/01/2026	$42.55	$9.65	$17.07	$0.00	$69.27
	12/07/2026	$43.85	$9.65	$17.07	$0.00	$70.57
	06/07/2027	$45.25	$9.65	$17.07	$0.00	$71.97
	12/06/2027	$46.65	$9.65	$17.07	$0.00	$73.37
	06/05/2028	$48.15	$9.65	$17.07	$0.00	$74.87
	12/04/2028	$49.65	$9.65	$17.07	$0.00	$76.37
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY)	06/01/2024	$34.80	$9.65	$15.06	$0.00	$59.51
LABORERS - ZONE 3 (HEAVY & HIGHWAY)	12/01/2024	$36.00	$9.65	$15.06	$0.00	$60.71
	06/01/2025	$37.25	$9.65	$15.06	$0.00	$61.96
	12/01/2025	$38.49	$9.65	$15.06	$0.00	$63.20
	06/01/2026	$39.79	$9.65	$15.06	$0.00	$64.50
	12/01/2026	$41.08	$9.65	$15.06	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$34.55	$9.65	$17.07	$0.00	$61.27
	12/02/2024	$35.75	$9.65	$17.07	$0.00	$62.47
	06/02/2025	$37.00	$9.65	$17.07	$0.00	$63.72
	12/01/2025	$38.25	$9.65	$17.07	$0.00	$64.97
	06/01/2026	$39.55	$9.65	$17.07	$0.00	$66.27
	12/07/2026	$40.85	$9.65	$17.07	$0.00	$67.57
	06/07/2027	$42.25	$9.65	$17.07	$0.00	$68.97
	12/06/2027	$43.65	$9.65	$17.07	$0.00	$70.37
	06/05/2028	$45.15	$9.65	$17.07	$0.00	$71.87
	12/04/2028	$46.65	$9.65	$17.07	$0.00	$73.37
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$34.55	$9.65	$17.07	$0.00	$61.27
	12/02/2024	$35.75	$9.65	$17.07	$0.00	$62.47
	06/02/2025	$37.00	$9.65	$17.07	$0.00	$63.72
	12/01/2025	$38.25	$9.65	$17.07	$0.00	$64.97
	06/01/2026	$39.55	$9.65	$17.07	$0.00	$66.27
	12/07/2026	$40.85	$9.65	$17.07	$0.00	$67.57
	06/07/2027	$42.25	$9.65	$17.07	$0.00	$68.97
	12/06/2027	$43.65	$9.65	$17.07	$0.00	$70.37
	06/05/2028	$45.15	$9.65	$17.07	$0.00	$71.87
	12/04/2028	$46.65	$9.65	$17.07	$0.00	$73.37
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 - ZONE 3 (BUILDING & SITE)*	06/03/2024	$34.80	$9.65	$17.07	$0.00	$61.52
	12/02/2024	$36.00	$9.65	$17.07	$0.00	$62.72
	06/02/2025	$37.25	$9.65	$17.07	$0.00	$63.97
	12/01/2025	$38.50	$9.65	$17.07	$0.00	$65.22
	06/01/2026	$39.80	$9.65	$17.07	$0.00	$66.52
	12/07/2026	$41.10	$9.65	$17.07	$0.00	$67.82
	06/07/2027	$42.50	$9.65	$17.07	$0.00	$69.22
	12/06/2027	$43.90	$9.65	$17.07	$0.00	$70.62
	06/05/2028	$45.40	$9.65	$17.07	$0.00	$72.12
	12/04/2028	$46.90	$9.65	$17.07	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2024	$34.80	$9.65	$15.06	$0.00	$59.51
	12/01/2024	$36.00	$9.65	$15.06	$0.00	$60.71
	06/01/2025	$37.25	$9.65	$15.06	$0.00	$61.96
	12/01/2025	$38.49	$9.65	$15.06	$0.00	$63.20
	06/01/2026	$39.79	$9.65	$15.06	$0.00	$64.50
	12/01/2026	$41.08	$9.65	$15.06	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE*	08/01/2024	$43.05	$11.49	$20.53	$0.00	$75.07
	02/01/2025	$44.90	$11.49	$20.53	$0.00	$76.92
	08/01/2025	$45.81	$11.49	$20.53	$0.00	$77.83
	02/01/2026	$46.89	$11.49	$20.53	$0.00	$78.91
	08/01/2026	$48.65	$11.49	$20.53	$0.00	$80.67
	02/01/2027	$49.77	$11.49	$20.53	$0.00	$81.79

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE-TILE FINISHER-Local 3 Marble/Tile (Spr/Pitt)*

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.53	$11.49	$20.53	$0.00	$53.55
2	60	$25.83	$11.49	$20.53	$0.00	$57.85
3	70	$30.14	$11.49	$20.53	$0.00	$62.16
4	80	$34.44	$11.49	$20.53	$0.00	$66.46
5	90	$38.75	$11.49	$20.53	$0.00	$70.77

Effective Date - 02/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.45	$11.49	$20.53	$0.00	$54.47
2	60	$26.94	$11.49	$20.53	$0.00	$58.96
3	70	$31.43	$11.49	$20.53	$0.00	$63.45
4	80	$35.92	$11.49	$20.53	$0.00	$67.94
5	90	$40.41	$11.49	$20.53	$0.00	$72.43

Notes:

Apprentice to Journeyworker Ratio:1:5

MARBLE MASON/TILE LAYER(SP/PT)SeeBrick
BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE

See "BRICK/STONE/ARTIFICIAL MASONRY(INCL.MASONRY WATERPROOFING)

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MECHANIC/WELDER/BOOM TRUCK *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.78	$15.15	$0.00	$67.96

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MILLWRIGHT (Zone 3) *MILLWRIGHTS LOCAL 1121 - Zone 3*	01/01/2024	$41.20	$10.08	$21.22	$0.00	$72.50
	01/06/2025	$43.48	$10.08	$21.22	$0.00	$74.78
	01/05/2026	$45.76	$10.08	$21.22	$0.00	$77.06

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 3*

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$22.66	$10.08	$5.36	$0.00	$38.10
2	65	$26.78	$10.08	$6.34	$0.00	$43.20
3	75	$30.90	$10.08	$18.78	$0.00	$59.76
4	85	$35.02	$10.08	$19.76	$0.00	$64.86

Effective Date - 01/06/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$23.91	$10.08	$5.36	$0.00	$39.35
2	65	$28.26	$10.08	$6.34	$0.00	$44.68
3	75	$32.61	$10.08	$18.78	$0.00	$61.47
4	85	$36.96	$10.08	$19.76	$0.00	$66.80

Notes: Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 $5.72, Step 2 $6.66)
Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:4

MORTAR MIXER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$34.80	$9.65	$17.07	$0.00	$61.52
	12/02/2024	$36.00	$9.65	$17.07	$0.00	$62.72
	06/02/2025	$37.25	$9.65	$17.07	$0.00	$63.97
	12/01/2025	$38.50	$9.65	$17.07	$0.00	$65.22
	06/01/2026	$39.80	$9.65	$17.07	$0.00	$66.52
	12/07/2026	$41.10	$9.65	$17.07	$0.00	$67.82
	06/07/2027	$42.50	$9.65	$17.07	$0.00	$69.22
	12/06/2027	$43.90	$9.65	$17.07	$0.00	$70.62
	06/05/2028	$45.40	$9.65	$17.07	$0.00	$72.12
	12/04/2028	$46.90	$9.65	$17.07	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"						
OILER *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$35.02	$13.78	$15.15	$0.00	$63.95
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS VI *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$32.74	$13.78	$15.15	$0.00	$61.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 3*	07/01/2024	$57.26	$9.95	$23.95	$0.00	$91.16
	01/01/2025	$58.46	$9.95	$23.95	$0.00	$92.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.63	$9.95	$0.00	$0.00	$38.58
2	55	$31.49	$9.95	$6.66	$0.00	$48.10
3	60	$34.36	$9.95	$7.26	$0.00	$51.57
4	65	$37.22	$9.95	$7.87	$0.00	$55.04
5	70	$40.08	$9.95	$20.32	$0.00	$70.35
6	75	$42.95	$9.95	$20.93	$0.00	$73.83
7	80	$45.81	$9.95	$21.53	$0.00	$77.29
8	90	$51.53	$9.95	$22.74	$0.00	$84.22

Effective Date - 01/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$29.23	$9.95	$0.00	$0.00	$39.18
2	55	$32.15	$9.95	$6.66	$0.00	$48.76
3	60	$35.08	$9.95	$7.26	$0.00	$52.29
4	65	$38.00	$9.95	$7.87	$0.00	$55.82
5	70	$40.92	$9.95	$20.32	$0.00	$71.19
6	75	$43.85	$9.95	$20.93	$0.00	$74.73
7	80	$46.77	$9.95	$21.53	$0.00	$78.25
8	90	$52.61	$9.95	$22.74	$0.00	$85.30

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	07/01/2024	$40.03	$9.65	$19.90	$0.00	$69.58
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 3*	01/01/2025	$41.23	$9.65	$19.90	$0.00	$70.78

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 3 - Spray/Sandblast - New*

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.02	$9.95	$0.00	$0.00	$29.97
2	55	$22.02	$9.95	$4.43	$0.00	$36.40
3	60	$24.02	$9.95	$4.83	$0.00	$38.80
4	65	$26.02	$9.95	$5.23	$0.00	$41.20
5	70	$28.02	$9.95	$17.49	$0.00	$55.46
6	75	$30.02	$9.95	$17.89	$0.00	$57.86
7	80	$32.02	$9.95	$18.29	$0.00	$60.26
8	90	$36.03	$9.95	$19.10	$0.00	$65.08

Effective Date - 01/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.62	$9.95	$0.00	$0.00	$30.57
2	55	$22.68	$9.95	$4.43	$0.00	$37.06
3	60	$24.74	$9.95	$4.83	$0.00	$39.52
4	65	$26.80	$9.95	$5.23	$0.00	$41.98
5	70	$28.86	$9.95	$17.49	$0.00	$56.30
6	75	$30.92	$9.95	$17.89	$0.00	$58.76
7	80	$32.98	$9.95	$18.29	$0.00	$61.22
8	90	$37.11	$9.95	$19.10	$0.00	$66.16

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 3*	07/01/2024	$37.35	$9.95	$19.90	$0.00	$67.20
	01/01/2025	$38.55	$9.95	$19.90	$0.00	$68.40

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 3 - Spray/Sandblast - Repaint*

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.68	$9.95	$0.00	$0.00	$28.63
2	55	$20.54	$9.95	$4.43	$0.00	$34.92
3	60	$22.41	$9.95	$4.83	$0.00	$37.19
4	65	$24.28	$9.95	$5.23	$0.00	$39.46
5	70	$26.15	$9.95	$17.49	$0.00	$53.59
6	75	$28.01	$9.95	$17.89	$0.00	$55.85
7	80	$29.88	$9.95	$18.29	$0.00	$58.12
8	90	$33.62	$9.95	$19.10	$0.00	$62.67

Effective Date - 01/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.28	$9.95	$0.00	$0.00	$29.23
2	55	$21.20	$9.95	$4.43	$0.00	$35.58
3	60	$23.13	$9.95	$4.83	$0.00	$37.91
4	65	$25.06	$9.95	$5.23	$0.00	$40.24
5	70	$26.99	$9.95	$17.49	$0.00	$54.43
6	75	$28.91	$9.95	$17.89	$0.00	$56.75
7	80	$30.84	$9.95	$18.29	$0.00	$59.08
8	90	$34.70	$9.95	$19.10	$0.00	$63.75

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *	07/01/2024	$38.63	$9.95	$19.90	$0.00	$68.48
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 3*	01/01/2025	$39.83	$9.95	$19.90	$0.00	$69.68

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 3 - BRUSH NEW*

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.32	$9.95	$0.00	$0.00	$29.27
2	55	$21.25	$9.95	$4.43	$0.00	$35.63
3	60	$23.18	$9.95	$4.83	$0.00	$37.96
4	65	$25.11	$9.95	$5.23	$0.00	$40.29
5	70	$27.04	$9.95	$17.49	$0.00	$54.48
6	75	$28.97	$9.95	$17.89	$0.00	$56.81
7	80	$30.90	$9.95	$18.29	$0.00	$59.14
8	90	$34.77	$9.95	$19.10	$0.00	$63.82

Effective Date - 01/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.92	$9.95	$0.00	$0.00	$29.87
2	55	$21.91	$9.95	$4.43	$0.00	$36.29
3	60	$23.90	$9.95	$4.83	$0.00	$38.68
4	65	$25.89	$9.95	$5.23	$0.00	$41.07
5	70	$27.88	$9.95	$17.49	$0.00	$55.32
6	75	$29.87	$9.95	$17.89	$0.00	$57.71
7	80	$31.86	$9.95	$18.29	$0.00	$60.10
8	90	$35.85	$9.95	$19.10	$0.00	$64.90

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 3*	07/01/2024	$35.95	$9.95	$19.90	$0.00	$65.80
	01/01/2025	$37.15	$9.95	$19.90	$0.00	$67.00

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 3 - BRUSH REPAINT*

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.98	$9.95	$0.00	$0.00	$27.93
2	55	$19.77	$9.95	$4.43	$0.00	$34.15
3	60	$21.57	$9.95	$4.83	$0.00	$36.35
4	65	$23.37	$9.95	$5.23	$0.00	$38.55
5	70	$25.17	$9.95	$17.49	$0.00	$52.61
6	75	$26.96	$9.95	$17.89	$0.00	$54.80
7	80	$28.76	$9.95	$18.29	$0.00	$57.00
8	90	$32.36	$9.95	$19.10	$0.00	$61.41

Effective Date - 01/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.58	$9.95	$0.00	$0.00	$28.53
2	55	$20.43	$9.95	$4.43	$0.00	$34.81
3	60	$22.29	$9.95	$4.83	$0.00	$37.07
4	65	$24.15	$9.95	$5.23	$0.00	$39.33
5	70	$26.01	$9.95	$17.49	$0.00	$53.45
6	75	$27.86	$9.95	$17.89	$0.00	$55.70
7	80	$29.72	$9.95	$18.29	$0.00	$57.96
8	90	$33.44	$9.95	$19.10	$0.00	$62.49

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2024	$34.55	$9.65	$15.06	$0.00	$59.26
	12/01/2024	$35.75	$9.65	$15.06	$0.00	$60.46
	06/01/2025	$37.00	$9.65	$15.06	$0.00	$61.71
	12/01/2025	$38.24	$9.65	$15.06	$0.00	$62.95
	06/01/2026	$39.54	$9.65	$15.06	$0.00	$64.25
	12/01/2026	$40.83	$9.65	$15.06	$0.00	$65.54
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2024	$39.78	$15.07	$18.67	$0.00	$73.52
	12/01/2024	$39.78	$15.07	$20.17	$0.00	$75.02
	01/01/2025	$39.78	$15.57	$20.17	$0.00	$75.52
	06/01/2025	$40.78	$15.57	$20.17	$0.00	$76.52
	12/01/2025	$40.78	$15.57	$21.78	$0.00	$78.13
	01/01/2026	$40.78	$16.17	$21.78	$0.00	$78.73
	06/01/2026	$41.78	$16.17	$21.78	$0.00	$79.73
	12/01/2026	$41.78	$16.17	$23.52	$0.00	$81.47
	01/01/2027	$41.78	$16.77	$23.52	$0.00	$82.07

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$43.53	$9.40	$23.12	$0.00	$76.05
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2020	$43.53	$9.40	$23.12	$0.00	$76.05

Apprentice - *PILE DRIVER - Local 56 Zone 3*

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	0	$0.00	$0.00	$0.00	$0.00	$0.00

Notes: Apprentice wages shall be no less than the following Steps;
(Same as set in Zone 1)
1$57.06/2$61.96/3$66.87/4$69.32/5$71.78/6$71.78/7$76.68/8$76.68

Apprentice to Journeyworker Ratio:1:5

PIPELAYER *LABORERS - ZONE 3 (BUILDING & SITE)* For apprentice rates see "Apprentice- LABORER"	06/03/2024	$34.80	$9.65	$17.07	$0.00	$61.52
	12/02/2024	$36.00	$9.65	$17.07	$0.00	$62.72
	06/02/2025	$37.25	$9.65	$17.07	$0.00	$63.97
	12/01/2025	$38.50	$9.65	$17.07	$0.00	$65.22
	06/01/2026	$39.80	$9.65	$17.07	$0.00	$66.52
	12/07/2026	$41.10	$9.65	$17.07	$0.00	$67.82
	06/07/2027	$42.50	$9.65	$17.07	$0.00	$69.22
	12/06/2027	$43.90	$9.65	$17.07	$0.00	$70.62
	06/05/2028	$45.40	$9.65	$17.07	$0.00	$72.12
	12/04/2028	$46.90	$9.65	$17.07	$0.00	$73.62
PIPELAYER (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)* For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"	06/01/2024	$34.80	$9.65	$15.06	$0.00	$59.51
	12/01/2024	$36.00	$9.65	$15.06	$0.00	$60.71
	06/01/2025	$37.25	$9.65	$15.06	$0.00	$61.96
	12/01/2025	$38.49	$9.65	$15.06	$0.00	$63.20
	06/01/2026	$39.79	$9.65	$15.06	$0.00	$64.50
	12/01/2026	$41.08	$9.65	$15.06	$0.00	$65.79
PLUMBER & PIPEFITTER *PLUMBERS & PIPEFITTERS LOCAL 104*	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PLUMBER/PIPEFITTER - Local 104*

Effective Date - 03/17/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$22.14	$9.55	$10.10	$0.00	$41.79
2	50	$24.61	$9.55	$10.10	$0.00	$44.26
3	55	$27.07	$9.55	$10.10	$0.00	$46.72
4	60	$29.53	$9.55	$10.10	$0.00	$49.18
5	65	$31.99	$9.55	$10.10	$0.00	$51.64
6	70	$34.45	$9.55	$10.10	$0.00	$54.10
7	75	$36.91	$9.55	$10.10	$0.00	$56.56
8	80	$39.37	$9.55	$10.10	$0.00	$59.02
9	80	$39.37	$9.55	$17.10	$0.00	$66.02
10	80	$39.37	$9.55	$17.10	$0.00	$66.02

Notes: **1:1,2:5,3:9,4:12

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PLUMBERS & PIPEFITTERS LOCAL 104*	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2024	$34.80	$9.65	$15.06	$0.00	$59.51
	12/01/2024	$36.00	$9.65	$15.06	$0.00	$60.71
	06/01/2025	$37.25	$9.65	$15.06	$0.00	$61.96
	12/01/2025	$38.49	$9.65	$15.06	$0.00	$63.20
	06/01/2026	$39.79	$9.65	$15.06	$0.00	$64.50
	12/01/2026	$41.08	$9.65	$15.06	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
POWDERMAN & BLASTER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$35.55	$9.65	$17.07	$0.00	$62.27
	12/02/2024	$36.75	$9.65	$17.07	$0.00	$63.47
	06/02/2025	$38.00	$9.65	$17.07	$0.00	$64.72
	12/01/2025	$39.25	$9.65	$17.07	$0.00	$65.97
	06/01/2026	$40.55	$9.65	$17.07	$0.00	$67.27
	12/07/2026	$41.85	$9.65	$17.07	$0.00	$68.57
	06/07/2027	$43.25	$9.65	$17.07	$0.00	$69.97
	12/06/2027	$44.65	$9.65	$17.07	$0.00	$71.37
	06/05/2028	$46.15	$9.65	$17.07	$0.00	$72.87
	12/04/2028	$47.65	$9.65	$17.07	$0.00	$74.37
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2024	$35.55	$9.65	$15.06	$0.00	$60.26
	12/01/2024	$36.75	$9.65	$15.06	$0.00	$61.46
	06/01/2025	$38.00	$9.65	$15.06	$0.00	$62.71
	12/01/2025	$39.24	$9.65	$15.06	$0.00	$63.95
	06/01/2026	$40.54	$9.65	$15.06	$0.00	$65.25
	12/01/2026	$41.83	$9.65	$15.06	$0.00	$66.54

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.56	$13.78	$15.15	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.78	$15.15	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS 404 - Construction Service (Northampton)*	05/01/2024	$26.14	$11.82	$7.25	$0.00	$45.21
RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$34.80	$9.65	$17.07	$0.00	$61.52
	12/02/2024	$36.00	$9.65	$17.07	$0.00	$62.72
	06/02/2025	$37.25	$9.65	$17.07	$0.00	$63.97
	12/01/2025	$38.50	$9.65	$17.07	$0.00	$65.22
	06/01/2026	$39.80	$9.65	$17.07	$0.00	$66.52
	12/07/2026	$41.10	$9.65	$17.07	$0.00	$67.82
	06/07/2027	$42.50	$9.65	$17.07	$0.00	$69.22
	12/06/2027	$43.90	$9.65	$17.07	$0.00	$70.62
	06/05/2028	$45.40	$9.65	$17.07	$0.00	$72.12
	12/04/2028	$46.90	$9.65	$17.07	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"						
ROLLER OPERATOR *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$38.42	$13.78	$15.15	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Coal tar pitch) *ROOFERS LOCAL 248*	10/02/2024	$42.38	$10.35	$18.00	$0.00	$70.73
	07/16/2025	$43.88	$10.35	$18.00	$0.00	$72.23
	10/02/2025	$44.88	$10.35	$18.00	$0.00	$73.23
	07/16/2026	$46.88	$10.35	$18.00	$0.00	$75.23
For apprentice rates see "Apprentice- ROOFER"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 248*	10/02/2024	$41.88	$10.35	$18.00	$0.00	$70.23
	07/16/2025	$43.38	$10.35	$18.00	$0.00	$71.73
	10/02/2025	$44.38	$10.35	$18.00	$0.00	$72.73
	07/16/2026	$46.38	$10.35	$18.00	$0.00	$74.73

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ROOFER - Local 248*

Effective Date - 10/02/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$25.13	$10.35	$0.00	$0.00	$35.48
2	65	$27.22	$10.35	$18.00	$0.00	$55.57
3	70	$29.32	$10.35	$18.00	$0.00	$57.67
4	75	$31.41	$10.35	$18.00	$0.00	$59.76
5	80	$33.50	$10.35	$18.00	$0.00	$61.85
6	85	$35.60	$10.35	$18.00	$0.00	$63.95
7	90	$37.69	$10.35	$18.00	$0.00	$66.04
8	95	$39.79	$10.35	$18.00	$0.00	$68.14

Notes:

Steps are 750 hrs.Roofer(Tear Off)1:1; Same as above

Apprentice to Journeyworker Ratio:1:3

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 248*	10/02/2024	$42.38	$10.35	$18.00	$0.00	$70.73
	07/16/2025	$43.88	$10.35	$18.00	$0.00	$72.23
	10/02/2025	$44.88	$10.35	$18.00	$0.00	$73.23
	07/16/2026	$46.88	$10.35	$18.00	$0.00	$75.23
For apprentice rates see "Apprentice- ROOFER"						
SCRAPER *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$39.03	$13.78	$15.15	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
SELF-POWERED ROLLERS AND COMPACTORS (TAMPERS) *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$38.42	$13.78	$15.15	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
SELF-PROPELLED POWER BROOM *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$35.80	$13.78	$15.15	$0.00	$64.73
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 63*	07/01/2024	$40.98	$12.20	$18.74	$2.13	$74.05
	01/01/2025	$42.23	$12.20	$18.74	$2.13	$75.30

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 63*

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$18.44	$5.49	$4.86	$0.85	$29.64
2	50	$20.49	$6.10	$5.40	$0.94	$32.93
3	55	$22.54	$6.71	$9.71	$1.15	$40.11
4	60	$24.59	$7.32	$9.71	$1.23	$42.85
5	65	$26.64	$7.93	$9.71	$1.31	$45.59
6	70	$28.69	$8.54	$9.71	$1.39	$48.33
7	75	$30.74	$9.15	$9.71	$1.47	$51.07
8	80	$32.78	$9.76	$17.66	$1.78	$61.98
9	85	$34.83	$10.37	$17.66	$1.86	$64.72
10	90	$36.88	$10.98	$17.66	$1.94	$67.46

Effective Date - 01/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$19.00	$5.49	$4.86	$0.85	$30.20
2	50	$21.12	$6.10	$5.40	$0.94	$33.56
3	55	$23.23	$6.71	$9.71	$1.15	$40.80
4	60	$25.34	$7.32	$9.71	$1.23	$43.60
5	65	$27.45	$7.93	$9.71	$1.31	$46.40
6	70	$29.56	$8.54	$9.71	$1.39	$49.20
7	75	$31.67	$9.15	$9.71	$1.47	$52.00
8	80	$33.78	$9.76	$17.66	$1.78	$62.98
9	85	$35.90	$10.37	$17.66	$1.86	$65.79
10	90	$38.01	$10.98	$17.66	$1.94	$68.59

Notes:

Apprentice to Journeyworker Ratio:1:3

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2024	$40.24	$15.07	$18.67	$0.00	$73.98
	12/01/2024	$40.24	$15.07	$20.17	$0.00	$75.48
	01/01/2025	$40.24	$15.57	$20.17	$0.00	$75.98
	06/01/2025	$41.24	$15.57	$20.17	$0.00	$76.98
	12/01/2025	$41.24	$15.57	$21.78	$0.00	$78.59
	01/01/2026	$41.24	$16.17	$21.78	$0.00	$79.19
	06/01/2026	$42.24	$16.17	$21.78	$0.00	$80.19
	12/01/2026	$42.24	$16.17	$23.52	$0.00	$81.93
	01/01/2027	$42.24	$16.77	$23.52	$0.00	$82.53

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2024	$40.53	$15.07	$18.67	$0.00	$74.27
	12/01/2024	$40.53	$15.07	$20.17	$0.00	$75.77
	01/01/2025	$40.53	$15.57	$20.17	$0.00	$76.27
	06/01/2025	$41.53	$15.57	$20.17	$0.00	$77.27
	12/01/2025	$41.53	$15.57	$21.78	$0.00	$78.88
	01/01/2026	$41.53	$16.17	$21.78	$0.00	$79.48
	06/01/2026	$42.53	$16.17	$21.78	$0.00	$80.48
	12/01/2026	$42.53	$16.17	$23.52	$0.00	$82.22
	01/01/2027	$42.53	$16.77	$23.52	$0.00	$82.82
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 669*	04/01/2023	$47.43	$11.45	$16.61	$0.00	$75.49

Apprentice - *SPRINKLER FITTER - Local 669*

Effective Date - 04/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$21.34	$8.22	$0.00	$0.00	$29.56
2	50	$23.72	$8.22	$0.00	$0.00	$31.94
3	55	$26.09	$11.45	$7.20	$0.00	$44.74
4	60	$28.46	$11.45	$8.35	$0.00	$48.26
5	65	$30.83	$11.45	$8.35	$0.00	$50.63
6	70	$33.20	$11.45	$8.60	$0.00	$53.25
7	75	$35.57	$11.45	$8.60	$0.00	$55.62
8	80	$37.94	$11.45	$8.60	$0.00	$57.99
9	85	$40.32	$11.45	$8.60	$0.00	$60.37
10	90	$42.69	$11.45	$8.60	$0.00	$62.74

Notes:

Apprentice to Journeyworker Ratio:1:1

TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 7*	06/30/2024	$50.01	$13.00	$14.86	$0.00	$77.87
	12/29/2024	$51.06	$13.25	$15.06	$0.00	$79.37
	06/29/2025	$52.16	$13.50	$15.21	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$15.36	$0.00	$82.37
	06/28/2026	$54.41	$14.00	$15.46	$0.00	$83.87
	01/03/2027	$55.56	$14.25	$15.56	$0.00	$85.37

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 7*

Effective Date - 06/30/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$20.00	$7.20	$0.60	$0.00	$27.80
2	45	$22.50	$7.20	$0.68	$0.00	$30.38
3	50	$25.01	$13.00	$7.40	$0.00	$45.41
4	55	$27.51	$13.00	$7.48	$0.00	$47.99
5	65	$32.51	$13.00	$9.64	$0.00	$55.15
6	70	$35.01	$13.00	$11.06	$0.00	$59.07

Effective Date - 12/29/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$20.42	$7.35	$0.61	$0.00	$28.38
2	45	$22.98	$7.35	$0.69	$0.00	$31.02
3	50	$25.53	$13.25	$7.47	$0.00	$46.25
4	55	$28.08	$13.25	$7.54	$0.00	$48.87
5	65	$33.19	$13.25	$9.74	$0.00	$56.18
6	70	$35.74	$13.25	$11.19	$0.00	$60.18

Notes:
Steps are 800 hours

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE*	08/01/2024	$63.44	$11.49	$23.59	$0.00	$98.52
	02/01/2025	$64.74	$11.49	$23.59	$0.00	$99.82
	08/01/2025	$66.89	$11.49	$23.59	$0.00	$101.97
	02/10/2026	$68.24	$11.49	$23.59	$0.00	$103.32
	08/01/2026	$70.44	$11.49	$23.59	$0.00	$105.52
	02/01/2027	$71.84	$11.49	$23.59	$0.00	$106.92

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TERRAZZO FINISHER-Local 3 Marble/Tile (Spr/Ptt)*

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.72	$11.49	$23.59	$0.00	$66.80
2	60	$38.06	$11.49	$23.59	$0.00	$73.14
3	70	$44.41	$11.49	$23.59	$0.00	$79.49
4	80	$50.75	$11.49	$23.59	$0.00	$85.83
5	90	$57.10	$11.49	$23.59	$0.00	$92.18

Effective Date - 02/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$32.37	$11.49	$23.59	$0.00	$67.45
2	60	$38.84	$11.49	$23.59	$0.00	$73.92
3	70	$45.32	$11.49	$23.59	$0.00	$80.40
4	80	$51.79	$11.49	$23.59	$0.00	$86.87
5	90	$58.27	$11.49	$23.59	$0.00	$93.35

Notes:

Apprentice to Journeyworker Ratio:1:5

TERRAZZO MECHANIC *BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE*	08/01/2024	$64.52	$11.49	$23.56	$0.00	$99.57
	02/01/2025	$65.82	$11.49	$23.56	$0.00	$100.87
	08/01/2025	$67.97	$11.49	$23.56	$0.00	$103.02
	02/01/2026	$69.32	$11.49	$23.56	$0.00	$104.37
	08/01/2026	$71.52	$11.49	$23.56	$0.00	$106.57
	02/01/2027	$72.92	$11.49	$23.56	$0.00	$107.97

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TERRAZZO MECH - Local 3 Marble/Tile (Spr/Pitt)*

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$32.26	$11.49	$23.56	$0.00	$67.31
2	60	$38.71	$11.49	$23.56	$0.00	$73.76
3	70	$45.16	$11.49	$23.56	$0.00	$80.21
4	80	$51.62	$11.49	$23.56	$0.00	$86.67
5	90	$58.07	$11.49	$23.56	$0.00	$93.12

Effective Date - 02/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$32.91	$11.49	$23.56	$0.00	$67.96
2	60	$39.49	$11.49	$23.56	$0.00	$74.54
3	70	$46.07	$11.49	$23.56	$0.00	$81.12
4	80	$52.66	$11.49	$23.56	$0.00	$87.71
5	90	$59.24	$11.49	$23.56	$0.00	$94.29

Notes:

Apprentice to Journeyworker Ratio:1:5

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	06/01/2024	$49.81	$9.65	$18.22	$0.00	$77.68
	12/01/2024	$51.28	$9.65	$18.22	$0.00	$79.15
	06/01/2025	$52.78	$9.65	$18.22	$0.00	$80.65
	12/01/2025	$54.28	$9.65	$18.22	$0.00	$82.15
	06/01/2026	$55.83	$9.65	$18.22	$0.00	$83.70
	12/01/2026	$57.33	$9.65	$18.22	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	06/01/2024	$45.60	$9.65	$18.22	$0.00	$73.47
	12/01/2024	$47.07	$9.65	$18.22	$0.00	$74.94
	06/01/2025	$48.57	$9.65	$18.22	$0.00	$76.44
	12/01/2025	$50.07	$9.65	$18.22	$0.00	$77.94
	06/01/2026	$51.62	$9.65	$18.22	$0.00	$79.49
	12/01/2026	$53.12	$9.65	$18.22	$0.00	$80.99
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2024	$45.48	$9.65	$18.22	$0.00	$73.35
	12/01/2024	$46.95	$9.65	$18.22	$0.00	$74.82
	06/01/2025	$48.45	$9.65	$18.22	$0.00	$76.32
	12/01/2025	$49.95	$9.65	$18.22	$0.00	$77.82
	06/01/2026	$51.50	$9.65	$18.22	$0.00	$79.37
	12/01/2026	$53.00	$9.65	$18.22	$0.00	$80.87
For apprentice rates see "Apprentice- LABORER"						
TRACTORS *OPERATING ENGINEERS LOCAL 98*	12/01/2023	$38.42	$13.78	$15.15	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2024	$40.82	$15.07	$18.67	$0.00	$74.56
	12/01/2024	$40.82	$15.07	$20.17	$0.00	$76.06
	01/01/2025	$40.82	$15.57	$20.17	$0.00	$76.56
	06/01/2025	$41.82	$15.57	$20.17	$0.00	$77.56
	12/01/2025	$41.82	$15.57	$21.78	$0.00	$79.17
	01/01/2026	$41.82	$16.17	$21.78	$0.00	$79.77
	06/01/2026	$42.82	$16.17	$21.78	$0.00	$80.77
	12/01/2026	$42.82	$16.17	$23.52	$0.00	$82.51
	01/01/2027	$42.82	$16.77	$23.52	$0.00	$83.11
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	06/01/2024	$57.71	$9.65	$19.00	$0.00	$86.36
	12/01/2024	$59.18	$9.65	$19.00	$0.00	$87.83
	06/01/2025	$60.68	$9.65	$19.00	$0.00	$89.33
	12/01/2025	$62.18	$9.65	$19.00	$0.00	$90.83
	06/01/2026	$63.73	$9.65	$19.00	$0.00	$92.38
	12/01/2026	$65.23	$9.65	$19.00	$0.00	$93.88
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	06/01/2024	$59.71	$9.65	$19.00	$0.00	$88.36
	12/01/2024	$61.18	$9.65	$19.00	$0.00	$89.83
	06/01/2025	$62.68	$9.65	$19.00	$0.00	$91.33
	12/01/2025	$64.18	$9.65	$19.00	$0.00	$92.83
	06/01/2026	$65.73	$9.65	$19.00	$0.00	$94.38
	12/01/2026	$67.23	$9.65	$19.00	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	06/01/2024	$49.78	$9.65	$19.00	$0.00	$78.43
	12/01/2024	$51.25	$9.65	$19.00	$0.00	$79.90
	06/01/2025	$52.75	$9.65	$19.00	$0.00	$81.40
	12/01/2025	$54.25	$9.65	$19.00	$0.00	$82.90
	06/01/2026	$55.80	$9.65	$19.00	$0.00	$84.45
	12/01/2026	$57.30	$9.65	$19.00	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	06/01/2024	$51.78	$9.65	$19.00	$0.00	$80.43
	12/01/2024	$53.25	$9.65	$19.00	$0.00	$81.90
	06/01/2025	$54.75	$9.65	$19.00	$0.00	$83.40
	12/01/2025	$56.25	$9.65	$19.00	$0.00	$84.90
	06/01/2026	$57.80	$9.65	$19.00	$0.00	$86.45
	12/01/2026	$59.30	$9.65	$19.00	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2024	$40.24	$15.07	$18.67	$0.00	$73.98
	12/01/2024	$40.24	$15.07	$20.17	$0.00	$75.48
	01/01/2025	$40.24	$15.57	$20.17	$0.00	$75.98
	06/01/2025	$41.24	$15.57	$20.17	$0.00	$76.98
	12/01/2025	$41.24	$15.57	$21.78	$0.00	$78.59
	01/01/2026	$41.24	$16.17	$21.78	$0.00	$79.19
	06/01/2026	$42.24	$16.17	$21.78	$0.00	$80.19
	12/01/2026	$42.24	$16.17	$23.52	$0.00	$81.93
	01/01/2027	$42.24	$16.77	$23.52	$0.00	$82.53

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
WAGON DRILL OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2024	$34.80	$9.65	$17.07	$0.00	$61.52
	12/02/2024	$36.00	$9.65	$17.07	$0.00	$62.72
	06/02/2025	$37.25	$9.65	$17.07	$0.00	$63.97
	12/01/2025	$38.50	$9.65	$17.07	$0.00	$65.22
	06/01/2026	$39.80	$9.65	$17.07	$0.00	$66.52
	12/07/2026	$41.10	$9.65	$17.07	$0.00	$67.82
	06/07/2027	$42.50	$9.65	$17.07	$0.00	$69.22
	12/06/2027	$43.90	$9.65	$17.07	$0.00	$70.62
	06/05/2028	$45.40	$9.65	$17.07	$0.00	$72.12
	12/04/2028	$46.90	$9.65	$17.07	$0.00	$73.62
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2024	$34.80	$9.65	$15.06	$0.00	$59.51
	12/01/2024	$36.00	$9.65	$15.06	$0.00	$60.71
	06/01/2025	$37.25	$9.65	$15.06	$0.00	$61.96
	12/01/2025	$38.49	$9.65	$15.06	$0.00	$63.20
	06/01/2026	$39.79	$9.65	$15.06	$0.00	$64.50
	12/01/2026	$41.08	$9.65	$15.06	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
WATER METER INSTALLER *PLUMBERS & PIPEFITTERS LOCAL 104*	03/17/2024	$49.21	$9.55	$17.10	$0.00	$75.86
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - West						
EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$44.67	$8.00	$12.55	$0.00	$65.22
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$30.58	$8.00	$5.48	$0.00	$44.06
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN / TRUCK DRIVER *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$39.97	$8.00	$10.96	$0.00	$58.93
For apprentice rates see "Apprentice- LINEMAN"						
HEAVY EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$47.01	$8.00	$13.22	$0.00	$68.23
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$51.71	$8.00	$15.55	$0.00	$75.26

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LINEMAN (Outside Electrical) - West Local 42*

Effective Date - 09/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$31.03	$8.00	$3.43	$0.00	$42.46
2	65	$33.61	$8.00	$3.51	$0.00	$45.12
3	70	$36.20	$8.00	$3.59	$0.00	$47.79
4	75	$38.78	$8.00	$5.16	$0.00	$51.94
5	80	$41.37	$8.00	$5.24	$0.00	$54.61
6	85	$43.95	$8.00	$5.32	$0.00	$57.27
7	90	$46.54	$8.00	$7.40	$0.00	$61.94

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	02/04/2019	$30.73	$4.70	$3.17	$0.00	$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77
TRACTOR-TRAILER DRIVER *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$44.67	$8.00	$12.55	$0.00	$65.22

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)
Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

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 **1**

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: MA20240019 09/13/2024

Superseded General Decision Number: MA20230019

State: Massachusetts

Construction Type: Highway

County: Hampden 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 $17.20 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 2024.
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 $12.90 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 2024.

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	01/05/2024
1	01/19/2024
2	05/31/2024
3	06/21/2024
4	09/06/2024
5	09/13/2024

ENGI0004-019 06/01/2024

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Group 1	$ 56.03	32.75
Group 2	$ 55.41	32.75

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: Broom/Sweeper; Crane; Gradall; Post Driver (Guardrail/Fences)
Group 2: Bulldozer; Grader/Blade

ENGI0098-010 06/01/2024

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Group 1	$ 41.23	30.58+A
Group 2	$ 40.92	30.58+A
Group 4	$ 37.47	30.58+A

Footnote:
A. Paid Holidays: New year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day,

Veterans Day, Thanksgiving Day and Christmas Day

POWER EQUIPMENT OPERATORS CLASSIFICATIONS
Group 1: Backhoe/Excavator/Trackhoe; Bobcat/Skid Steer/Skid Loader; Loader
Group 2: Milling Machine; Paver (Asphalt, Aggregate, and Concrete)
Group 4: Roller

IRON0007-027 03/16/2024

	Rates	Fringes
IRONWORKER (ORNAMENTAL AND STRUCTURAL)	$ 39.51	32.98

LABO0596-006 12/01/2021

	Rates	Fringes
LABORER (Traffic Control: Flagger)	$ 24.50	23.96

LABO0999-002 12/01/2021

	Rates	Fringes
LABORER (Common or General)	$ 32.50	23.96

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* PAIN0035-023 07/01/2024

	Rates	Fringes
PAINTER (Steel)	$ 56.76	36.00

SUMA2014-009 01/11/2017

	Rates	Fringes
CARPENTER, Includes Form Work	$ 33.03	20.02
CEMENT MASON/CONCRETE FINISHER	$ 52.13	20.89
ELECTRICIAN	$ 47.13	13.41
IRONWORKER, REINFORCING	$ 46.21	21.27
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and		

Distributor	$ 33.10	18.09
LABORER: Concrete Saw (Hand Held/Walk Behind)	$ 44.43	14.18
LABORER: Landscape	$ 44.11	18.85
OPERATOR: Forklift	$ 51.63	0.00
OPERATOR: Mechanic	$ 48.14	17.02
OPERATOR: Piledriver	$ 43.87	18.04
PAINTER: Spray (Linestriping)	$ 38.30	17.43
TRAFFIC CONTROL: Laborer-Cones/ Barricades/Barrels - Setter/Mover/Sweeper	$ 43.73	15.06
TRUCK DRIVER: Concrete Truck	$ 33.69	15.79
TRUCK DRIVER: Dump Truck	$ 43.81	5.39
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 classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which 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. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates

the State of Louisiana. 2012 is the year of 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. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

State Adopted Rate Identifiers

Classifications listed under the ""SA"" identifier indicate that the prevailing wage rate set by a state (or local) government was 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. 01/03/2024 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:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on

a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write 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 the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write 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 by 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

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

SPECIAL PROVISIONS

WALES

Federal Aid Project Number: STP/HSI-0032(043)X
Reconstruction & Improvements on Monson Road, from the Monson T.L. to Reed Hill Road (1.5 Miles)

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 *2024 Standard Specifications for Highways and Bridges*, the *Supplemental Specifications* contained in this book, the *2017 Construction Standard Details*, the *Traffic Management Plans and Detail Drawings*, *MassDOT Work Zone Safety Temporary Traffic Control,* 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 American Standard for Nursery Stock*; the Plans and these Special Provisions.

The Project is approximately 1.5 miles long and is located on the west side of Wales, beginning at the Monson Town line continuing east to the intersection with Reed Hill Road. The purpose of the project is to perform full depth roadway reconstruction, replace several culvert crossings, including two concrete box culverts, and closed system drainage improvements to Monson Road.

This Project consists of full depth pavement reconstruction of the existing roadway. The Project includes the construction of new four foot wide shoulders all along the roadway for pedestrian and bicycle use with minor adjustments to the alignment to improve safety. The Project includes sections of bituminous curb and new guardrail with up-to-date terminals for increased safety, proper signage and new pavement markings. The roadway drainage improvements include: construction of roadside vegitated and modified rockfill drainage and grass swales and sections of closed drainage system totaling approximately 3,500 feet (including catch basins with 4' sumps for additional sediment capture), and a wetland replication area. The Project also includes the replacement of all of the existing culvert crossings with a variety of reinforced concrete pipes ranging from 12 – 36 inches in diameter, two precast concrete culverts (one 9.8' wide x 5' high and one 8' wide x 4.5' high with natural steambed material), new steam channel construction, concrete headwalls, wingwalls, and bridge barriers, guiderail, and modified rockfill drainage pipe outlet protection.

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.

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.

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 approximately 427,879 18-kip(80-kn) ESALs.

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.

DRAINAGE

All drainage castings in new pavement areas shall be installed at base or binder course grade, as required by the Engineer, and reset to proposed finish surface grade prior to placement of the pavement surface course.

All existing pipes to be abandoned shall be plugged with brick masonry not less than 8 inches in thickness in conformance with the Standard Specifications, Subsection 140.63.

DRAINAGE STRUCTURES

Where new pipe is shown on the drawings to be connected into an existing drainage structure to remain, the existing structure shall be first cleaned to remove all mud, debris and other material. The existing structure wall shall be carefully and neatly cored using mechanical means to provide the minimum size opening required for the insertion of the new pipe. The proposed pipe end shall be set or cut off flush with the inside face of the existing structure wall and the remaining space around the pipe completely filled with non-shrink cement grout for the full thickness of the structure wall.

Existing shaped inverts shall be reconstructed as necessary to provide a smooth and uniform flow channel from the new pipe through the existing structure.

No separate payment will be made for the cost of connecting new pipes into existing structures, cleaning and necessary alterations of existing structures, but all costs in connection therewith shall be included in the unit prices bid for the various pipe items.

MATERIALS AND EQUIPMENT REMOVED AND STACKED

The Contractor shall carefully remove, transport, offloaded, and stack all material that, in the opinion of the Engineer, is salvageable. The material shall be delivered to the Wales Highway Department located at 3 Hegan Street, Wales, MA 01081. The Contractor shall coordinate with the Town of Wales's Highway Department, Christopher Ryan, to schedule drop-off time and location.

If the Engineer determines that any part of the material called out to be removed and stacked is unsuitable for reuse, or if the Town decides to abandon part or all of such materials, said material shall become the property of the Contractor, and he shall dispose of it legally offsite at his expense. The cost to stockpile and deliver, and off-load the material shall be considered incidental to the respective items. No separate payment will be made for to stockpile, deliver, off-load and stack the material, disposal undesirable materials, but all costs in connection therewith shall be included in the respective Contract Items.

BOUNDS

The Contractor shall exercise due care when working around all bounds which are to remain. Should any damage to a bound result from the actions of the Contractor, it shall be replaced and/or realigned by the Contractor as required by the Engineer. No further compensation will be due the Contractor for the materials and labor required to reestablish the bound in its proper orientation. All bounds, as shown on the plans, and bounds replaced or realigned shall be installed by a Land Surveyor registered in the Commonwealth of Massachusetts.

Bounds shown on the plans to be removed shall be carefully removed and delivered and stacked at the Wales Highway Department located at 3 Hegan Street, Wales, MA 01081 unless otherwise directed. The cost of this work shall be considered incidental to the project.

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.

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: **WE 314-0183**

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. Quantities for soil disposal are based on the project design, existing knowledge of soil contamination in the project area, the presence of known risk factors for soil contamination in the project area, and the designer's best professional judgment.

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.

NATIONAL GRID EMERGENCY TELEPHONE NUMBERS

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

ENVIRONMENTAL PERMITTING

An Order of Conditions has been obtained from the Wales Conservation Commission under the Wetlands Protection Act. The proposed work occurs in jurisdictional wetland resources subject to section 401 or section 404 of the Clean Water Act; therefore, a Water Quality Certification from the Massachusetts Department of Environmental Protection and authorization from the US Army Corps of Engineers has been obtained. The Contractor is advised that all terms and conditions within said permits shall be strictly adhered to.
If field conditions and/or Contractor-proposed erection, demolition, staging, or other procedures 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 obtained allowing such work. The Contractor must notify the District 2 Highway Director and Resident Engineer in writing at least 60 days prior to desire commencement of the proposed activity. All environmental submittals, including any Contract with Local, State, or Federal environmental agencies, must be coordinated with the District 2 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 obtain the environmental permits

TREE REMOVAL

The removal of existing trees shown on the plans, or required by the Engineer, 9 inches in diameter or smaller shall be considered incidental to the project. The Contractor shall coordinate with the Town of Wales Tree Warden prior to marking or removal of any trees within the project limits and will not mark or remove any tree within the project limits without approval from the Town of Wales or MassDOT.

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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.

NORTHERN LONG-EARED BAT PROTECTION

The U.S. Fish and Wildlife Service (USFWS) has listed the northern long-eared bat (NLEB) as threatened under the Endangered Species Act (ESA) and the following requirements exist to protect the bat and its habitat. 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.

On July 22-25, 2022, 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 2022 survey guidelines. The survey did not detect northern long-eared bat, and as stated within the survey guidelines, the survey is valid for five years. Due to the 5-year validity of the negative presence/absence survey, it is recommended that the contractor conduct all activities that could result in stressors to the bats such as tree removal/trimming, bridge and/or structure removal/maintenance, lighting, or use of percussive, by July 22, 2027. 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.

Due to the negative survey results, the project is eligible for a May Affect, Not Likely to Adversely Affect (NLAA) determination, without 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 A00855). Therefore, the project has completed Section 7 consultation through the Endangered Species Act, and no AMMs apply to the project.

The Contractor shall ensure all personnel working in on the project site are aware of all environmental commitments related to NLEB, including all applicable AMMs. NLEB Bat information (https://www.fws.gov/midwest/endangered/mammals/nleb/) shall be made available to all personnel.

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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

(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.

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.

TRAFFIC ACCOMODATION

(Supplementing Subsection 7.1.7)

The Contractor shall have a length of no more than 2,000 feet under construction at one time. All drainage work shall be installed before the roadway is excavated. Two (2) way traffic shall be in place at the end of each workday.

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 of his intention to commence opertations affecting such utilities at least one week in advance of the commencement of such operations. The Contractor shall, at the same time, file a copy of such notice with the Engineer.

Any required de-energizing or the overhead electric utilities shall be coordinated directly with the affected utility company and must occur in the spring or fall and only for a duration of up to 6 hours.

A list of public and private utilities can be found on the MassDOT – Highway website at:
https://www.mass.gov/info-details/utility-contacts-by-district-and-municipality

Select District 2
Select Town of WALES
Locate the utility contact

NOTICE TO OWNERS OF UTILITIES (Continued)

Following are the names of owners and representatives of the principal utilities that may be affected, but completeness of the list is not guaranteed by the Department:

OWNERS OF UTILTIES

Electric Sandra Annis National Grid Electric 548 Haydenville Road Leeds, MA 01053 413-582-7424 Sandra.annis@nationalgrid.com	Telephone Karen Mealey Verizon 385 Myles Standish Blvd. Taunton MA 02780 774-409-3160 karen.m.mealey@verizon.com
Gas David Wood Tennessee Gas Pipeline Company 8 Anngina Drive Enfield, CT 06082 860-763-6005 David_wood@kindermorgan.com	Cable Matthew Heinrichs Charter Communications 301 Barber Avenue Worcester, MA 01606 774-243-9787 Matt.heinrichs@chartercom.com
Highway Department Christopher Ryan Highway Department – Town of Wales 3 Hegan Street Wales, MA 01081 413-245-7494 Road-com@townofwales.net	Town Clerk Leis Phinney, Town Clerk Town of Wales 3 Hollow Road P.O. Box 834 Wales, MA 01081 413-245-7571
Police Department Thomas J. Ford, Chief of Police 3 Hollow Road Wales, MA 01081 413-245-6030 EDessert.police@townofwales.net	Fire Department John Croke, Fire Chief 3 Hegan Road, P.O. Box 604 Wales, MA 01081 413-245-7695 JCroke.fire@townofwales.net
WRTA Joshua Rickman WRTA Administrator WRTA, 60 Foster Street Worcester, MA 01608 508-453-3400 jrickman@therta.com	WRTA Nick Burnham WRTA Manager of Transit Operations & Planning WRTA, 60 Foster Street Worcester, MA 01608 508-453-3401 nburnham@therta.com

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.

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.

NOTIFICATION OF FUNDING SOURCES FOR WORK TO BE PAID BY OTHERS

This contract has an agreement with the ***Town of Wales;*** whereas when the construction costs for the contract scope exceed the total participating contract bid price by more than ten percent (10%), the ***Town*** shall be responsible for the amount over 110% of the total participating contract bid price.

VALUE ENGINEERING CHANGE PROPOSAL

This Subsection defines the conditions and requirements which apply to Value Engineering Change Proposals ("VECPs"). The purpose of this provision is to encourage the Contractor to propose changes in certain project requirements that will maintain the project's functional requirements at a savings in contract time, contract price, or both. The net savings obtained by using a VECP that meets the conditions and requirements set forth here will be shared by the Contractor and MassDOT.

VECP's under this provison are to be initiated, developed and submitted to MassDOT by the Contractor. The VECP must show the contemplated changes to the Drawings, Specifications and other requirements in the Contract. When a VECP submitted pursuant to this section is fully accepted by MassDOT, the VECP will be implemented by the Contractor and paid using the current cost and resource loaded schedule. Contractor shall demonstrate that the VECP is equal to, or better than, the original design or material; that there is an interest in public safety within the VECP; that there is a life-cycle cost benefit; and/or that end users will benefit from the shortened schedule. VECPs shall be consistent with the MassHighway/MassDOT Standard Specifications for Highways and Bridges and other applicable reference documents and directives. Any proposed deviation from these documents will need to be clearly identified in the VECP Proposal Documents, and must be approved by MassDOT's Chief Engineer before accepting this VECP.

A. In order to be considered for MassDOT review each VECP shall:

1. Be clearly labeled pursuant to this Subsection;

2. Yield a net savings at least two hundred and fifty thousand (250,000.00) Dollars and/or a net saving of contract completion duration of at least three (3) months;

3. The proposed changes to contract items must:

    a. maintain the specified items' required functions (service life, reliability);

    b. meet applicable safety regulations and codes;

    c. material substitutions must be in accordance with DOT prequalified/preapproved products and must be tested in accordance with standard material specs/testing methods (and considering all relevant environmental, load, and other relevant factors);

    d. show economy of operation, ease of maintenance, ease of construction, and necessary standardized features and appearance; and

4. Shall not require an extension of Contract Time or Contract Milestones, with the exception of cases when there are anticipated significant cost saving.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

The thresholds above are considered to be a general guideline. MassDOT will consider VECPs outside of these thresholds if a significant benefit is demonstrated. Additionally, notwithstanding this VECP process, MassDOT will consider minor revisions in the form of a Contract Modification.

Further, any VECP submitted shall be in sufficient detail to clearly define the proposed change. The Contractor's failure to provide information of the type, detail and in a format to facilitate the MassDOT's review, may be grounds for rejection of the VECP. Additionally, the Contractor will not be entitled to any equitable adjustment or increased Time, due to any aspect of any of the proposed VECP including permitting, right of way, utility coordination or delayed responses by MassDOT. If, after the progression of the work associated with the executed Contract Modification for the VECP, any additional costs are realized by the Contractor or any of the sub-consultants, sub-contractors, or suppliers, the Contractor shall be obligated to pay for any and all costs.

B. The following initial items shall be provided by the Contractor for MassDOT's review. *Items 1-6 need to be submitted prior to the start of MassDOT's review of the VECP and item 7 is an important consideration for the pricing of the VECP and the timeline of the proposed VECP schedule.*

1. ***VECP Description***: A description of the difference between the existing and the proposed Contract requirements, and the comparative advantages and disadvantages of each;

2. ***VECP Change Listing***: A listing of the Contract requirements that will need to be changed, modified, or reviewed as well as the proposed Contract document changes in the Instructions to Bidders, Contract, Standard Specifications, General Requirements and Special Provisions required by the VECP.

3. ***Construction Schedule Update*****:** Any changes in the Contract Time(s) or Contract Milestone(s), that will result from acceptance of the VECP, shall be accompanied by a contemporaneous schedule analysis *(i.e, the Contractor's baseline schedule submission, all past/required monthly schedule updates, a detailed assessment of all past delays, and a resource loaded Crticial Path Method schedule as specified in Section 8.0 / Subsection 8.02 of this Contract)* of the projected Work that remains including the proposed VECP related schedule changes *(inclusive of the timeline to review accept the VECP and the timeline for implementing the design changes)* in the remaining work. This shall be submitted in the form of a Proposal Schedule until the VECP has been formally accepted. Note: All of this information is to be updated, recertified, and formally accepted by MassDOT before final acceptance of this this VECP is issued.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

4. ***Date for MassDOT's Acceptance***: A statement that clearly justifies the date by which the VECP must be accepted to obtain the maximum price reduction, noting any effect upon the Contract Time(s) and/or Contract Milestone(s). This statement must include a narrative that demonstrates the most recent construction schedule has been utilized to justify that proposed acceptance date *(e.g. "in order to start to fabricate critical materials, authorization must be provided to work on the shop drawings by no later than [date]").* The Contractor should allow for at least sixty (60) to ninety (90) days for acceptance by MassDOT once all of the VECP documentation has been provided. Acceptance shall mean that MassDOT has received a finalized and executed contract modification. However, this is a proposed Contract change.

   The Contractor is fully obligated to progress the Work of the original Contract and MassDOT is not liable for any delays or costs that may occur in the review phase of any VECP proposal.

5. ***Cost and Savings Estimates***: A detailed estimate of the anticipated net savings, calculated as follows:

   a. ***Original Scope:*** Isolate the cost of performing the original contract construction activities, in accordance with the original Contract Documents, as originally bid by the Contractor, that are anticipated to be superseded by the VECP. *This cost is to include any original contract scope that is anticipated to be altered or eliminated by the VECP such as, shop drawing preparation, inspection work, testing, maintenance of traffic, or any other original contract costs, that have yet to have been performed at the time of this VECP submission.*

   b. ***New VECP Scope:*** Calculate the cost of performing the comparable construction activities associated with the VECP.

   c. ***Contractor's Engineer & Inspection***: Calculate the cost of engineering, inspection, and design work by the Contractor's Engineer/Designer. This should be a realistic estimate of the costs of any required engineering, design and review work by the Contractor's Engineer.

   d. ***MassDOT's Costs:*** MassDOT's estimate of costs to perform engineering/design reviews, cost estimate reviews, schedule reviews, and any other administrative costs to review and recommend implementation of the proposed VECP. *(including all anticipated increased costs to MassDOT on other Contracts and all anticipated follow-on increased costs to MassDOT, if any)* as provided by MassDOT. MassDOT's estimated costs must be included the VECP calculation and will be provided by MassDOT in support of the VECP evaluation process.

   e. ***Other Costs:*** Estimated costs associated with any revisions to other project related costs, such as Environmental Permits or Right of Way acquisitions, including other agency or municipality costs, as provided by MassDOT.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

Net Savings:

The net savings to be split between MassDOT and the Contractor shall be calculated using the items above as follows: a - (b+c+d+e) = net savings

6. *The Contractor shall also provide:*

   a. A proposed Change Order, which explains and justifies any required Equitable Adjustment in the Contract Price.

   b. The Contractor's actual costs expended for developing the VECP as of the date of the VECP submission;

***7. Design Changes and Drawings*:** The costs that are outlined above should be inclusive of the following design and engineering responsibilities.

   a. Design changes shall be prepared and stamped by the Contractor's professional designer and/or engineer. In addition, in the development of the VECP; the Contractor is responsible for anticipating and managing all aspects associated with any VECP design work that must be performed by a licensed Engineer.

   b. The Contractor's engineer must analyze and stamp all components of any aspect of the project that has been redesigned, changed, or altered as a result of this VECP.

   c. The Contractor's engineer shall provide all calculations and supporting design/engineering documentation that was utilized to develop the changes and stamped drawings. These will be used by MassDOT's Designer-of-Record to review the VECP changes. The Contractor is limited to selecting only those engineer's that have been pre-qualified by MassDOT's A&E Board.

   d. MassDOT's Designer-of-Record will review and respond to all completed design submissions related to this VECP within thirty (30) calendar days, unless determined to be a non-critical path item.

   e. MassDOT will be responsible for estimating and managing MassDOT's Designer-of-Record during the VECP review and implementation. Should any significant conflicts arise, between the Contractor's Engineer and MassDOT's Designer-of-Record, the DOT and the Contractor will work expeditiously to resolve the conflict. Should this type of conflict continue for greater than five (5) days, the Contractor is to bear all financial and time related impacts of such delay and must seek to resolve the design conflict, in an acceptable manner to MassDOT. The resolution of this conflict will be funded at the Contractor's expense – exclusive of the net saving that was agreed to at the execution of the contract modification for this VECP.

   f. The Contractor's Engineer may also be required to inspect the construction work. The Contractor is to include such anticipated inspection costs in the initial VECP.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

g. MassDOT's Designer of Record will remain the Designer-of-Record for the entire Project. Any costs incurred in the use of MassDOT's Designer-of-Record by MassDOT or Contractor associated with the review of a VECP are to be included in the calculated net savings.

C. Approval of the VECP shall not occur until a Contract Modification, incorporating the VECP, is issued by MassDOT and properly executed by the Contractor. MassDOT may accept or reject part or all of any VECP at any time prior to an executed Contract Modification for the applicable VECP. The decision of MassDOT, concerning acceptance or rejection of any VECP, shall be final and shall not be subject to dispute resolution.

It is expected that several weeks may go by before the final VECP documentation has been executed with a Contract Modification. Therefore, MassDOT intends to make certain that the initial cost estimate information has not changed before entering into a Contract Modification. As the VECP evaluation process is finalized, and prior to the signed Contract Modification for the VECP, the Contractor and MassDOT must re-certify the current status of the originally proposed cost and/or schedule savings.

Until a contract modification is issued and schedule and cost/savings re-certification is complete and accepted by MassDOT, the Contractor shall remain obligated to perform the Work in accordance with the terms and conditions of the original Contract Documents.

Upon completion of the work associated with the VECP, MassDOT may require verification that the VECP savings has been achieved.

D. VECPs will be processed (distributed, reviewed, commented upon, accepted or rejected) expeditiously (pursuant to M.G.L. c. 30, § 39R); however, as this is an elective modification to the contract, MassDOT shall not be liable for any delay or cost in the review and acceptance of the VECP. During the review of the VECP, the Contractor remains obligated to progress the original Contract scope, and schedule, as planned; until a Contract Modification, accepting the Contractor re-certified VECP, has been executed by MassDOT.

The Contractor has the right to withdraw part, or all of any VECP, prior to acceptance by MassDOT. Such withdrawal shall be made in writing to the Engineer. The Contractor shall state the period of time, from the date of the initial VECP submittal, that the VECP shall remain valid and feasible. Revision of this validity and feasibility period shall be allowed only by mutual agreement of the Contractor and the Engineer in writing.

If the Contractor desires to withdraw the proposal prior to the expiration of this period for non-technical reason, MassDOT reserves the right to recover all actual costs that have been incurred to MassDOT.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

If the Contractor withdraws the VEC Proposal, MassDOT reserves the right to proceed with the VECP or any portion of the VECP as a normal change and the Contractor waives any right it may have had to share in net savings thereunder.

For purposes of this provision, expiration of the time established by the Contractor for approval shall be considered as withdrawal by the Contractor if MassDOT requests an extension of that time and the Contractor does not provide a written extension.

E. With regard to unknown conditions or sub-surface work, in general, the expectation is that the Contractor and MassDOT will strive to gain enough knowledge about the risks in order to provide a forward-priced Change Proposal. Therefore, any costs to fully evaluate the proposal, such as additional borings and/or test pits, must be considered in the cost evaluation of whether the VECP is worth pursuing. However, if it is impractical to gather conclusive exploratory information, before the VECP is executed, MassDOT may consider provisions in the VECP that clearly identifies the risk sharing (cost and time) related specifically to the unknown/sub-surface conditions. If these VECP provisions are acceptable to MassDOT they are to include supplemental language to provide a determination of the final savings/cost, and time impacts, no later than 45 days after the sub-surface work is completed. All other aspects of the VECP, unrelated to these Provisions, will be binding upon execution of the VECP.

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 when required in this Subsection. These requirements are in addition to, and not in limitation of, requirements imposed in other sections.

The requirements for scheduling submissions are established based on the Project Value at the time of the bid and are designated as Type A, B, C or D. The definitions of these Schedule Requirement Types are summarized below. Complete descriptions of all detailed requirements are established elsewhere in this specification.

Type A – for all Site-Specific Contracts with a Project Value over $20 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Resource-Loading
- Resources Graphic Reporting
- Cash Flow Projections from the CPM
- Cash Flow Charts
- Cost-loaded CPM
- Contractor-furnished CPM software, computer and training

Type B – for all Site-Specific Contracts with a Project Value between $10 Million and $20 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Cost-loaded CPM
- Resource-Loading
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software, computer and training

SECTION 722 (Continued)

Type C – for all Site-Specific Contracts with a Project Value between $3 Million and $10 Million

- 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, computer and training

Type D - for all contracts with a Project Value less than $3 Million; various locations contracts of any dollar amount; contracts with durations less than one-hundred and eighty (180) Calendar Days; and other contracts as determined by the Engineer.

- Bar chart schedule updated monthly or at the request of the Engineer (See Section 722.62.B - Bar Charts.)
- Monthly Projected Spending Report (PSR) (See Section 722.62.F - Projected Spending Reports.)

MATERIALS, EQUIPMENT, PERSONNEL

722.40 General

A. Software Requirements (Types A, B and C)

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 within twenty-eight (28) Calendar Days after Notice to Proceed. The computer and software shall be maintained and serviced as recommended by the computer manufacturer and/or as required by the Engineer during the duration of the Contract at no additional cost to the Department. The Contractor shall provide professional training in the basic use of the software for up to eight (8) Department employees. The trainer shall be approved by the Engineer. This training shall be provided within twenty-eight (28) Calendar Days after Notice to Proceed.

B. Scheduler Requirements

For all schedule types, if the Contractor plans to use outside scheduling services, the scheduler shall be approved as a subcontractor 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.

SECTION 722 (Continued)

CONSTRUCTION METHODS

722.60 General

A. Schedule Planning Session
(Types A, B and C)

The Contractor shall conduct a schedule planning session within seven (7) Calendar Days after the Contractor receives the NTP and 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;
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 minimum of five (5) copies of 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 (All Types)

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. Baseline Schedules shall be resubmitted within fifteen (15) Calendar Days after receipt of the Engineer's comments.

2. Contract Progress Schedule / Monthly Update Reviews
   The Engineer will respond to each submittal within twenty one (21) Calendar Days. Schedules shall be resubmitted by the Contractor within five (5) Calendar Days after receipt of the Engineer's comments.

   Failure to submit schedules as and when required could result in the withholding of full or partial pay estimate payments by the Engineer.

SECTION 722 (Continued)

722.61 Schedule Content and Preparation Requirements

(Types A, B and C unless otherwise noted)

Each Contract Progress Schedule shall fully conform to these requirements.

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.

B. ACTIVITIES

The schedules shall clearly define the progression of the Work from NTP to Contractor Field Completion (CFC) by using separate activities for each of the following items:

1. NTP
2. Each component of the Work defined by specific activities
3. Detailed activities to satisfy permit requirements
4. Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before purchasing
5. 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
6. 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
7. Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third party work affecting the Contract
8. The Critical Path, clearly defined and organized
9. Float shall be clearly identified
10. 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
11. Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents
12. Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
13. Full Beneficial Use (FBU) Contract Milestone per the requirements of Subsection 8.03 - Prosecution of Work
14. Contractor’s request for validation of FBU (ready to open to traffic)
15. The Department’s confirmation of completed work to allow for FBU

SECTION 722 (Continued)

16. Substantial Completion Contract Milestone per the requirements of Subsections 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes and 8.03 - Prosecution of Work
17. Contractor's request for validation of Substantial Completion
18. Punchlist 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 and 8.03 - Prosecution of Work
19. Contractor confirmation that all punchlist work and documentation has been completed
20. Physical Completion of the Work Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
21. Documentation Completion per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
22. Contractor Field Completion Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
23. 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
24. Traffic work zone set-up and removal, night work and phasing
25. Early Utility Relocation (by others) that has been identified in the Contract
26. Right-of-Way (ROW) takings that have been identified in the Contract
27. Material Certifications
28. Work Breakdown Structure in accordance with the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at:
    https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit
29. For Type A and B Contracts only: All items to be paid, 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.

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.

SECTION 722 (Continued)

D. DURATIONS

Activity durations shall be in Work Days. Planned Original Durations shall be established with consideration to 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.

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 (for Types A and B only)

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 as specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit

G. ACTIVITY IDENTIFICATION NUMBERS

The Contractor shall use the activity identification numbering system specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located online at the address above.

H. ACTIVITY CODES

The Contractor shall use the activity codes specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located online at the address above.

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.

SECTION 722 (Continued)

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.
- 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. Refer to the Project Special Provisions for specific restrictions.
- 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. Refer to the Project Special Provisions for specific restrictions.
- 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: Refer to the Project Special Provisions for specific restrictions.
- Night-time paving and striping operations, traffic and temperature restrictions: Refer to the Project Special Provisions for specific 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.

SECTION 722 (Continued)

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.
8. For Type A Schedules, each month, the Contractor will be paid using the Cost-loaded CPM activities for Lump Sum payment items. This requirement supersedes any requirements elsewhere in this Contract regarding partial payments of schedule-of-values for all Lump Sum items.

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

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.

Except as stated elsewhere in this subsection, schedule submittals shall include each of the documents listed below, prepared in two formats, for distribution as follows:

a. four (4) compact discs (CD); one (1) each for the Office of Project Controls and Performance Oversight (O-PC&PO), the Boston Construction Section Office, the District Construction Office and the Resident Engineer's Office. Additional copies shall be required if the work is performed in more than one district.
b. two (2) hard copies plotted in color on 24" X 36" paper; one (1) copy each for the District Construction Office and the Resident Engineer's Office. No copies for the O-PC&PO and the Boston Construction Section Office. Additional copies shall be required if the work is performed in more than one district.

SECTION 722 (Continued)

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;
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.

SECTION 722 (Continued)

B. Bar Charts (Types A, B, C and D)

One (1) time-scaled 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 time-scaled 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.

Bar Charts shall be printed in color and submitted on 11" X 17" paper or, if approved by the Engineer, as a .pdf file.

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. The DASC 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

The reports described in Subsections D, E and F below shall be submitted with all of the schedules listed in Subsection722.20 - General:

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.

For Unit Price pay items, in addition to the above, estimates to complete and 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.

SECTION 722 (Continued)

F. Projected Spending Reports (Types B, C and D)

A Projected Spending Report (PSR) shall be prepared and submitted in accordance with the instructions listed at the end of this section. 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. If the difference between the Contractor's monthly projections vs. the actual spending is greater than 10%, the Contractor's monthly spending projection shall be revised and resubmitted within fifteen (15) Calendar Days.

The Projected Spending Report (PSR) shall be depicted in a tabular format and printed in color on 11 x 17-sized paper or larger as approved by the Engineer. For additional instructions and a template for preparing the Projected Spending Report (PSR), refer to the Contractor's Construction Schedule Toolkit located on the MassDOT-Highway Division website at: https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit or consult with the District Construction Scheduler.

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.

SECTION 722 (Continued)

C. Contract Progress Schedules / Monthly Updates (Types A, B, C and D)

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 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 as-built sequencing and as-built dates for completed and in-progress activities. As-built 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.

Except as otherwise designated by a Contract Modification, no Contract Progress Schedule that extends performance beyond the Contract Time and/or beyond any Contract Milestone shall be approved by the Engineer. The Contractor shall submit a Recovery Schedule if any Contract Progress Schedule/Monthly Update indicates a failure to meet the Contract Dates.

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 bar chart 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.

SECTION 722 (Continued)

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.

Failure to submit Short-Term Construction Schedules every two (2) weeks may result in withholding of full or partial payments by the Engineer.

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 three (3) Calendar Days 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 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.

SECTION 722 (Continued)

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 fourteen (14) 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 most efficiently demonstrate the schedule impacts 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 resource 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/Contract Progress Schedule.

C. Recovery Schedules

The Contractor shall promptly report to the Engineer all schedule delays during the prosecution of the Work. Except as otherwise designated by a Contract Modification, no Contract Progress Schedule that extends performance beyond the Contract Time and/or beyond any Contract Milestone shall be approved by the Engineer. The Contractor shall submit a Recovery Schedule within fourteen (14) Calendar Days of a Contract Progress Schedule submission that shows failure to meet the Contract Dates. This requirement is critical to the Department's ability to make informed decisions regarding Contract Time and costs.

SECTION 722 (Continued)

During the prosecution of the Work, should the Contractor's progress on a critical operation clearly not meet anticipated production, without cause by fault of the Department, or should a critical activity or series of activities not be staffed in accordance with the Contractor's approved Baseline Schedule resource planning, the Contractor shall be obligated to recover such delay. Recovery Schedules shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements within fourteen (14) Calendar Days of any of the cases listed above.

Recovery Schedules shall clearly indicate any proposed overtime hours, additional shifts, and the resources that are proposed to be incorporated in to the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts and shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of Time Extensions, without additional compensation for any Contractor delays, if it is determined to be in the best interest of the Department to do so.

During the review of any Recovery Schedule, all Contract Progress Schedules shall continue to be required every month.

The Engineer may request that the Contractor prepare a Recovery Schedule to further mitigate any delays that are shown in an accepted TEA/Contract Progress Schedule.

Changes represented in accepted Recovery Schedules shall be incorporated into the next Contract Progress Schedule.

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/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 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.

Changes represented in 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.

SECTION 722 (Continued)

E. Disputes (Types A, B, C and D)

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.

Any dispute concerning the acceptance of a schedule or any other question of fact arising under this subsection shall be determined by the Engineer. Pending resolution of any dispute, the last schedule accepted by the Engineer will remain the Contract Schedule of Record.

COMPENSATION

722.80 Method of Measurement and Basis of Payment (Types A, B, C and D)

The Special Provisions will specify the fixed-price amount to be paid to the Contractor for the Project Schedule requirements contained herein. Each bidder shall include this lump-sum, fixed-price bid item amount in his/her bid. Failure to do so may be grounds for the rejection of the bid.

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.

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.

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:

$$\text{Monthly Payment} = \frac{\text{Remaining Fixed Price amount (80\% of Item 100.)}}{\text{Contract Duration in whole months} - 2 \text{ months}}$$

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.

SECTION 722 (Continued)

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. Late submittal of missed Contract Progress Monthly Updates 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 withholding of full or partial payments by the Engineer.

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. Item 100. will be the basis for this Equitable Adjustment.

722.82 Payment Items

100.	SCHEDULE OF OPERATIONS - FIXED PRICE $_____	LUMP SUM

ITEM 102.521 TREE AND PLANT PROTECTION FENCE FOOT

The work under this Item shall conform to the relevant provisions of Subsections 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.

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.

ITEM 102.521 (Continued)

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.

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.

ITEM 102.521 (Continued)

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 Subsection 771.

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.

ITEM 102.521 (Continued)

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 TPPZ fencing.

- Sixty (60) percent of the value payment will be made when TPPZ 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 180.01 ENVIRONMENTAL HEALTH AND SAFETY PROGRAM LUMP SUM

GENERAL

It is the Contractor's ultimate responsibility to ensure the health and safety of all the Contractor's employees and subcontracting personnel, the Engineer and his representatives, and the public from any on-site chemical contamination present in air, soil, water and sediment. Boring location #B-107 identified trace asphalt, petroleum odor at a depth of 5.0-7.0 feet. In areas where excavation work will be conducted to install new or replacement drainage structures and lines, the Contractor should be aware of possible impacts due to contaminated soil and groundwater.

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.

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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, soils, sediments and/or groundwater may be contaminated. 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 sampling, analysis and characterization of potentially contaminated media, preparation 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 Massachusetts Contingency Plan (MCP). LSP hours related to the characterization and disposal of contaminated soil and/or sediment are incidental to the disposal items. An estimate of LSP services to be provided shall be submitted to the Engineer for approval before any LSP activity begins.

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 DEP shall be submitted for all work assignments listed for the LSP and environmental technicians.

The LSP shall evaluate soil and/or sediment with discoloration, odor, and presence of petroleum liquid or sheening 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 soil and/or sediment. Any enhanced management of contaminated soil to ensure proper stockpiling and storage is incidental to the LSP Services item. The LSP shall adequately characterize subsurface conditions prior to backfill in areas where contaminated material has been excavated. The Engineer shall approve the locations of the testing sites prior to the sampling.

ITEM 180.03 (Continued)

Contaminated soil, sediment and/or groundwater shall be handled in accordance with all applicable state and federal statutes, regulations and policies. The LSP shall adequately characterize contaminated media for comparison to the requirements of the MCP. 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. The LSP shall maintain written records in a clear and concise format which tracks the excavation, stockpiling, analysis and reuse/disposal of all suspect contaminated soils, sediments and groundwater. These records shall be up-to-date and available to the Engineer on a biweekly basis. The LSP shall review and summarize the laboratory data from any analyses performed on contaminated media. A report shall be delivered to the Engineer outlining the material sampling methods, laboratory analysis results 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, penalties and enforcement requirements imposed by applicable regulatory agencies for failure to meet regulatory and contract timeframes. No compensation will be provided for such fines, penalties 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 Department before submittal to the DEP, except if an imminent hazard condition exists as defined in 309 CMR 4.03(4)(b).

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.

ITEM 180.03 (Continued)

In order to maintain compliance with the MCP 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. 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), semivolatile 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. LSP hours related to soil/sediment disposal (disposal characterization, landfill acceptance, disposal package preparation, etc.) shall be incidental to disposal items.

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. Laboratory testing related to soil/sediment disposal (disposal characterization, landfill acceptance, disposal package preparation, etc.) shall be incidental to disposal items.

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 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.

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.**

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.

ITEMS 181.11 through 181.14 (Continued)

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.

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.

ITEMS 181.11 through 181.14 (Continued)

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.

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 penalties and/or for 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.

ITEMS 181.11 through 181.14 (Continued)

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.

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.

ITEMS 181.11 through 181.14 (Continued)

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.

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.

ITEMS 181.11 through 181.14 (Continued)

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.

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 402.12 DENSE GRADED CRUSHED STONE FOR SHOULDERS CUBIC YARD

The work under this Item shall conform to the relevant provisions of Subsection 402 of the Standard Specifications and the following:

The work under this Item consists of placing crushed stone material in the shoulder areas where required by the Engineer to match the elevation of the finished pavement. The work also includes placing material in dirt or gravel driveways to provide a reasonable transition to the finished pavement edge or paved apron edge.

MATERIALS

This material shall meet the requirements of Subsection M2.01.7 of the Standard Specifications with the exception that the fine aggregate may consist of stone screening. The material shall meet the following gradation requirements:

Sieve Designation	Percent Passing
1”	100
¾"	95-100
½"	75-93
3/8"	60-85
#4	35-55
#16	15-30
#50	8-20
#200	5-15

CONSTRUCTION METHODS

The Dense graded crushed stone may be spread by mechanical or hand methods as appropriate for the location used. The Contractor shall otherwise place, spread, compact, and finish the material as specified in Subsection 402.61 of the Standard Specifications.

METHOD OF MEASUREMENT

Item 402.12 will be measured for payment by the CUBIC YARD of dense graded crushed stone for shoulders placed, complete in place.

BASIS OF PAYMENT

Item 402.12 will be 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.

ITEM 504.2 GRANITE CURB TYPE VA4 – SPLAYED END EACH

Work under this Item shall conform to the relevant provisions of Subsection 501 of the Standard Specifications and the following:

The work under this Item shall include furnishing and installing curb transition sections at proposed granite curb inlets to match into proposed HMA curbing or proposed edge of pavement. The curbing shall be type VA4 and shall have a minimum length of six feet (6'-0"). The curb shall be sawcut to match into the proposed adjacent granite curb inlets at one end and the opposite end shall match into the proposed HMA curb or proposed edge of pavement as shown on the plans.

METHOD OF MEASUREMENT

Item 504.2 will be measured for payment by the EACH granite curb type VA4 – splayed end, complete in place. Each six-foot splayed end curb shall constitute a single unit.

BASIS OF PAYMENT

Item 504.2 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 629.11 PRECAST HIGHWAY GUARDRAIL TRANSITION EACH

The work under this Item shall conform to the relevant provision of Subsection M4.02.14 of the Standard specifications and the following.

The work under this Item consists of furnishing and placing Portland cement concrete highway guardrail transition unit on an accepted foundation, prepared subgrade or sub-base in accordance with these specifications and in reasonably close conformity with the lines, grades and dimensions shown on the plans.

MATERIALS

Materials shall meet the requirements specified in the following Subsections of Division III of the Standard Specifications:

Materials:
Cement and Cement Concrete Materials.....M4
Precast Concrete Highway Units.....M4.02.14
Cement Concrete Blocks.....M4.05.1
High Performance Concrete.....M4.06.1
Steel Reinforcement.....M8.01.0
Epoxy Coated Reinforcing Bars M8.01.7
Preformed Joint Filler M9.14.0
Demountable Reflectorized Delineators.....M9.30.7

Plain dowel bars shall conform to ASTM A36 and shall be galvanized according to AASHTO M 111M/M 111.

CONSTRUCTION METHODS

The subgrade shall be properly shaped and compacted as specified in Subsection 170 of the Standard Specifications.

Precast Highway Guardrail Transition unit shall be placed on a previously compacted gravel foundation utilizing 24-in. by 24–in. by 8-in. concrete leveling blocks conforming to the provisions of M4.05.1 odf the Standard specifications. Cement Concrete Blocks set flush with the top of the gravel to control setting of the unit to the proper grade.

The Contractor shall schedule their operation and sequence of installation of the unit so that a minimum amount of closure pieces will be required.

Expansion and construction joints shall be as shown in the Construction Standard Details. Any units showing cracks or other damages due to curing, transportation, installation or other acts of the Contractor shall be removed and replaced by the Contractor at no additional compensation.

Finishing, Curing, and Protective Sealing

Precast Highway Guardrail Transition unit shall be finished, cured, and sealed according to the applicable specifications of Subsection M4.02.14: Precast Concrete Highway Units of the Standard Specifications.

ITEM 629.11 (Continued)

METHOD OF MEASUREMENT

Item 629.11 will be measured for payment by the EACH Precast Highway Guardrail Transition, complete in place.

BASIS OF PAYMENT

Item 629.11 will be paid for at the Contract unit price per EACH, which price shall include all labor, equipment; materials including finishing, curing, protective sealing, delineators, reinforcing steel, premolded filler, concrete leveling blocks, and all incidental costs required to complete the work.

Gravel borrow for the foundation of the barriers and between the sections will be paid for under Item 151; Gravel Borrow.

ITEM 691.01 BALANCE STONE WALL REMOVED AND REBUILT FOOT

The work under this Item shall conform to the applicable provisions of Subsections 685, 690, 901, of the Standard Specifications, the Plans, and the following:

The work under this Item consists of carefully dismantling, stockpiling stone, and rebuilding selected fieldstone balance stone walls in new locations within the project area. Balance stone walls to be removed and rebuilt as identified on the plans. Locations of new walls shall comply with all ROW and clear recovery requirements.

To allow mason greatest selection of local fieldstone in rebuilding balance wall, no stones from balance stone walls shall be discarded from project area until all rebuilt balance walls on project are complete.

The work shall include the total volume of adjusted wall, disassembly of existing wall, and reconstructing wall in new location complete as shown on the plans and as required by the Engineer.

The work shall include but not be limited to digging and trenching, removal of vegetation, labor, tools, equipment and all incidentals required to complete the work as stated herein, shown on the Contract plans, and as required by the Engineer. 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.

MATERIALS

Stone from existing project area balance walls shown to be removed shall be used. Ideally stone from segments of wall shall simply be relocated. No stone from walls not to be removed shall be used.

Most stones are dry laid but vary in size. Some stones may be boulders embedded in the ground.

Any supplemental stones that are required shall be field stones which match the size, color, and texture of the existing stones as closely as is feasible.

Stones from existing walls should not require cleaning. Natural staining or patches of lichen growth is acceptable.

No mortar shall be used anywhere or for any reason in reconstructing dry laid balance walls.

SUBMITTALS

The stonework shall be done by masons who are experienced in construction of dry laid stone walls. At least one of the masons shall have 10 years or more experience constructing mortarless, dry-laid balance stone walls. Resume and projects showing experience shall be submitted to Engineer and MassDOT Landscape Section for approval.

ITEM 691.01 (Continued)

CONSTRUCTION METHODS

Prior to the disassembly of the existing wall, photographs of the existing conditions of the wall shall be taken to serve as a guide for its reconstruction.

The Contractor shall take care not to damage the existing stones during the disassembly and reconstruction of the wall.

The Contractor shall provide a secure location for stockpiling stone prior to reconstruction, so that stones will not be damaged, lost or stolen.

The rebuilt walls shall maintain a linear appearance and irregular character of local early agricultural farmer walls to as great a degree as possible.

To prepare the base, remove vegetation and excavate a trench up to 12 inches deep as needed to achieve stable, unfrozen soil. Place the bottom row of stones in the trench. Stones from select, existing dismantled walls, shall be used to rebuild the new walls.

The open spaces about the base of the wall shall be filled with the materials excavated from the trench. Surplus excavation shall be used as directed in location or disposed.

The stones shall be laid in a two-over-one, one-over-two pattern so as to break joints and all vertical spaces shall be packed full with spalls or chinking stones. No spalls or chinking shall be allowed in the beds and at least 25% of the stones in the face shall be headers evenly distributed throughout the wall.

Additional available stone may be used to increase height of wall if needed. The walls shall not exceed four feet in height.

Upon completion of all walls, stone shall be disposed of or stockpiled at a location to be determined by the Engineer and the Town.

ITEM 691.01 (Continued)

METHOD OF MEASUREMENT

Item 691.01 will be measured for payment by the FOOT of length of balance stone walls removed and rebuilt, complete in place.

BASIS OF PAYMENT

Item 691.01 will be paid for at the Contract unit price per FOOT, which price shall include all labor, equipment, worker protection, environmental compliance, submittals, vegetation removal, materials, tools, material testing, transportation/hauling, 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 Item 141. Class A Trench Excavation or Item 144.Class B Rock Excavation as required by the Engineer.

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

Silt sacks shall be installed in retained existing and proposed catch basins and drop inlets within the project limits and as required by the Resident 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 directed 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 Contractors 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 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 the requirements of Subsection M9.50.0 for separation of the Standard Specifications. Construction and installation shall be in accordance with AASHTO M 288 and the following:

The work under this Item consists of furnishing and placing geotextile fabric for separation under stone for pipe ends and under revetment stone slope protection at the locations shown on the Construction Details or as required by the Engineer.

CONSTRUCTION

Atmospheric exposure of the geotextile fabric to the elements following lay down shall be a maximum of 14 days.

For seams that are sewn in the field, the Contractor shall provide at least a six-foot length of sample sewn seam for the approval of the Engineer before the geotextile fabric is installed. The seams sewn for sampling shall be sewn using the same type of equipment and procedures as will be used for the production seams. If seams are sewn in both the machine and cross machine direction, samples of seams for both directions shall be provided. The seam assembly description shall be submitted by the Contractor along with the seam samples. This description shall include the seam type, stitch type, sewing thread, and stitch density. If the Contractor elects to sew seams instead of overlap, colored thread must be used.

Geotextile shall be placed in intimate contact with soils without wrinkles or folds, and shall be anchored on a smooth graded surface approved by the Engineer. The geotextile shall be placed in such a manner that placement of the overlaying materials will not excessively stretch or tear it.

Adjacent geotextile sheets shall be joined by either sewing or overlapping. At roll ends, overlapped seams shall overlap a minimum of 12 inches, except when placed under water, where they shall overlap a minimum of 3 feet. Adjacent rolls shall overlap a minimum of 12 inches.

Care shall be taken during installation to prevent damage to the geotextile as a result of the installation process. Should the geotextile be damaged, a geotextile patch shall be placed over the damaged area extending a minimum of 3 feet beyond the limits of the damage.

Any section of fabric that is damaged shall be repaired in accordance with the manufacturer's requirements and AASHTO M 288 and to the satisfaction of the Engineer or it shall be replaced at no cost to the state.

Bedding and Slope Protection:

The geotextile shall be placed and anchored on a prepared surface approved by the Engineer. The geotextile shall be laid loosely so that placement of the overlaying materials will not stretch or tear the geotextile. The backfill placement shall begin at the toe and proceed up the slope. Successive geotextile sheets shall be overlapped in such a manner that the upstream sheet is placed over the downstream sheet.

ITEM 698.3 (Continued)

Riprap shall not be dropped onto the geotextile from a height greater than 12 inches. Slope protection and smaller sizes of stone filling shall not be dropped onto the geotextile from a height exceeding 3 feet.

The surface upon which the geotextile is to be placed shall be within reasonable conformity to the proposed grade.

METHOD OF MEASUREMENT

Item 698.3 will be measured for payment by the SQUARE YARD of geotextile for separation actually installed, complete in place. Overlapping for seams and joints shall be measured as one layer of fabric. Any embedment or wrapping at the toe or top of the slope, applied per manufacturer's installation recommendations or the Engineer's direction shall be measured for payment.

BASIS OF PAYMENT

Item 698.3 will be paid for at the Contract unit price per SQUARE YARD, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

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) (not including the bypass tray)
- 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
- 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 755.35 INLAND WETLAND REPLICATION AREA LUMP SUM

GENERAL

The work under this Item shall conform to the relevant provisions of Subsections 120, 770, 771 of the Standard Specifications and the following:

Work under this Item shall include furnishing material and the construction and maintenance of inland wetland replication areas as shown on the drawings and as required by the Engineer. Inland Wetland Replication Area shall hereafter be referred to as Replication Area. All work shall be in coordination with an approved Wetland Specialist as specified under that item.

Wetland Restoration work shall be as specified and compensated under that item. Construction of tidal wetlands shall be as specified under the approproximate item for tidal wetland mitigation.

The Replication Area shall be constructed prior to wetland impacts unless otherwise approved by the Engineer, specified herein, or specified in permit conditions and approvals. Construction schedule shall be appropriate to planting and seeding season (see below). Changes to this schedule will require written approval from the Engineer.

Construction of the Replication Area shall be completed as shown on the drawings at the following location:

Area at Station: ***85+50*** Area = ***1204*** sf.

Replication Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers Permit.

The Contractor is responsible for protection and preservation of natural areas adjacent to the Replication Area both within and outside the project limits and for the duration of the Contract; including but not limited to damage to soils or vegetation due to erosion, sedimentation, compaction, trampling, vehicles, storage of materials, or other negligence shall be repaired to the satisfaction of the Engineer and at the Contractor's expense.

The Wetland Specialist overseeing the Wetland Replication construction work shall not be from the same company as that which is performing planting, seeding, or participating in any aspect of the Wetland Replication construction.

ITEM 755.35 (Continued)

SUBMITTALS - DOCUMENTS

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): As specified below, shall be submitted to the Engineer for distribution to appropriate regulatory agencies.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.75 and 755.76.

SUBMITTALS - MATERIAL

Soil and Amendments

No soil, compost, or other soil amendment imported to the work site shall contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants.

At least sixty (60) days prior to installation and prior to ordering, the Contractor shall submit for approval sources of soil, compost, and amendments. Submittal shall include the supplier and location of the source. Off-site sources shall be identified and available for inspection by the Wetland Specialist prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Samples of tested and approved wetland soil and soil amendments for soil texture, organic carbon content or other routine soil analysis parameters (e.g., pH, Cation Exchange Capacity, Percent Base Saturation) and Soil Organic Matter Analysis will be required if requested by the Engineer. The grab samples shall be collected by the Contractor or Wetland Specialist from multiple representative locations in the wetland topsoil mix following the "UMASS Soil and Plant Tissue Testing Laboratory Sampling and Collection Protocols" (or equivalent certification paperwork provided by the soil supplier). The lab analysis shall be provided to the Engineer along with written certification from the Contractor or Wetland Specialist that the wetland topsoil was collected per the referenced protocol and meets the desired specification. The analysis and written certification of same shall be provided to the Engineer prior to placing the wetland topsoil in the Replication Area.

Seed Mix

Certificate of Materials from the supplier shall be submitted 30 days prior to seeding and must be approved prior to ordering materials. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

ITEM 755.35 (Continued)

Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

Bill of lading or notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Plant Certification

Plant Certification shall be per the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the Standard Specifications. The nursery source shall certify the provenance or origin of all plants.

Other Material: Submittals shall be per the respective item.

MATERIALS

Sediment Control Barrier and Erosion Prevention Measures
Sediment control barriers shall be per Item 767.121.

Erosion prevention measures for disturbed areas adjacent to the Replication Area shall include but not necessarily be limited to compost blankets, jute mesh, seeding, and/or combinations thereof as approved by the Engineer.

Sediment controls and erosion prevention devices and measures shall be compensated under the respective items.

Wetland Soil

Soil appropriate for the Replication Area may be either hydric soil excavated from the impacted wetland, a manufactured mix of compost and on-site borrow, or a combination thereof, as approved by the Engineer.

Hydric soil from the impacted wetland area may be spread on the surface of the constructed Replication Area as an inoculant or can be placed in a bulk fashion in a roughly 1:1 ratio of area and depth. Soil shall be handled such that the original soil structure is preserved and shall not be compacted, screened, or otherwise processed.

ITEM 755.35 (Continued)

Hydric soil from the impacted wetland that is infested with invasive plant species identified on the Massachusetts Invasive Plant Advisory Group (MIPAG) shall not be used in the Replication Area unless approved by the Wetland Specialist and Engineer. To the extent possible, infested soil shall be disposed of within the project limits in an upland area outside of regulated areas and as approved by the Invasive Plant Management Strategy item (if in the contract) or by the Engineer.

A manufactured mix suitable for wetlands shall consist of on-site borrow from the proposed Replication Area (if approved by the Wetland Specialist and Engineer) thoroughly mixed with compost to achieve a target organic carbon content of 10-12% (up to 21% percent organic matter) by dry weight. The organic material used for mixing shall be well or partially decomposed. Clean leaf compost is the preferred soil amendment to achieve these standards though other materials may be used if approved by the Wetland Specialist and Engineer. Note that "clean" refers both to a negligible amount (<1%) of physical contaminants such as plastic and to the lack of chemical contaminants that might pose a hazard to plants or animals. Off-site borrow may be used for mixing if approved in advance by the Engineer.

No soil or soil amendment shall be brought on site without approval of the material source by the Wetland Specialist and the Engineer. Soils used in the replacement area shall be free of rocks greater than 4 inches in diameter.

Plants

Plant material shall conform to the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the latest edition of the Standard Specifications and as amended below.

Plants shall be native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion.

Plant species and sizes to be included in the Replication Area shall be:

- as specified in the plan schedule provided on the construction plans.

Requests for substitutions shall be submitted in writing to the Engineer for review by the Wetland Specialist, MassDOT Landscape Architect, and, if required, the relevant regulatory agency at least thirty (30) days prior to planting. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries that have been inspected by state and/or federal agencies.

ITEM 755.35 (Continued)

Seed Mix

Mix 765.552 Wetland Mix – Obligate Mix

	Botanical Name	Common Name	% PLS By Weight
Grass			
	Carex vulpinoidea	Fox Sedge	26.50%
	Carex lurida	Shallow Sedge	15.00%
	Sparganium eurycarpum	Giant Bur Reed Eco PA	10.00%
	Carex lupulina	Hop Sedge	7.00%
	Carex crinita	Fringed Sedge	6.00%
	Scirpus cyperinus	Woolgrass	4.00%
	Juncus effusus	Soft Rush	3.00%
	Carex comosa	Bearded Sedge	3.00%
	Scirpus atrovirens	Green Bulrush	3.00%
	Sparganium americanum	Burrweed	2.50%
	Scirpus validus	Bulrush, soft-stem	2.00%
	Carex stricta	Tussock Sedge	1.00%
	Glyceria canadensis	Manna Grass	1.00%
			84.00%
Herb/Forb			
	Verbena hastata	Blue Vervain	4.00%
	Aster puniceus	Aster - Swamp	2.00%
	Eupatorium maculatum	Joe-pye Weed	1.50%
	Eupatorium perfoliatum	Boneset	2.00%
	Iris versicolor	Blue Flag Iris	2.00%
	Alisma subcordatum	Mud Plaintain	1.00%
	Vernonia noveboracensis	New York Ironweed	1.00%
	Bidens cernua	Nodding Burr Marigold	1.00%
	Solidago patula	Roughleaf goldenrod	0.50%
	Mimulus ringens	Monkey Flower	0.50%
	Chelone glabra	White Turtlehead	0.50%
			16.00%
			100.00%

Seeding Rate:
Species ecotype shall be as native to New England region as possible.
Apply this mix at 20 lbs PLS/acre.

Seeding shall conform to the Standard Specifications Section M6, ROADSIDE DEVELOPMENT MATERIALS.

Fertilizers shall not be used.

ITEM 755.35 (Continued)

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

Mulch/Compost Blanket for Seeding

Hydromulch shall be per the manufacturer's recommendations and shall be wood fiber or straw mulch only. Mulch shall be incidental to seeding.

Compost Blanket may be used in lieu of mulch for seeding. Compost Blanket shall meet the material and submittal requirements of that Item and shall be applied as specified below. Compost Blanket shall be compensated under that item.

CONSTRUCTION METHODS

SITE PROTECTION MEASURES

Minimizing Damage

The Contractor shall plan and execute operations in a manner minimizing the amount of excavated and exposed fill or other foreign materials that could be washed or otherwise carried into Replication Area and nearby resource areas.

Construction of and access to the Replication Area shall minimize damage to existing vegetation and soils as specified herein. Damage to soils or vegetation shall be repaired to the satisfaction of the Engineer and at the Contractor's expense. If required for soil remediation, tilling and the addition of compost shall be at the Contractor's expense.

Wetland topsoil shall be deposited and graded in the Replication Area in a manner that minimizes travel and subsequent compaction of the subgrade (including any specified pit and mound topography) to the extent practicable, including use of track mounted excavators as appropriate. Should soils be compacted, they shall be loosened by a method such as disking, spring-tooth harrowing and/or rototilling. The Contractor shall use boards, timber or composite mats, or other approved materials as necessary, to protect existing and/or new wetlands from compaction due to heavy foot traffic or if equipment is required to travel over wetland soil. All labor and materials required for protection and preservation of site shall be incidental to this Item.

ITEM 755.35 (Continued)

Stockpiling of Soil

Stockpiling of soil, including hydric soil for replication, shall be at least 100 feet from the edge of the bordering and isolated vegetated wetlands and inland banks, unless approved otherwise by the Engineer. Stockpiled soils shall be securely stabilized and contained. Any areas of exposed soil or stockpiles within and adjacent to the Replication Area that will remain inactive for more than 7 calendar days shall be sown with a mix of rapid germinating annual grasses (e.g., annual rye) covered with a layer of straw mulch applied at a rate of 90 pounds per 1,000 square feet. As necessary, the mulch shall be anchored with a tacking coat (non-tar) applied by a hydro seeder or other method recommended by the Wetland Specialist in consultation with the Engineer. In the event that there is excess borrow, it shall be disposed of under Excavation, Item 120.

Sediment Barriers

Placement: Sediment barriers shall be installed along the downslope perimeter of the Replication Area beginning and ending in the surrounding upland so that no excavated material or disturbed soil can enter adjacent wetlands or waters. Where construction work is immediately upgradient of the wetland, barriers shall be located so as to protect the Replication Area until slopes are stabilized. Sediment barriers shall be in place and approved by the Engineer prior to excavation work. No work shall take place outside the barriers.

Maintenance: The Contractor shall ensure that all sediment barriers function as intended and at all times per the specifications of those respective items.

Existing Trees to Remain

Tree protection shall be per the relevant specifications and as shown on the plans or as required by the Engineer. To protect root systems of existing trees to remain, the limits of the Replication Area may be adjusted, but the total area of replication required by the permits shall not be reduced. Access route may be adjusted as required.

Trees to be retained as snags (upright dead or dying trees left for wildlife habitat) within or adjacent to the Replication Area shall be as shown on the plans or as directed by the Wetland Specialist or Landscape Architect during the initial site walk. Trees to remain as snags shall be clearly marked prior to clearing. Trees that pose a potential fall hazard (i.e., are near a roadway) should have limbs and trunk cut such that the tree does not pose a fall hazard.

Coarse woody debris in the form of cut trees, stumps, logs, and brush shall be incorporated as shown on the plans or as directed by the Wetland Specialist or Landscape Architect. On site material shall be selected and marked by the Wetland Specialist, retained on the project site, and placed as specified below under Placement of Coarse Woody Debris.

All trees, stumps, or brush not specified to remain shall be removed and shall not be stockpiled in the wetland resource areas while awaiting disposal.

Work shall be coordinated with Clearing or Tree Removal Item and compensated under that Item.

ITEM 755.35 (Continued)

PRE-WETLAND CONSTRUCTION SITE WALK

Delineating the Replication Area and Access Route. The Contractor shall stake out the Replication Area boundaries and the intended access route and set grade stakes for approval by the Wetland Specialist and Engineer. Following staking and demarcation of areas, the Engineer and Wetland Specialist shall approve or modify as necessary the limits of work, the access route, final location and configuration of replication, grade stake elevations, proposed location of sediment barriers, and review proposed construction methods.

As part of the delineation and approval process, the Wetland Specialist shall mark trees to be converted to snags, select course woody debris to be retained for re-use, and select rocks or other elements to be used for habitat features.

Invasive Plants: As part of the initial site walk, the wetland to be impacted and the proposed replication site shall be inspected for the presence of invasive plants. If invasive plants are found, they shall be addressed as described herein under Invasive Plants.

SOIL WORK

Final grades in the Replication Area shall meet the target elevations as shown on the Plans or as adjusted by the Wetland Specialist to achieve the desired hydrology and micro-habitat. If adjustments are required, a Request for Information (RFI) shall be submitted to the Engineer for approval. Adjustments shall be documented and included in the As-Built plans (if required) and/or other applicable required documents.

Excavation & Grading

When required by permits, the Wetland Specialist shall notify MADEP and the ACOE (as applicable) at least 72 hours prior to excavation.

Soil in the proposed wetland areas that must be removed for grades to conform to the proposed elevations shall be stripped and disposed of, or, if suitable for reuse, be stockpiled in an approved location. Stockpiled soils shall be kept wet and not allowed to dry out. Procedures for maintaining appropriate moisture levels shall be documented by the Wetland Specialist and provided to the Engineer and the Contractor.

Replication area shall be excavated as shown on the drawings. Where replication area is adjacent to existing reference wetland, finish grade of replication shall generally match existing grades and micro-topography, notwithstanding any deviations that are necessary to achieve the desired hydrology and habitat in the Replication Area.

Prior to placement of backfill, scarify subgrade to a depth of 4 to 6 inches.

ITEM 755.35 (Continued)

Placement of Wetland Soil

Following excavation, scarification, and grading of sub-grade, and after the sub-grade elevations are approved by the Wetland Specialist, suitable soil previously removed or an evenly mixed organic/mineral soil created on-site shall be spread to the design depth and thickness over the proposed wetland areas as shown on the plans and as directed by the Wetland Specialist.

Vehicles used to transport soil from offsite shall be washed or cleaned with air pressure to prevent exotic or invasive seeds or root fragments from contaminating the Replication Area.

Final Grading

The finished grade of the Replication Area shall be at an elevation that will provide an unrestricted hydrologic connection between the Replication Area and adjacent resource areas. The hydrologic connection should be in keeping with restoring the intended function of the replacement wetland relative to the impacted reference wetland. The Contractor shall verify that this elevation is not at a level that could negatively alter the hydrology of an adjacent wetland. Microtopography in the form of hummocks, pits and mounds shall be as shown on the plans or as adjusted by the Wetland Specialist. Final elevations and grading of wetland soil shall be approved by the Wetland Specialist and the Engineer.

To avoid compaction once soil has been placed, no heavy equipment shall travel across placed soil and no work shall occur in wet or moist soil. Soil that is compacted due to construction activities shall be replaced with soil as specified herein and at the Contractor's expense.

Installation of Monitoring Wells in Replication Area

For a constructed Replication Area over 1,000 square feet, a representative number of monitoring wells shall be installed in locations as shown on the Plans. Monitoring wells shall include data loggers. For purposes of this specification, a data logger refers to a battery powered device that records groundwater level. Data shall be collected by the Wetland Specialist and submitted with Monitoring Reports and as required by applicable permits. Wells shall be installed immediately following completion of construction of the Wetland Replication Area. Wells shall be installed in accordance with USDA/NRCS technical report entitled: "Sprecher, S.W. 2008. Installing monitoring wells in soils (Version 1.0). National Soil Survey Center, Natural Resources Conservation Service, USDA, Lincoln, NE." or equivalent methodology approved by Engineer.

ITEM 755.35 (Continued)

RESTORING VEGETATION

Placement of Coarse Woody Material

If specified within this Contract or if directed by the Wetland Specialist or Landscape Architect during the initial site walk, woody debris shall be placed in the Replication Area and/or adjacent upland buffer. Material shall be placed as shown on the plans or as directed following placement of wetland soil and prior to application of compost and/or seed. Woody material shall cover a minimum of 5-20 percent of the Replication Area, depending on whether it is a meadow or woodland wetland and how much wood is available from construction clearing. Where trees are cut for construction purposes, logs of a minimum length of 8 feet must comprise a minimum of 50% of the woody material left on site. Brush shall be included along with logs and stumps as directed. Woody material shall be placed in a deliberate and naturalistic manner.

Planting

Following placement of wetland soil and approval of final grade and conditions, Replication Area shall be planted. Planting shall conform to SUBSECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER of the Standard Specifications and as amended below.

Planting Season shall be May 15-June 15 and September 1-November 1 unless otherwise specified in applicable permit conditions.

Prior to planting, the Wetland Specialist shall approve the condition of the plant material and the method of installation and shall oversee the planting work. Replication Area shall be planted in the dry. Plants shall be placed according to the planting details and within the range of target elevations and at the spacing shown on the Plans or, if spacing is not indicated on the Plans, at the direction of the Wetland Specialist. Unless otherwise noted on the Plans, final plant locations shall be determined on site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer or Wetland Specialist and shall be replaced at the Contractor's expense.

Plant material shall be furnished and installed as indicated including all labor, materials, plants, equipment, incidentals, re-setting of plants (frost heaves, etc.), irrigation, re-planting and clean up. If previously approved species are not available at the time of planting, the Wetland Specialist may propose substitutions relative to species, size, and quantities for review and approval by the MassDOT Landscape Architect. Upon approval by MassDOT, substitutions shall be approved by the regulating authority, if and as necessary. Provisions shall be made for a growth warranty of at least two (2) calendar years from the date of Conditional Acceptance as described below or as required by permits.

ITEM 755.35 (Continued)

Seeding

Following placement of wetland soil and planting (if included), the Replication Area shall be seeded using one of the following methods:

- Broadcast by hand or with a hand-held spreader followed by application of straw mulch. If necessary, seed shall be lightly raked to insure good seed-to-soil contact.
- Hydro-seeded with hydro mulch per the Standard Specifications and per the manufacturer's directions.
- Hand broadcast seed with Compost Blanket pneumatically applied at the same time to ensure light cover of soil topdressing over seed.

If spring conditions are drier than usual, supplemental watering may be required. If sowing during the summer months, supplemental watering will likely be required until germination.

If required, seeding limits for different seed mixes shall be determined by the Wetland Specialist.

PLANT ESTABLISHMENT AND INVASIVE MANAGEMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by May 15 after fall planting shall be replaced within the immediate or next planting period and at the Contractor's expense.

Seeding that fails to establish according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this Item.

Invasive Plants: Corrective measures shall be taken to remove or treat invasive plant species in the Replication Areas. Invasive plants shall include those listed as invasive by Massachusetts Invasive Plant Advisory Group (MIPAG) and the US Army Corp of Engineer's New England District's Compensatory Mitigation Guidance

The strategy for chemical and/or manual removal shall be as directed by the Wetland Specialist, shall continue for the duration of the monitoring period, and shall be incidental to this Item.

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland construction work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist demonstrating that the wetland replication construction work was done according to plans (or how modified) and meets required permit conditions. The narrative shall include photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

ITEM 755.35 (Continued)

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Replication Area and surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The final finished target elevations have been met and maintained relative to the approved plans and reference wetland. Areas that are too high or too low should be identified along with suggested corrective measures.
- Hydrology meets performance standards.
- Specified seed mix has been seeded. If inspected 30 or more days after seeding, seeded species in the wetland and adjacent upland shall show signs of good germination and healthy growth.
- Planted woody and herbaceous species meet specifications and are establishing well.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- There are no invasive plants visible in the replication area.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Replication work is not approved, MassDOT will issue a rejection letter requiring corrective actions. The Wetland Specialist shall recommend corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Wetland Specialist shall be compensated under Item 755.75.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

REQUEST FOR CERTIFICATE OF COMPLIANCE

If required, a request for a Certificate of Compliance (Partial or Full) pursuant to the Massachusetts Wetlands Protection Act regulations shall be prepared and submitted to MassDOT within 30 days following Conditional Acceptance.

The Request for Certificate of Compliance shall include the following:

- A brief narrative of the work on company letterhead signed by the Wetland Specialist. Narrative shall be prepared as a MS Word document and shall include substantive explanation that demonstrates compliance with EACH relevant permit condition. Narrative shall note variations from the originally permitted design.
- As-built Drawings signed by the Contractor's PE registered in the Commonwealth of Massachusetts. As-built drawings shall show hydrologic conditions, status of plantings and seeding, and shall include a narrative and minimum of 4 photographs documenting site conditions. Plans should note variations from the originally permitted design.

ITEM 755.35 (Continued)

When required, drawings shall meet the Army Corp of Engineer's New England District's Compensatory Replication Guidance, including: scale in the range of 1"=20' to 1" = 100', contours at 1' intervals, spot elevations for intermediate elevations, and polygons outlining each Replication Area, and, as applicable, plant community types. The As-built Drawings shall be provided to the Engineer electronically in Portable Document Format (PDF). If requested by the Engineer, the Drawings shall be provided in printed paper format (11" x 17" sheets, unless otherwise directed). Drawings must be scalable.

- Other documents as required.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Contractor, Wetland Specialist and regulatory representative (if required) shall assess the Replication Area. Final Acceptance will initiate the start of the Wetland Monitoring Period.

The following conditions shall be inspected and approved for acceptance and payment.

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover at least 95 percent of the Replication Area, excluding areas of open water areas or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

If the mitigation work does not meet the above condition and is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions. Work not approved will be addressed by the Contractor at no extra cost.

Wetland Specialist shall be compensated under Item 755.75.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

ITEM 755.35 (Continued)

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 95 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.35 will be paid for at the Contract unit price per LUMP SUM, which price shall include all labor, materials, equipment, submittals, maintenance, all required soil, site preparation, grading, wetland seeding, planting, mulching, watering, monitoring wells, registered surveyor, as-built plans, Request for Certificate of Compliance, and all incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 60% upon Conditional Acceptance.
- 20% after receipt and acceptance of Certificate of Compliance by the Engineer and once all permit construction requirements have been met and approved.
- 20% upon Final Acceptance.

Excavation will be paid under Item 120.
Sediment Control Barrier will be paid under Item 767.121
Wetland Specialist will be paid under Item 755.75
Wetland Monitoring Reports for follow-up monitoring will be paid under Item 755.76

ITEM 755.45 WETLAND RESTORATION SQUARE YARD

DESCRIPTION

The work under this Item shall conform to the relevant provisions of Subsections 120, 751, 765, 767, and 771 of the Standard Specifications and the following:

The work under this Item shall include all labor and furnishing of materials to complete the work specified herein to protect and restore existing inland wetland areas that will be temporarily impacted as shown on the drawings and as required by the Engineer.

Inland Wetland Replication work shall be as specified and compensated under that item. Tidal wetland mitigation shall be as specified under the appropriate item for tidal wetlands.

Restoration Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers General Permit.

All work shall be in coordination with an approved Wetland Specialist. Wetland Specialist qualifications and requirements shall be per Item 755.75, Wetland Specialist.

SUBMITTALS – DOCUMENTS

Survey: To establish or confirm pre-construction baseline elevation of temporarily impacted area(s), a survey shall be submitted to the Engineer prior to any fill or other land disturbance.

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): If applicable, request for a Certificate of Compliance shall be submitted to the Engineer for distribution to appropriate regulatory agencies as specified below.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.76 Wetland Monitoring Reports.

ASSOCIATED ITEMS AND MATERIALS

Compost shall be in accordance with Subsection 751 and M1.06.0 Organic Soil Additives of the Standard Specifications. Compost shall not contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants. Off-site sources shall be identified and available for inspection prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

ITEM 755.45 (Continued)

Compost Blanket shall be as specified under that item.

Seed Mix

Required submittals include:

- Certificate of Materials from the supplier shall be submitted and approved 30 days prior to ordering seed. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

- Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

- Bill of lading or a notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

ITEM 755.45 (Continued)

Seed mix shall be:

Mix 765.552 Wetland Mix – Obligate Mix

	Botanical Name	Common Name	% PLS By Weight
Grass			
	Carex vulpinoidea	Fox Sedge	26.50%
	Carex lurida	Shallow Sedge	15.00%
	Sparganium eurycarpum	Giant Bur Reed Eco PA	10.00%
	Carex lupulina	Hop Sedge	7.00%
	Carex crinita	Fringed Sedge	6.00%
	Scirpus cyperinus	Woolgrass	4.00%
	Juncus effusus	Soft Rush	3.00%
	Carex comosa	Bearded Sedge	3.00%
	Scirpus atrovirens	Green Bulrush	3.00%
	Sparganium americanum	Burrweed	2.50%
	Scirpus validus	Bulrush, soft-stem	2.00%
	Carex stricta	Tussock Sedge	1.00%
	Glyceria canadensis	Manna Grass	1.00%
			84.00%
Herb/Forb			
	Verbena hastata	Blue Vervain	4.00%
	Aster puniceus	Aster - Swamp	2.00%
	Eupatorium maculatum	Joe-pye Weed	1.50%
	Eupatorium perfoliatum	Boneset	2.00%
	Iris versicolor	Blue Flag Iris	2.00%
	Alisma subcordatum	Mud Plaintain	1.00%
	Vernonia noveboracensis	New York Ironweed	1.00%
	Bidens cernua	Nodding Burr Marigold	1.00%
	Solidago patula	Roughleaf goldenrod	0.50%
	Mimulus ringens	Monkey Flower	0.50%
	Chelone glabra	White Turtlehead	0.50%
			16.00%
			100.00%

Seeding Rate:
Species ecotype shall be as native to New England region as possible.
Apply this mix at 20 lbs PLS/acre.

Fertilizers shall not be used.

Straw mulch or hydromulch shall be per Section M6 of the Standard Specifications.

ITEM 755.45 (Continued)

Plants

Plant material shall conform to the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the Standard Specifications and as amended below.

Plant Certifications shall be submitted at the time of delivery and shall conform to the Standard Specifications. Plants shall be native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion. The nursery source shall certify the provenance or origin of all plants.

Plant species and sizes to be included in the Restoration Area shall be as specified on the plans.

Requests for substitutions shall be submitted in writing to the Engineer for review by the MassDOT Landscape Architect, and, if required, the relevant regulatory agency at least thirty (30) days prior to planting. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries.

Dead and failing plants shall be replaced per the requirements of Subsection 771 of the Standard Specifications.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

CONSTRUCTION METHODS & SEQUENCE

Site Protection Prior to Impacts

Prior to any land work, as part of the initial site-walk, the Wetland Specialist shall photo-document the site and provide a summary report of existing conditions as outlined under Item 755.75 Wetland Specialist.

Where and as required vegetation shall be cut flush and area surveyed to establish pre-construction elevations.

ITEM 755.45 (Continued)

Following the cutting and surveying, temporary separation fabric or timber matting shall be placed as required to protect soil and vegetation from compaction, contamination, and/or other damages. Fabric and timber mats shall be placed as specified under the respective items and the Engineer shall approval placement.

Restoration Upon Completion of Roadway Construction Work

Sediment Barriers

If required for sediment control during Restoration work (i.e, tilling is required to restore soil), sediment barriers shall be installed along the downslope perimeter of the Restoration Area beginning and ending in the surrounding upland so that no disturbed soil can enter adjacent wetlands or waters. Sediment barriers shall be in place and approved by the Engineer prior to any soil disturbance. No work shall take place outside the barriers.

Removal of Fill and Grading

Fill and temporary separation fabric or mats shall be removed and disposed of as specified under the respective items.

If required, grades shall be restored to pre-construction elevations as shown in the baseline survey or as required by the Engineer and Wetland Specialist to restore hydrologic functions. Final elevations shall be approved by the Engineer prior to soil preparation and seeding. Grading shall be incidental to this item.

Following approval of grading to elevations required, soil shall be prepared and seeded as follows.

Soil Scarification

Compacted soil shall be scarified with equipment approved by the Engineer. Upon approval of soil scarification, the area shall ***be seeded with mulch.***

Seeding with Mulch

Upon approval of prepared soil, area shall be seeded. Seeding shall be hand broadcast with straw mulch applied per the Standard Specifications and per the manufacturer's directions. Hydromulch shall be straw or wood fiber only and shall be per the manufacturer's recommendations.

ITEM 755.45 (Continued)

Planting

Planting shall conform to SECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER of the Division I Standard Specifications and as amended below.

Planting Season is May 15-June 15 and September 1-November 1 unless otherwise specified in applicable permit conditions.

Restoration Area shall be planted in the dry. Plants shall be placed according to the planting details and within the range of target elevations and at the spacing shown on the Plans or, if spacing is not indicated on the Plans, at the direction of the Wetland Specialist or the MassDOT Landscape Architect. Unless otherwise noted on the Plans, final plant locations shall be determined on site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer and shall be replaced at the Contractor's expense.

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by June 1 after fall planting shall be replaced at the Contractor's expense.

Plant material shall be furnished and installed as indicated including all labor, materials, plants, equipment, incidentals, re-setting of plants (frost heaves, etc), irrigation, re-planting and clean up.

If previously approved species are not available at the time of planting, the MassDOT Landscape Architect will propose substitutions relative to species, size, and quantities. Substitutions shall then be approved by the regulating authority if necessary. Provisions shall be made for a growth warranty as described below or as required by permits.

PLANT AND SEED ESTABLISHMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by May 15 after fall planting shall be replaced within the immediate or next planting period and at the Contractor's expense.

Seeding that fails to establish according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

ITEM 755.45 (Continued)

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland restoration work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist (if applicable to project) demonstrating that the wetland restoration work was done according to plans (or how modified) and meets required permit conditions (if applicable). The narrative shall include, photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Restoration Area and the surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The target elevations have been restored per the survey or adjusted per the Engineer. Areas that are too high or too low should be identified along with suggested corrective measures.
- Soil compaction has been mitigated.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- Hydrology meets performance standards and has been adequately restored.
- Specified seed mix has been seeded and seeded species in the wetland and adjacent upland show signs of good germination and healthy growth.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no invasive plants visible in the restored wetland area.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Restoration work is not approved, MassDOT will issue a rejection letter requiring corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Wetland Specialist and regulatory representative (if required) shall assess the Restoration Area. Final Acceptance will initiate the start of the Monitoring Period (if required).

ITEM 755.45 (Continued)

The following conditions shall be inspected and approved for acceptance and payment:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 100 percent of the restoration area, excluding areas of open water, large boulders or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no visible invasive plants.

If the restoration work is not approved, MassDOT will issue a rejection letter requiring corrective action. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation. Work not approved shall be addressed by the Contractor at no extra cost.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended, relative to the preexisting condition of the restored wetland.
- Seeded species are establishing well and cover 100 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

ITEM 755.45 (Continued)

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.45 will be paid for at the Contract unit price per Square Yard, which price shall include all labor, materials, compost and amendments, seed, mulch, equipment, submittals, maintenance, grading, and incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 50% upon completion of soil preparation and seeding
- 25% upon Conditional Acceptance
- 25% upon Final Acceptance or approval of the Engineer

Excavation of temporary fill will be paid under Item 120.
Geotextile Fabric for Temporary Soil Protection will be paid under Item 698.3
Sediment Control Barrier will be paid under Item 767.121
Jute Mesh will be paid under Item 767.9
Wetland Specialist will be paid under Item 755.75
Wetland Monitoring Reports for follow-up monitoring will be paid under Item 755.76
Plants will be paid under the respective items.

ITEM 755.75 WETLAND SPECIALIST HOUR

Work under this Item shall be for services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications hereafter referred to as the "Wetland Specialist."

"Wetland Mitigation" shall be used herein for applicable wetland work. For this project, applicable wetland work is for: Item 755.35 Inland Wetland Replication Area.

The Wetland Specialist shall demonstrate knowledge and expertise to coordinate and oversee all work associated with the Wetland Mitigation as defined herein, as shown on the Plans, as required by permits, and as specified under the relevant Wetland Mitigation items.

Regulatory monitoring reports following Final Acceptance of the Wetland Mitigation shall be per Item 755.76, Wetland Monitoring Reports.

For all onsite work, the Wetland Specialist shall sign in and sign out with the Engineer.

The Wetland Specialist shall not be from the same company as the company responsible for planting, seeding, and/or maintaining the wetland.

QUALIFICATIONS

The Wetland Specialist shall have a minimum of five (5) years of experience with construction and monitoring of wetland mitigation areas similar in size, type, and complexity to the Contract mitigation. When required by permits, at least ten (10) years of experience may be required. The Wetland Specialist shall be thoroughly versed in the Commonwealth of Massachusetts Wetlands Protection Act (MGL C.131, s.40), U.S. Army Corps of Engineers New England District Compensatory Mitigation Guidance, and all other relevant regulations of the Massachusetts Department of Environmental Protection and the U.S. Army Corps of Engineers New England District.

SUBMITTALS - QUALIFICATION

Within sixty (60) days following the Notice to Proceed, the Contractor shall provide proof of qualifications for the Wetland Specialist to the Engineer for approval. Submittals shall include, but not be limited to, the following:

- Resume of the individual on-site implementing the Wetland Specialist work. If the Wetland Specialist changes over the course of the project, the new individual shall submit resume and qualifications for approval 30 days prior to doing any work on-site.
- Resume of any personnel working on-site in place of the Wetland Specialist. Individual shall be approved prior to work on-site.
- Narrative describing the company, its expertise, technical qualifications and experience with wetland construction.
- At least three (3) references from prior work of a similar nature completed in the last five (5) years and by the individuals who will perform the work. Provide contact information for each reference including address, phone number and email.

ITEM 755.75 (Continued)

- A summary of each reference project including nature of the work, project size, dates, and period of construction and monitoring, methodologies used, and summary of success (or not) in terms of meeting performance objectives. Summary shall include a minimum of one before and one after photo for each project.

SUBMITTALS – DOCUMENTATION AND REPORTS

Wetland Construction Oversight

Wetland Specialist shall provide documentation of pre-existing conditions and wetland construction as specified below and as part of fulfilling the Scope of Work described below. Documentation shall include photos that are clear and legible. Photos are incidental to this Item.

- ***Site Walk Prior to Disturbance and Construction of Wetlands:*** Provide brief assessment with photos, including documentation of the existing wetlands to be impacted (both permanent and temporary), proposed wetland replication area, and reference/model wetland areas (typically an adjacent undisturbed wetland or the existing wetland to be impacted). Photos of existing wetlands that will be temporarily impacted shall include a view from at least 3 angles.
- ***Excavation and Grading:*** Documentation shall include minimum of two photos of the excavated wetland and two photos after final grading prior to planting and seeding. For restoration areas, photos shall show soil preparation (i.e, tilling and grading), if applicable.
- ***Approval of Subgrades****:* The Wetland Specialist shall inspect the sub-grade of the Replication Area to ensure that proper hydrology is likely to be established and shall provide the Engineer with written confirmation and photographs upon completion of subgrade excavation work. Written confirmation shall include recommended field adjustments, based on field observations, to achieve the desired hydrology and designed wetland system.
- ***Planting and Seeding:*** Provide assessment and photos of vegetation upon completion of planting and seeding work.
- ***Data logger output from Monitoring Wells*** shall be submitted with reports, if applicable and requested.

Wetland construction documentation and reports shall be submitted with Request for Conditional Acceptance and for the Order of Conditions, Water Quality Certifications, and other regulatory permits as required.

Requests for Acceptance of Work & Regulatory Compliance

The Wetland Specialist shall submit the following documents if and as specified herein and under Item the relevant Wetland Mitigation items:

- Request for Conditional Acceptance.
- Request for Certificate of Compliance (Partial or Full) when applicable.
- Request for Final Acceptance.

ITEM 755.75 (Continued)

SCOPE OF WORK

In the event of discrepancies with the applicable permits, the Wetland Specialist shall submit a Request for Information (RFI) to the Engineer.

General

The Wetland Specialist shall be responsible for the following:

- Review and have a comprehensive knowledge of the environmental permits relevant to the specific mitigation work being done so as to ensure compliance throughout the duration of the contract.
- Identify and inform the Contractor and Engineer of unique site conditions which may require adjustments to the schedule, design, or construction methods. For example, wildlife nesting, illegal dumping, or rare species.
- Identify and inform the Contractor and Engineer of any sediment or erosion control problems observed within mitigation areas.
- Advise so as to avoid impacts to adjacent areas and regulated wetland resources.
- Participate in necessary meetings as required by permits and when requested by the Engineer.

Inspections & Construction Oversight

The Wetland Specialist shall be responsible for, but not limited to, the following:

- Pre-Construction Site Walk
    - Following surveying, flagging, and staking of all relevant boundaries and elevations by the Contractor, the Wetland Specialist shall walk the site with the Engineer and the Contractor to review existing and proposed conditions, recommend changes if necessary, and approve the following: location and boundaries of the Mitigation Area, target elevations and grades, location of tree protection associated with the Mitigation Area, and final layout and limits of clearing for access route.
    - Select and mark snags, logs, and woody material to be retained for placement in the Wetland Mitigation, as appropriate.
    - Note invasive plants in and adjacent to Wetland Mitigation.
    - Provide summary report if and as specified under Wetland Mitigation items.
- Excavation, Soil Placement, Grading for Replication Areas
    - Approve excavated depth and grading for appropriate wetland hydrology, subsoil preparation, and finished grade of placed wetland soil.
    - Adjust grades as required and approve microtopography. If grades need to be adjusted, submit an RFI to the Engineer.
    - If requested by the Engineer, the Wetland Specialist shall inspect stockpiled wetland soil for moisture content and signs of undesirable weeds.
- Soil Protection and Restoration Measures for Restoration Areas
    - Review and approve methods of soil protection and restoration if required.
    - Confirm decompaction will adequately restore appropriate wetland hydrology. If decompaction measures need to be adjusted, submit an RFI to the Engineer.

ITEM 755.75 (Continued)

- Re-vegetation of Mitigation Area
    - Placement of woody material to be re-used.
    - Verify seed used complies with specifications and site conditions, determine limits for wetland seeding based on elevations, approve seeding and mulching methods, and collect seed tags to submit with Request for Conditional Acceptance.
    - Review planting methods (if applicable) prior to installation and oversee layout of wetland plants.

Conditional Acceptance

Upon completion of construction of the wetland, as part of the Request for Conditional Acceptance, the Wetland Specialist shall provide a brief narrative demonstrating that the wetland construction work was done according to plans (or how modified) and meets the conditions required for acceptance as specified under the Wetland Mitigation items. Submittal shall include a report and photo documentation of pre-construction conditions, construction work, seeding, planting, and other work as specified under the Wetland Mitigation items. Photos of completed Wetland Restoration areas shall include the same views as the pre-construction reference photos.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the Wetland Mitigation and surrounding area to ensure that it meets the conditions specified under the Wetland Mitigation items.

Upon approval, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Mitigation work is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

Request for Certificate of Compliance

If required, a Request for Certificate of Compliance shall be prepared and submitted to the Engineer immediately following Conditional Acceptance. Request shall be as specified under the relevant Wetland Mitigation items.

Request for Final Acceptance

Following one full growing season, the Wetland Specialist shall provide a brief narrative of the status of the Wetland Mitigation to be submitted with the Request for Final Acceptance.

Upon receipt of the Request, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the Wetland Mitigation and surrounding area to ensure that it meets the conditions specified under the relevant Wetland Mitigation items.

If the Wetland Mitigation is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

ITEM 755.75 (Continued)

METHOD OF MEASUREMENT

Item 755.75 Wetland Specialist shall be measured per hour for on-site service provided by the Wetland Specialist.

Work shall include all inspections, photos, submittals, and associated tasks for construction and restoration oversight, narratives for Conditional and Final Acceptance, Request for Certificate of Compliance (Partial or Full) if required, documentation required for permits, and all other work specified above. Payment shall not include travel time or time spent off-site on reports. Decimal Pay Limits will be 0.25 hours.

BASIS OF PAYMENT

Item 755.75 Wetland Specialist shall be paid at the Contractor bid price for each hour, or fraction thereof, spent on-site to perform the work as described above. Reports and photo documentation are required for payment.

Post wetland construction reports shall be per Item 755.76, Wetland Monitoring Reports.

ITEM 755.76 WETLAND MONITORING REPORTS LUMP SUM

Work under this Item shall be for the submittal of Wetland Monitoring Reports following the completion of wetland construction and shall include all inspections, photos, and other work required to complete those reports as specified herein.

"Wetland Mitigation" shall be used herein for applicable wetland work, whether Wetland Replication (creation of a new wetland) and/or Wetland Restoration (restoration after temporary impacts).

The Contractor shall retain the services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications, hereafter referred to as the "Wetland Specialist," to complete the Wetland Monitoring reports. Wetland Specialist shall meet requirements specified under Item 755.75 Wetland Specialist.

All on-site Wetland Specialist services required to complete the construction and revegetation of the wetland replication, including preparation and submission of monitoring reports during construction, shall be per Item 755.75 Wetland Specialist.

SCOPE OF WORK

Post-Construction Wetland Monitoring Reports

Final Acceptance of the wetland construction work as specified under item 755.35 and/or 755.45 shall initiate the beginning of the Monitoring Period.

Inspections and reports shall be performed to ensure compliance with mitigation requirements defined under the relevant Wetland Mitigation items and with all applicable environmental permits. Monitoring reports shall cover the following:

- Identification of all plant species present
- Percent cover for each plant species and overall percent surface area cover by indigenous wetland plant species for replication area and upland
- Description of the viability, health, and vigor of installed plants as well as volunteer plant species within the replication areas
- Description of remedial measures taken to ensure criteria are met
- Depth to apparent water table and/or depth of surface inundation, both as measured from the soil surface and data loggers, as appropriate.
- A conclusion regarding the success of the wetland mitigation area relative to the performance standards at 310 CMR 10.55(4)(b) (unless varied), the design plans, and performance criteria established by MADEP in the variance conditions (when applicable), and the reference wetland.
- Recommendation for a corrective plan of action if needed.

ITEM 755.76 (Continued)

Reports shall be submitted to the Engineer as a digital copy in Portable Document Format (PDF) unless otherwise requested. Hard copies shall be provided as requested by the Engineer. All reports shall be marked with the applicable permit numbers and identifying information as required in the permits. Reports shall include photo documentation of the wetland/s being monitored and shall include a minimum of 3 views from different orientations. Views shall be labeled.

Spring Reports, when required, shall be submitted to the Engineer by July 1 for dispersal to the appropriate permitting agencies.

End of Year Reports (which may serve as the Fall Report) shall be based on inspections that occur prior to October 15th. Reports shall be submitted to the Engineer no later than November 1 of each year.

Monitoring Reports shall be as follows for ***2*** years:

- *MassDEP: 1 Report – at the end of each year (Prior to January 15th of the following year).*
- *ACOE: 1 Report - at the end of each year (Prior to January 15th of the following year)*
- *Conservation Commission: 2 Reports - One in the spring and one in the fall of each year..*
-

BASIS OF PAYMENT AND METHOD OF MEASUREMENT

Item 755.76 Wetland Monitoring Reports and associated inspections shall be at the Contract unit price per Lump Sum and shall include all labor, materials, equipment, and all incidental costs required to complete the work. Lump Sum will be paid in equal installments of the Lump Sum divided by the number of reports submitted. Payment shall be upon submittal and acceptance of each report, based on the following schedule:

- Year 1 = ***4 Reports***
- Year 2 = ***4 Reports***

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 penalty 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.

The contractor shall employ an Environmental Monitor (EM) to ensure compliance with the Water Quality Certification (WQC) and the Conservation Commission Order of Conditions. The requirements for the EM are as stated in the WQC and the name, contact information, and qualifications of the proposed EM shall be provided to MassDEP for approval prior to the Pre-Construction Meeting. The name and contact information of the approved EM shall be provided to the Wales Conservation Commission prior to the start of work.

ITEM 756. (Continued)

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.

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. The 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.

This Item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, and preparation of monthly reports. In addition, any erosion controls beyond those specified in bid items which are selected by the Contractor to facilitate and/or address the Contractor's schedule, methods and prosecution of the work shall be considered incidental to this item.

ITEM 756. (Continued)

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.

Compensation

Payment for all work under this Item shall be made at the contract unit price, lump sum, which shall include all work detailed above, including Plan preparation, required revisions, revisions/addenda during construction, monthly reports, employing the Environmental Monitor, and filing fees.

Payment of fifty (50) % of the contract price shall be made upon acceptance of the NPDES Stormwater Pollution Prevention plan. Payment of forty (40) % of the contract price shall be made in equal installments over the expected duration of stormwater pollution prevention measures. Payment of the final ten (10) % of the contract price shall be paid upon satisfactory submission of a Notice of Termination (NOT) when final stabilization has been achieved.

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. The 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. Photo-biodegradable fabric shall not be used.

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, sedimentation fence shall be used in addition to compost filter tubes and straw bales and shall be compensated under that 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. If necessary to accommodate field conditions and to maximize effectiveness, barrier locations may be shifted with approval from the Engineer. 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 runoff will flow either through or over the barrier but not around it.

ITEM 767.121 (Continued)

Sedimentation Fence

Materials and Installation shall be per Subsection 670.40 and 670.60 of the Standard Specifications and the following:

Sedimentation 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 Subsection 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 (despite fabric decay) 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 sedimentation 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).
- Sedimentation 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.

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 Contractor’s expense.

ITEM 767.9 JUTE MESH SQUARE YARD

The work under this Item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following.

The work under this Item shall consist of furnishing and installing jute mesh fabric to prevent soil erosion. Jute mesh shall be placed over all areas of exposed soil in locations shown on the plans or as required by the Engineer.

MATERIALS

Jute netting or similar material shall be new, unused, undyed, and unbleached 100% biodegradable yarn (no polypropylene) and of uniform plain weave. The materials should weigh approximately 1.0 (+/- 5%) pounds per linear yard (assuming a 4-foot width).

Shall meet the following minimum requirements:

Open Area:	70-75%
Mesh Size:	approximately 1/2 inch with an open area of 60-65%.
Roll Weight:	approximately 1.0 (+/- 5%) pounds per linear yard
Warp Ends:	78 per linear yard
Weft Ends:	41 per linear yard
Recommended flow:	6 fps (1.8 m/s)
Functional Longevity:	6-9 months

Anchoring devices shall be 11-gauge steel staples 6-inch minimum length. In loose soils the length of the staples shall be 9-inches.

For areas that will be routinely mowed anchoring devices shall consist of minimum 8” wooden stakes. Longer stakes shall be used where loose soils or other conditions obligate, as required by the Engineer.

CONSTRUCTION METHODS

Area shall be seeded prior to installation of jute netting.

Installation shall be such as to ensure continuous contact with soil without folds or wrinkles. Jute netting shall be laid such that upslope fabric is placed over lower slope fabric by a minimum of 3 feet. Adjoining rolls shall be overlapped a minimum 6 inches. The netting shall extend beyond at least 1 foot beyond the edge of the seeded area.

The Contractor shall bury the ends of the jute netting 6-8 inches in anchor trenches at top and bottom of slopes.

ITEM 767.9 (Continued)

Jute netting shall be anchored in place with vertically driven metal staples. The staples shall be driven in until their tops are flush with the soil. Staples shall be placed at 12-inch intervals along the top of a slope and in staggered courses along the face of the slope to achieve a minimum of 3 staples per square yard, or at manufacturer's recommendations for the given site conditions.

Contractor shall reseed all trenched and otherwise disturbed areas with specified seed mix. The Contractor shall maintain the jute netting and make satisfactory repairs of any areas damaged until acceptance of seed establishment.

METHOD OF MEASUREMENT

Jute Mesh will be measured by the number of Square Yards complete in place, including anchoring, as measured across the surface of grade and does not include buried or overlapped portions. The quantity measured for payment shall not exceed that shown on the plans or as directed by the Engineer.

Mesh that becomes loose or that is not otherwise functioning to stabilize soil shall be repaired and new or additional jute matting installed as required at the Contractor's expense. Soil erosion shall be repaired, and area shall be raked and reseeded with the original specified mix as required by the Engineer at the Contractors expense.

BASIS OF PAYMENT

Item 767.9 will be paid for at the contract unit price per Square Yard, which price shall include all labor, materials, equipment, trenching, placing, and stapling of jute fabric, reseeding of trenched and disturbed areas, and all incidental costs required to complete the work.

ITEM 776.553	**MAPLE – RED – OCTOBER GLORY, 3-3.5 INCH CALIPER**	**EACH**
ITEM 780.100	**ELM – PRINCETON, 2-2.5 CALIPER**	**EACH**
ITEM 782.534	**REDBUD – EASTERN, 2-2.5 INCH CALIPER**	**EACH**
ITEM 783.042	**SERVICEBERRY – AUTUMN BRILLIANCE, 2-2.5 INCH CALIPER**	**EACH**

The work under these Items shall conform to the relevant provisions of Subsections 120, and 771 of the Standard Specifications and the following:

Work under these Items shall consist of furnishing, planting and/or transplanting specified trees, as shown on the plans and/or as required by the Engineer.

ITEM 813.811	**UNDERGROUND SERVICE RELOCATION NO. 1**	**EACH**
ITEM 813.812	**UNDERGROUND SERVICE RELOCATION NO. 2**	**EACH**
ITEM 813.813	**UNDERGROUND SERVICE RELOCATION NO. 3**	**EACH**
ITEM 813.814	**UNDERGROUND SERVICE RELOCATION NO. 4**	**EACH**
ITEM 813.815	**UNDERGROUND SERVICE RELOCATION NO. 5**	**EACH**

The work shall conform to the relevant provisions of Subsection 813 of the Standard Specifications and the following:

GENERAL

The work under these Items shall consist of moving and relocating the existing underground utility services from the following locations:

Item #	Description	UP#	Station/Offset
813.811	UG Service Relocation No. 1	P85	Sta. 19+50 LT
813.812	UG Service Relocation No. 2	P81-1	Sta. 27+00 RT
813.813	UG Service Relocation No. 3	P80	Sta. 29+55 LT
813.814	UG Service Relocation No. 4	P77	Sta. 36+05 RT
813.815	UG Service Relocation No. 5	P62	Sta. 70+60 LT

A new utility pole will be installed on the same side of the street. The underground conduit shall be extended by the Contractor to where the new utility pole is installed. New conduit risers and wiring shall be installed and connected to the newly relocated utility poles and power lines.

The work shall include all excavation and backfill, compaction, new riser, new conduit, new wire and materials, concrete encasement or any other requirements set by the respective utility company, local codes and guidelines and in accordance with the latest edition of the National Electrical Code.

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.

ITEMS 813.811 through 813.816 (Continued)

METHOD OF MEASUREMENT

Items 813.811, 813.812, 813.813, 813.814, and 813.815 will be respectively measured for payment by the EACH underground service relocation, complete in place.

BASIS FOR PAYMENT

Items 813.811, 813.812, 813.813, 813.814, and 813.815. will be paid for at the respective Contract unit price per EACH, which prices shall include all labor, materials, tools, equipment, and all incidental costs required to complete the work.

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 these Items.

ITEM 816.82	**TEMPORARY TRAFFIC CONTROL SIGNAL - LOCATION NO.1**	**LUMP SUM**
ITEM 816.83	**TEMPORARY TRAFFIC CONTROL SIGNAL - LOCATION NO.2**	**LUMP SUM**
ITEM 816.85	**PORTABLE DRIVEWAY ASSISTANCE DEVICE**	**LUMP SUM**

The work under these Items shall conform the provisions of Section 800 of the Standard Specifications, supplemented by the following:

The work under these Items includes furnishing and installing of portable temporary traffic control signal (TTCS) equipment, portable Driveway Assistance Devices (DAD), signs, temporary vehicle detection and providing all incidental materials necessary for operating and controlling the temporary traffic control signals, as shown on the plans and sketches at the following locations:

Location No. 1 – Stage 1 and 2 - Culvert No. 1 at 24+92

Location No. 2 – Stage 1 and 2 - Culvert No. 3 at 86+45

The Contractor shall provide a Temporary Traffic Control Signal (TTCS) for the above referenced locations at all times throughout the duration of construction while alternating one-way traffic is required. The TS for each location shall provide a fully-operational portable temporary traffic signal control signal system at the specified location that conforms to MUTCD standards are guidance and as required by the Engineer.

The DAD signal unit is a portable device designed to be used for residential driveways or entrances that fall within a one lane bi-directional work zone.

Each stage of alternating one-way traffic consists of DADs (where needed) and two portable temporary traffic control signals. The system must operate continuously when deployed. MassDOT reserves the right to terminate these Items at any time if it determines the system is not performing in accordance with this Specification or the Contractor has not met the responsibilities identified in this Specification.

MATERIALS

Provide materials that are in accordance with the requirements of this Special Specification and the details shown on the plans. The system must comply with the manufacturer's specifications and recommendations. A list of approved equipment can be found on MassDOT's Qaulified Traffic Control Equipment List under Subsection 850: Traffic Controls for Construction and Maintenance Activities.

Section 850 :Traffic Controls for Construction and Maintenance Activities (mass.gov)

Maintain an adequate inventory of parts to support maintenance and repairs of the DAD system within allowable downtime limits.

ITEMS 816.82, 816.83 and 816.85 (Continued)

Furnish, assemble, fabricate, or install materials referenced under this Specification that are corrosion resistant, in good working condition, and in strict conformance with the details shown on the plans or as directed.

Provide the equipment, supplies, materials, and labor required to make the system operational.

Assume responsibility for communication costs including cellular telephone service, FCC licensing, wireless data networks, satellite and internet subscription charges, solar power system support, and battery charging and maintenance. In addition to these requirements, repair or replace any equipment damaged due to crashes, vandalism, adverse weather, etc. that may occur during the Contract period.

EQUIPMENT

Ensure the DAD system is comprised of the items required to provide an operational system and as shown on the plans. Furnish equipment under this Specification that is in good working condition. The equipment furnished and installed under this Section must include the following:

- Platform,
- power,
- portable trailers,
- portable traffic signal system,
- communication system,
- DAD signal units, and
- signs.

Platform. Furnish a platform that is painted highway safety orange and clearly marked with the manufacturer, serial number, and emergency phone number. Equip the platform with a digital LED readout displaying the current battery voltage at all times and a 110 V charger to facilitate external charging.

POWER

Batteries. Provide a unit equipped with batteries to power the system components 24 hr. a day for 7 days each week. Have additional batteries on standby.

Solar Panels. Provide a unit equipped with solar panels that generate enough power to enable the system to continually recharge the batteries without external charging.

Portable Trailers. Provide portable trailers or carts with trailer lights and delineated with retroreflective material for mounting each DAD unit.

ITEMS 816.82, 816.83 and 816.85 (Continued)

Portable Traffic Control Signal System (TTCS). Furnish, operate, and maintain new or used portable traffic signal units. Assure used units are in good working condition and approved before use. The portable traffic signal units must have the capability of communicating and programming with the DAD communication system and must be in accordance with the requirements of the NEMA TS-5 (2017) Standard. Units will remain the property of the Contractor.

Communication System Requirements. All signals, TTCSS, and DADs within the system must have the ability to communicate via 900 MHz wireless radio as a primary data communication method between units.

If wireless connectivity is not feasible, hardwired connectivity will be an acceptable alternative.

Wireless Communication. When wireless radio communication is used, the radio units must maintain the communication link at a minimum distance of 1 mi. under normal operating conditions. Normaloperating conditions should be defined as a clear line of sight between TTCS units. The radio system must conform to the applicable Federal Communication Commission requirements and all applicable state and local requirements.

Hardwired Communication. If hardwired communication is used, deploy the communication cable in a manner that will not intrude in the direct work area of the project or obstruct vehicular and pedestrian traffic.

DAD Signal Units. Each DAD must have one signal head consisting of 3 LED indications as follows:

Three Head Unit. One signal head consisting of 3 LED indications as follows:

- one 12-in. diameter steady red ball indication centered over,
- one 12-in. diameter yellow flashing left arrow, and
- one 12-in. diameter yellow flashing right arrow.

Mount all signal indications in a polycarbonate signal head with visors.

Signs. Place 2 regulatory signs, conforming to standards and details shown on the plans, on each DAD in an area clearly visible to the motorist.

ITEMS 816.82, 816.83 and 816.85 (Continued)

CONSTRUCTION METHODS

At least 30 days prior to implementation of each stage, or applicable sub-stages if traffic signal modifications are required, submit a 1:20 scale temporary traffic control signal plan for the location to the Engineer for review. The TS Plan shall be stamped, dated and signed by a professional engineer registered in the Commonwealth of Massachusetts, and shall include the following:

- Dimensions of Lanes, Shoulders, and Islands
- Design and locations of temporary signal equipment and their supports
- Signal Phasing and Timing
- Location of Signal Appurtenances
- Location of Signing and Pavement Markings (stop bars, lane lines, etc.)
- Location, method, and mode of Temporary Detection

The Engineer's approval of the TS plan does not relieve the Contractor of ensuring the TS meets the requirements of the MUTCD. The Contractor shall not implement the TS plan until all MassDOT review comments have been adequately addressed.

At Construction Notice to Proceed, the Contractor shall assume maintenance responsibilities of the above referenced temporary traffic control signal locations. The Contractor shall notify the Engineer for the project records of all dates when TS any of the above TS locations has been modified in any way.

Notify the following parties that TTCS maintenance responsibility has been transferred to the Contractor: Signal Owner, the Engineer, the MassDOT District Construction Office, Municipal Engineer (or other designated Municipal traffic control signal operations official), and the applicable local Police Department. Provide these parties with a list of telephone numbers of personnel who will be on-call 24 hours/day and 7 days/week, during TTCS.

Respond to traffic signal malfunctions by having a representative at the site within three hours from the initial contact. Within twenty-four (24) hours, the Contractor shall have the traffic signal operating according to plan. It shall be the Contractor's responsibility to arrange for Police Details to temporarily control intersection vehicular and pedestrian traffic movements during times when the TS at any of the above locations are not in full- or partial-operation.

If the Engineer determines that the nature of a malfunction requires immediate attention and/or the Contractor does not respond within three (3) hours, then an alternate maintenance service will be called to repair the signal. The Contractor shall be responsible for expenses incurred by the alternate maintenance service for each call. The alternate maintenance service may be the owner of the signal or another qualified electrical Contractor.

Installation.

Install new or used TTCSs and DADs in conformance with the manufacturer's specifications.

ITEMS 816.82, 816.83 and 816.85 (Continued)

Assure used units are in good working condition and are approved before use. Units will remain the property of the Contractor.

Install system components as shown on the plans, or as directed.

Use established industry and utility safety practices to erect assemblies near overhead or underground utilities.

Operational Requirements.

Use the DAD units in conjunction with 2 portable TTCS units. The portable traffic signal units must have the capability of communicating and programming with the DAD communication system and must be in accordance with the requirements of the NEMA TS-5 (2017) Standard.

System Operation. During each green interval on the primary traffic phase, each DAD unit must display a flashing yellow arrow corresponding to the direction of mainline traffic movement.

Programming. Program DAD units as part of the TTCSs in 1-sec. increments from 3 to 999 sec. In the event multiple DAD units are required, all units must be capable of being programmed with individual timing programs based on their placement within the work zone.

Malfunction Management System (MMS). Equip each DAD unit and portable traffic signal within the signal system with a Malfunction Management System (MMS) that has the ability to communicate with all signals within the signal system. In the event of a fault at any signal or DAD unit within the signal system, that fault must be communicated to every portable traffic signal and DAD within the signal system, at which time every portable traffic signal and DAD unit must enter into the fault mode.

Conflict Monitoring. When any conflicting channels are detected as concurrently active, the MMS must transfer all portable traffic signals and DAD units within the signal system to fault mode.

Multiple Indication Monitoring. The MMS should monitor active signal and DAD unit indications and verify safe and proper operation. If a conflict or potentially unsafe scenario occurs, the MMS must transfer all signals and DAD units within the system to the fault mode.

Communication Monitoring. When communication between the signal and DAD units is lost, the system must enter into the fault mode.

Lack of Indication Monitoring. The signals and DAD units within the TTCSs must enter into the fault mode when all instances of a signal lamp are lost for more than 1,000 milliseconds, unless one instance of signal indication (at the signal loss location) is active and functioning properly.

ITEMS 816.82, 816.83 and 816.85 (Continued)

Voltage Monitoring. The DAD unit must have a mechanism for monitoring battery voltage and must be equipped with an LED readout displaying the current battery voltage at all times. In the event of a low battery condition, the DAD unit must be equipped with the ability to notify up to 3 individuals via SMS text message or email of the low battery condition.

Fault Modes. The DAD must have the ability to be programmed in a fault mode of solid red or flashing red upon a system fault.

Consequences of Failed Performance. Upon any notification of failure of any duration, complete a repair within the maximum allowable 24 hr. without additional cost to the Department or time extension of the Contract. The equipment is also subject to rejection. Any rejected equipment may be offered again for retest provided the noncompliance has been corrected.

Inspection

When requested by the Engineer, the TS will be subject to a field review by a representative of the MassDOT District Office and/or the Town, which may generate additional comments requiring revisions to the temporary signal.

SYSTEM COORDINATOR

The Contractor must designate a System Coordinator who will be responsible for overseeing the placement of the devices and for testing and calibrating the equipment. The System Coordinator must be locally available to maintain system components, move portable devices as necessary, and respond to emergency situations. The Ayatem Coordinator's local phone number or toll-freen number shall be provided to District Engineer for the maintenance of the system at any time. The System Coordinator must be accessible 7 days a week and 24 hr. a day while the system is deployed and must respond within 2 hr. of notification.

Each DAD unit must be continually monitored throughout periods of deployment.

Technical support for the system must be available for periods of operation.

ITEMS 816.82, 816.83 and 816.85 (Continued)

BASIS FOR PAYMENT

Items 816.81, 816.82, and 816.85 will be paid for at the Contract Lump Sum prices, which prices shall include all labor, materials, equipment and all incidental costs required to complete the work. This price is full compensation for the TTCS and DAD signal units; signs; portable trailers; setup; furnishing, operating, relocating, adjusting, and removing equipment; replacement parts; maintenance; batteries; fuel; oil; related consumables; programming; an onsite system coordinator; calibration; making the system fully operational; and materials, equipment, labor, tools, and all incidental costs required to complete the work. This price also includes any costs associated with communications (for example, cellular fees); power; and damage from vandalism, weather, or traffic incidents.

Payment of 50% of the Lump Sum bid price of the respective Items, for the location, will be made following the first TS stage modification implemented by the Contractor and accepted by the Engineer.

The remaining 50% of the Lump Sum bid price of the respective Items, for the location, will be paid following the completion of the final stage when the TTCS and DAD are no longer required.

ITEM 853.21 TEMPORARY BARRIER REMOVED AND RESET FOOT

Work under this Item shall conform to the relevant provisions of Subsection 850 of the Standard Specifications and shall consist of removing, transporting and resetting temporary barrier systems and limited deflection temporary barrier systems from alignments established along the roadway to new alignments in accordance with the details shown on the plans, as required by the construction and staged construction operations and as required by the Engineer for the channelization of traffic and/or work zone protection.

The work under this Item shall also include furnishing and installing all hardware and associated materials per the details and/or manufacturer's specifications. The work shall also include necessary patches and repairs caused by the temporary barrier system to damaged pavement surfaces or any adjacent longitudinal barrier once the system has been removed.

Temporary barrier systems and limited deflection temporary barrier systems shall be removed from existing locations and reset in accordance to the construction methods stated in the respective barrier items.

Damage to the pavement surface or adjacent permanent barriers caused by removing or resetting temporary barrier shall be repaired as directed by the Engineer at the Contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 853.21 will be measured and paid by the FOOT, in place which shall provide full compensation for removing, relocating, resetting, realigning, and transporting maintaining the temporary barrier system and/or limited deflection temporary barrier system. The Contractor will be paid for this item each time the barrier is relocated either to a new work zone, to off-season storage, or back to the project from storage. The Contractor will not be separately compensated for any work necessary to maintain or re-align units or replace damaged units. No payment will be made for removing and resetting barriers for the purpose of gaining access to the construction work zone. No payment will be made for removing, relocating and resetting any barriers moved for the convenience of the Contractor.

For temporary barrier systems that require anchorage systems, the cost of furnishing, installing and removing 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 this Item.

ITEM 853.23 TEMPORARY BARRIER (TL-3) FOOT

Work under this Item shall conform to the relevant provisions of Subsection 850 and shall consist of furnishing, installing, maintaining and final removal of TL-3 temporary barrier systems for channelization of traffic and/or work zone protection.

Materials

The Contractor shall use a temporary 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 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 shall be submitted and approved by the Engineer prior to procurement of an alternate temporary barrier system.
The Contractor shall supply shop drawings to confirm the available clear area behind the 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 shall be installed on all temporary barrier systems in conformance with the relevant provisions of Subsection 850.69 and shall be incidental to the temporary barrier systems.

Temporary impact attenuators that are listed on the Qualified Traffic Control Equipment List shall be used whenever a blunt end of the temporary 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 or bridge railing by a method approved by the manufacturer.

Construction Methods

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 shall not place any breaks in the temporary barrier system that will result in sections that are shorter than the stated minimum length-of-need (LON) under MASH Test 3-11. Exceptions shall 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 barrier system.

Within the LON section, temporary barrier systems shall 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 barrier during installation, while in service, and/or during removal shall be repaired as directed by the Engineer at the Contractor's expense.

ITEMS 853.23(Continued)

Temporary barrier systems that require anchorage systems shall conform with the relevant provisions of Subsection 850.70.

METHOD OF MEASUREMENT

Items 853.23 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 temporary barrier installed in place, including all incidental items. This price shall include the cost of furnishing, installing, maintaining and final removal of all temporary barrier systems.

For 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 temporary barrier removed and reset will be made under Item 853.21.

ITEM 859.1 REFLECTORIZED DRUMS WITH SEQUENTIAL FLASHING WARNING LIGHTS DAY

The work under this Item shall conform the relevant provisions of Subsection 850 of the Standard Specifications and the following:

Work under this Item consists of furnishing, installing, maintaining in proper operating conditions, and removing reflectorized drums, and any necessary ballast, equipped with sequential flashing warning lights.

MATERIALS

Reflectorized drums shall be listed on the MassDOT Qualified Traffic Control Equipment List. Reflective sheeting on drums shall meet or exceed ASTM D4956 Type VIII. All drums shall be maintained in a satisfactory manner including the removal of oils, dirt, and debris that may cause reduced retroreflectivity.

The Contractor shall use one of the following sequential flashing warning light systems unless otherwise approved by the Engineer:

1. Empco-Lite LWCSD.
2. pi-Lit® Sequential Barricade-Style Lamp; or
3. Unipart Dorman SynchroGUIDE.

Sequential flashing warning lights shall be secured to reflectorized drums per the light manufacturer's specifications.

CONSTRUCTION METHODS

The first ten (10) drums in any merging or shifting taper as designated in the Temporary Traffic Control Plan shall be equipped with sequential flashing warning lights. These lights shall be operating, at a minimum, between dusk and dawn when the taper is deployed.

The successive flashing of the sequential warning lights shall occur from the upstream end of the merging or shifting taper to the downstream end of the taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55, nor more than 75 times per minute.

Warning lights shall be powered off when drums are not deployed in a taper.

ITEM 859.1 (Continued)

METHOD OF MEASUREMENT

A group of ten (10) reflectorized drums with sequential flashing warning lights is considered one (1) unit and will be measured by the day. Each period of up to 24 hours during which this unit is in use will be measured as one day regardless of the number of times that the drums are positioned, repositioned, removed, or returned to service.

BASIS OF PAYMENT

Reflectorized Drums with Sequential Flashing Warning Lights will be paid for at the Contract unit price per day, which shall include full compensation for furnishing, positioning, repositioning, and removing the group of ten (10) drums as directed by the Engineer.

ITEM 862.506	**6 INCH RECESSED WHITE LINE (MC, FD, WR)**	**FOOT**
ITEM 862.512	**12 INCH RECESSED WHITE LINE (MC, FD, WR)**	**FOOT**
ITEM 863.506	**6 INCH RECESSED YELLOW LINE (MC, FD, WR)**	**FOOT**

The work under these Items shall conform to the relevant provisions of Subsection 860 of the Standard Specifications and shall consist of furnishing and installing Recessed Multi-Component (MC), Wet Reflective (WR) Pavement Markings at the locations shown on the plans or as required by the Engineer.

If the Multi-Component Pavement Marking materials is applied over a different pavement marking material, the Contractor shall provide documentation that the Multi-Component Pavement Marking Material being used will adhere to the existing marking material.

MATERIALS

MC pavement markings shall consist of a two-component, 100% solids liquid binder, first drop beads or elements to provide wet and dry retro-reflectivity, and second drop glass beads to improve the durability of the pavement marking, reduce track-free times, and provide supplementary retro-reflectivity. MC Pavement Marking binders are typically composed of, but not limited to Epoxies, Polyureas, or Uretanes.

Classification of dry time is based upon the results of the test procedures found in ASTM D711 (73.5 ±3.5° at 50 ± 5% relative humidity) when applied with glass beads. MC Ultra-Fast Dry (MC, UFD) pavement markings shall have no track time of 3 minutes or less. MC Fast Dry (MC, FD) pavement markings shall have no track time of 10 minutes or less. MC Standard Dry (MC, SD) pavement markings shall have no track time of 45 minutes or less. The Contractor shall provide a Certificate of Compliance verifying the product supplied meets the specified dry time requirements per ASTM D711 prior to installation.

The Contractor shall select a liquid binder and bead/element combination that meets these performance specifications.

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% 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: GENERAL

ITEMS 862.506 through 863.506 (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

The Contractor shall follow all installation instructions from the manufacturer, including allowable ranges of temperature and humidity for installation, unless otherwise approved by the Engineer.

The pavement surface shall be clean, dry and free of laitance, oil, dirt, grease, paint or other foreign contaminants prior to the installation of any new pavement markings, if an air lance is used to clean the surface, air compressors shall initially be blown out away from the application area to prevent compressor condensation build-up. A minimum of 24 hours of dry time following any rainfall is required prior to the placement of pavement markings.

Recessing of markings shall be per 860.65: Recessed Markings.

Application rate for binder and all glass beads shall consider final pavement surface composition and smoothness in advance of application to ensure proper wet film thickness and embedment of all beads. 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 MC binder shall be 20 mils but should be increased if recommended by the manufacturer. The line thickness shall meet across at least the middle 2/3 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 color and have clean, well-defined edges.

Glass beads 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 should be embedded in the binder to a depth of approximately 50% of their diameter.

Glass beads shall be applied as a reflective medium, using the double drop method, at a rate in accordance with the manufacturer’s specification in order to meet the minimum retro-reflectivity levels.

ITEMS 862.506 through 863.506 (Continued)

Newly installed pavement markings shall be protected from tracking during the curing per Subsection 860.63 of the Standard Specifications.

METHOD OF MEASUREMENT

Recessed pavement markings (MC, FD, WR) are to be paid for on the actual length of lines applied.

BASIS OF PAYMENT

Recessed pavement markings (MC, FD, WR) will be paid for at the Contract unit price under each Item of the contract based on the measurements as determined by the Engineer. The Contract prices shall include all material, labor, and equipment required or incidental to the satisfactory completion of the work.

ITEM 874.4 TRAFFIC SIGN REMOVED AND STACKED EACH

The work under this Item shall conform to the relevant provisions of Subsection 828 of the Standard Specifications and the following:

Work under this Item shall include the removal, dismantling, and stacking of the existing roadside traffic and street name signs as shown on the plans or as required by the Engineer. The work shall also include the excavation of foundations, removal of posts and supports, disposal of the concrete, backfilling with compacted gravel of the holes resulting from foundation excavation.

As shown on the plans and as required by the Engineer, all existing sign foundations, posts and supports shall be removed and discarded.

The existing signs shall not be removed and stacked without the permission of the Engineer.

Non-salvageable material, as determined by the Engineer, shall become the property of the Contractor and shall be legally disposed of offsite at no additional compensation.

The traffic signs removed shall be stacked at a location coordinated by the Engineer and the Town.

METHOD OF MEASUREMENT

Item 874.4 will be measured for payment by the EACH traffic sign assembly removed and stacked.

BASIS OF PAYMENT

Item 874.4 will be paid for at the Contract unit price per EACH, which price shall include all labor, equipment, materials, for removing and stacking the sign, the excavating and disposal of the existing foundation, posts and supports of the same and the supplying and placing of compacted gravel backfill where foundations and posts are removed, and restoration of surface, and all incidental costs required to complete the work.

ITEM 953.1	**TEMPORARY SUPPORT OF EXCAVATION - CULVERT NO. 1**	**LUMP SUM**
ITEM 953.2	**TEMPORARY SUPPORT OF EXCAVATION - CULVERT NO. 2**	**LUMP SUM**
ITEM 953.3	**TEMPORARY SUPPORT OF EXCAVATION - CULVERT NO. 3**	**LUMP SUM**

The work under these Items shall conform to the relevant portions of Subsections 140 and 950 of the Standard Specifications, and the following:

The temporary support of excavation shall be designed by the Contractor.

The temporary support of excavation shall consist of sheet piling or soldier piles (drilled micropiles, steel H-piles) and timber lagging reinforced, as required, by the framework of wales, struts, tie-backs, deadman soil anchors, corner braces and vertical spacers; or any other system approved by the Engineer. The approximate layout of the temporary support of excavation is shown on the plans. Steel sheeting, if used, shall conform to M202M/M 202-08 (2016). Foreign source of supply may be submitted for approval if sufficient documentation is provided demonstrating that domestic material is unavailable and that M202M/M 202-08 (2016) compatibility is achieved.

The Contractor shall be aware of the following:

A. The temporary support of excavation shall be designed to resist a surcharge live load of at least H20 truck loading and any construction equipment loading.
B. The Contractor shall make his own evaluation of existing conditions and facilities, and of the effects of the proposed temporary support of excavation and construction methods, and shall provide in his design for all loads and methods necessary to permit the construction of the proposed abutments and wingwalls while maintaining public safety and protecting completed work and all third party property from damage caused by this operation.
C. Timber lagging, if used, shall be southern yellow pine, mixed hardwoods or equivalent of Grade 2 or better, having F_b= 1,500 psi, minimum. Install lagging tightly against the soil to minimize loss of ground. If necessary, install the lagging one board at a time as required to minimize loss of ground in any local areas having unstable soil conditions. Immediately backpack the lagging tightly with gravel backfill as required to fill any voids that develop behind the lagging.

Utility lines shall be accurately located to ensure that the proposed temporary support of excavation will not interfere with them or with the utility company's access to them.

ITEMS 953.1, 953.2, and 953.3 (Continued)

Prior to the start of work, the Contractor shall submit excavation support plan for approval by MassDOT. Such plan should include, at minimum:

1. A detailed description of the means, methods, equipment, and sequence of the planned excavations and excavation support.
2. A plan showing the anticipated location(s) of excavation support

All work shall be performed in such a manner to minimize impacts on the adjacent properties and wetlands.

DESIGN

The temporary support of excavation at the locations shown on the proposed headwall plans shall be fully designed in accordance with the requirements of AASHTO Guide Design Specifications for Bridge Temporary Works latest edition and all interims published as of the bid opening date.

SUBMISSION OF DESIGN CALCULATIONS

The complete temporary support of excavation design and plans shall be completed and stamped by a Professional Structural Engineer registered in Massachusetts. Prior to the installation, the plans and calculations shall be submitted to the Engineer for his information, approval, and as evidence that the requirements of these provisions have been fulfilled. Furnishing such plans and calculations shall not relieve the Contractor of the sole responsibility for safety of the public, personnel, equipment, and structures, as well as successful project completion.

The design documents prepared by the Contractor shall show the horizontal and vertical extents of the temporary support of excavation, the sizes and dimensions of the components of the system, its proposed method of bracing, construction notes, and any other necessary measures required to allow for the proposed construction. The temporary support of excavation shall not be installed until the Contractor's design has been reviewed and approved by the Engineer. Any work done or materials ordered for the work involved prior to acceptance of the design calculations, plans, and detailed drawings shall be at the Contractor's own risk.

MATERIALS

Structural steel shapes for soldier piles shall conform to Subsection M8.05.1 of the Standard Specifications, and other structural steel components shall conform to Subsection M8.05.0 of the Standard Specifications. All material used for the temporary support of excavation shall be new (or used but in like-new condition), sound and free from strength-impairing defects. Any materials removed after the proposed construction is in place shall be salvaged to the Contractor.

ITEMS 953.1, 953.2, and 953.3 (Continued)

Fabricated sections and corners shall be bolted and satisfactory for the use intended.

High strength steel may be used at the Contractor's option at no additional cost.

The Contractor shall furnish the manufacturer's sworn statement, in lieu of mill inspection, for the material furnished and in full accordance with Section 6.00 of the Standard Specifications.

CONSTRUCTION METHODS

Temporary support of excavation shall be installed entirely outside the neat lines of the proposed foundations, as shown on the plans. Guide wales or other devices shall be used to insure accurate driving and aligning of the piles.

Any movement in the temporary support of excavation that would prevent the proper construction of the proposed foundation shall be corrected at the expense of the Contractor.

All welding and the preparations and assembly of material for welding shall conform to the MassDOT Standard Specifications., the AASHTO AWS Bridge Welding Specifications latest edition including interim revisions published by AASHTO as of the bid opening date.

Any portion of the temporary support of excavation that becomes tilted or damage shall be repaired, or if in the opinion of the Engineer it cannot properly be adjusted, the Contractor shall replace at no additional cost.

Temporary earth support system shall be removed from the project site when it is not needed unless otherwise approved by the Engineer. Any part of the temporary earth support system that protrudes into the supporting soil below the bridge structure (culvert, wingwall, and/or headwall) shall be cut off and 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 degrees from the horizontal.

BASIS OF PAYMENT

Items 953.1, 953.2, and 953.3 will be paid for at the respective Contract price per LUMP SUM, which prices shall include all labor, material, equipment, engineering design, submittals, and all incidental costs required to complete the work.

Payment for control of water shall be included under Items 991.3, 991.4, 991.5, 991.6, and 991.7.

Payment under these Item will be based on the following percentages: Approved design 10%, installation 60%, and removal 30%.

ITEM 983.522 NATURAL STREAMBED MATERIAL CUBIC YARD

The work under this Item shall conform to the relevant provisions of Subsection 983 of the Standard Specifications and the following:

The purpose of this Item is to provide natural streambed material to naturalize the channel in the proposed culvert, and in the channel where finer sediment is encountered.

This work of this Item shall consist of furnishing and placing streambed material inside, upstream and downstream of a culvert to set the desired channel profile, establish a natural bed, and maintain aquatic organism passage.

The ultimate product will, to the extent possible, replicate the function and appearance of natural areas of the existing stream adjacent to the culvert.

The streambed material is an important element to comply with environmental permits issued for the project. In order to satisfy those requirements and ensure the restoration is constructed as designed, MassDOT Environmental Services will be providing a Fluvial Geomorphologist (Geomorphologist) to provide on-site oversight and assistance during streambed restoration.

At least 30 days prior to the commencement of construction, the Contractor or Resident Engineer shall coordinate with MassDOT's Geomorphologist. At this meeting, the Geomorphologist will provide an overview of the channel restoration work and will discuss the Contractor's proposed streambed restoration material source, anticipated means, methods, and schedule.

Related Items:

Modified Rockfill. Shall conform to the requirements of Subsection M2.02.4 Modified Rockfill of the Standard Specifications and shall be paid for under Item 986.

The Geomorphologist will be on site periodically during construction to assist the Contractor and Resident Engineer on installation of the streambed material in accordance with the environmental permits.

MATERIAL

The streambed material is to be installed as depicted on the plans.

Any stone excavated from the existing streambed during the project shall be stockpiled and reused for streambed restoration, provided the excavated stone is characteristic of the existing stream material upstream and downstream of the work area, or meets the below criteria.

If the excavated material is not suitable or there is not enough material, the streambed material shall be locally sourced, rounded river stone, that matches the composition of the native riverbed. The following gradation may be used as a guide.

ITEM 983.522 (Continued)

Streambed Material Gradation

Stone/Sieve Size	% Finer
900 mm (36 inches)	90-100
300 mm (12 inches)	75-90
150 mm (6 inches)	30-75
4.75 mm (No. 4)	4-30
75 µm (No. 200)	0-4

The streambed material shall be well graded and shall be approved by the Resident Engineer and Geomorphologist prior to use.

Stone placed inside of the culvert shall be placed such that the structure is not damaged. Care shall be taken to limit segregation of the materials. Add sand borrow item as needed to seal the bed and prevent subsurface flow. There shall be no subsurface flow upon final inspection.

Larger material will project up through the bed to create habitat and hydraulic roughness.

CONSTRUCTION METHODS

See the plans for construction details for the natural streambed material over the riprap in the culvert, and for the natural material in the channel, as needed.

The streambed material shall fill / choke the voids in the underlying riprap. The riprap shall be choked with finer streambed material, and shall consist of a well-graded mix of cobble, gravel, sand and silt that represents the local streambed. Fill voids by hand tamping with metal tamping rods, by shaking stone with the teeth of an excavator bucket, and/or by spraying water to settle fines between large stones. Plate compactors shall not be used. The purpose for filling the voids is to prevent subsurface flow where water disappears into the large voids in the stone fill below the channel bed surface.

The material shall be installed during dewatered conditions in accordance with the environmental permits. Boulders that are part of the natural streambed material shall project above the bed to maintain a natural level of hydraulic roughness and to re-establish fish habitat.

Once all material has been placed in the culvert and approved by the Geomorphologist and Resident Engineer, the Contractor shall restore flow in such a way to slowly wet the stream to minimize the initial sediment pulse. Every attempt shall be made to minimize the downstream movement of sediment.

The final streambed in the culvert and approaches shall look like a natural riverbed, shall match nearby river reaches, and there shall be minimal subsurface flow upon final inspection by the Project Engineer and Geomorphologist.

The Contractor shall submit to the Resident Engineer for approval prior to the start of operations, a placement plan and method of placement.

ITEM 983.522 (Continued)

METHOD OF MEASUREMENT

Item 983.522 will be measured for payment by the CUBIC YARD of natural streambed material imported to the site and installed, measured within the limits shown on the Plans or as required by the Engineer.

BASIS OF PAYMENT

Item 983.522 will be paid for at the Contract unit price per CUBIC YARD, which price shall include all labor, material, equipment, furnishing, transporting, and placing the material specified, and all incidental costs required to complete the work.

Excavation required for the streambed material, including stockpiling of on-site materials, shall be considered incidental to the work under this Item983.522.

The Geomorphologist will be provided by MassDOT at no cost to the Contractor.

ITEM 991.3	**CONTROL OF WATER – LOCATION 1**	**LUMP SUM**
ITEM 991.4	**CONTROL OF WATER – LOCATION 2**	**LUMP SUM**
ITEM 991.5	**CONTROL OF WATER – LOCATION 3**	**LUMP SUM**
ITEM 991.6	**CONTROL OF WATER – LOCATION 4**	**LUMP SUM**
ITEM 991.7	**CONTROL OF WATER – LOCATION 5**	**LUMP SUM**

The work under these Items shall include all pumping, cofferdam, sandbagging, earth and bridge excavation, by-pass piping and other measures, inclusive of optional sheeting not otherwise included under Item 953.1 for Temporary Support of Excavation, necessary for sufficient water control to accomplish the removal of the existing structure and the construction of the proposed structure and its associated excavation within the channel and the placement of natural streambed material as depicted on the plans.

Dewatering shall be conducted to ensure that all structural concrete is placed and cured in the dry. For demolition purposes, dewatering shall be conducted on an as needed basis as determined by the Contractor.

It is the responsibility of the Contractor to determine the need and extent of dewatering required and to submit methods and materials the Contractor proposes to use for the Engineer's approval.

All necessary permitting, documents and fees required for all dewatering work shall be the responsibility of the Contractor and shall be included in the cost of these Items.

CONSTRUCTION METHODS

Plans and calculations for all sandbagging, pipes, dikes, optional sheeting and other water control measures shall be developed by the Contractor for this Item. These plans and calculations shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts and shall be submitted for the approval of the Engineer prior to the start of construction.

The Contractor shall use such equipment and shall perform his/her operations in such a manner that boiling or other disturbances of the soil in the foundation area will be prevented and that turbidity is not released into the river or wetland. The Contractor shall keep the area being excavated dry by such means that water will be prevented from entering from the adjacent soils and adversely affecting the stability of the foundation material or supporting soils.

All dewatering and related earthwork shall be conducted in such a manner as to prevent siltation or contamination of the waterway.

The pumping discharge shall not be allowed to enter directly into the waterway. The water from the work areas shall be pumped to a settling tank before discharge into the bypass pipe. The tank shall be constructed so as to allow for the pumped water to pass through the tank with sediments settling out before outletting to an area enclosed by hay bales. Storage volume shall be determined by the following formula: Cubic feet of storage required = Pump discharge rate x 16. The tank can be constructed of concrete, fiberglass or any other material that will meet the following:

ITEM 991.3 through ITEM 991.7 (Continued)

1. Approximately 70 percent sedimentation trapping efficiency shall be achieved with a typical tank to ensure that the tanks are adequately sized to prevent overtopping from dewatering and to provide the required filtering.
2. The outlet from the settling tank shall not cause erosion of the surrounding area. An approved method of controlling erosion, such as an erosion control blanket, stone, etc., shall be used at the outlet of the tank.

The settling tanks shall be maintained as follows:

1. Inspect at least twice daily during dewatering operations.
2. Repair any damage immediately.
3. Clean tank outlet daily. Remove any debris immediately.
4. Remove sediments when deposits reach 8 inches below the outlet invert.
5. Dispose sediments outside of wetland areas at a location approved by the Engineer.

The Contractor shall inspect compost filter tubes or hay bales that surround the outlet daily and shall immediately replace any that are damaged.

Pumping shall be conducted in a manner, which will not adversely affect the freshly placed concrete within the excavation.

The Contractor shall provide and maintain ample pumps, pipes and other devices to promptly and continually remove and dispose of water from the excavation areas. The size and configuration of pumps and pipes shall be selected by the Contractor. Continuous power supply (including back-up) shall be provided for operation of water control pump(s).

The Contractor shall provide the means of removing all sediment from water pumped from the excavation areas; this shall include the use of sedimentation basins, check dams, sedimentation fences or tanks as directed by the Engineer. The Contractor shall provide a dewatering filter basin sized to have a minimum retention time of 24 hour.

BASIS OF PAYMENT

Items 991.3, 991.4, 991.5, 991.6, and 991.7 will be paid for at the respective Contract unit price per LUMP SUM, which prices shall include all labor, equipment, materials, engineering design, submittals, and all incidental costs required to complete the work.

Payment of 75% of the lump sum bid price of these Items will be made upon complete installation to the satisfaction and approval of the Engineer.

The remaining 25% of the lump sum bid price of these Items will be paid following proper complete removal of all temporary water control measures from the site, as determined by the Engineer.

ITEM 995.011 CULVERT STRUCTURE, CULVERT NO. 1 LUMP SUM
ITEM 995.021 CULVERT STRUCTURE, CULVERT NO. 3 LUMP SUM

This work under these Items shall consist of designing, fabricating, furnishing, and installing a precast concrete box culvert, precast cut-off and return walls as shown on the Plans.

The culvert sections shall be manufactured in accordance with the applicable requirements of Subsection 901 of the Standard Specifications, Supplemental Specifications, the Plans, and this Special Provision.

MATERIALS

The following materials shall meet the requirements specified in the following Subsections of the Standard Specifications, unless indicated otherwise on the Construction Drawings:

Precast Concrete Box Culvert	M4.02.14
Reinforcing Bars	M8.01.0
Welded Steel Wire Fabric	M8.01.2

Preformed flexible joint sealants between precast units shall be in accordance with AASHTO M 198-B.

Bituminous Damp-proofing shall be in accordance with Subsection 970 of the Standard Specifications.

The work shall also include the designing, detailing, fabricating and installing of a precast concrete box culvert at the locations indicated on the Contract Plans by the Contractor.

Manufacturers offering prefabricated precast concrete box culverts which meet the basic geometric requirements indicated on the Contract Plans shall be listed on MassDOT's Qualified Construction Materials List (QCML).

ITEMS 995.011 and 995.021 (Continued)

Precast concrete box culvert design shall conform to the AASHTO LRFD Bridge Design Specifications 9th edition 2020 and the 2013 MassDOT Bridge Design Manual with interim revisions. The design and fabrication shall comply with the following material standards:

- Epoxy coated reinforcing steel bars shall meet the requirements of AASHTO M 31 and AASHTO M 284.
- Cement shall meet the requirements of AASHTO M 85.
- Aggregates shall meet the requirements AASHTO M 6/M 80.
- Air-entraining admixtures shall meet the requirements of AASHTO M 154.
- Admixtures other than the air-entraining shall meet the requirements of AASHTO M 194.
- Concrete minimum compressive strength at 28 days shall be 5000 psi, Type III standard gray cement with local sand and aggregates unless otherwise directed by the Engineer.
- Bituminous damp-proofing shall be Sonneborn Hydrocide 700B and shall meet the requirements of ASTM D1227, Type 2, Class 1, and ASTM D1187 Type 1.

All steel components and fasteners shall be galvanized in accordance with Subsection M7.10.0 of Division III, Materials.

DESIGN

The Contractor shall submit design computations for the culvert units to the Engineer for review and approval. The computations shall be prepared in accordance with the AASHTO LRFD Bridge Design Specifications 9th edition 2020 and the 2013 MassDOT LRFD Bridge Manual with interim revisions, and HL-93 live loading. The calculations shall include load ratings prepared in accordance with the MassDOT Bridge Manual. To expedite the review and approval process, submissions containing computer computations shall include electronic copies of the actual input and output files. The design computations shall consider all loadings as are appropriate for each stage of fabrication, shipment, construction, and upon completion. Design computations and shop drawings shall be prepared and stamped by a Structural Professional Engineer with experience in culvert design and licensed to practice in the Commonwealth of Massachusetts.

Prior to fabrication, eight sets of complete shop drawings showing, as a minimum, the following information shall be submitted to the Engineer for approval:

1. Professional Engineer stamp licensed to practice in the Commonwealth of Massachusetts.
2. Plan layout of the structure indicating the piece mark of each unit.
3. Complete details of all precast units, including all dimensions and tolerances, locations and types of reinforcement, finish treatments, and concrete strengths at lifting and at 28 days.
4. Joint dimensions and details including type and brand of joint sealing materials.
5. Locations and methods of forming lifting holes, type and location of lifting devices, and the method of handling and transporting all precast units to the job site.

ITEMS 995.011 and 995.021 (Continued)

The minimum cover of concrete over the reinforcement shall be 2 inches or as indicated on the plans.

MANUFACTURE

Slump and air content tests shall be taken and recorded for every manufactured culvert section along with four (4) test cylinders.

Any of the methods of curing as stipulated in Subsection M4.02.14 of the Standard Specifications shall be used and the preferred method of curing shall be submitted to the Engineer for approval.

Handling devices shall be permitted in each unit for the purposes of handling and placing. Each culvert cell section shall contain the necessary temporary hardware so it may be connected and drawn and held to the adjacent culvert section. Bolts shall conform to ASTM Designation A307. After the full length of culvert for each stage of construction has been connected and drawn tight as approved by the Engineer, all temporary hardware and bolts shall be removed.

Any inserts on the inside surface of the culvert shall be recessed into the wall and grouted over after assembly in order to maintain a smooth, unbroken inside wall surface. Each culvert section shall contain a suitable number of reinforced lifting fixtures to insure safe and level handling and to prevent any damage during fabrication, handling, transportation and installation.

Unless otherwise shown on the plans, each separate culvert cell section shall have a male and female ship-lap joint with not less than 1-1/2 in. of concrete overlap. Each section shall have one pre-placed 1 in. preformed flexible joint sealant cemented to the joint surface.

Repairs

Culvert sections shall be repaired because of occasional imperfections in manufacture or handling damage and will be acceptable if, in the opinion of the Engineer, the repairs are sound, properly finished and cured, and the repaired sections conform to the requirements of this specification.

Inspection

Inspection shall be performed in accordance with Section M4.02.14 Paragraph G.

Rejection

Culvert sections shall be subject to rejection due to the failure to conform to any of the specification requirements. Individual sections may be rejected because of any of the following:

1. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint;
2. Defects that indicate imperfect proportioning, mixing and molding;
3. Excessive honeycombed or open texture;
4. Damaged ends at time of delivery, where such damage would prevent making a satisfactory joint.

ITEMS 995.011 and 995.021 (Continued)

Marking

The following information shall be clearly marked on the interior of each section by indentation, waterproof paint, or other approved means:

1. Date of manufacture and lot number;
2. Name and trademark of the manufacturer.

Installation

The precast concrete culvert system shall be installed in a workmanlike manner in accordance with the lines and grades indicated on the Plans and the requirements described in the Plans and specification. The Contractor shall supply competent workmen and equipment sufficient to install the sections in a safe, accurate, workmanlike manner.

The Contractor shall ensure the stability of the precast box culvert units during transportation and construction.

Backfilling operations shall not begin until the following check(s) have been made:

1. All joint seals are properly placed.

The backfilling procedures shall be in accordance with Subsections 120, 150, and 170 of the Standard Specifications.

BASIS OF PAYMENT

Items 995.011 and 995.021 will be paid for at the respective Contract unit price per LUM SUM, which prices shall include all labor, materials, equipment, design, submittals, and all incidental costs required to complete the work.

Backfill will be paid for under Item 151.2 – Gravel Borrow for Backfilling Structures and Pipes.

996.03 ENDWALL STRUCTURE, WALL NO. 1 LUMP SUM

The work under this Item shall conform to the relevant provisions of Ssubsection 901 of the Standard Specifications and the following.

The work under Item shall consist of furnishing and placing Portland cement concrete endwall unit on a prepared subgrade or sub-base in accordance with these specifications and in reasonably close conformity with the lines, grades and dimensions shown on the plans.

MATERIALS

Materials shall meet the requirements specified in the following Subsections of the Standard SpecificationsI,

Materials:
Cement and Cement Concrete Materials.....M4
Precast Concrete Highway Units.....M4.02.14
High Performance Concrete.....M4.06.1
Steel Reinforcement.....M8.01.0
Epoxy Coated Reinforcing Bars M8.01.7

CONSTRUCTION METHODS

The subgrade shall be properly shaped and compacted as specified in Subsection 170: Grading of the Standard Specifications.

The Endwall Structure unit shall be placed on a previously compacted gravel foundation.

Finishing, Curing, and Protective Sealing

The Endwall Structure unit shall be finished, cured, and sealed according to the applicable specifications of Subsection M4.02.14: Precast Concrete Highway Units of the Standard Specifications.

BASIS OF PAYMENT

Item 996.03 will be paid for at the Contract unit price per LUMP SUM, which price shall include all labor, equipment; materials including finishing, curing, protective sealing, reinforcing steel, and all incidental costs required to complete the work.

Gravel borrow for the foundation of the barriers and between the sections will be paid for under Item 151; Gravel Borrow.

END OF SPECIAL PROVISIONS

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THE COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
TEN PARK PLAZA - BOSTON, MA

ESTIMATE OF QUANTITIES - DETAIL SHEET

CITY/TOWN: Wales
STA 11+00.00 to STA. 88+00.00
TYPE OF PROJECT: Roadway Reconstruction

YEAR: 2024
ROAD: Monson Road
CLASS: Rural Major Collector
DATE: September 9, 2024

Earth Excavation:	18000 CY	Gravel Borrow:	13570 CY

PAVEMENT NOTES

PROPOSED PAVEMENT MILLING AND OVERLAY: **AREA=125 SY**
1 1/2" SUPERPAVE SURFACE COURSE - 9.5 (SSC-9.5) OVER
PAVEMENT MILLING AND VARIABLE DEPTH OVERLAY

PROPOSED FULL DEPTH PAVEMENT: **AREA=24,413 SY**
1 1/2" SUPERPAVE SURFACE COURSE - 9.5 (SSC-9.5)
1 3/4" SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC-12.5)
3 1/4" SUPERPAVE INTERMEDIATE COURSE - 19 (SIC-19.0)
4" DENSE GRADED CRUSHED STONE
8" GRAVEL BORROW, TYPE B

PROPOSED HOT MIX ASPHALT DRIVEWAY: **AREA=1131 SY**
1 1/2" HOT MIX ASPHALT MODIFIED TOP COURSE OVER
2 1/2" HOT MIX ASPHALT INTERMEDIATE COURSE BINDER OVER
8" GRAVEL BORROW, TYPE B

TACK COAT
BITUMEN FOR TACK COAT (RS-1) SHALL BE APPLIED AT RATE OF 0.07 TO 0.09 GALLON PER SQUARE YARD OVER MILLED SURFACES AND 0.06 TO 0.08 GALLON PER SQUARE YARD OVER BASE AND INTERMEDIATE PAVEMENT COURSES.

Plan No's	Estimate by WS
Profile No's	Checked by ND
Calc. Book No.	Submitted by Weston & Sampson
From Report of	Dist. Hwy. Eng. Office Engineer
	Dated

ITEM 102.521 TREE AND PLANT PROTECTION FENCE

Station	Offset
12+75	30’ RT
15+56	25' RT
15+83	25' RT
15+85	23' RT
15+86	23' RT
15+96	24' RT
16+08	21' RT
16+12	24' RT
16+15	21' RT
16+37	34' LT
16+40	33' LT
16+59	16' RT
16+60	18' RT
16+62	18' RT
16+62	19' RT
17+00	32' RT
17+02	30' RT
18+39	46' LT
20+67	27' RT
30+08	18’ LT
51+64	24’ LT
53+69	22’ LT
54+50	20’ LT
56+40	20’ LT
62+72	27’ RT
64+90	25’ LT
75+02	31’ LT
75+36	39’ LT
79+53	33’ LT
79+72	35’ LT
79+74	36’ LT
79+88	35’ LT
81+04	31’ LT
81+25	31’ LT

ITEM 103. TREE REMOVED – DIAMETER UNDER 24 INCHES

Station	Offset
12+02	14' LT
12+31	13' LT
12+92	9’ LT
13+44	7' LT
13+45	7' LT
13+47	10' LT
13+53	10' LT
13+57	7' LT
14+14	11' LT
14+16	10’LT
14+17	10' LT
19+09	9' RT
20+69	23' RT
20+71	19' RT
20+76	18' RT
20+80	15' RT
24+00	17' LT
24+04	16' LT
68+01	12' RT
69+37	8' RT

ITEM 104. TREE REMOVED – DIAMETER 24 INCHES AND OVER

Station	Offset
11+74	16' LT
15+02	16’ LT
15+28	19’ LT
15+89	26' LT
18+52	5' RT
24+77	19’ LT
29+55	33’ LT
30+27	15' LT
52+67	15' LT
54+72	15' LT
55+19	16' LT
70+38	11' RT

ITEM 221. FRAME AND COVER

Station	Offset
21+08.3	7.2' LT
22+34.87	5.7' LT
23+21.3	4.9' LT
23+48.8	5.2' RT
25+26.9	6.2' RT
48+25.9	4.7' LT
50+23.1	5.7' LT
50+48.1	5.5' RT
51+93.6	5.2' RT
54+92.6	5.1' RT
57+42.3	5.9' RT
59+91.5	5.3' RT
62+41.4	5.6' RT
64+91.4	5.2' RT
67+40.6	5.1' RT
72+20.7	5.3' RT
73+04.5	5.4' RT
73+19.4	5.2' RT
81+27.6	6.5' RT
78+95.9	6.1' RT
76+93.9	6.2' RT
81+96.0	6.4' RT
85+71.7	6.0' RT

ITEM 222.1 FRAME AND GRATE - MASSDOT CASCADE TYPE

Station	Offset	Type
19+80	13’ LT	CBCI
21+00.1	13’ LT	CBCI
22+00	47’ LT	CB
23+12	13.2’ LT	CBCI
23+12	13.1’ RT	CBCI
23+36.9	13.2’ LT	CBCI
23+36.9	13.1’ RT	CBCI
25+31.4	13.1’ RT	CBCI
27+74.4	13.1 RT	CBCI
48+15.4	13’ LT	CBCI
48+15.6	12.9’ RT	CBCI
50+27	13’ LT	CBCI
50+27	13’ RT	CBCI
50+52	13’ LT	CBCI
50+52	13’ RT	CBCI
52+01.8	13’ LT	CBCI
52+02	12.9’ RT	CBCI
55+00.2	13.1’ RT	CBCI
57+50	13’ RT	CBCI
57+50.1	13’ LT	CBCI
60+00.2	13.1’ LT	CBCI
60+00	13.1’ RT	CBCI
62+49.8	13.1’ LT	CBCI
62+50.2	13.1’ RT	CBCI
64+99.9	13.1’ LT	CBCI
64+99.9	13.1’ RT	CBCI
67+50	13.1’ LT	CBCI
67+50	13.1’ RT	CBCI
72+11.8	13.1’ LT	CBCI
73+00.5	13.1’ LT	CBCI
73+00.5	13.1’ RT	CBCI
73+25.4	13.1’ LT	CB
73+25.6	13.1’ RT	CBCI
76+85.2	13.1’ LT	CBCI
78+85.5	13.1’ LT	CBCI
81+18.5	13.1’ LT	CBCI
81+18.5	13.1’ RT	CBCI
85+59.1	12.9’ LT	CBCI
85+58.7	13’ RT	CBCI
85+84.5	13’ LT	CBCI
85+82.9	13’ RT	CBCI

ITEM 242.12 12 INCH REINFORCED CONCRETE PIPE FLARED END

Station	Offset
25+09	24.5’ RT
43+76	18.31’ LT
43+76	18.31’ LT
43+76	22.08’ RT
43+76	22.08’ RT
46+60	21.54’ LT
46+60	22.15’ RT
50+54	25.7’ RT
51+10	24.3’ RT
73+26	25.40’ RT
81+90	18.7’ RT

ITEM 242.15 15 INCH REINFORCED CONCRETE PIPE FLARED END

Station	Offset
13+60	20.83’ LT
14+45	20.35’ LT
22+25	24.58’ RT
51+10	28.62’ RT

ITEM 242.18 18 INCH REINFORCED CONCRETE PIPE FLARED END

Station	Offset
15+32	20.23’ LT
15+32	23.85’ RT
1+38.07	68.31 RT
1+60.14	19.82 LT

ITEM 472. TEMPORARY ASPHALT PATCHING

FOR TEMPORARY DRAINAGE TRENCH PATCHING AND OVERBUILDING OF ROADWAY FOR STAGED CONSTRUCTION OF CULVERTS

ITEM 514. GRANITE CURB INLET - STRAIGHT

Station	*Offset*	*Type*
19+80	13’ LT	CBCI
21+00.1	13’ LT	CBCI
23+12	13.2’ LT	CBCI
23+12	13.1’ RT	CBCI
23+36.9	13.2’ LT	CBCI
23+36.9	13.1’ RT	CBCI
25+31.4	13.1’ RT	CBCI
27+74.4	13.1 RT	CBCI
48+15.4	13’ LT	CBCI
48+15.6	12.9’ RT	CBCI
50+27	13’ LT	CBCI
50+27	13’ RT	CBCI
50+52	13’ LT	CBCI
50+52	13’ RT	CBCI
52+01.8	13’ LT	CBCI
52+02	12.9’ RT	CBCI
55+00.2	13.1’ RT	CBCI
57+50	13’ RT	CBCI
57+50.1	13’ LT	CBCI
60+00.2	13.1’ LT	CBCI
60+00	13.1’ RT	CBCI
62+49.8	13.1’ LT	CBCI
62+50.2	13.1’ RT	CBCI
64+99.9	13.1’ LT	CBCI
64+99.9	13.1’ RT	CBCI
67+50	13.1’ LT	CBCI
67+50	13.1’ RT	CBCI
72+11.8	13.1’ LT	CBCI
73+00.5	13.1’ LT	CBCI
73+00.5	13.1’ RT	CBCI
73+25.6	13.1’ RT	CBCI
76+85.2	13.1’ LT	CBCI
78+85.5	13.1’ LT	CBCI
81+18.5	13.1’ LT	CBCI
81+18.5	13.1’ RT	CBCI
85+59.1	12.9’ LT	CBCI
85+58.7	13’ RT	CBCI
85+84.5	13’ LT	CBCI
85+82.9	13’ RT	CBCI

ITEM 627.83 GUARDRAIL TANGENT END TREATMENT, TL-3

Start STA	End STA	Offset
14+50	14+63	25’ RT
14+65	14+78	25’ LT
16+02	16+14	25’ RT
16+88	17+00	25’ LT
20+25	20+37	25’ RT
23+10	23+22	25’ RT
24+26	24+38	25’ RT
24+67	24+79	25’ LT
25+58	25+70	25’ RT
25+79	25+92	25’ LT
30+62	30+75	25’ RT
33+25	33+28	25’ RT
35+22	35+34	25’ RT
36+84	36+97	25’ RT
42+75	42+87	25’ RT
43+57	43+70	25’ LT
43+86	43+98	25’ RT
44+57	44+70	25’ LT
49+33	49+46	25’ RT
49+96	50+08	25’ LT
51+46	51+58	25’ LT
51+71	51+84	25’ RT
71+83	71+95	25’ RT
74+07	74+19	25’ RT
80+08	80+21	25’ RT
81+79	81+92	25’ LT
82+59	82+72	25’ RT
82+92	83+04	25’ LT
84+54	84+66	25’ RT
87+79	87+92	25’ RT
87+87	88+00	25’ LT
02+07	02+20	25’ RT
02+20	02+07	25’ LT

ITEM 628.24 TRANSITION TO BRIDGE RAIL

Station	Offset
24+70	15' RT
24+70	15’ LT
25+15	15’ RT
25+15	15’ LT
86+00	15’ RT
1+65	10’ RT
87+10	15’ LT

ITEM 715. RURAL MAILBOX REMOVED AND RESET

Station	Offset
14+05	3' LT
14+45	3' LT
16+15	18.5' RT
16+70	11' RT
16+75	10' RT
17+05	12.5' RT
30+25	15' LT
47+50	14.5' LT
47+55	14' LT
53+30	13' LT
56+40	14' LT
56+40	17' LT
61+30	18' LT
65+35	21' LT
67+20	21' LT
67+22	21’ LT
70+95	23’ LT
73+07	24' LT
73+10	24' LT
78+16	10’ RT
84+40	18' LT

ITEM 767.121 **SEDIMENT CONTROL BARRIER**

Start Station	End Station	Side
10+97	13+72	RT
15+00	16+80	RT
16+91	17+25	RT
16+95	17+26	LT
17+39	23+50	RT
17+49	20+19	LT
21+05	21+48	LT
21+77	22+89	RT
24+42	26+02	RT
24+51	27+88	LT
26+26	29+13	RT
28+12	28+87	LT
29+62	29+82	RT
30+21	33+20	RT
30+55	32+50	LT
34+50	39+75	RT
42+00	47+75	RT
44+00	45+52	LT
45+61	48+00	LT
49+36	51+81	RT
49+36	51+81	LT
53+55	56+17	LT
54+85	65+80	RT
56+58	61+14	LT
61+28	65+70	RT
65+92	66+98	LT
67+13	70+69	LT
70+84	72+70	LT
72+83	73+30	LT
73+17	74+37	RT
73+60	74+69	LT
75+60	75+87	LT
76+16	77+50	LT
76+37	79+75	RT
77+58	78+04	LT
78+55	79+24	LT
81+08	81+33	LT
81+09	86+96	RT
81+56	83+50	LT
84+75	85+37	LT
85+89	86+09	LT
86+23	88+01	LT
87+04	88+01	RT

ITEM 776.553 MAPLE- RED – OCTOBER GLORY, 3-3.5 INCH CALIPER

Station	Offset
85+20	36' RT
85+40	35’ RT

ITEM 780.100 ELM – PRINCETON, 2-2.5 INCH CALIPER

Station	Offset
14+08	28' LT
17+30	50’ LT
17+70	20' RT
18+80	24' RT
20+10	22' RT
22+90	23' LT
26+90	24' LT
27+30	22' LT
32+70	26' RT
53+70	22' LT
70+25	26' RT
84+90	27' RT
87+60	30’ LT

ITEM 782.534 REDBUD- EASTERN, 2-2.5 INCH CALIPER

Station	Offset
17+15	31' LT
17+80	60’ LT
19+75	22' RT
26+15	25' LT
26+60	25' LT
26+75	25' LT
52+30	25' LT
65+10	28' LT
75+35	27' RT
75+65	30' LT
76+40	27' LT
79+90	30' LT
85+75	23’ LT

ITEM 783.042 SERVICEBERRY– AUTUMN BRILLIANCE, 2-2.5 INCH CALIPER

Station	Offset
23+63	25' RT
24+10	25' RT
24+45	25' RT
31+57	24' LT
31+67	27' LT
33+30	39' LT
33+40	35' LT
33+70	40' LT
43+02	26' LT
43+15	26' LT
44+50	21' RT
45+75	23' RT
45+90	25' RT
46+50	23' LT
46+75	22' LT
47+00	23' RT
65+20	33' LT
65+25	21' LT
76+78	25' LT
77+05	21' LT
77+15	26' LT
80+50	25' LT
85+10	23' LT
85+25	23' LT
85+80	23' RT
85+90	26' RT
86+00	23' RT

ITEM 847.1 **SIGN SUP (N/GUIDE)+RTE MKR W/1 BRKWAY POST ASSEMBLY – STEEL**

Station	Offset
11+85	15.7’ RT
22+61	17.9’ LT
22+61	19.5’ RT
30+28	22.7’ RT
53+15	18.1’ RT
53+15	17.1’ LT
56+56	35.7 LT
76+62	25.2’ LT
83+71	17.3’ LT
2+00	11.2’ RT
2+28	10.5’ LT
1+60	11.2’ RT
87+50	16.6’ LT
88+81	18.6 LT

ITEM 848.1 **SIGN SUP (N/GUIDE)+RTE MKR W/2 BRKWAY POST ASSEMBLIES – STEEL**

Station	Offset
17+25	27.2’ LT
56+06	20.5’ LT
73+27	23.4’ LT
86+72	24.5’ RT

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DOCUMENT A00808

PROJECT UTILITY COORDINATION FORM

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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	

9/20/2024
PRINTED

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 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)
Stage : 1 Phase : A			Enabling' work by the Contractor - _Clearing and Tree removal. Contractor reviews proposed locations for new utility poles with the RE							
			UTILITY OPERATIONS - _____							
Task: 1			***NGRID/Verizon***						no	
		u	Pre-Check for staking and DigSafe	5		x		x		
		u	Install 55 New Utility Poles and 27 Anchors along Monson Road	82		x		x		
		u	**NGRID and Verizon** install new pole P43 and P43 1/2 with associated anchors	2		x				
			Sub-Total	**89**						
			UTILITY OPERATIONS - _____							
Task: 2			***NGRID***						no	
		u	Frame Poles and Transfer Wire along Monson Road	50	X			x		
		u	Install Equipment	10	X			x		
		u	Cut Over Overhead Customers	3	X			x		
			Sub-Total	**63**						
			UTILITY OPERATIONS - _____							
Task: 2			***Charter (note all Power Company Work must be done prior to Charter Inc. Start Date)***						no	
		u	Transfer existing plant to new poles	10	x			x		
		u	Construct strand and ground	4	x			x		
		u	Construct new coax and strand	4	x			x		
		u	Splice coax and activate	4	x			x		
		u	Construct new fiber	6	x			x		
		u	Delash existing fibers and relocate slack	4	x			x		
		u	Splice multible fibers at new locations	15	x			x		
		u	Transfer or install power supply onto new poles	1	x			x		
		u	Wreck out old power supply	1	x			x		
		u	Relocate underground coax and place vault	2	x			x		
			Sub-T	**51**						
			UTILITY OPERATIONS - _____							
Task: 3_			***Verizon***						no	
		u	Verizon Line place all anchors, PAG's where necessary	6	x			x		
		u	Verizon Line place new strand where necessary	5	x			x		
		u	Verizon Splice to splice in new cable slack where necessary	10	x			x		
		u	Verizon Line transfer all cables,drops, and associated equipment to new poles	50	x			x		
		u	Verizon Line to remove old strand where necessary	3	x			x		
		u	Verizon Splice to trim out cable slack where necessary	5	x			x		
		u	Verizon Line remove all anchors, PAG's whwere necessary	7	x			x		
		u	Remove old poles	40	x			x		
			Sub-Total	**126**						

IMPORTANT BASIS NOTES - FOR CONTRACTOR

RESPONSIBLE PARTY: C = Contractor, U = Utility Co.	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 ?	
			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)
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.							
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 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

Temporary Traffic Control

Typical Details and
Massachusetts Guidelines
for MassDOT, Municipalities,
Utilities, and Contractors

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INTRODUCTION

This guide has been prepared to assist in the planning and installing of temporary traffic controls in maintenance, utility, or short-term construction work areas (work lasting 10 hours or less). This guide serves to assist with the many decisions that must be made for each work site. Special planning for traffic control is necessary on a case by case basis because conditions can vary widely among work locations. **Since this guide cannot cover every situation, representative illustrations covering typical short-term construction, maintenance, and utility operations are presented**.

All typical traffic control device setups illustrated should be considered as guides. The traffic control devices that are shown, the arrangement or position of the devices, and the distances prescribed in the tables are based on the Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) and the Massachusetts Amendments to the MUTCD (MA Amendments), but these illustrations only present minimum standards. The provision of safe work zones for all roadway users and roadway workers affected by these activities is paramount. Traffic controls may be expanded or improved upon whenever deemed necessary. Traffic movement through the work site all traffic control devices shall be periodically observed and inspected at all locations.

If necessary, Part 6 of the MUTCD and the MA Amendments, Chapter 17 (Work Zone Management) of MassDOT's Project Development & Design Guide, and the “Traffic Engineering and Safety Section” of the MassDOT web site: (https://www.massdot.state.ma.us/highway/Departments/TrafficandSafetyEngineering.aspx), as well as MassDOT District offices can provide additional guidance, information, and suggestions for work zone setups.

RESPONSIBILITIES FOR TRAFFIC CONTROL

Short-term construction, maintenance, and utility work on or near the roadway creates a potentially hazardous situation, typically requiring the use of temporary traffic controls. These controls are important to protect both work crews and the road users. It is the responsibility of each maintenance foreman to establish and maintain safe and effective controls.

Usually the supervisor, working with the crew, plans the traffic control procedures for proposed work sites. The foreman is responsible for re-questing, storing, and maintaining all traffic control devices necessary for their crews.

The foreman is responsible for placing the devices according to these guidelines. They must inspect each installation and observe traffic flow through the area. The foreman is generally authorized to make adjustments to the original installations that, in their judgment, are necessary to improve the control of traffic and establish greater safety.

All necessary traffic control devices must be installed before work begins and properly maintained during the work period. They must also be removed as soon as they are no longer relevant to the roadway conditions.

In situations such as night time road or lane closures, detours, or other unusual conditions on state highways, the District Traffic Maintenance Engineer (DTME) should be advised. If the DTME is absent, the section foreman shall follow the instructions of the District Maintenance Engineer.

TRAFFIC CONTROL DEVICES

Traffic control devices regulate the movement of road users, warn of unexpected or unusual roadway conditions, and inform them how to maneuver safely through or around the work area. All signs, channelizing devices, barricades, and other miscellaneous traffic control devices should work together to guide traffic safely and efficiently. Common temporary traffic control devices are outlined and described below.

Signs

Temporary traffic control zone (TTCZ) signs are the primary means of providing information and directions to roadway users. All signs must be retroreflective per MassDOT's latest standard.

Warning signs call attention to unexpected conditions and to situations that might not be readily apparent to road users on or adjacent to a roadway. Warning signs alert road users to conditions that might call for a reduction of speed or an action in the interest of safety and efficient traffic operations. Nearly all warning signs for construction and work areas have black legends and borders on a fluorescent orange background.

Regulatory signs shall be used to inform road users of selected traffic laws or regulations and indicate the applicability of the legal requirements. Regulatory signs typically have black legends and borders on a white background.

Channelizing Devices

When used properly, traffic cones, reflectorized plastic drums, and barricades guide traffic through the work area along an appropriate travel path. It takes roadway users a certain distance along the roadway to safely move away from the upcoming active work site. These transition distances are based on the following taper length (L) formulas:

L = $WS^2/60$ for speeds of 40 mph or less; or

L = WS for speeds of 45 mph or more; where

- L = minimum length of taper in feet,
- S = posted speed limit or typical travel speed in miles per hour prior to the work, and
- W = width of lane closure in feet.

The spacing of channelizing devices (in feet) is approximately equal to the existing speed of traffic (in mph).

Warning Lights

Rotating beacons and other flashing lights mounted on work vehicles, signs, or channelizing devices help alert roadway users to the work area. They may also be used to warn roadway users of hazards within the work area. The first 10 drums in any taper shall be equipped with sequential flashing lights.

Arrow Boards

Arrow boards are a special type of sign that are highly visible work zone warning devices. They are particularly effective on highways, where both speed and volume are high. Arrow boards in the non-directional, CAUTION, mode (four corner flashing) may be used to indicate that a shoulder is closed. Arrow boards in the arrow mode shall only be used when a travel lane is dropped on a multi-lane road and one lane of traffic must merge with another. All arrow boards should be located at the beginning of each lane or shoulder closure taper without extending outside of it. Arrow boards shall flash at a rate of 25 to 40 flashes per minute. Arrow boards shall not be used to indicate a lane shift.

BASIC REQUIREMENTS

In every work situation, the temporary traffic control setup must: Give roadway users sufficient advance warning of the work area; advise roadway users of the proper actions to take and travel paths to follow; and provide protection to roadway users, workers, and the work area. These three general requirements can be met as outlined below.

Provide Advance Warning

Warning devices along the approaches to a work area alert roadway Users to changes to road and operating conditions. Roadway users are usually alerted to these dangers via a sign or series of signs installed in the same order as the roadway user generally would expect to see them on long-term construction projects.

The initial project limit sign is usually a general warning such as “ROAD WORK 1500 FT”. Other operational warning signs then provide the roadway user with more specific information about the situation. A minimum of three advance warning signs (the initial project limit sign and two operational warning signs) is recommended when work is located on the traveled way. Warning lights and flags can be used to attract attention to the signs. A highly visible work area helps reinforce the advance warnings.

Advise and Direct Travelers

Operational warning signs provide information to the road-way user such as the type of work being performed, special conditions to watch for, or actions to take. These include signs such as, SHOULDER WORK, RIGHT LANE CLOSED, DETOUR 500 FT, ROAD CLOSED to THRU TRAFFIC, POLICE OFFICER AHEAD, etc. All of these signs must be located far enough in advance of the work area that the roadway user has sufficient time to react to them appropriately. For projects in Urban Areas, see detail: Typical Device Spacing for minimum sign spacing.

Protect Travelers, Workers, and the Work Area

The primary protection of any work area is its own visibility. Traffic cones, reflectorized plastic drums, portable breakaway barricades, etc. are used to make the work area visible and separate workers from traffic.

Other devices, such as flashing lights, flags, delineators, temporary lighting, and portable changeable message signs (PCMS) can be used to provide additional emphasis and visibility.

Workers must protect themselves by being alert to their work situation, wearing safety vests and hard hats, and by facing traffic whenever possible.

Work vehicles can also add protection when they are equipped with truck mounted attenuators, rotating beacons, flashing lights, flashing arrow boards, etc. and are parked between workers and oncoming traffic. However, workers should not position themselves between two closely parked vehicles. No private personal vehicles are allowed within the work site.

PLANNING GUIDELINES

Decisions regarding selection of work area traffic control devices require a knowledge and understanding of the specifics of each work zone. As there may be vast differences between situations, three main variables need to be considered prior to determining the need for, or the selection of, traffic control devices: 1) location of work, 2) type of roadway, and 3) speed of traffic.

Compiling information about these variables will help with planning a safe work area control. Each of these variables is explained below.

Location of Work

The choice of traffic controls needed for a short-term construction, maintenance, or utility operation depends upon the work zone's location. As a general rule, the closer the active work site is to the roadway, the more control devices are needed. Work can take place:

- Away from the shoulder or edge of pavement. No special devices are needed if work is confined to an area 15 or more feet from the edge of the shoulder. A general warning sign, such as ROAD WORK AHEAD, should be used if workers and equipment must occasionally move closer to the roadway.
- On or near the shoulder/ edge of pavement. This area should be signed as if work were on the road itself, since it is part of the roadway users' recovery area. Advance warning and operational signs are needed, as well as channelization devices to direct traffic and keep the work area visible to roadway users.
- On the median of a divided highway. Work in this location may require traffic control in both directions of traffic. Advance warning and channelization devices should be used if the median is narrow.
- On the roadway. This condition requires detailed protection for workers and sufficient warning to roadway users. Advance warning must provide a general message that work is taking place as well as information about specific hazards and specific actions the roadway user must take.

TYPE OF ROADWAY

The characteristics of the roadway also have an important influence on the selection of work area traffic control. The roadway, itself, may present special hazards. You should plan for maximum protection, using the worst hazard present as your guide to signing the work area. Some general considerations are described below for road conditions.

One-way roads: A one-way road requires signage on both sides of the road if it carries two or more lanes in one direction, ensuring roadway users in all lanes are alerted and informed.

Two-way roads:

- **Undivided:** Two-way, undivided roads will usually require controls for both directions of traffic. When the active work site is well off the roadway, controls for the opposite lane may be eliminated.
- **Divided:** Work on divided multi-lane roadways can often be handled as work along a one-way road (i.e. signs are provided along both sides of the roadway along the direction affected). If the work is in the median, both directions of traffic must be controlled, and both approaches should be double signed (i.e. have all 3 advance warning signs on both sides of each direction).

EFFECTS OF SPEED ON WORK ZONES

Speed is an important consideration in the use of work area traffic control devices. As a general rule, the greater the speed of traffic approaching a work area, the greater the size, number, and spacing of control devices.

Size. The standard size for most warning signs is 36 x 36 inches on conventional roadways and 48 x 48 inches on freeways and expressways. Signs larger than the standard 36 x 36 inches may be desirable on high-speed conventional roads.

Position. Install signs far enough in advance of the work area so the roadway users have time to react to them (see charts associated with diagrams for spacing).

OTHER FACTORS

Sight Obstructions. To ensure safety, work areas must be visible. Assess the placement of the temporary traffic control devices by driving through the area, and determine if the devices can be easily seen and provide sufficient time for roadway users to react in a safe manner. Extra precaution should be enacted in areas where horizontal or vertical curves may obstruct a roadway user's clear view of road activities ahead.

Police/Flaggers. It should be noted that the MUTCD does not require police/flaggers for stationary setups. If police/flaggers are used, a police/flagger ahead sign should be used in advance of any point where the police/flagger is stationed to control road users.

PROCEDURES FOR WORK AREA TRAFFIC CONTROL

1. PLAN YOUR WORK

Inspect location of work area and its surroundings.

Analyze:

- Location of work in relation to the traveled way, intersecting road-ways, driveways, and sight distances;
- Type of roadway and traffic involved; and
- Volume and speed of traffic.

Meet and discuss the work and necessary traffic control with the crew.

Study representative illustrations in this guide to develop a temporary traffic control plan (TTCP).

Other Considerations:

- Base your traffic control plan on the premise that all roadway users are unfamiliar with the area.
- The closer the work area location is to traffic, the more controls are needed.
- Plan for maximum protection.
- Select and inspect the temporary control devices needed (including all warning signs), if they are not in good condition, REPLACE THEM!
- Then collect and transport them to the work site.
- Determine their proper placement.
- Install signs and other traffic control devices prior to allowing personnel or equipment onto the roadway.
- Make sure signs are reflective, accurate, clean, and meet specifications. Completely cover any existing permanent signs that will conflict with the messages of the new work area control signs.

2. INSTALLING/REMOVING TEMP. TRAFFIC CONTROL DEVICES

Care must be exercised when installing and removing temporary traffic control (TTC) devices. The traffic control needed to perform the operation safely is dictated by the location on the roadway the operation will occur: in a shoulder or a lane, in the left lane or right, etc. In all cases, installing TTC begins and ends as a mobile operation.

A shadow vehicle with a truck mounted attenuator (TMA) shall be used to protect workers installing and removing TTC devices on all roadways with a posted speed limit of 45 MPH or greater as directed by the engineer. TTC devices shall not be installed or removed from a shadow vehicle with a TMA. TTC devices shall be installed or removed from a work operation vehicle only and a shadow vehicle with a TMA shall be used to protect the workers installing or removing the devices.

PROCEDURES FOR WORK AREA TRAFFIC CONTROL (CONT.)

3. INSTALL TRAFFIC CONTROL DEVICES AT WORK SITE

FOR LOWER SPEED (≤ 40 MPH) ROADWAYS:

1) All devices shall be installed in order with the flow of traffic.

2) Where one direction of traffic is being affected, the first sign installed should be the sign farthest from the work site, and on the same side as the work.

3) Where two directions of traffic are affected, install signs for opposing traffic first, starting with the sign farthest from the work area. When signs for opposing traffic have been installed, install signs on the same side as the work area, again beginning with the sign farthest from the active work site.

4) Once signs are in place, other traffic control devices shall be installed in the same manner as the signs.

FOR HIGHER SPEED (≥ 45 MPH) ROADWAYS:

1) All devices shall be installed in order with the flow of traffic.

2) Install all advance warning signs, beginning with the ROAD WORK XXX (W20-1) sign and ending with the END ROAD WORK/DOUBLE FINES END (MA-R2-10E) sign.

3) Install all signs beginning with the opposite side which will be closed (for a right lane closure; first, install all signs on the left side (shoulder) and then install all signs on the right side (shoulder). No signs shall be erected on the roadway unless delineated by traffic control devices.

4) If required, install shoulder taper as the mobile operation advances.

5) Install arrow board on the shoulder prior to the merging taper or as close to the beginning of the merging taper as possible.

6) Install channelizing devices to form a merging taper. Use of a shadow vehicle with a TMA during installation is required on roads with speed limits of 45 MPH or greater or as directed by the Engineer.

7) Install traffic control devices along the buffer space at the appropriate spacing.

8) Continue placing devices along the work space at the appropriate spacing.

9) Install devices for the termination area as necessary.

10) Place the shadow vehicle with a TMA in advance of the first work crew or hazard approached by motorists. Multiple shadow vehicles may be required based on the number of lane and shoulder closures implemented.

4. INSPECT WORK AREA SIGNING AND CONTROL DEVICES

1) Assess the placement of the temporary traffic control devices by driving through the work area. All approaches to the work zone should be checked.

2) Ensure roadway users will have sufficient time to read signs and react in a safe manner.

PROCEDURES FOR WORK AREA TRAFFIC CONTROL (CONT.)

3) Check visibility of entire work area. If approaching roadway users can't see the work area well, or if they can't see ahead to traffic that may already be queued on the approach because of the work, additional traffic control devices should be deployed.

4) Check to ensure the proper temporary traffic control devices are positioned to protect workers from traffic (where possible).

5) Ensure all workers wear safety vests, hard hats, and all other necessary safety equipment. All worker safety gear should be in good condition. All reflective gear should be clean and highly visible in the dark.

6) Record in the log book the number and location of all signs and devices.

Considerations:

- Work area signs should never be blocked from view or obscured by vegetation, existing signs, or other obstructions.
- Flags, flashing lights, and edge line traffic cones can be used to improve visibility.

5. REMOVE TRAFFIC CONTROL DEVICES AT WORK SITE

All workers and equipment should be clear from work site BEFORE removing signs and other devices.

FOR LOWER SPEED (≤ 40 MPH) ROADWAYS:

1) Remove signs and other devices within the delineated area when work is complete.

2) Remove other traffic control devices in the reverse order in which they were installed

3) Remove signs in the reverse order in which they were installed (i.e. sign closest to the work area to be removed first).

4) When the operation is complete, uncover any existing permanent signs covered in Step 2.

5) Record in the log book the time at which the signs were removed.

FOR HIGHER SPEED (≥ 45 MPH) ROADWAYS:

All TTC devices for a stationary lane closure on a multi-lane roadway, except advance warning signs, should be removed against the flow of traffic in the following sequence:

1) Remove the channelizing devices starting from the end of the activity area working back to the widest part of the merging taper.

2) A shadow vehicle with TMA shall be positioned to protect workers removing devices and work backwards as the setup is removed from the roadway.

PROCEDURES FOR WORK AREA TRAFFIC CONTROL (CONT.)

3) Place the removal vehicle on the shoulder, and remove the channelizing devices from the merging taper by hand onto the work vehicle.

4) Remove the arrow board once traffic is clear and it is safe to do so.

5) Circle back and moving with the flow of traffic, remove the advance warning signs starting with the opposite side from previous lane closure first.

6) At no time shall workers run across the multilane roadway to remove signs on both sides of the road simultaneously.

7) Record in the log book the time at which the signs were removed

RAMP FACILITIES

At all times it is necessary to control the on and off-ramp traffic during the installation and breakdown of traffic control devices. Use of temporary traffic slow-downs or rolling roadblocks is recommended to allow for the safety of workers handing temporary traffic control devices on ramp facilities. A shadow vehicle with a TMA shall be used to protect the workers installing or removing the devices. At no time shall the work operation vehicle be used as the shadow vehicle with the TMA.

USE OF THIS GUIDE

Illustrations showing minimum standards for short-term construction, maintenance, and utility operations are arranged in this guide by type of operation. The users of this guide should compare all illustrated examples and examine their differences. After gathering information about the work zones using the general guidelines as outlined, proceed as follows:

1) Turn to the Index. Consider the type of operations and the type of roadway upon which work will occur.

2) Select the figure that most closely matches the conditions where you plan to work. Remember that all diagrams represent minimum standards.

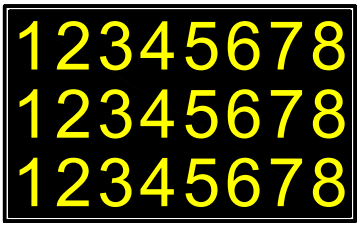
3) Read the title of the illustration to ensure that it is appropriate to your location. Study the layout of traffic control devices and read all notes.

4) Consult the appropriate tables, as directed on each illustration to determine taper length and proper spacing of signs. Notice that distances change when speeds change. Also note that these are guidelines, only, and they must be adapted to your specific work area.

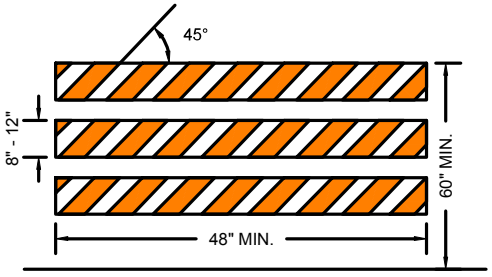
5) Use the **"PROCEDURES FOR WORK AREA TRAFFIC CONTROL"** for assistance in completing all necessary steps to provide effective and safe work area traffic control.

massDOT Massachusetts Department of Transportation Highway Division PAGE 10	Work Zone Safety Standard Details and Drawings	FIGURE 1 TYPICAL TRAFFIC CONTROL DEVICES NOT TO SCALE

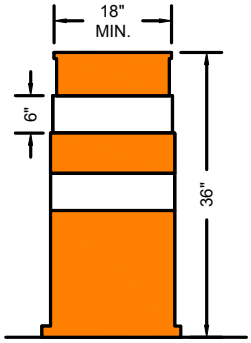
SIGN



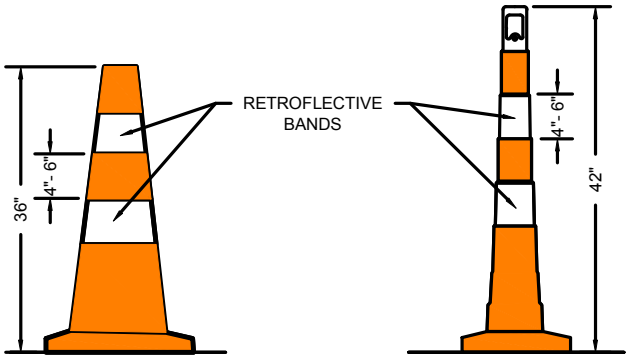
PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)



TYPE III BARRICADE

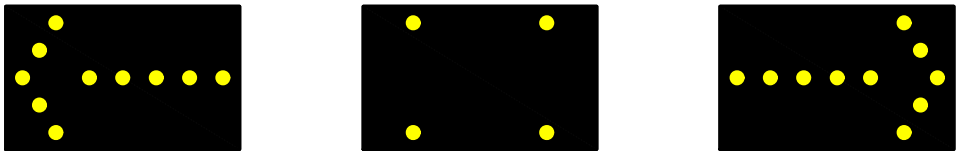


DRUM



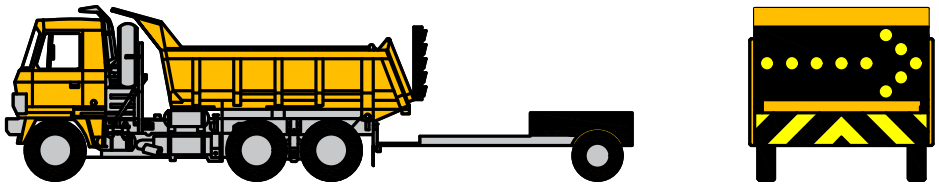
CONES

Cones may be used for all daytime operations. For night work, drums should be used to form the taper(s) and cones can be used along the tangent section of the work setup.



LEFT CAUTION RIGHT

ARROW BOARD (WITH MODE)



TRUCK MOUNTED ATTENUATORS

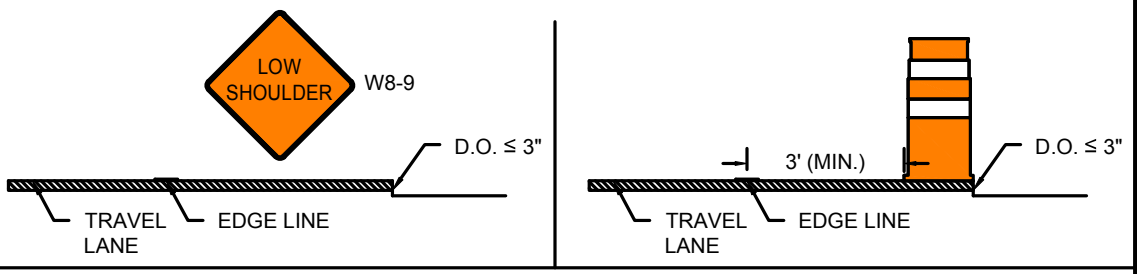
Truck Mounted Attenuators (TMA) shall be positioned between the start of the work area and the end of the designated buffer zone. The TMAs are to be positioned in each temporarily closed lane. This includes shoulders (≥8 feet) whether combined with a travel lane closure or being closed alone. These TMA conditions are required on roadways with speeds of 45 MPH or greater. TMAs can be used on other roadways at the discretion of the engineer. TMAs shall be used for the deployment and removal of all traffic control devices, including all advance warning signs.

SHORT-TERM PAVEMENT EDGE DROP-OFFS

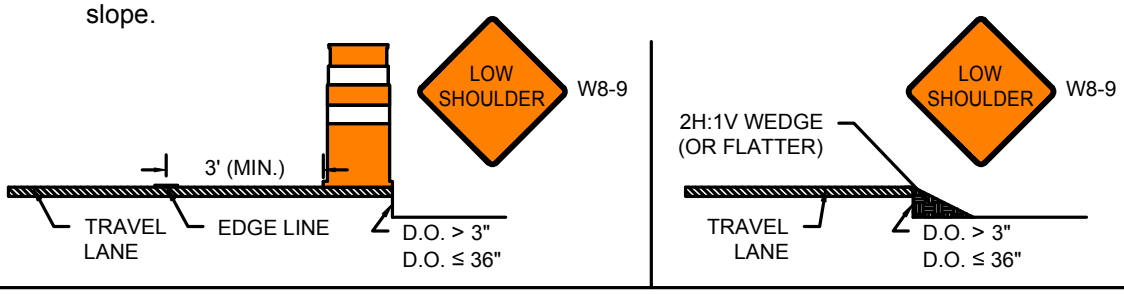
Note that this guidance is adopted from the Roadside Design Guide*, 4th Edition.*

Pavement drop-offs may occur during paving, excavation, and other construction activities. Drop-offs create hazards for vehicles if not properly mitigated. The following applies for all roads with speed limits greater than 30 mph; for roads with speed limits of 30 mph or less, treatments for pavement edge drop-offs are at the discretion of the Engineer. Drop-offs between adjacent, open travel lanes should not exceed 2", and any drop-off in excess of 3" should not be left unattended without one of these mitigation measures applied.

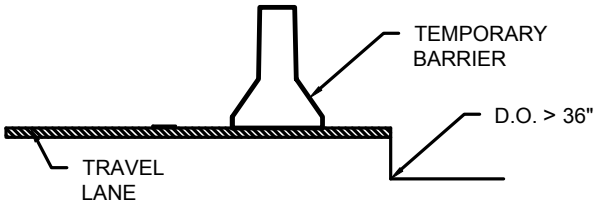
- Shoulder drop-offs 3" or less adjacent to a shoulder or active travel lane should be mitigated by:
  - ✓ A W8-9 (LOW SHOULDER) sign in advance of and at regular intervals throughout the treatment; or
  - ✓ The placement of drums on the traffic side of the drop-off.



- Shoulder drop-offs greater than 3" but less than or equal to 36" should be mitigated by:
  - ✓ A W8-9 (LOW SHOULDER) sign in advance of and at regular intervals throughout the treatment and the placement of drums on the traffic side off the drop-off, offset at least 3' from the travel lane; or
  - ✓ A W8-9 (LOW SHOULDER) sign in advance of and at regular intervals throughout the treatment and the placement of a temporary wedge of material along the face of the drop-off. The wedge should consist of stable material placed on a 2H:1V or flatter slope.



- Shoulder drop-offs greater than 36" must be protected by temporary barrier.



massDOT Massachusetts Department of Transportation Highway Division

PAGE 11

Work Zone Safety Standard Details and Drawings

FIGURE 2
PAVEMENT EDGE
DROP-OFF GUIDANCE
NOT TO SCALE

massDOT Massachusetts Department of Transportation Highway Division PAGE 12	Work Zone Safety Standard Details and Drawings	TYPICAL DEVICE SPACING

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	320	305	20	55
45-55	500 / 1000 / 1000	660	495	40	40
60-65	1000 / 1600 / 2600	780	645	40	50

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

MINIMUM SPACING OF ADVANCE WARNING SIGNS FOR URBAN ROADWAYS	
ROAD TYPE	DISTANCE BETWEEN SIGNS
URBAN (LOW SPEED)	100 FT
URBAN (HIGH SPEED)	350 FT

NOTES

1. 40 FT = 10 FT PAVEMENT MARKING + 30 FT SKIP

LEGEND

WORK ZONE

CHANNELIZATION DEVICE

FLASHING ARROW BOARD

PORTABLE CHANGEABLE MESSAGE SIGN

TRUCK MOUNTED ATTENUATOR

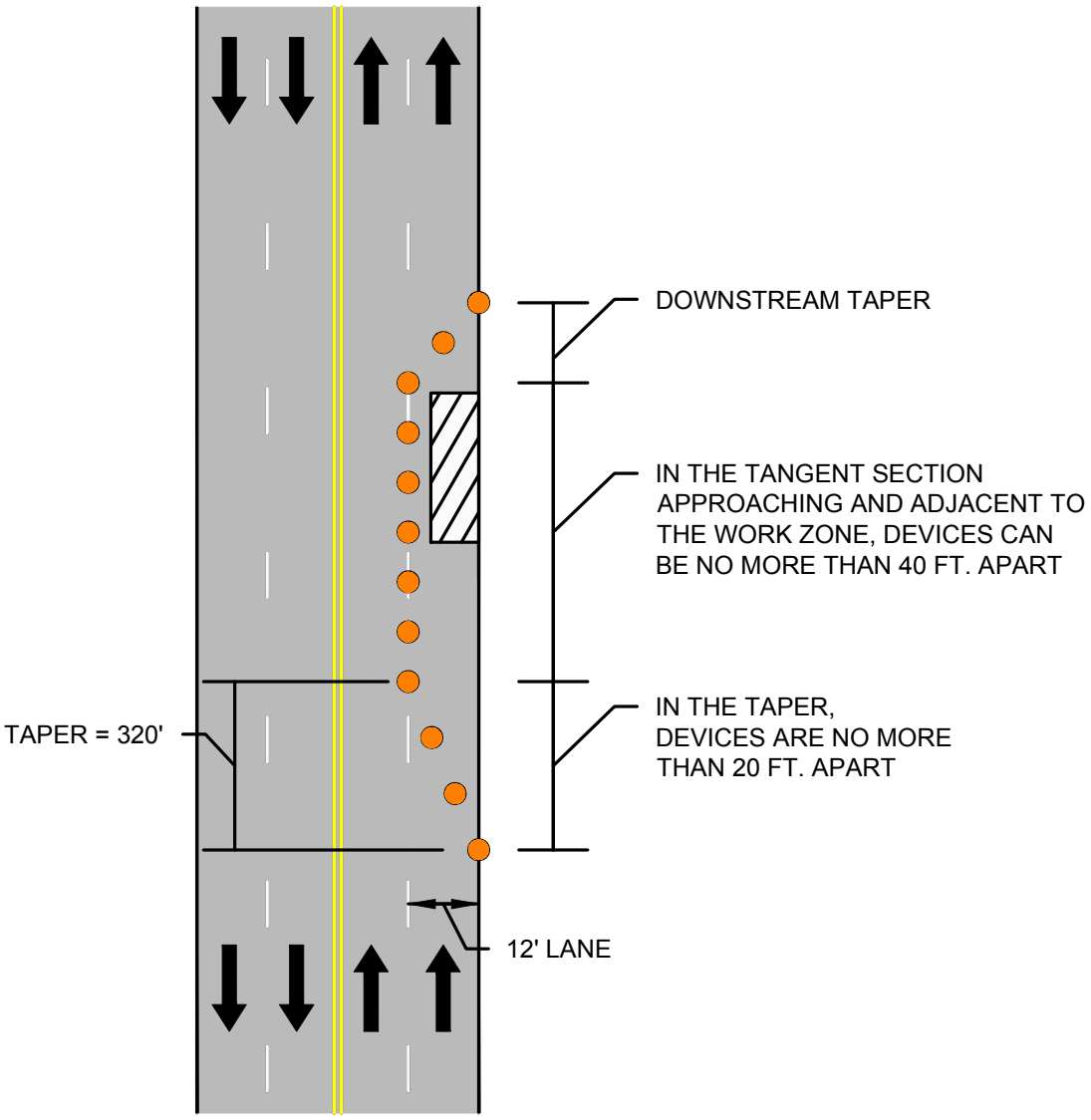
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 13	Work Zone Safety Standard Details and Drawings	FIGURE 3 TYPICAL DEVICE SPACING (AT 30 MPH)

Guidance for Flagging Operations

NOTE:
A flagger shall always be aware of their surroundings and have a good escape route. A flagger shall never be positioned directly beside or against construction equipment. When a flagger is required to direct traffic in an area where the escape route is partially blocked by a traversable obstruction such as a guardrail, the flagger shall be physically capable of traversing that obstruction. Prior to commencing a project, the supervisor in charge shall review the project, including guardrail areas, for safe flagging stations. The supervisor in charge shall clearly communicate with the flagger(s), indicating any locations where they cannot safely perform their duties.

Each flagger shall be equipped with the following high visibility clothing, signaling, and safety devices:

1) A white protective hard hat with a minimum level of reflectivity per the requirements of ANSI, Type I, Class E&G;
2) A clean, unfaded, untorn lime/yellow reflective safety vest and pants meeting the requirements of ANSI 107 Class 3 with the words "Traffic Control" on the front and rear panels in minimum two (2) inch (50 millimeter) high letters;
3) A 24 inch "STOP/SLOW" traffic paddle conforming to the requirements of Part 6E.03 of the Manual on Uniform Traffic Control Devices (MUTCD), a weighted, reflectorized red flag, flagger station advance warning signage, and two-way radios capable of providing clear communication within the work zone between flaggers, the Contractor, and the Engineer. The traffic paddle shall be mounted on a pole of sufficient length to be seven feet above the ground as measured from the bottom of the paddle;
4) A working flashlight with a minimum of 15,000 candlepower and a six inch red attachable wand, a whistle with a working lanyard, and a First Aid kit that complies with the requirements of ANSI Z308.1; and
5) An industrial/safety type portable air horn that complies with the requirements of the U.S. Coast Guard.

A "STOP/SLOW" paddle should be the primary hand-signaling device. It shall have an octagonal shape on a rigid handle. Flag use should be limited to emergency situations.

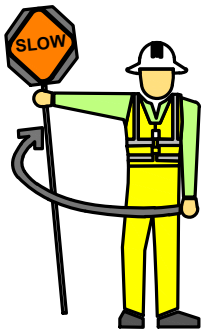
TO STOP TRAFFIC

Properly Trained Flaggers

- Give clear messages to drivers.
- Allow distance for drivers to react.
- Coordinate with other flaggers.
- Use standard signaling methods.

Properly Equipped Flaggers

- Use approved stop/slow paddles.
- Use approved safety apparel.
- Use retroreflective equipment.
- Use hand held radios, as needed.
- All flaggers shall wear safety apparel that meets ANSI Class 3 requirements. The combination of vest and pants is required.



TO LET TRAFFIC PROCEED

Proper Flagging Stations

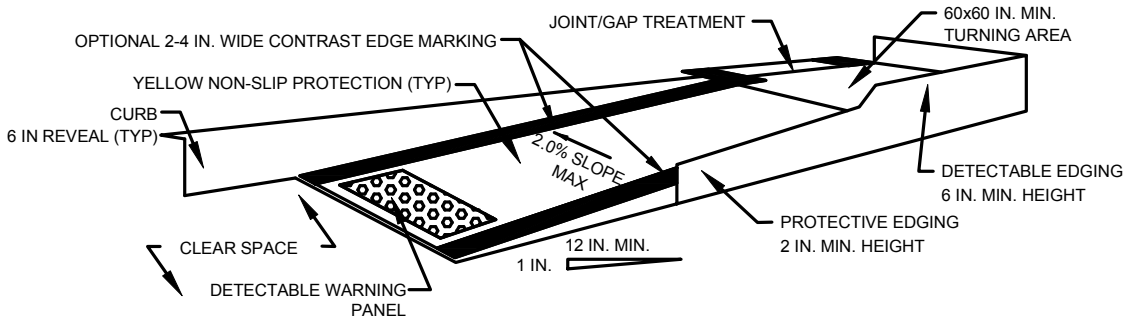
- Good approach sight distance.
- Highly visible to traffic.
- Stand alone away from other machinery and people.
- Stand on right edge of pavement or shoulder- proceed to centerline only when first vehicle has come to stop.
- Have a good escape route.

TO ALERT AND SLOW TRAFFIC

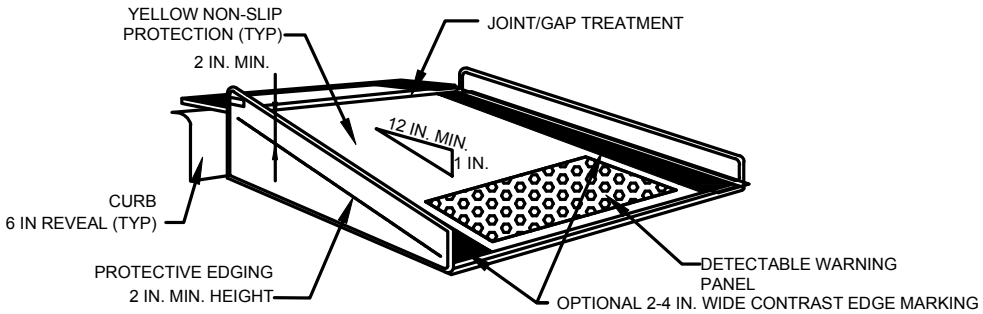
Proper Advance Warning Signs

- Always use warning signs.
- Allow for reaction distance from signs.
- Remove signs if no longer necessary or not flagging.
- Use free hand in up-and-down motion to help slow traffic.

massDOT Massachusetts Department of Transportation Highway Division PAGE 16	Work Zone Safety Standard Details and Drawings	FIGURE 4 TYPICAL PEDESTRIAN DEVICES (1 OF 2) NOT TO SCALE



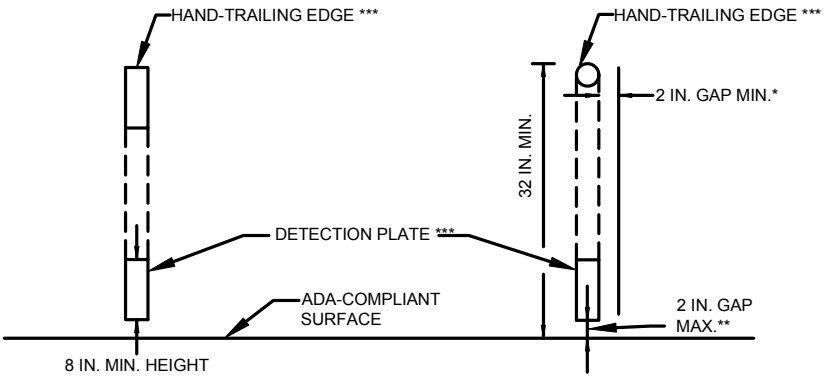
TEMPORARY CURB RAMP-PARALLEL TO CURB



TEMPORARY CURB RAMP-PERPENDICULAR TO CURB

NOTES:

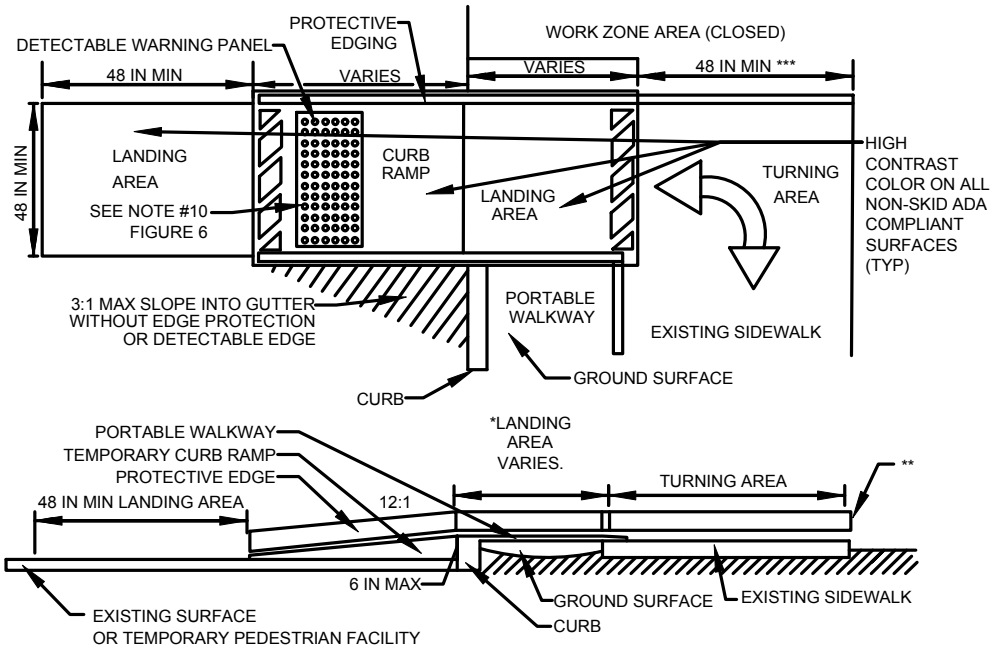
1. CURB RAMPS SHALL BE 60 IN. MINIMUM WIDTH WITH A FIRM, STABLE, AND NON-SLIP SURFACE.
2. PROTECTIVE EDGING WITH A 2 IN. MINIMUM HEIGHT SHALL BE INSTALLED WHEN THE CURB RAMP OR LANDING PLATFORM HAS A VERTICAL DROP OF 6 IN. OR GREATER OR HAS A SIDE APRON SLOP STEEPER THAN 1:3 (33%). PROTECTIVE EDGING SHOULD BE CONSIDERED WHEN THE CURB RAMPS OR LANDING PLATFORMS HAVE A VERTICAL DROP OF 3 IN. OR MORE.
3. PROTECTABLE EDGING WITH 6 IN. MINIMUM HEIGHT AND CONTRASTING COLOR SHALL BE INSTALLED ON ALL CURB RAMP LANDINGS WHERE THE WALKWAY CHANGES DIRECTION (TURNS).
4. THE CURB RAMP WALKWAY AND LANDING AREA SURFACE SHALL BE OF A SOLID CONTINUOUS CONTRASTING COLOR ABUTTING UP TO THE EXISTING SIDEWALK.
5. CURB RAMPS AND LANDINGS SHOULD HAVE A 1:50 (2%) MAX CROSS-SLOPE.
6. CLEAR SPACE OF 48x48 IN. MINIMUM SHALL BE PROVIDED ABOVE AND BELOW THE CURB RAMP.
7. WATER FLOW IN THE GUTTER SYSTEM SHALL HAVE MINIMAL RESTRICTION.
8. LATERAL JOINTS OR GAPS BETWEEN SURFACES SHALL BE LESS THAN 0.5 IN. WIDTH.
9. CHANGES BETWEEN SURFACE HEIGHTS SHOULD NOT EXCEED 0.5 IN. LATERAL EDGES SHOULD BE VERTICAL UP TO 0.25 IN. HIGH, AND BEVELED AT 1:2 BETWEEN 0.25 IN. AND 0.5 IN. HEIGHT.
10. IF A TEMPORARY PEDESTRIAN RAMP LEADS TO A CROSSWALK, THEN A DETECTABLE WARNING PAD MUST BE ADHERED TO THE BASE OF THE RAMP. IF IT LEADS TO A PROTECTED PEDESTRIAN BYPASS THAT DOES NOT CONFLICT WITH VEHICULAR TRAFFIC, THEN A PAD SHALL NOT BE INSTALLED ON THE RAMP.



CROSS SECTION VIEW

PEDESTRIAN CHANNELIZING DEVICE

* THERE SHALL BE A 2 INCH GAP BETWEEN THE HAND-TRAILING EDGE AND ITS SUPPORT.
** A MAXIMUM 2 INCH GAP BETWEEN THE BOTTOM OF THE BOTTOM RAIL AND THE SURFACE MAY BE USED TO PROVIDE DRAINAGE.
*** THE HAND-TRAILING EDGE AND DETECTION PLATE SHALL BE CONTINUOUS THROUGHOUT THE LENGTH OF THE PATH SUCH THAT A PEDESTRIAN USER WITH A LONG CANE CAN FOLLOW IT.



TEMPORARY CURB RAMP

* LANDING AREA USED TO OVERLAP NON-ADA COMPLIANT SURFACES.
** DETECTABLE EDGE REMOVED IF A CONTINUOUS SIDEWALK.
*** 60 IN. IF AN OBSTRUCTION IS AT BACK OF SIDEWALK.

massDOT Massachusetts Department of Transportation Highway Division PAGE 17	Work Zone Safety Standard Details and Drawings	FIGURE 5 TYPICAL PEDESTRIAN DEVICES (2 OF 2) NOT TO SCALE

massDOT Massachusetts Department of Transportation Highway Division PAGE 18	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY HALF OF ROADWAY CLOSED WORK NEAR CURVE

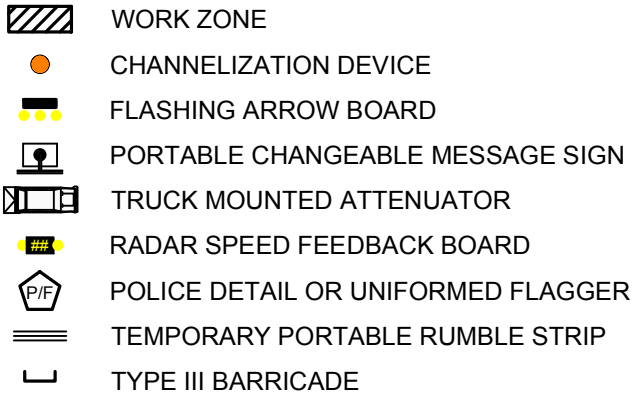
POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	50	100	20	30
45-55	500 / 1000 / 1000	100	150	40	20

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

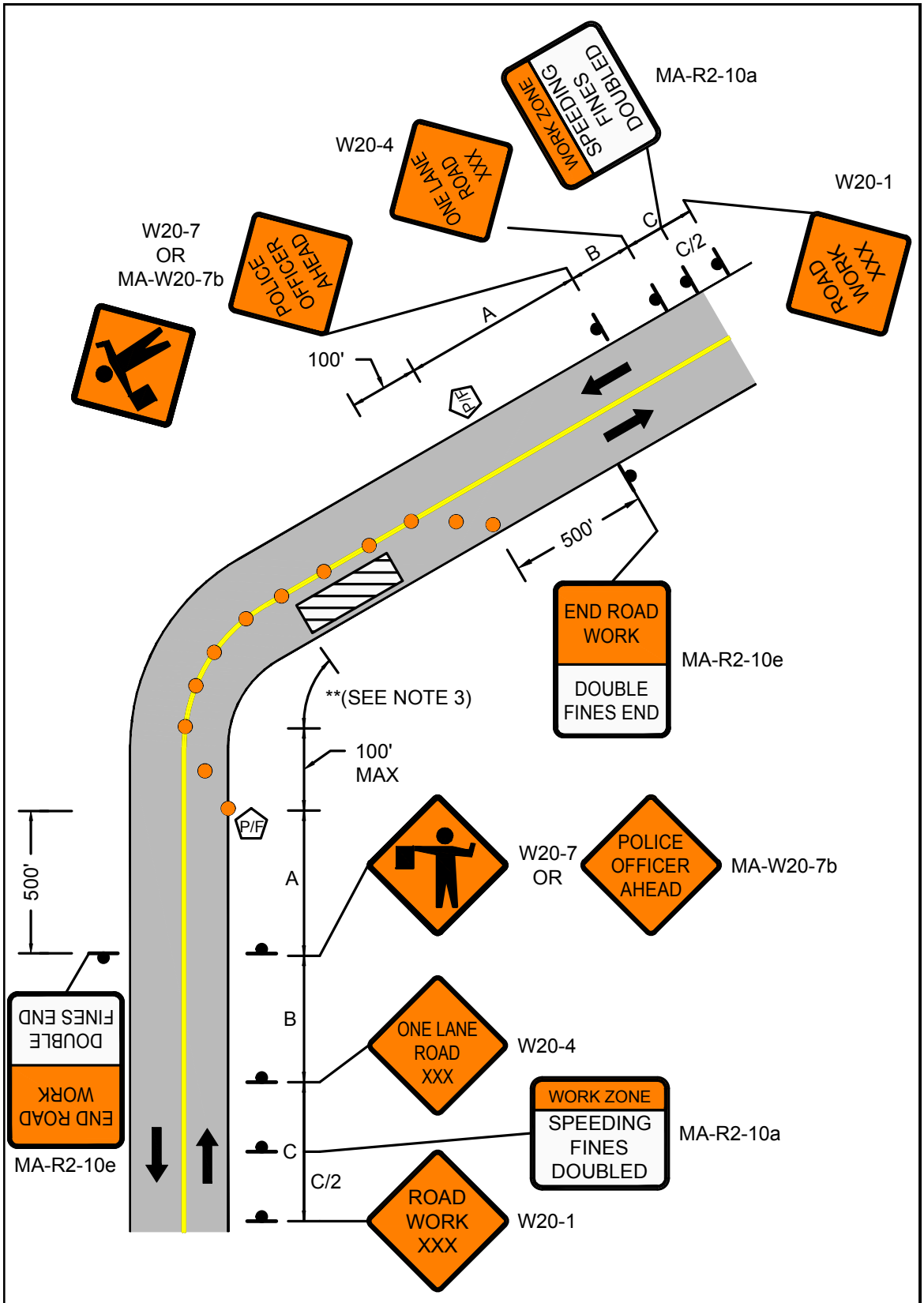
NOTES

1. IF POLICE DETAIL/UNIFORMED FLAGGER SUPPORT IS REQUIRED, PROVIDE TWO UNITS.
2. MA-R2-10a LOCATED AT C/2.
3. ** = EXTEND ENOUGH SO TAPER IS BEFORE CURVE

LEGEND



NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 19	Work Zone Safety Standard Details and Drawings	FIGURE 6 STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY HALF OF ROADWAY CLOSED WORK NEAR CURVE

massDOT Massachusetts Department of Transportation Highway Division PAGE 20	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY HALF OF ROADWAY CLOSED

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	50	100	20	30
45-55	500 / 1000 / 1000	100	150	40	20

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED REGULATORY OR WORK ZONE SPEED	SEPARATION BETWEEN RUMBLE STRIPS
36-mph to 55-mph	15-feet
35-mph and under	10-feet

NOTES

1. IF POLICE DETAIL/UNIFORMED FLAGGER SUPPORT IS REQUIRED, PROVIDE TWO UNITS.
2. MA-R2-10a LOCATED AT C/2.
3. ** OPTIONAL AT THE ENGINEER'S DISCRETION.
4. *** SHALL BE DEPLOYED IF RUMBLE STRIPS ARE PRESENT.

LEGEND

WORK ZONE

CHANNELIZATION DEVICE

FLASHING ARROW BOARD

PORTABLE CHANGEABLE MESSAGE SIGN

TRUCK MOUNTED ATTENUATOR

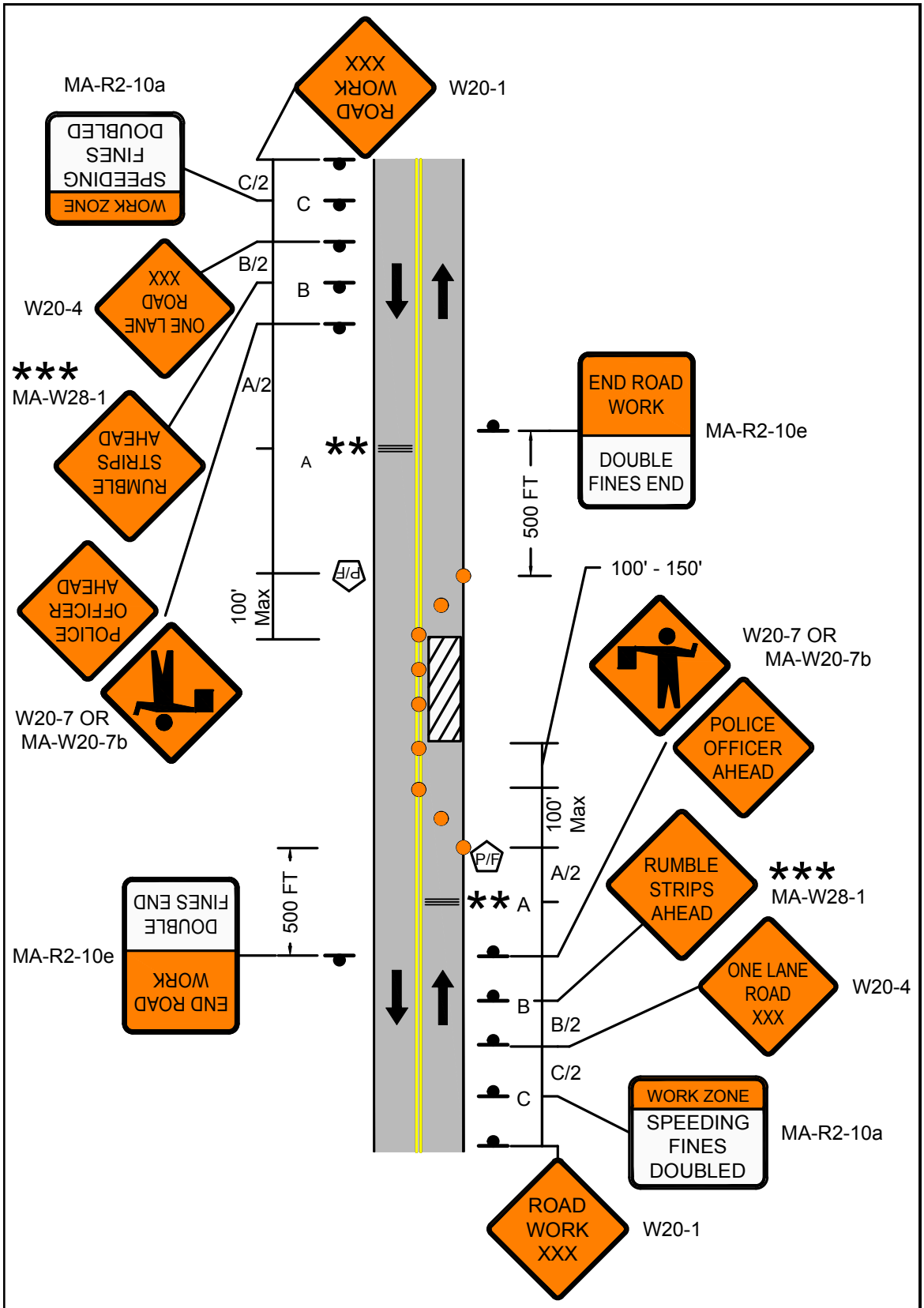
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division

PAGE 21

Work Zone Safety Standard Details and Drawings

FIGURE 7
STATIONARY OPERATIONS
TWO LANE UNDIVIDED ROADWAY
HALF OF ROADWAY CLOSED

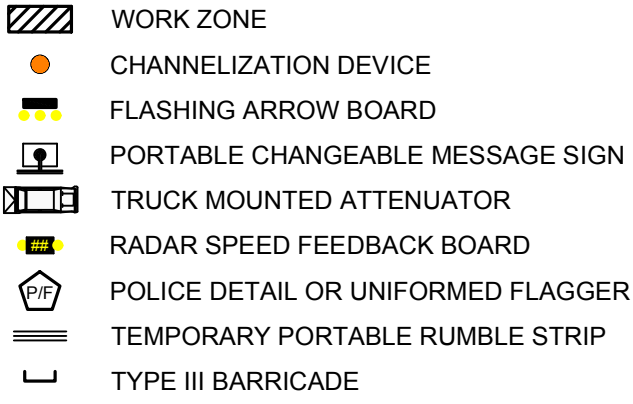
massDOT Massachusetts Department of Transportation Highway Division PAGE 22	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY SHOULDER CLOSED

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		SHOULDER TAPER LENGTH (L/3) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	110	305	20	45
45-55	500 / 1000 / 1000	220	495	40	30
60-65	1000 / 1600 / 2600	260	645	40	35

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES
1. MA-R2-10a at C/2 and A/2.

LEGEND



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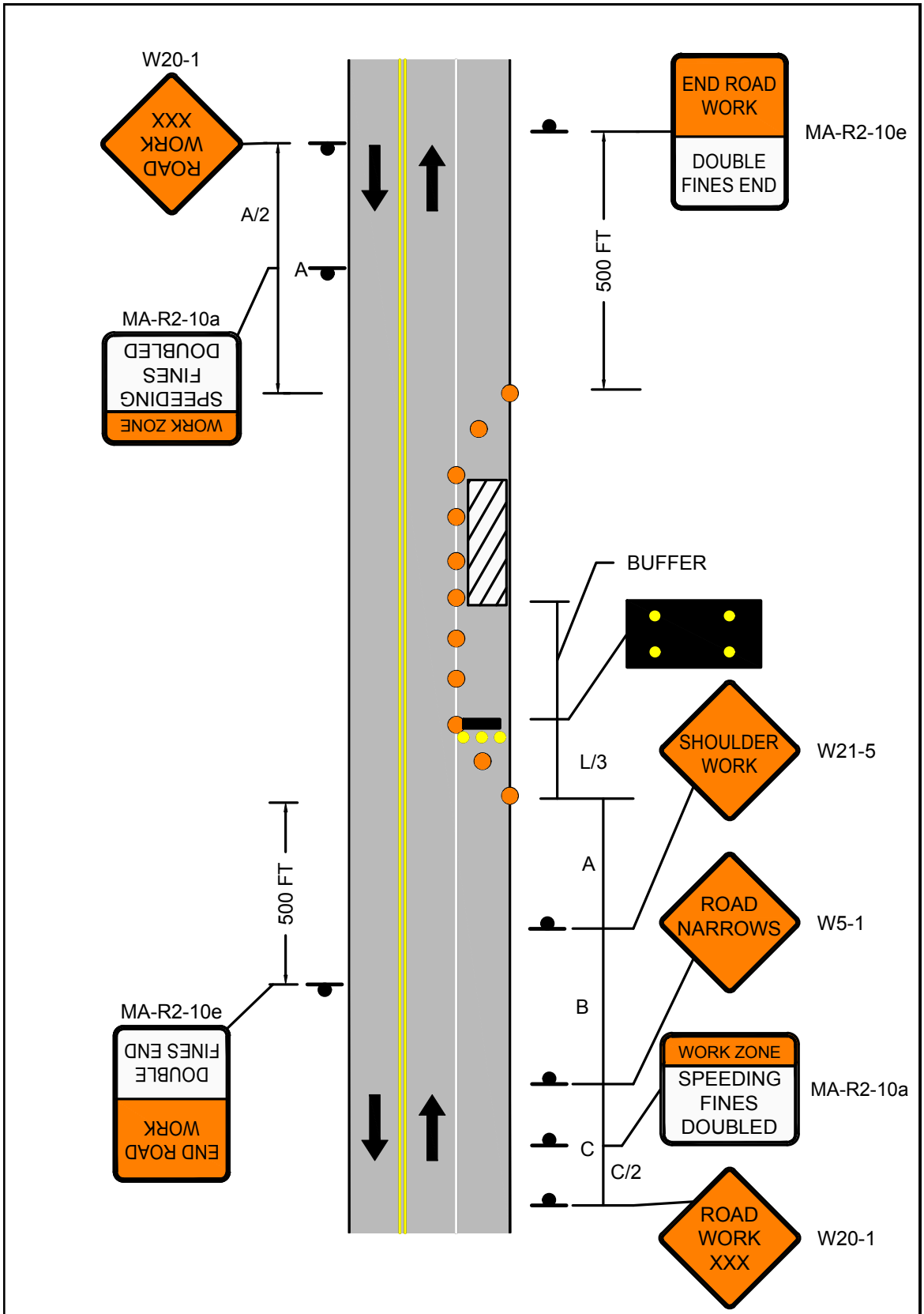


massDOT Massachusetts Department of Transportation Highway Division PAGE 23	Work Zone Safety Standard Details and Drawings	FIGURE 8 STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY SHOULDER CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 24	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY WITH TRAVERSABLE SHOULDER HALF OF ROADWAY CLOSED MAINTAIN TWO-WAY TRAFFIC

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	160	305	20	125
45-55	220	330	495	40	100
60-65	260	390	645	40	115

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

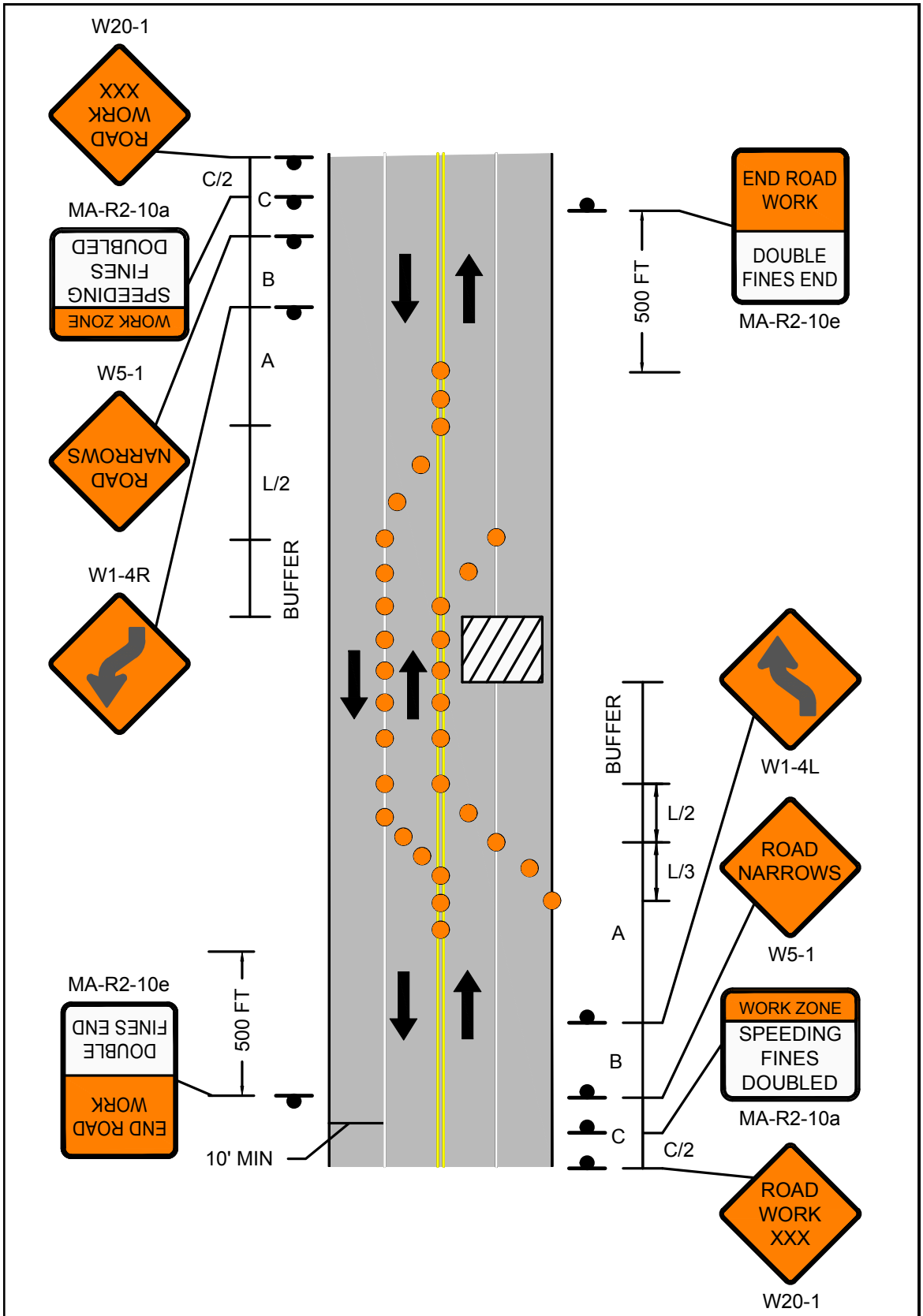
NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND

- WORK ZONE
- CHANNELIZATION DEVICE
- FLASHING ARROW BOARD
- PORTABLE CHANGEABLE MESSAGE SIGN
- TRUCK MOUNTED ATTENUATOR
- RADAR SPEED FEEDBACK BOARD
- POLICE DETAIL OR UNIFORMED FLAGGER
- TEMPORARY PORTABLE RUMBLE STRIP
- TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 25	Work Zone Safety Standard Details and Drawings	FIGURE 9 STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY WITH TRAVERSABLE SHOULDER HALF OF ROADWAY CLOSED MAINTAIN TWO-WAY TRAFFIC

massDOT Massachusetts Department of Transportation Highway Division PAGE 26	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY RIGHT LANE CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	60
45-55	220	660	495	40	50
60-65	260	780	645	40	55

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT A/2 AND C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION.

LEGEND

WORK ZONE

CHANNELIZATION DEVICE

FLASHING ARROW BOARD

PORTABLE CHANGEABLE MESSAGE SIGN

TRUCK MOUNTED ATTENUATOR

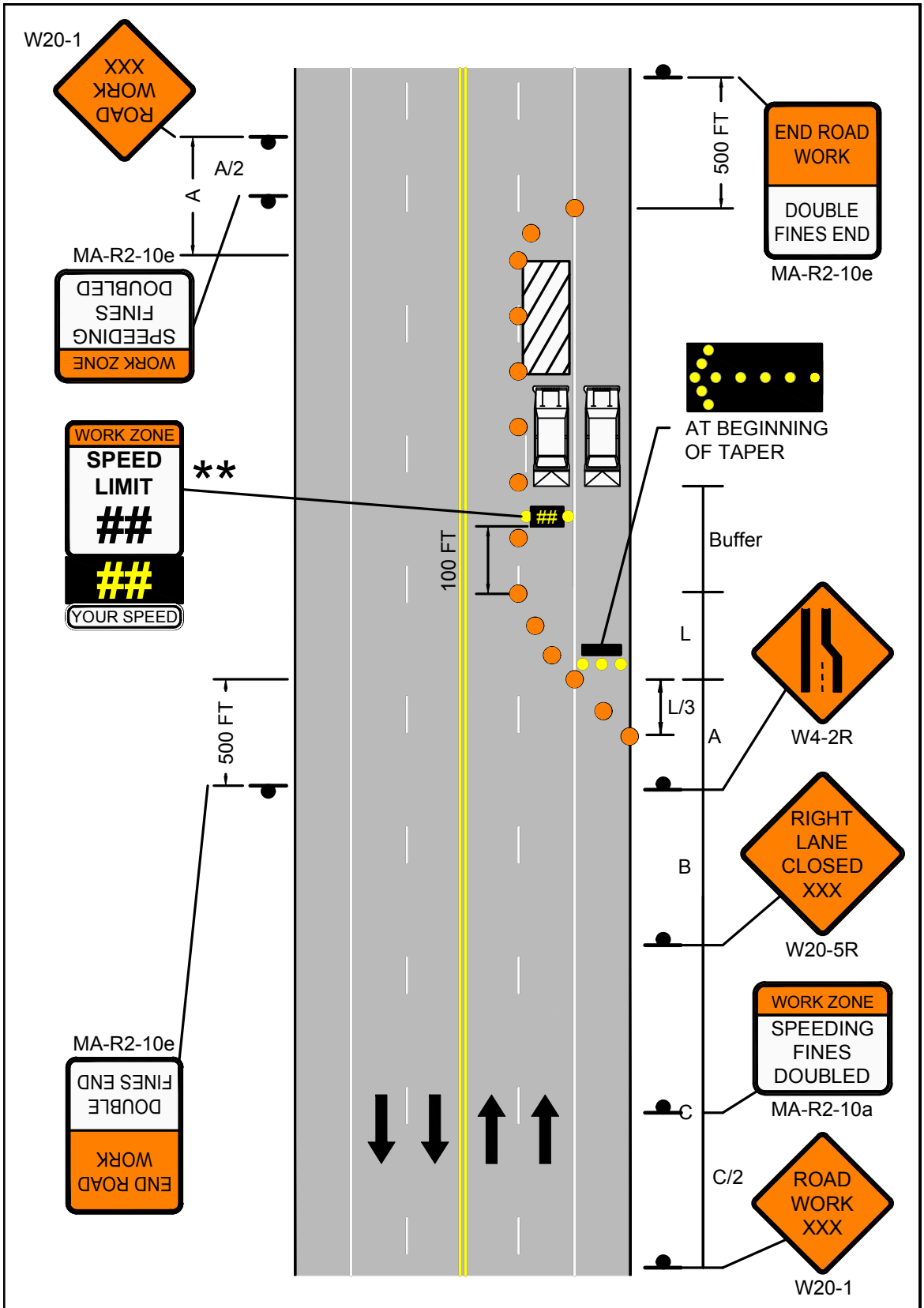
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 27	Work Zone Safety Standard Details and Drawings	FIGURE 10 STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY RIGHT LANE CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 28	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY LEFT LANE CLOSED

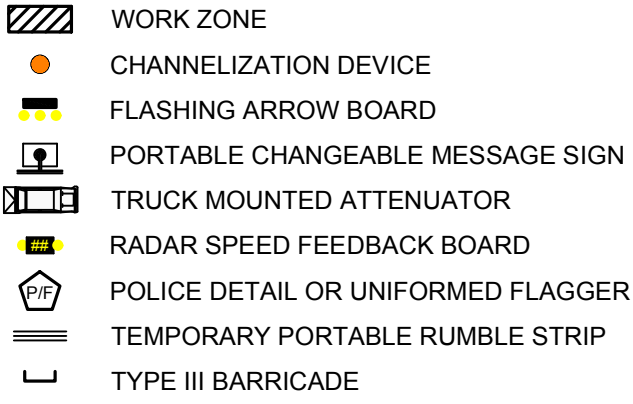
POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	320	305	20	105
45-55	500 / 1000 / 1000	660	495	40	80
60-65	1000 / 1600 / 2600	780	645	40	100

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES

1. MA-R2-10a LOCATED AT A/2 AND C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION. 2' OFFSET FROM EDGE OF TRAVEL LANE TO RADAR SPEED FEEDBACK BOARD IS REQUIRED. BOARD MAY BE MOVED FULLY OR PARTIALLY OFF PAVED SHOULDER, IF REQUIRED.

LEGEND



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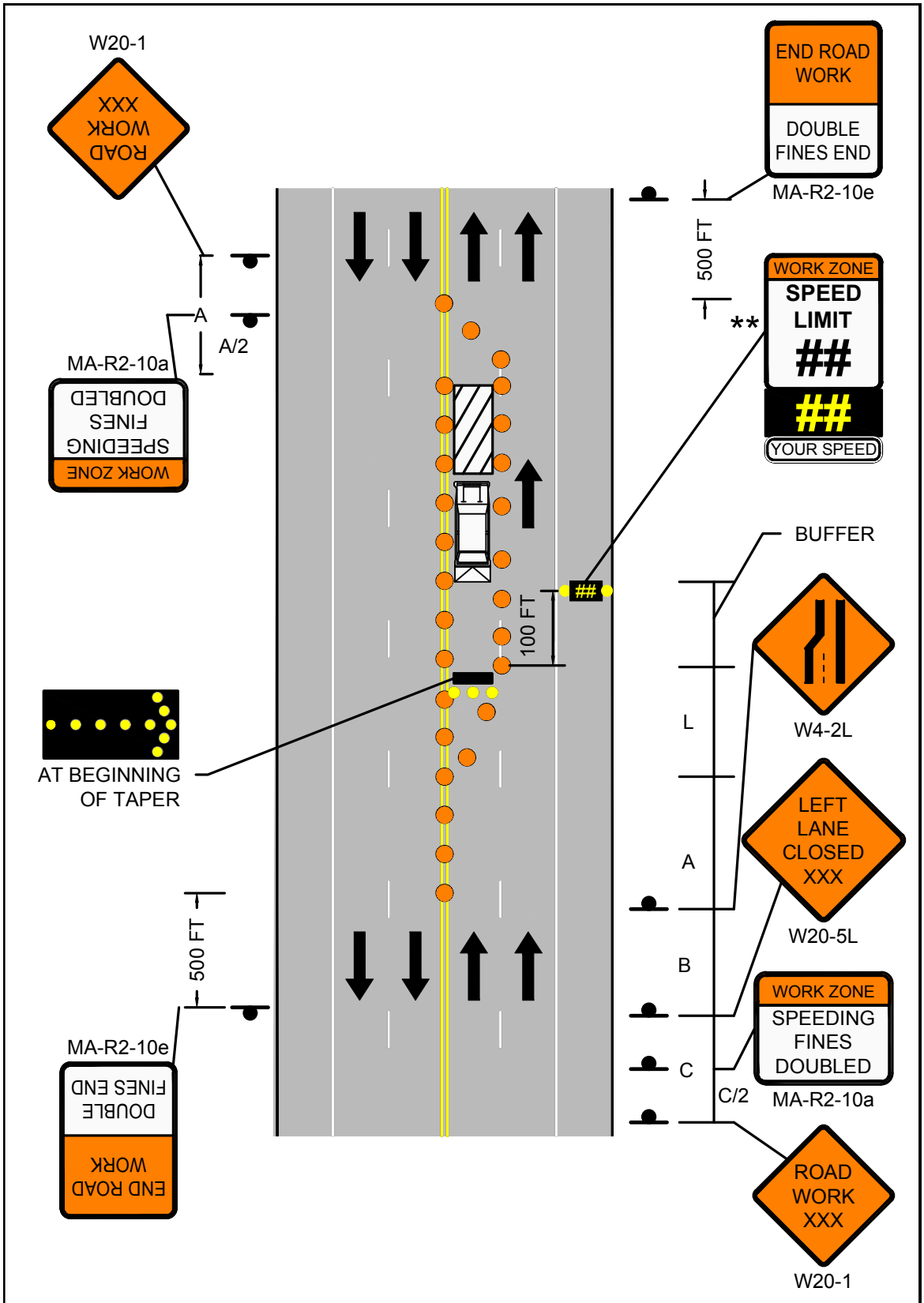


massDOT Massachusetts Department of Transportation Highway Division

PAGE 29

Work Zone Safety Standard Details and Drawings

FIGURE 11
STATIONARY OPERATIONS
FOUR LANE UNDIVIDED ROADWAY
LEFT LANE CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 30	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY HALF OF ROADWAY CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	160	305	20	140
45-55	220	660	330	495	40	120
60-65	260	780	390	645	40	140

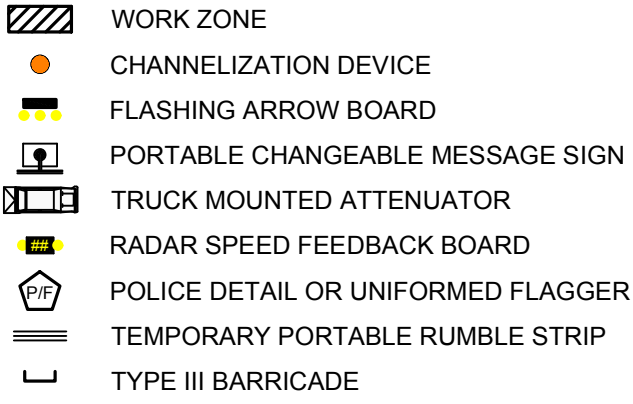
* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION.
3. W1-4L SHALL BE PLACED AT THE MIDDLE OF THE TANGENT.

LEGEND



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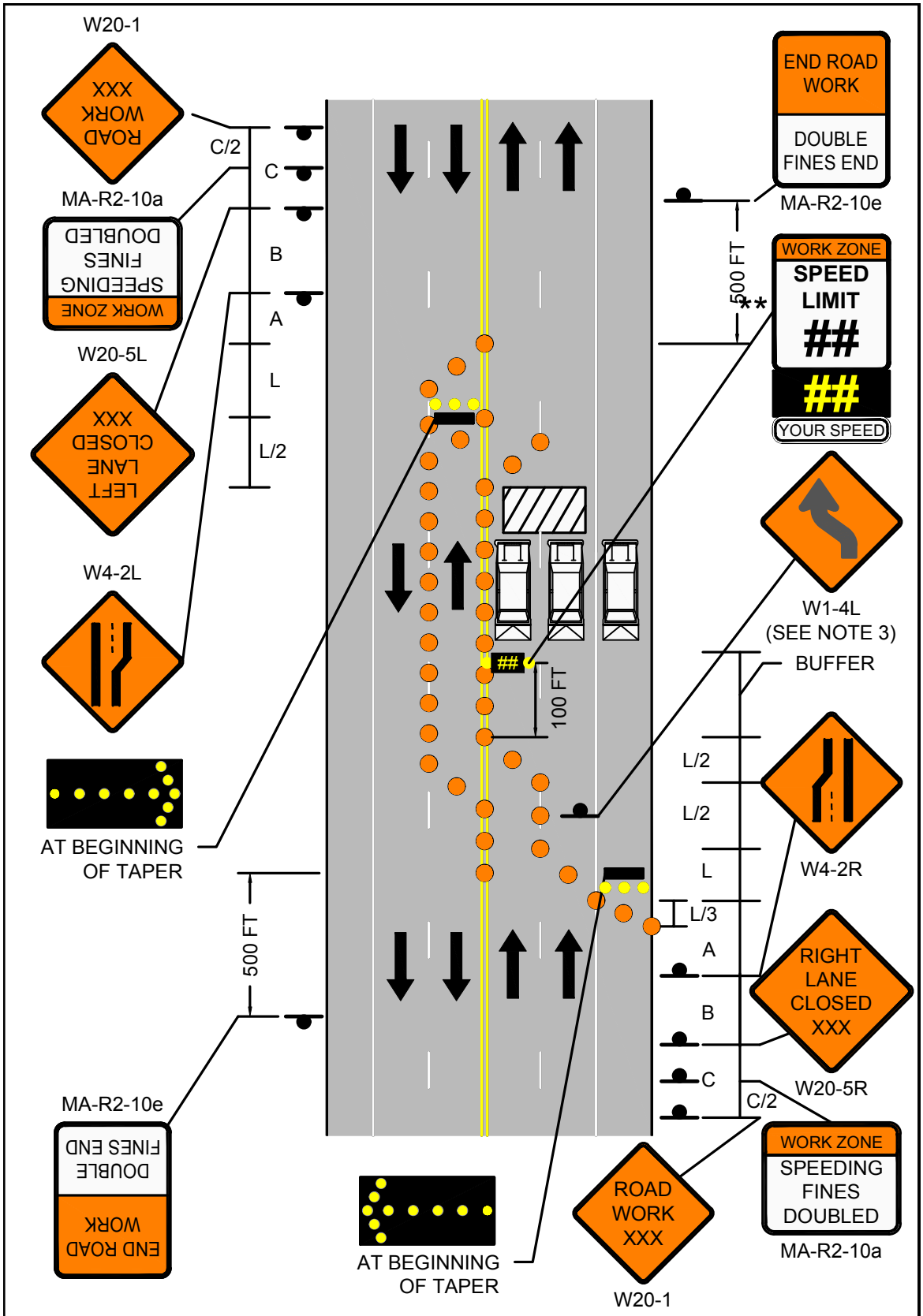


massDOT Massachusetts Department of Transportation Highway Division PAGE 31	Work Zone Safety Standard Details and Drawings	FIGURE 12 STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY HALF OF ROADWAY CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 32	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY RIGHT LANE CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	60
45-55	220	660	495	40	50
60-65	260	780	645	40	55

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION.

LEGEND

WORK ZONE

CHANNELIZATION DEVICE

FLASHING ARROW BOARD

PORTABLE CHANGEABLE MESSAGE SIGN

TRUCK MOUNTED ATTENUATOR

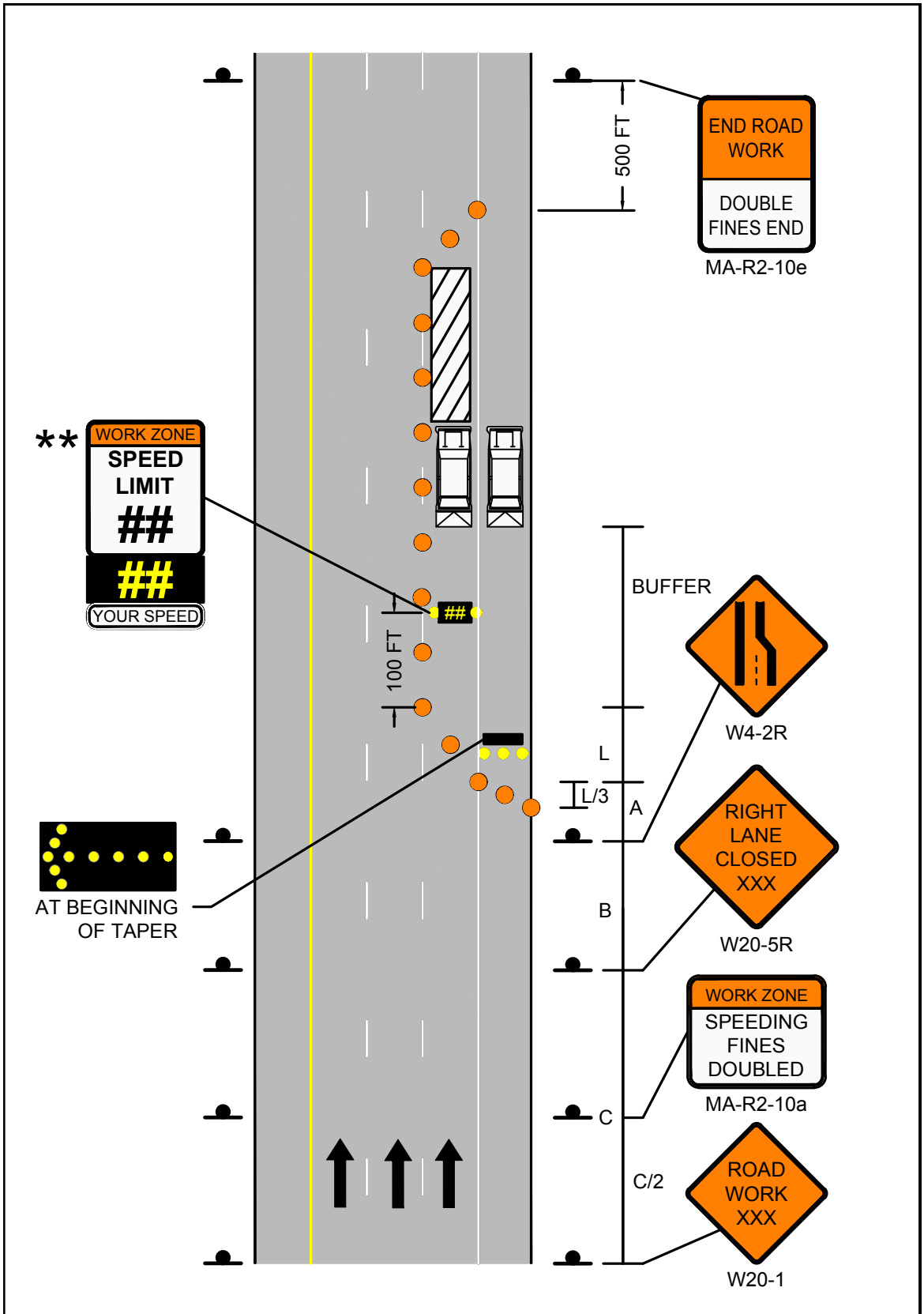
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 33	Work Zone Safety Standard Details and Drawings	FIGURE 13 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY RIGHT LANE CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 34	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY LEFT LANE CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	60
45-55	220	660	495	40	50
60-65	260	780	645	40	55

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION.

LEGEND

WORK ZONE

CHANNELIZATION DEVICE

FLASHING ARROW BOARD

PORTABLE CHANGEABLE MESSAGE SIGN

TRUCK MOUNTED ATTENUATOR

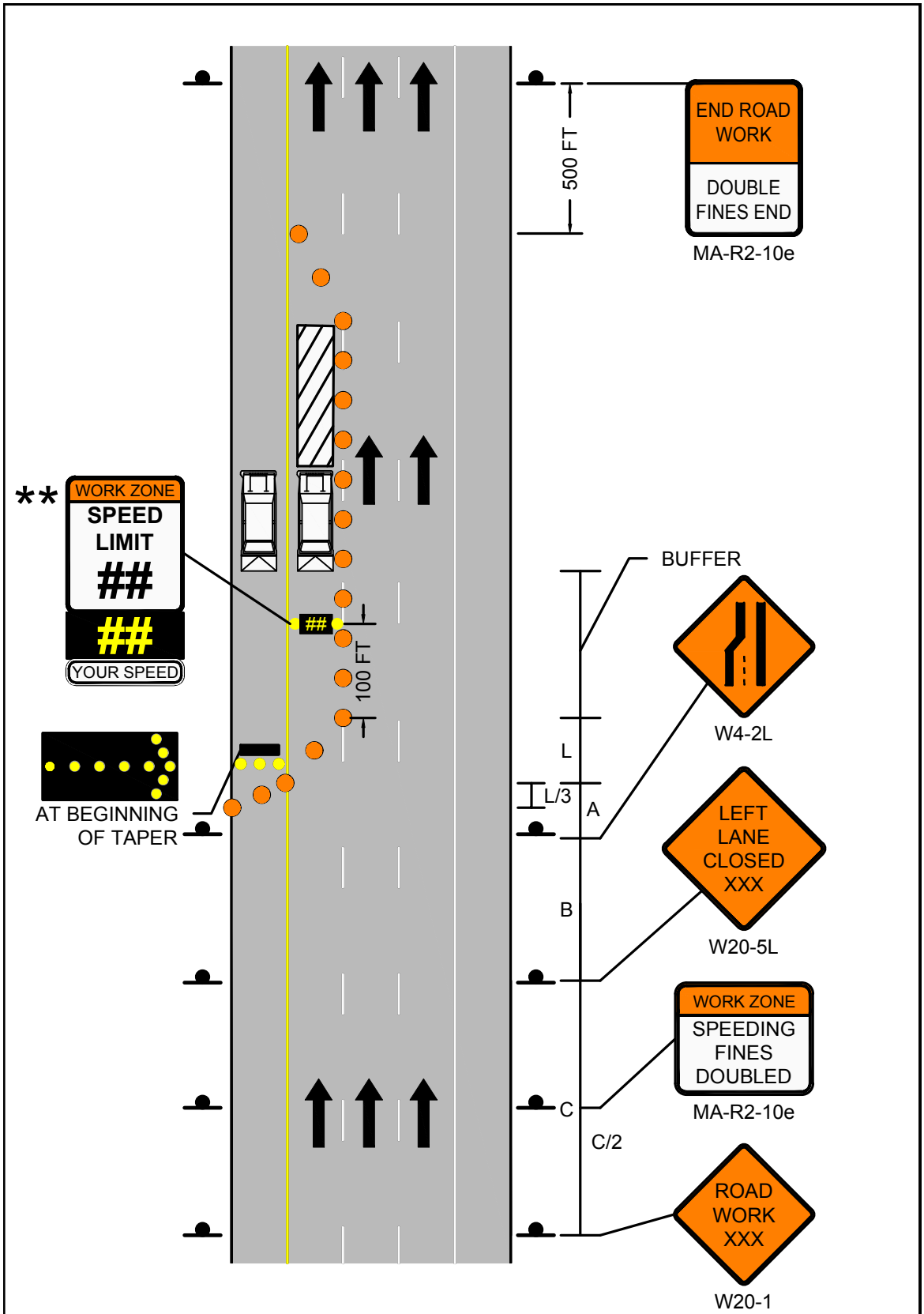
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division PAGE 35	Work Zone Safety Standard Details and Drawings	FIGURE 14 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY LEFT LANE CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 36	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE OR RIGHT/CENTER LANES CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TANGENT LENGTH BETWEEN TAPERS T (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	640	305	20	110
45-55	220	660	1320	495	40	100
60-65	260	780	1560	645	40	115

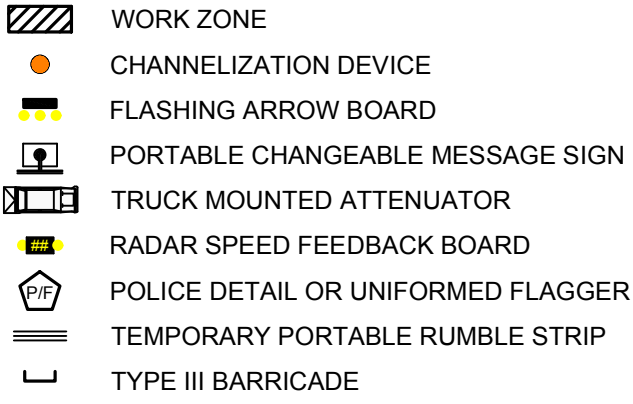
* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION.
3. *** THIS SET OF SIGNS SHALL BE LOCATED AT T/2.

LEGEND



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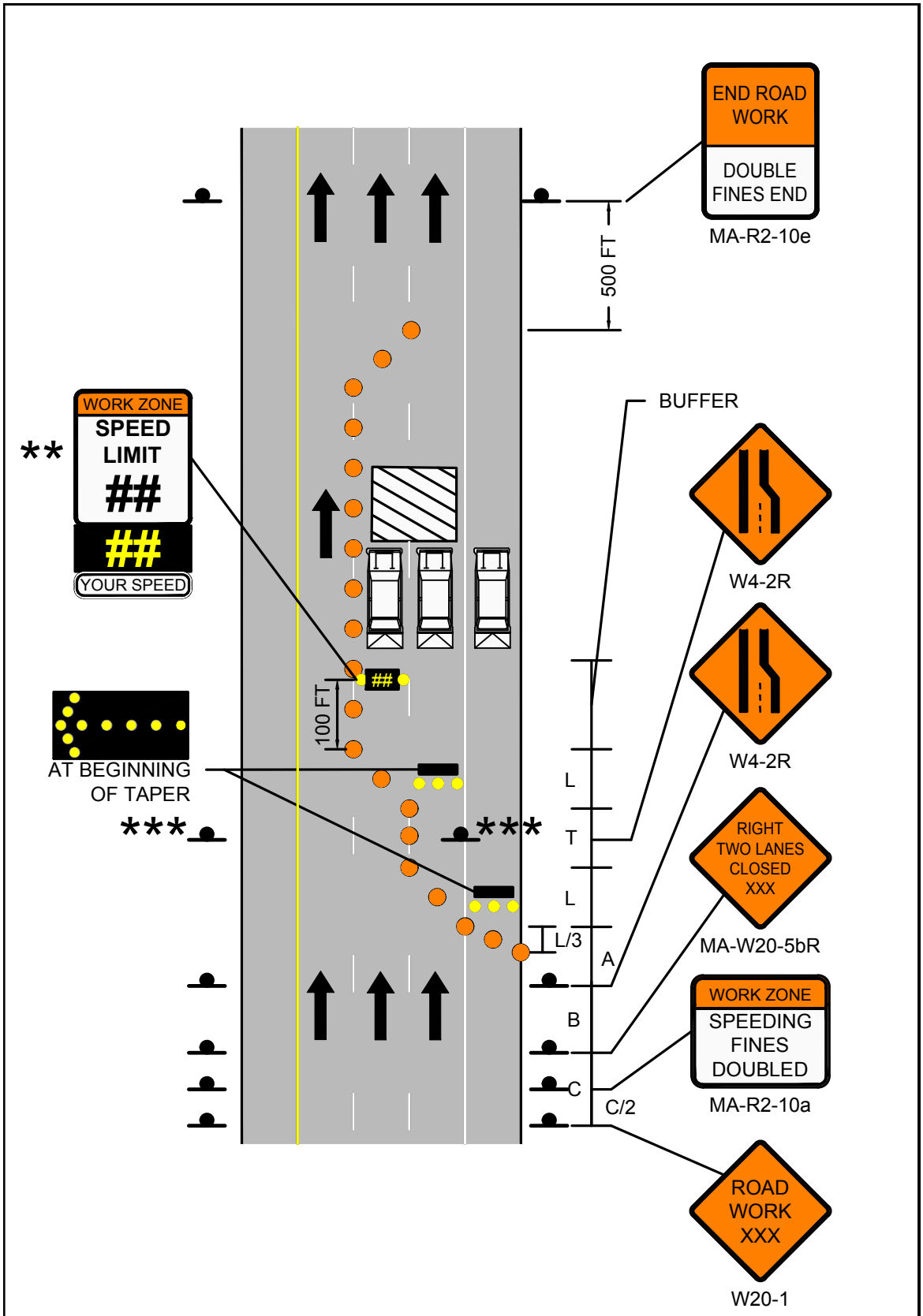


massDOT Massachusetts Department of Transportation Highway Division PAGE 37	Work Zone Safety Standard Details and Drawings	FIGURE 15 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE OR RIGHT/CENTER LANES CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 38	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE OR LEFT/CENTER LANES CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TANGENT LENGTH BETWEEN TAPERS T (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	640	305	20	110
45-55	220	660	1320	495	40	100
60-65	260	780	1560	645	40	115

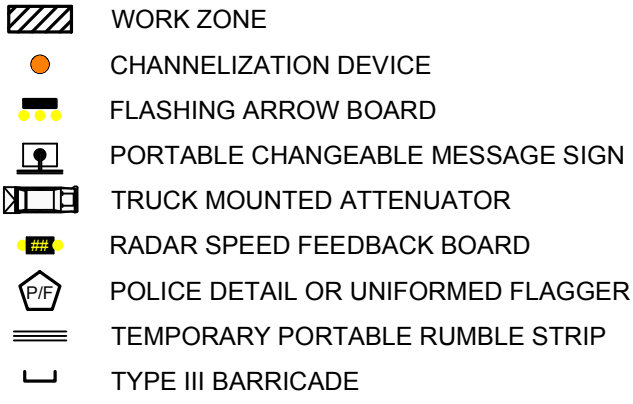
* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. ** OPTIONAL AT THE ENGINEER'S DISCRETION.
3. *** THIS SET OF SIGNS SHALL BE LOCATED AT T/2.

LEGEND



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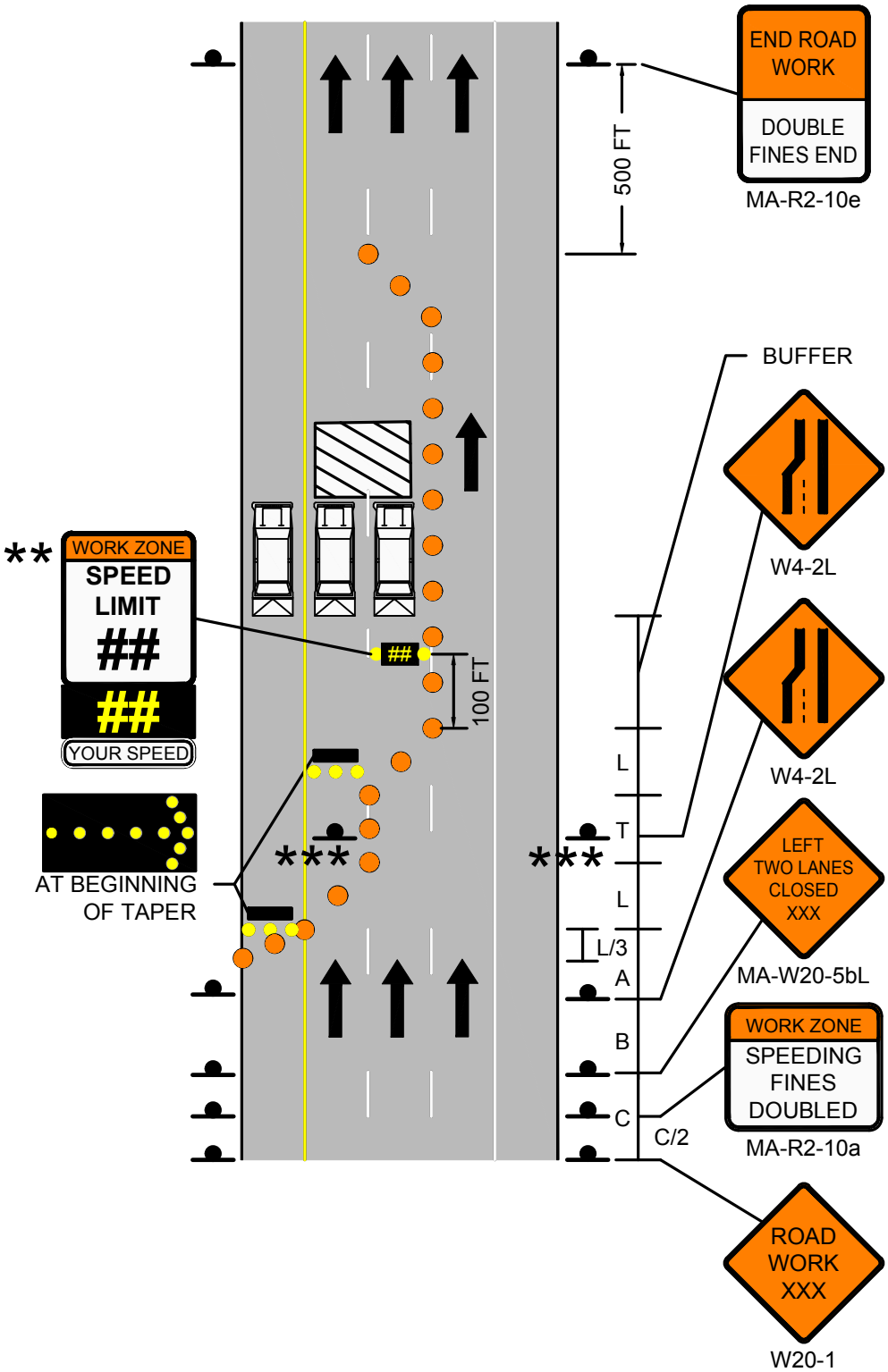


massDOT Massachusetts Department of Transportation Highway Division PAGE 39	Work Zone Safety Standard Details and Drawings	FIGURE 16 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE OR LEFT/CENTER LANES CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 40	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY RIGHT SIDE OF OFF RAMP CLOSED

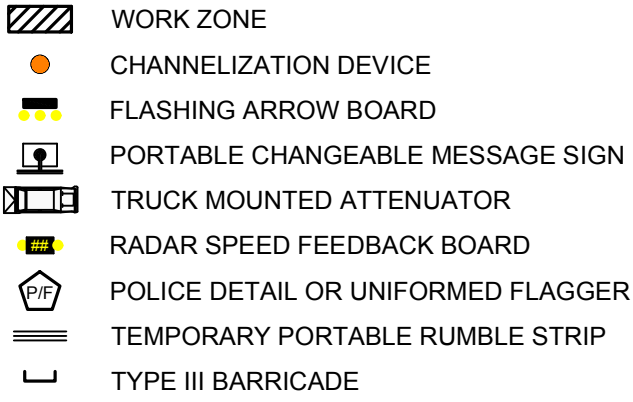
POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	160	305	20	45
45-55	500 / 1000 / 1000	330	495	40	35

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND



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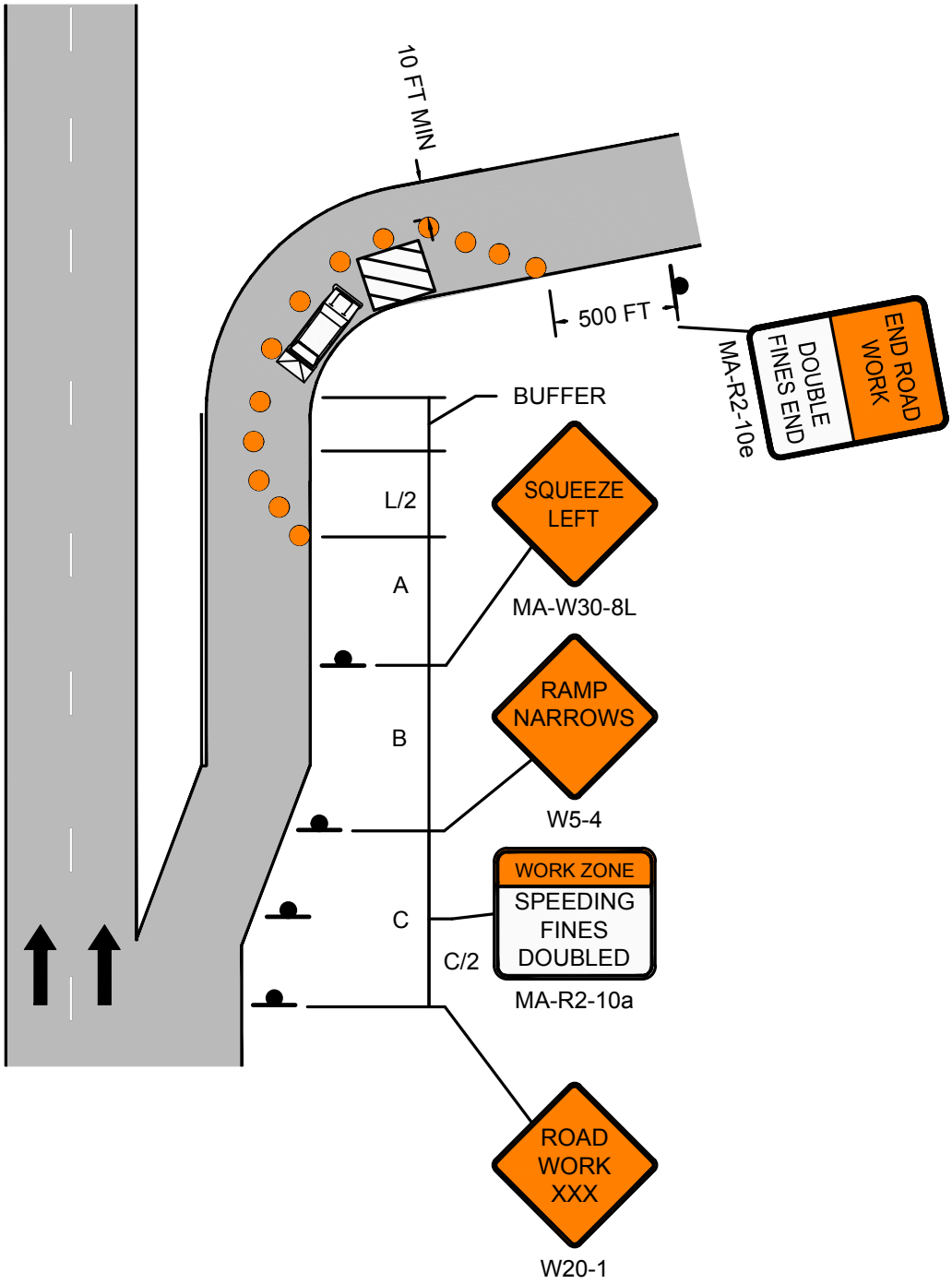


massDOT Massachusetts Department of Transportation Highway Division PAGE 41	Work Zone Safety Standard Details and Drawings	FIGURE 17 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY RIGHT SIDE OF OFF RAMP CLOSED

massDOT Massachusetts Department of Transportation Highway Division PAGE 42	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY LEFT SIDE OF OFF RAMP CLOSED

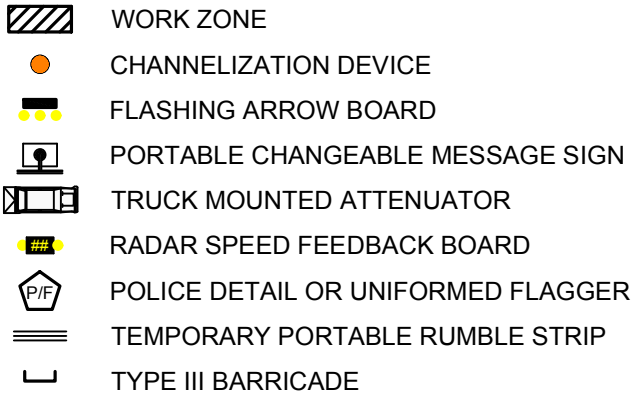
POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	160	305	20	45
45-55	500 / 1000 / 1000	330	495	40	35

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND



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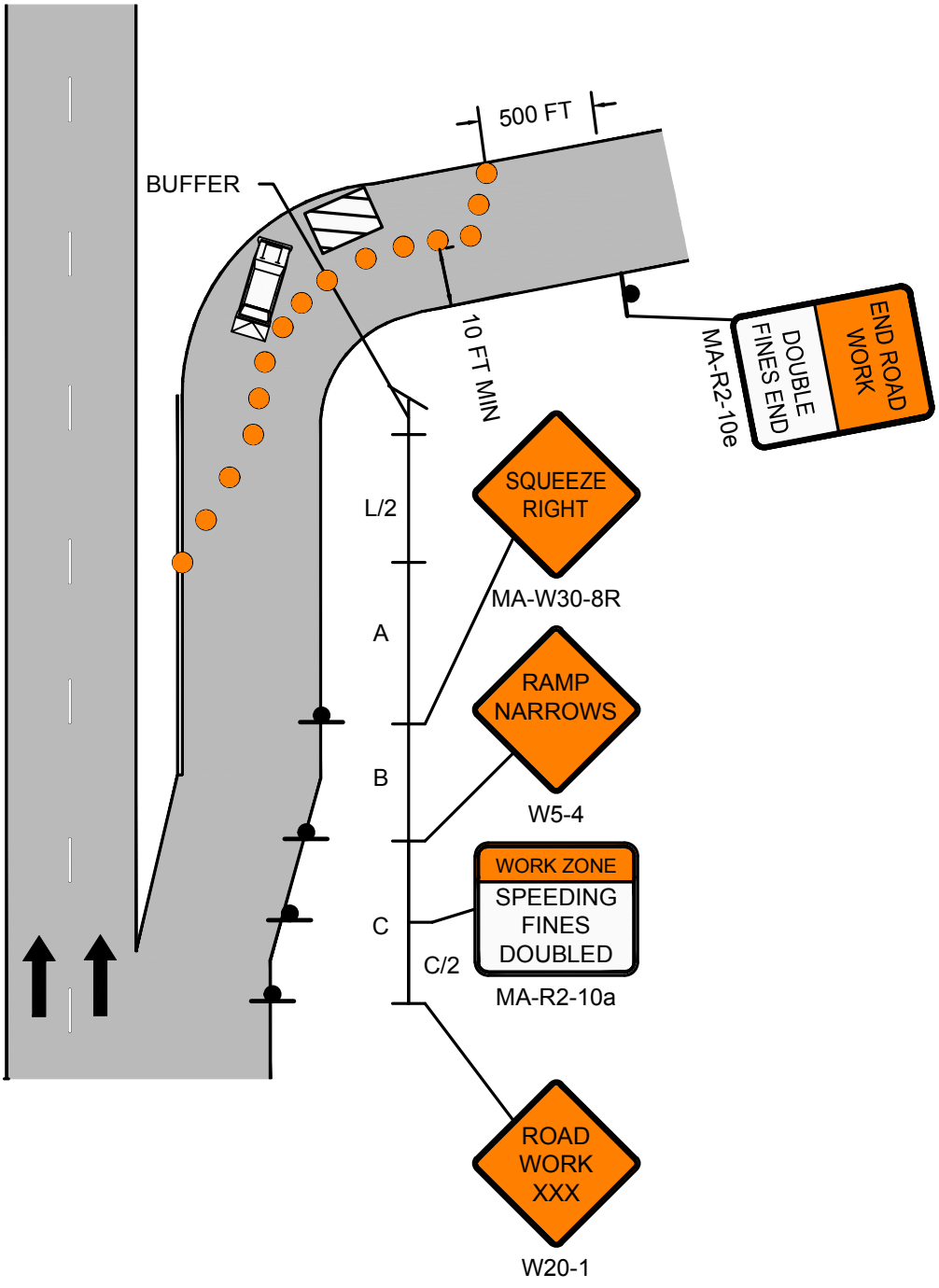


massDOT Massachusetts Department of Transportation Highway Division	Work Zone Safety Standard Details and Drawings	FIGURE 18 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY LEFT SIDE OF OFF RAMP CLOSED PAGE 43

massDOT Massachusetts Department of Transportation Highway Division PAGE 44	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY ROADWORK BEYOND ON RAMP

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	175
45-55	220	660	495	40	135
60-65	260	780	645	40	155

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND

WORK ZONE

CHANNELIZATION DEVICE

FLASHING ARROW BOARD

PORTABLE CHANGEABLE MESSAGE SIGN

TRUCK MOUNTED ATTENUATOR

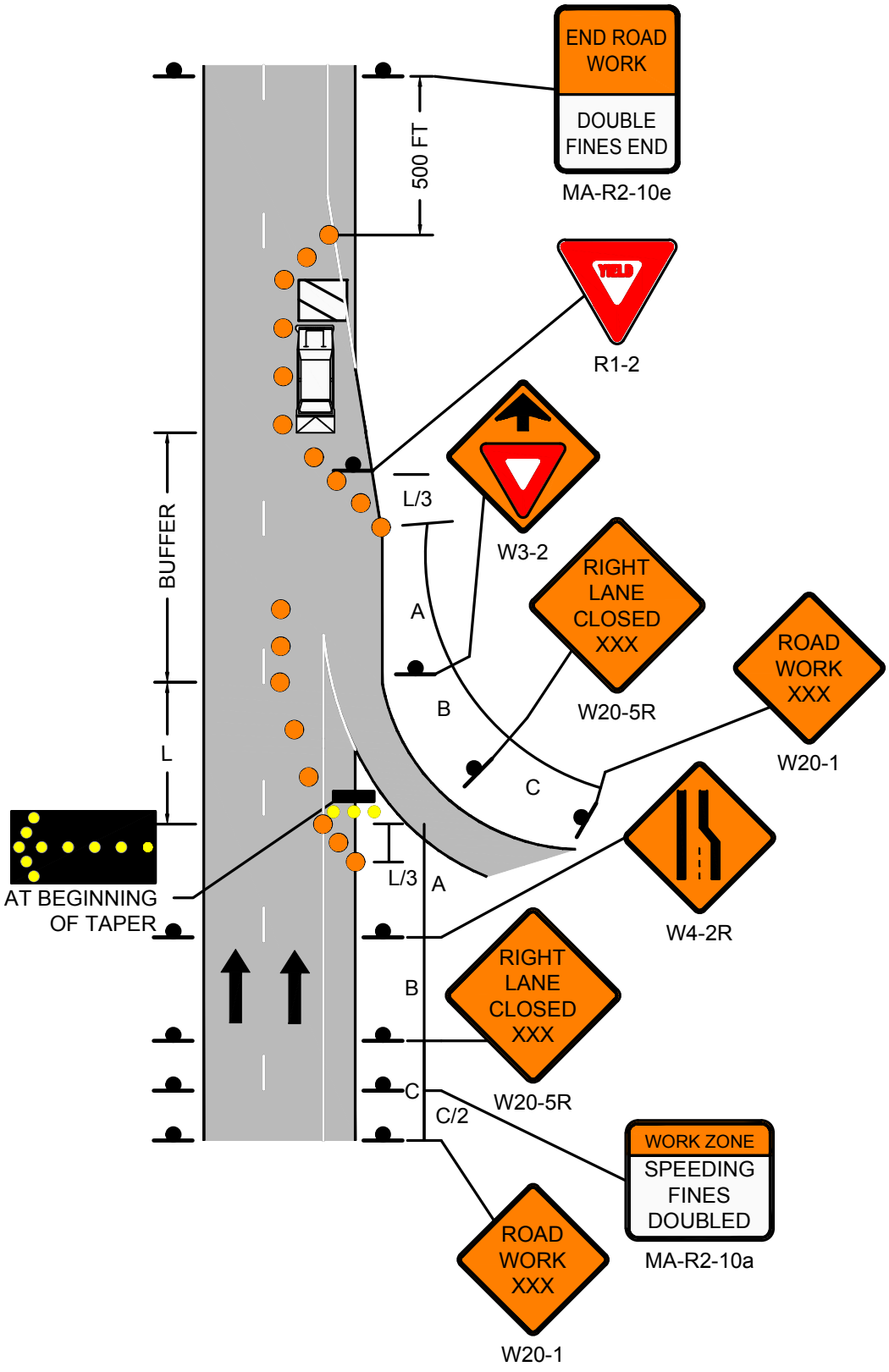
RADAR SPEED FEEDBACK BOARD

POLICE DETAIL OR UNIFORMED FLAGGER

TEMPORARY PORTABLE RUMBLE STRIP

TYPE III BARRICADE

NOT TO SCALE



massDOT Massachusetts Department of Transportation Highway Division

PAGE 45

Work Zone Safety Standard Details and Drawings

FIGURE 19
STATIONARY OPERATIONS
MULTILANE DIVIDED ROADWAY
ROADWORK BEYOND ON RAMP

massDOT Massachusetts Department of Transportation Highway Division PAGE 46	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY ROADWORK BEYOND OFF RAMP

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	160	305	20	70
45-55	220	660	330	495	40	55
60-65	260	780	390	645	40	65

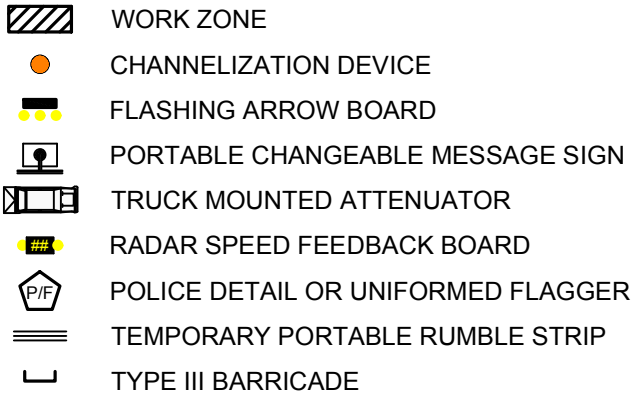
* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

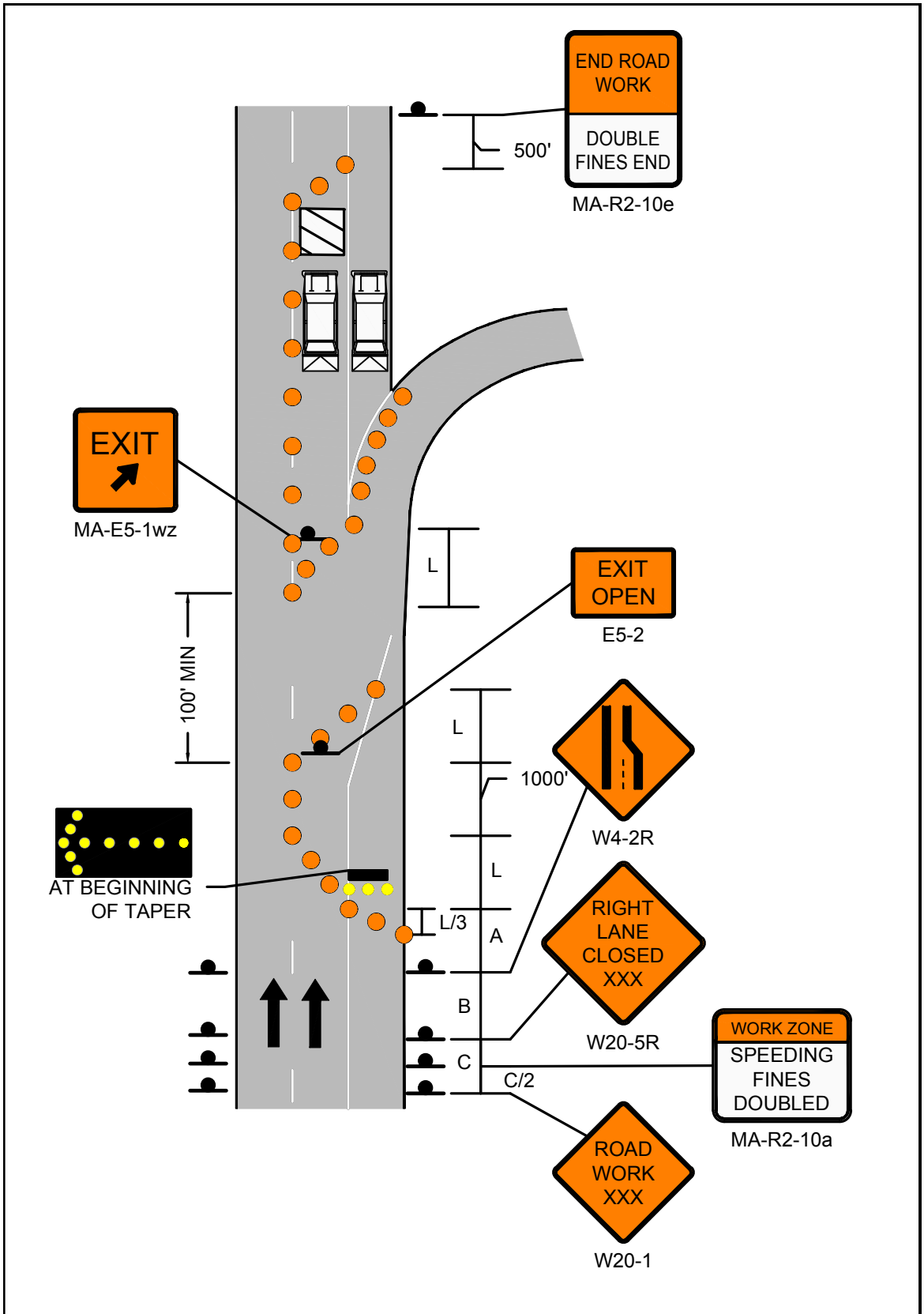
NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND



NOT TO SCALE



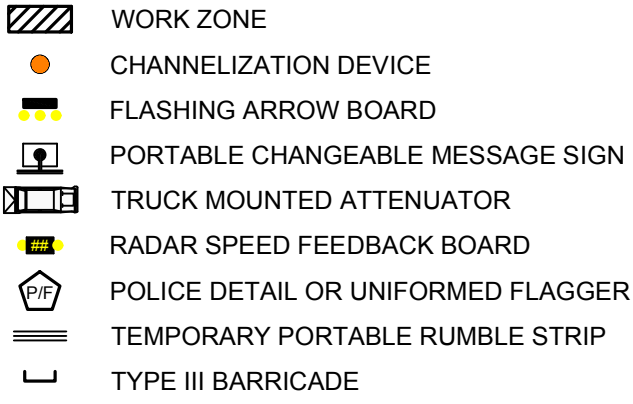
massDOT Massachusetts Department of Transportation Highway Division PAGE 47	Work Zone Safety Standard Details and Drawings	FIGURE 20 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY ROADWORK BEYOND OFF RAMP

massDOT Massachusetts Department of Transportation Highway Division PAGE 48	Work Zone Safety Standard Details and Drawings	MULTILANE DIVIDED ROADWAY TYPICAL RAMP CLOSURE

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		SHOULDER TAPER LENGTH (L/3) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES
25-40	500 / 500 / 500	110	305	20	45
45-55	500 / 1000 / 1000	220	495	40	30
60-65	1000 / 1600 / 2600	260	645	40	35

NOTES
1. MA-R2-10a LOCATED AT C/2.
2. * NOT REQUIRED IF RIGHT LANE IS CLOSED IN ADVANCE OF EXIT.
3. ** OPTIONAL AT ENGINEER'S DISCRETION.

LEGEND



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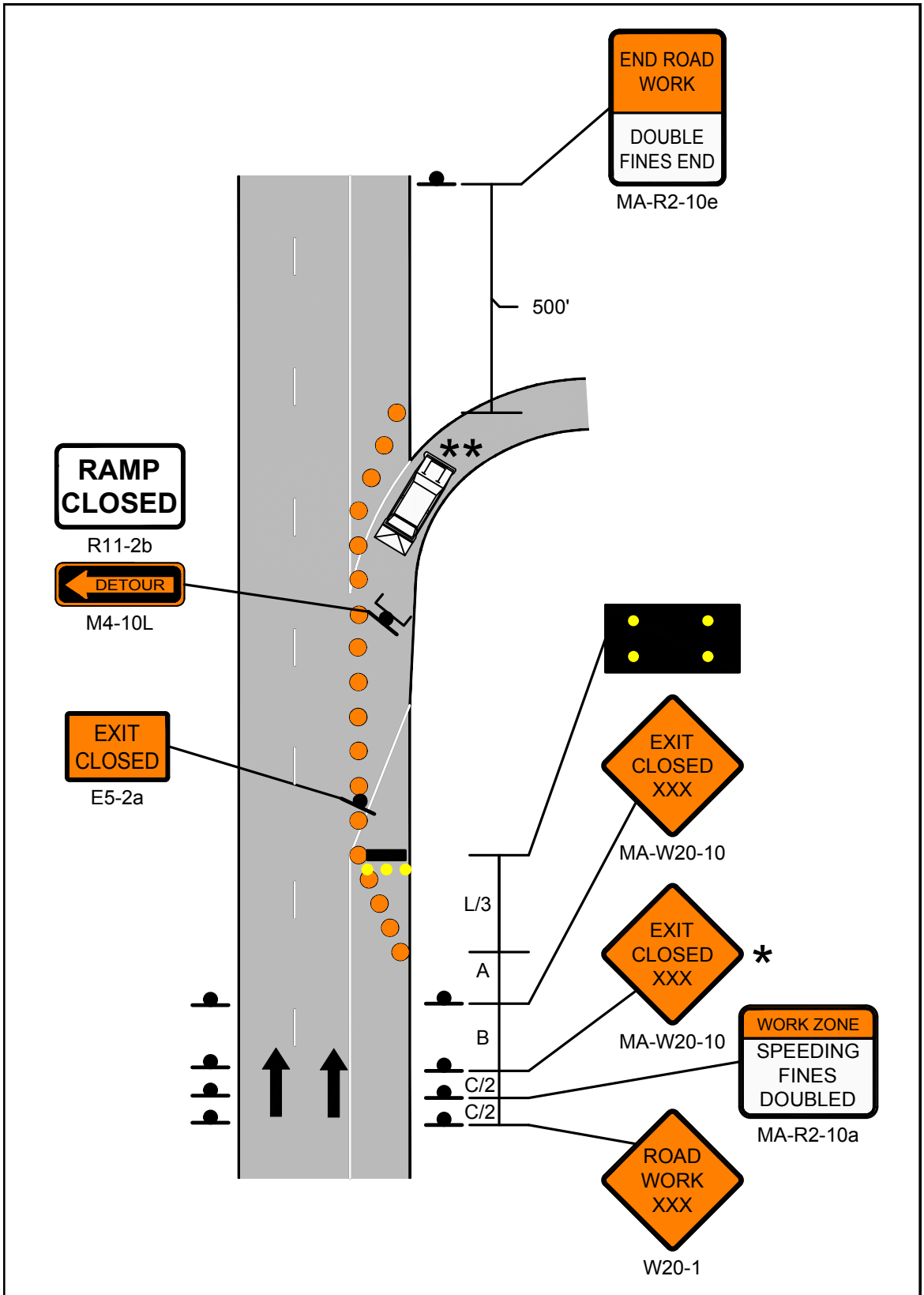


massDOT Massachusetts Department of Transportation Highway Division PAGE 49	Work Zone Safety Standard Details and Drawings	FIGURE 21 MULTILANE DIVIDED ROADWAY TYPICAL RAMP CLOSURE

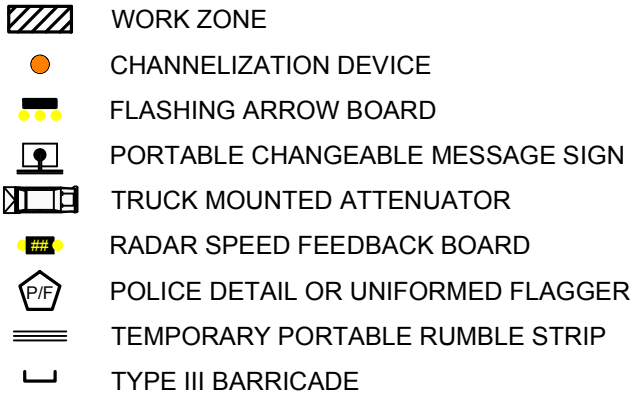
massDOT Massachusetts Department of Transportation Highway Division PAGE 50	Work Zone Safety Standard Details and Drawings	MULTILANE DIVIDED ROADWAY TYPICAL CLOVERLEAF RAMP CLOSURE

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		SHOULDER TAPER LENGTH (L/3) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES
25-40	500 / 500 / 500	110	305	20	45
45-55	500 / 1000 / 1000	220	495	40	30
60-65	1000 / 1600 / 2600	260	645	40	35

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. * NOT REQUIRED IF RIGHT LANE IS CLOSED IN ADVANCE OF EXIT.
3. ** OPTIONAL AT ENGINEER'S DISCRETION.

LEGEND



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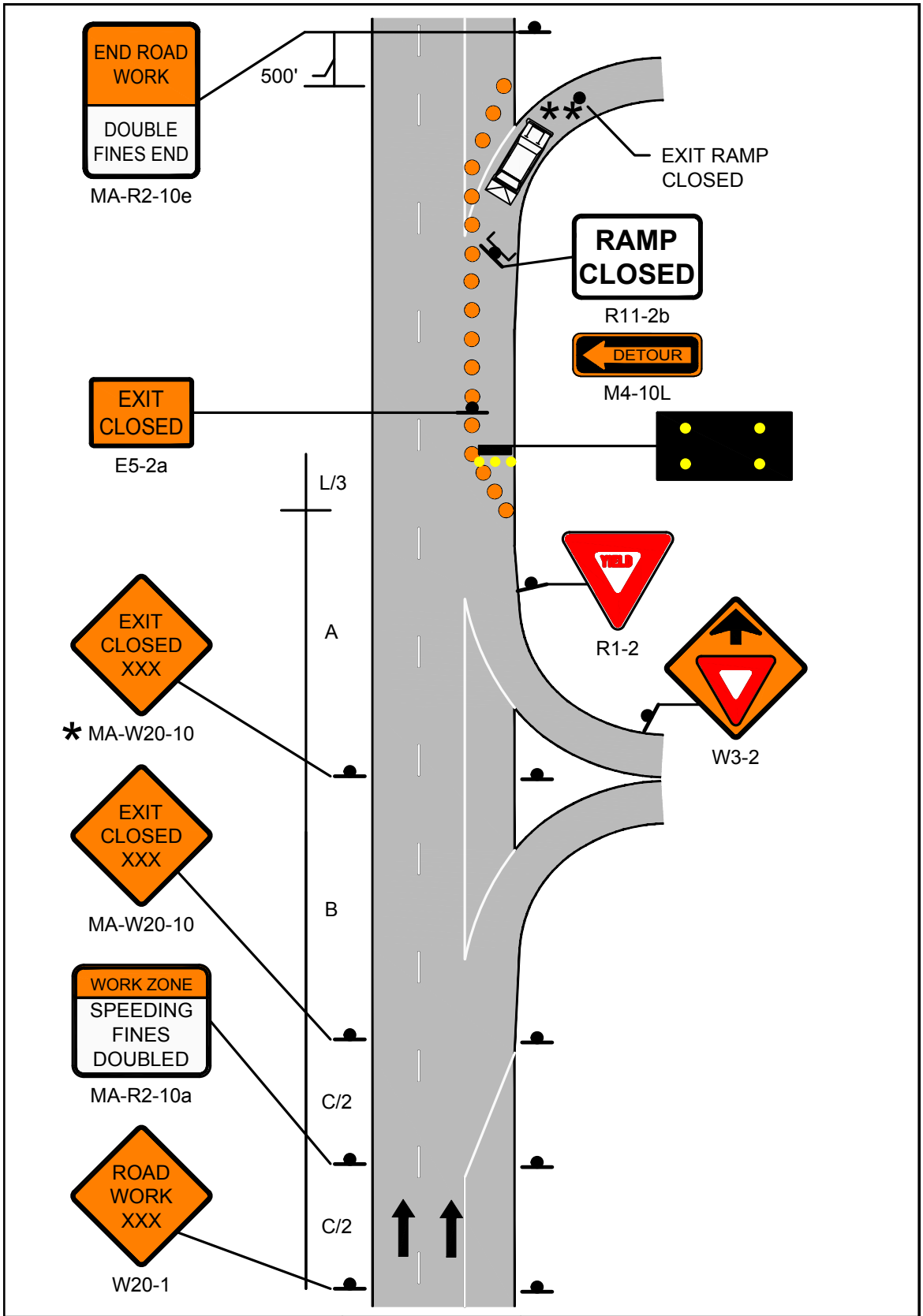


massDOT Massachusetts Department of Transportation Highway Division PAGE 51	Work Zone Safety Standard Details and Drawings	FIGURE 22 MULTILANE DIVIDED ROADWAY TYPICAL CLOVERLEAF RAMP CLOSURE

massDOT Massachusetts Department of Transportation Highway Division PAGE 52	Work Zone Safety Standard Details and Drawings	MULTILANE DIVIDED ROADWAY TYPICAL RAMP CLOSURE ADVANCE SIGNING

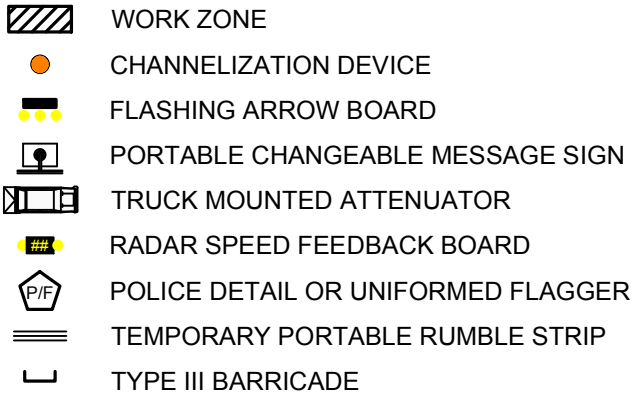
NOTES

1. IF THE CLOSED RAMP IS LOCATED DOWNSTREAM FROM THE PROPOSED DETOUR ROUTE/RAMP, A PCMS SHALL BE POSITIONED AT A SUFFICIENT DISTANCE IN ADVANCE OF THE DETOUR ROUTE/RAMP AND SHOULD STATE WHICH RAMP IS CLOSED AND WHICH SHALL BE USED FOR THE DETOUR.

2. IF THE CLOSED RAMP IS LOCATED UPSTREAM FROM THE PROPOSED DETOUR ROUTE/RAMP, A PCMS SHALL BE POSITIONED PRIOR TO THE CLOSED RAMP AND SHOULD STATE WHICH RAMP IS CLOSED AND WHICH SHALL BE USED FOR THE DETOUR.

3. A SUFFICIENT NUMBER OF DETOUR SIGNS (M4-9 SERIES) SHOULD BE DEPLOYED TO PROPERLY DIRECT DETOURED TRAFFIC. SIGN SPACING SHALL BE AT THE DIRECTION OF THE ENGINEER.

LEGEND



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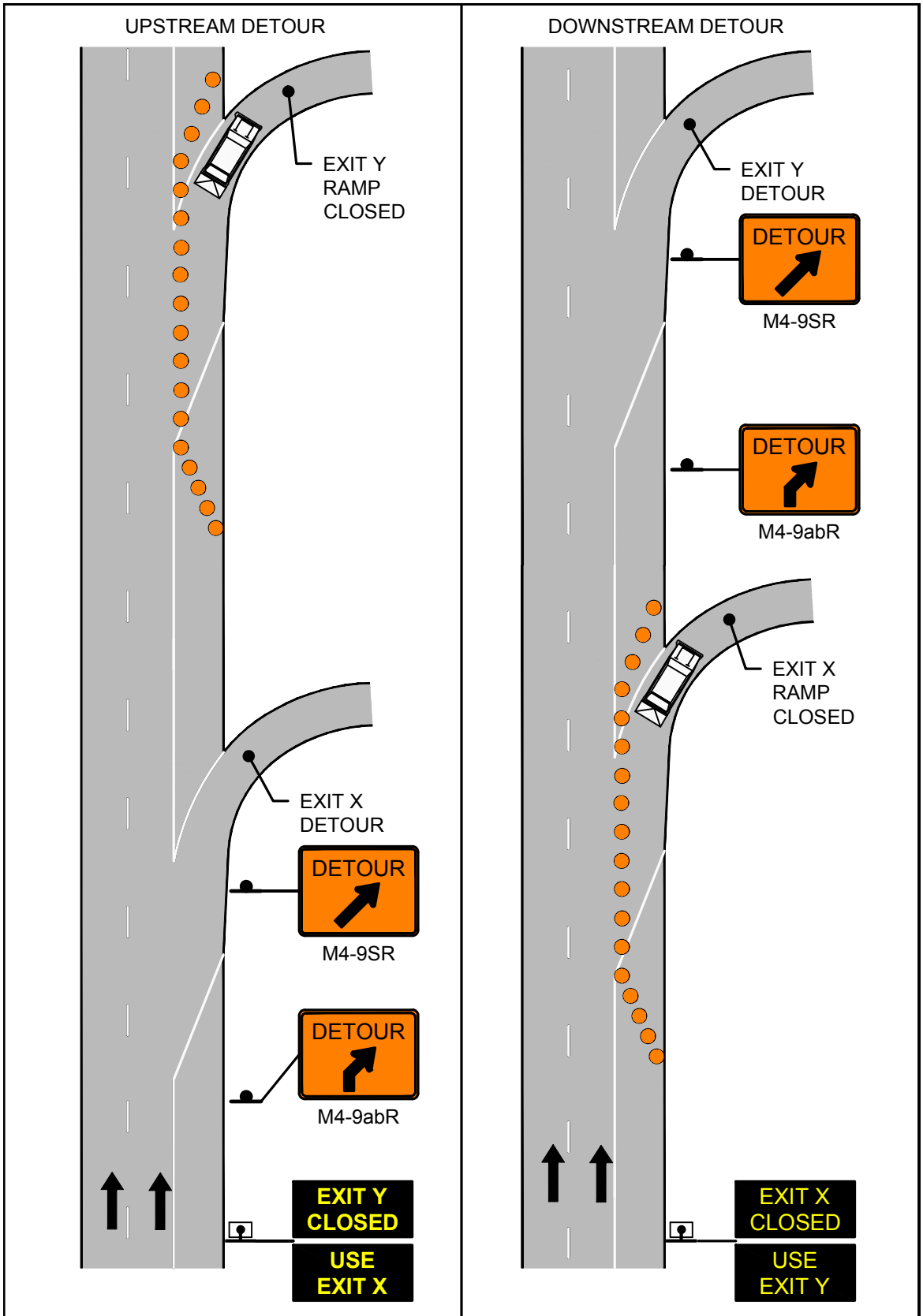


massDOT Massachusetts Department of Transportation Highway Division

PAGE 53

Work Zone Safety
Standard Details
and Drawings

FIGURE 23
MULTILANE DIVIDED ROADWAY
TYPICAL RAMP CLOSURE
ADVANCE SIGNING

massDOT Massachusetts Department of Transportation Highway Division PAGE 54	Work Zone Safety Standard Details and Drawings	FIGURE 24-1 MULTILANE DIVIDED ROADWAY PLACEMENT OF TEMPORARY PORTABLE RUMBLE STRIPS SHEET 1 OF 2

POSTED REGULATORY OR WORK ZONE SPEED	SEPARATION BETWEEN RUMBLE STRIPS
Above 55-mph	20-feet
36-mph to 55-mph	15-feet
35-mph and under	10-feet

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	TANGENT LENGTH BETWEEN TAPERS (T) (FT)
25-40	500 / 500 / 500	640
45-55	500 / 1000 / 1000	1320
60-65	1000 / 1600 / 2600	1560

NOTES

1. THE INTENTION OF THESE DETAILS IS ONLY TO DEPICT THE PLACEMENT OF TEMPORARY PORTABLE RUMBLE STRIPS (TPRS) IN RELATIONSHIP TO THE TAPER AND THE BUFFER OF A SINGLE- OR MULTI-LANE CLOSURE. THE DEPICTION OF THE NUMBER AND SPACING OF ALL OTHER TRAFFIC CONTROL DEVICES IS NOT TO SCALE. REFER TO OTHER DETAILS FOR LANE CLOSURES FOR THE PLACEMENT AND NUMBER OF ALL OTHER TRAFFIC CONTROL DEVICES.
2. THESE DETAILS ONLY DEPICT RIGHT LANE CLOSURES. LEFT LANE CLOSURES SHOULD UTILIZE A MIRROR IMAGE OF THESE SETUPS, STARTING WITH CLOSURE OF THE LEFTMOST LANE.
3. * THIS TPRS ARRAY IS OPTIONAL AT THE ENGINEER'S DISCRETION. IF USED, IT SHOULD BE PLACED ADJACENT TO THE BUFFER.
4. DETAILS SHOW THE MINIMUM NUMBER OF TPRS REQUIRED. ADDITIONAL MAY BE USED IF CONDITIONS WARRANT.

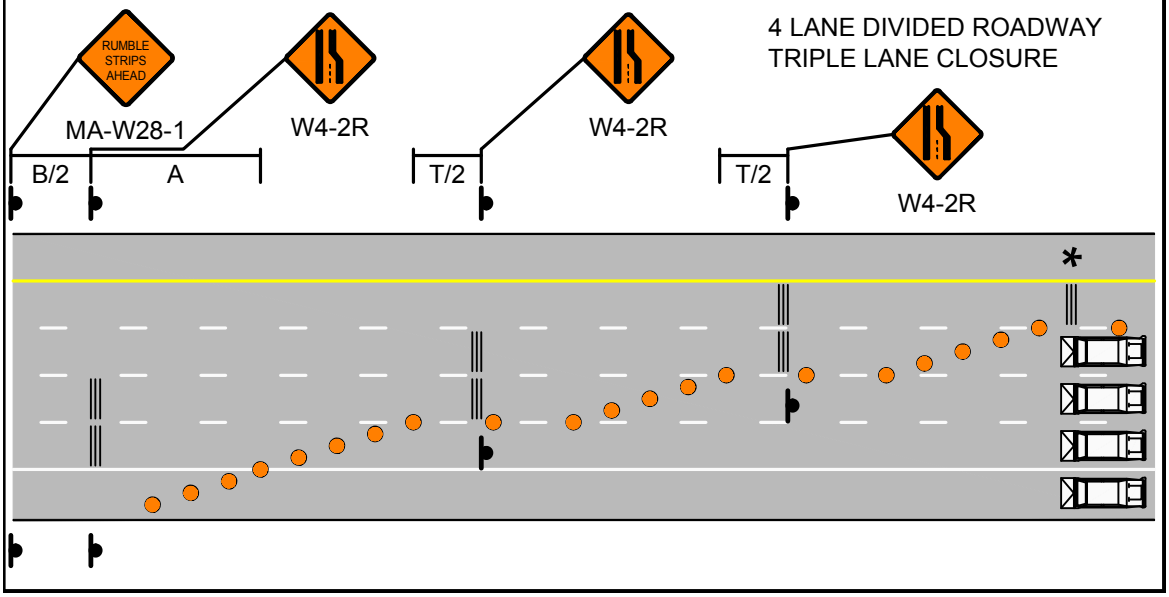
LEGEND

CHANNELIZATION DEVICE

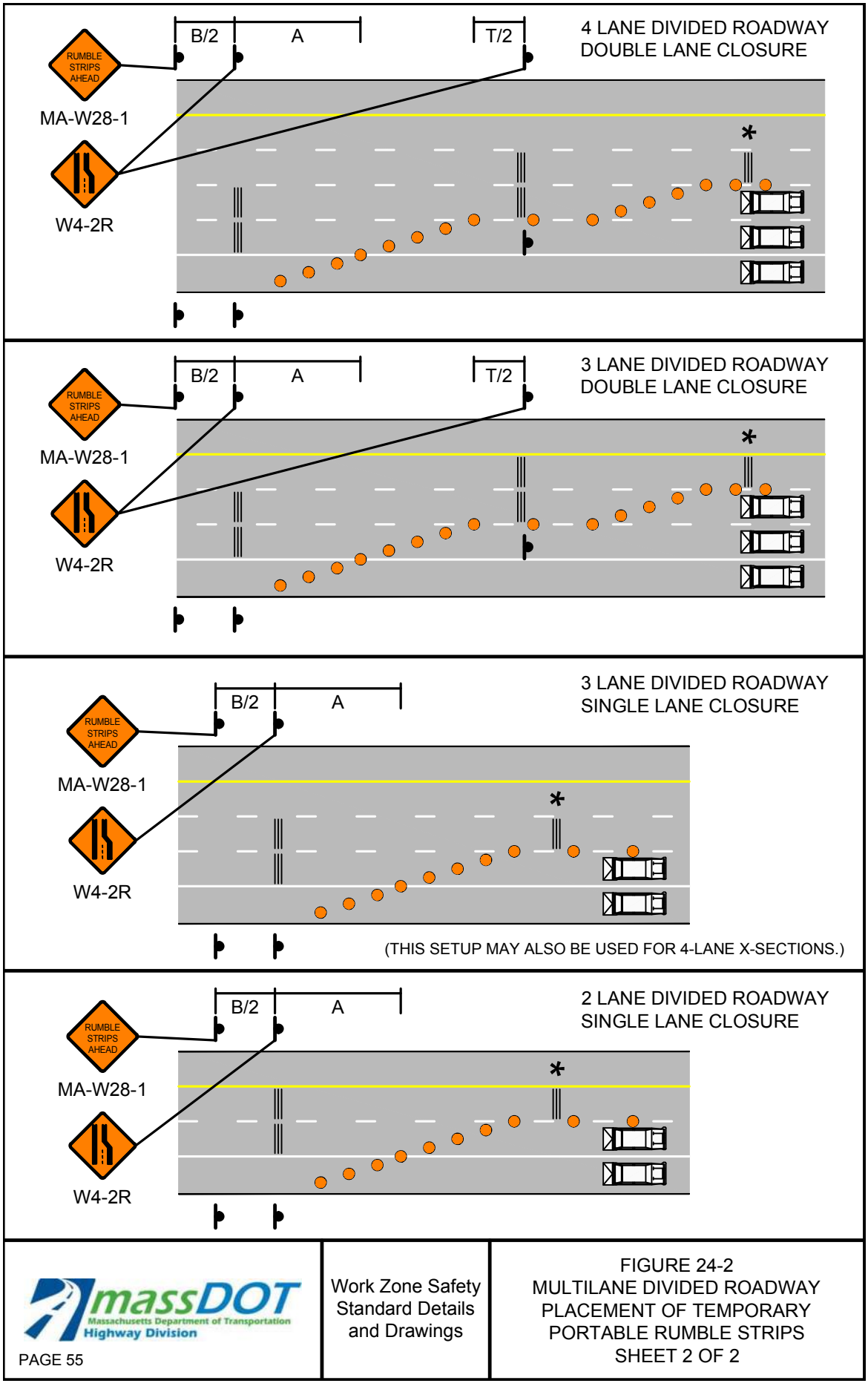
TRUCK MOUNTED ATTENUATOR

TEMPORARY PORTABLE RUMBLE STRIP

NOT TO SCALE



4 LANE DIVIDED ROADWAY
TRIPLE LANE CLOSURE



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Work Zone Safety Standard Details and Drawings

FIGURE 24-2
MULTILANE DIVIDED ROADWAY
PLACEMENT OF TEMPORARY
PORTABLE RUMBLE STRIPS
SHEET 2 OF 2

massDOT Massachusetts Department of Transportation Highway Division PAGE 56	Work Zone Safety Standard Details and Drawings	NOTES FOR MOBILE OPERATIONS

Notes for Mobile Operations

- Unless otherwise stated, these notes shall apply to all Mobile Operation setups.
- Additional, setup-specific notes may be found on individual sheets.

1. The Supervisor shall travel the designated roadway prior to scheduling the work to ensure that sufficient and appropriate traffic control devices will be available. Special consideration shall be exercised to ensure that appropriate traffic controls be placed in areas that will have limited visibility of the work areas or any associated traffic queues.

2. Vehicles used for these operations shall be made highly visible with appropriate equipment such as flashing lights, rotating beacons, flags, signs, flashing arrow boards, and/or portable changeable message signs. Any signs mounted to these vehicles shall not obscure the visibility of other devices.

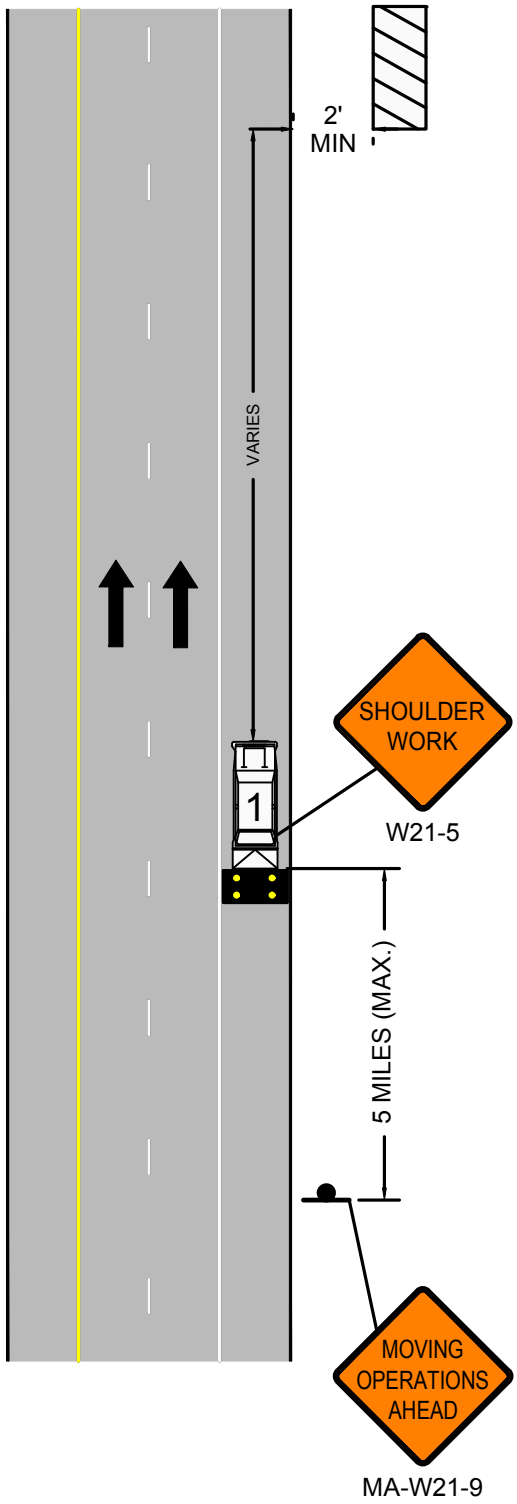
3. All vehicles shown may not be required based upon roadway conditions. However, when needed and practical, additional shadow vehicles and equipment to warn and protect motorists and workers should be used. Based upon roadway conditions, the addition of a police detail with cruiser may be used for additional protection or warning for the traveling public.

4. The distance between the work and shadow vehicle(s) may vary according to the terrain and other factors. Shadow vehicles are used to warn traffic of the operations ahead. Whenever adequate sight distance exists, the shadow vehicle(s) should maintain the minimum appropriate distance and maintain the same speed to prevent non-work related vehicles from entering the work convoy. If this formation cannot be maintained then additional traffic control devices should be deployed in advance of any vertical or horizontal curves that may restrict the sight distance of an oncoming vehicle to either the work vehicle or associated traffic queue.

5. All shadow vehicles shall be equipped with a truck or trailer mounted attenuator (TMA) and a flashing arrow board.

6. Signs should be covered or turned from view when work is not in progress.

7. Portable changeable message signs may be used in lieu of MA-W21-9 signs and any signs mounted directly to a shadow vehicle.



LEGEND

WORK ZONE

SHADOW VEHICLE

FLASHING ARROW BOARD
(WITH STATUS)

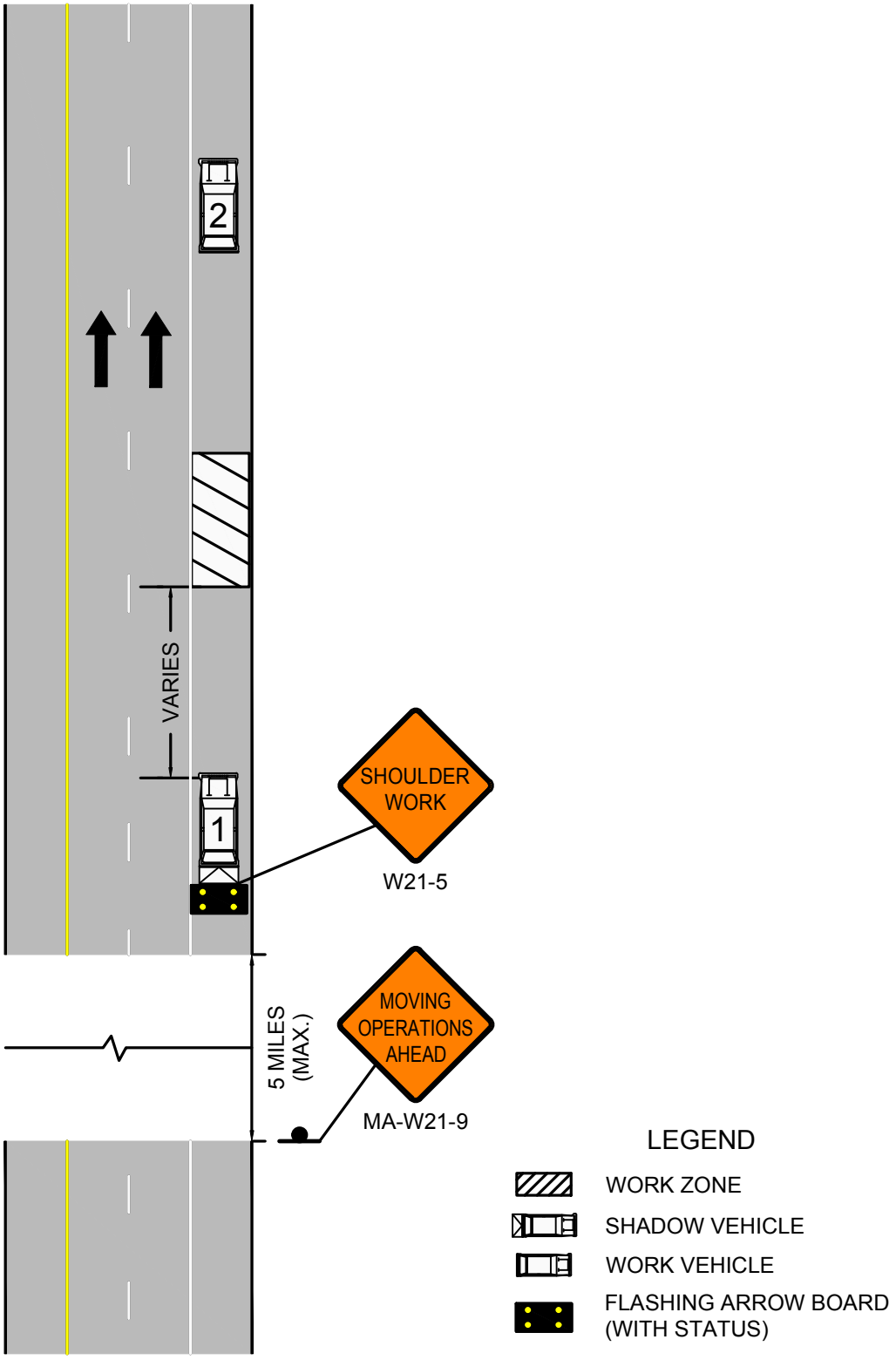
NOT TO SCALE

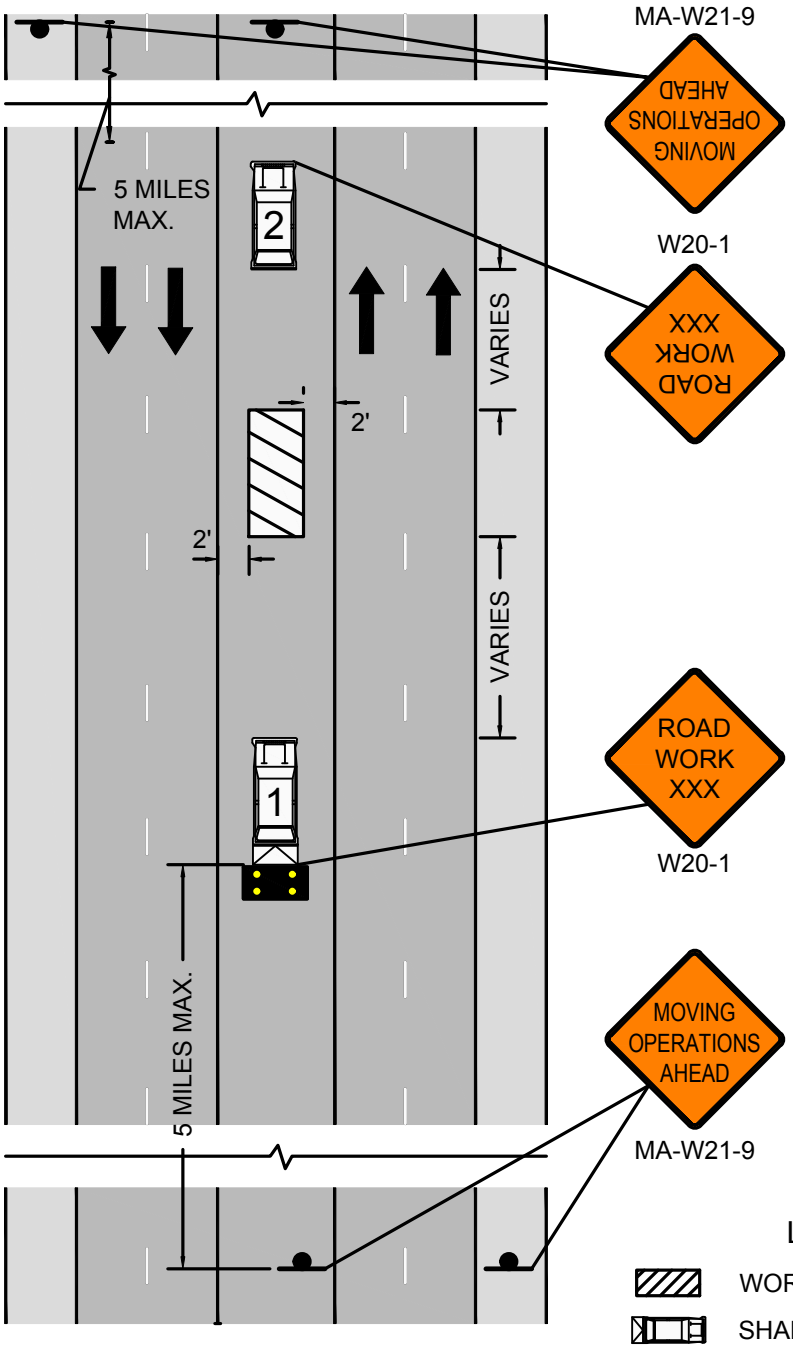
NOTES

1. IF THE WORK AREA IS SUFFICIENTLY AWAY FROM THE EDGE OF ROADWAY (20' MINIMUM) THEN SIGNS AND VEHICLES MAY NOT BE REQUIRED.

massDOT Massachusetts Department of Transportation Highway Division PAGE 57	Work Zone Safety Standard Details and Drawings	FIGURE 25 MOBILE OPERATIONS ANY ROADWAY BEYOND RIGHT SHOULDER

massDOT Massachusetts Department of Transportation Highway Division PAGE 58	Work Zone Safety Standard Details and Drawings	FIGURE 26 MOBILE OPERATIONS ANY ROADWAY SHOULDER





LEGEND

- WORK ZONE
- SHADOW VEHICLE
- WORK VEHICLE
- FLASHING ARROW BOARD (WITH STATUS)

NOT TO SCALE

NOTES

1. IF THE 2' OFFSET CANNOT BE MAINTAINED, A SHORT-TERM STATIONARY SETUP SHOULD BE USED.

massDOT Massachusetts Department of Transportation Highway Division PAGE 59	Work Zone Safety Standard Details and Drawings	FIGURE 27 MOBILE OPERATIONS DIVIDED ROADWAY MEDIAN WORK

massDOT Massachusetts Department of Transportation Highway Division

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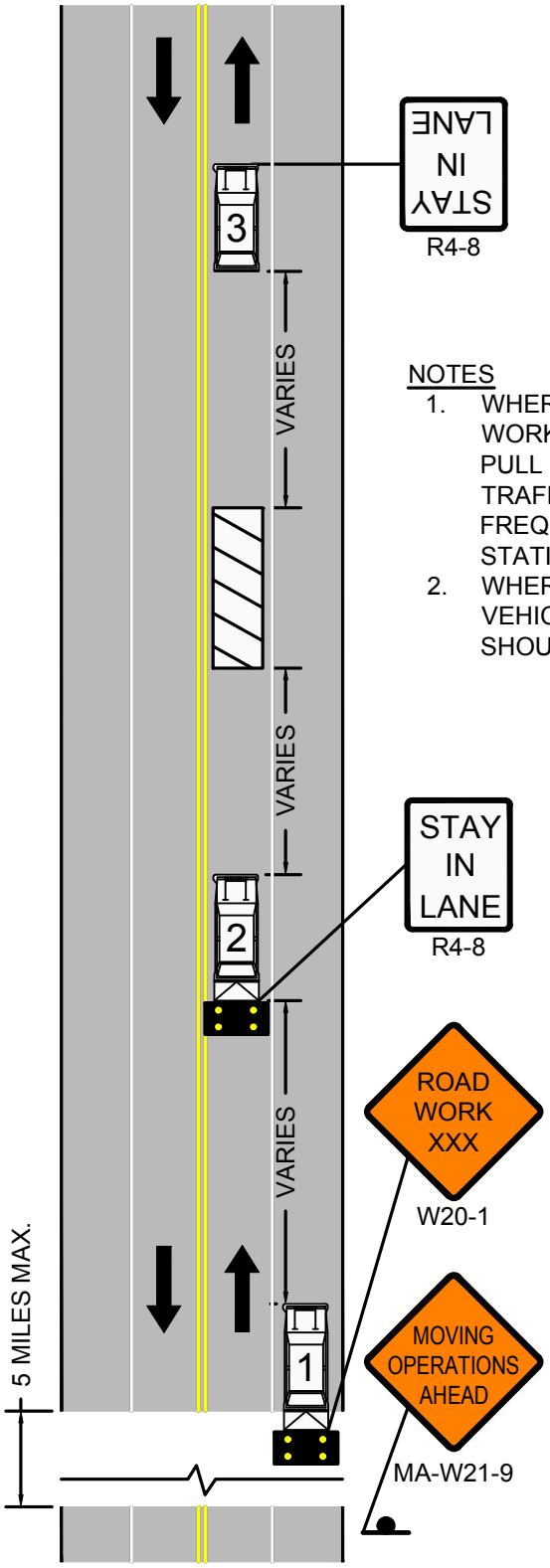
Work Zone Safety Standard Details and Drawings

FIGURE 28
MOBILE OPERATIONS
UNDIVIDED TWO LANE ROADWAY
HALF OF ROADWAY CLOSED



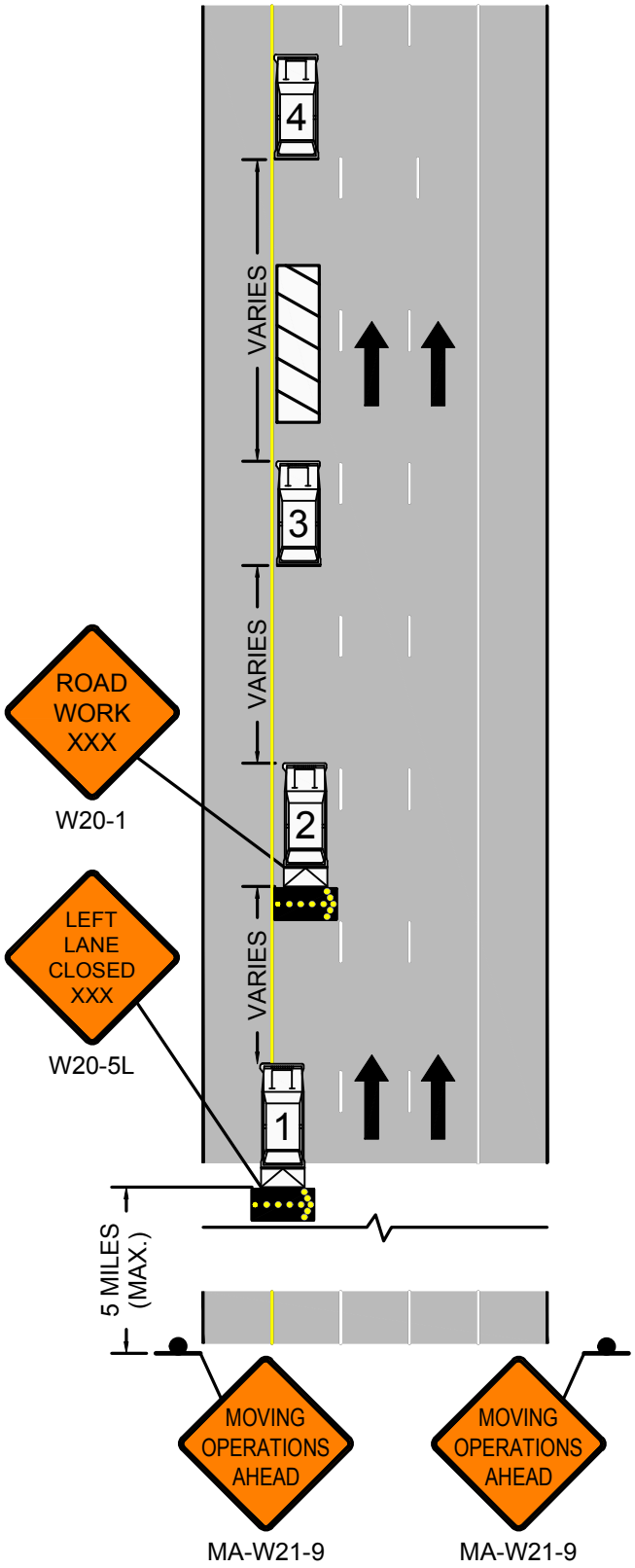
NOTES

1. WHERE PRACTICAL AND WHEN NEEDED, THE WORK AND SHADOW VEHICLE(S) SHOULD PULL OVER PERIODICALLY TO ALLOW TRAFFIC TO PASS. IF THIS CANNOT BE DONE FREQUENTLY, THEN AN ALTERNATE STATIONARY SETUP SHALL BE DEPLOYED.
2. WHERE A WIDE SHOULDER EXISTS, SHADOW VEHICLE #1 SHOULD DRIVE ON THE SHOULDER.

LEGEND

- WORK ZONE
- SHADOW VEHICLE
- WORK VEHICLE
- FLASHING ARROW BOARD (WITH STATUS)

NOT TO SCALE



LEGEND

- WORK ZONE
- SHADOW VEHICLE
- WORK VEHICLE
- FLASHING ARROW BOARD (WITH STATUS)

NOT TO SCALE

massDOT Massachusetts Department of Transportation Highway Division PAGE 61	Work Zone Safety Standard Details and Drawings	FIGURE 29 MOBILE OPERATIONS MULTILANE DIVIDED ROADWAY LEFT LANE

massDOT Massachusetts Department of Transportation Highway Division

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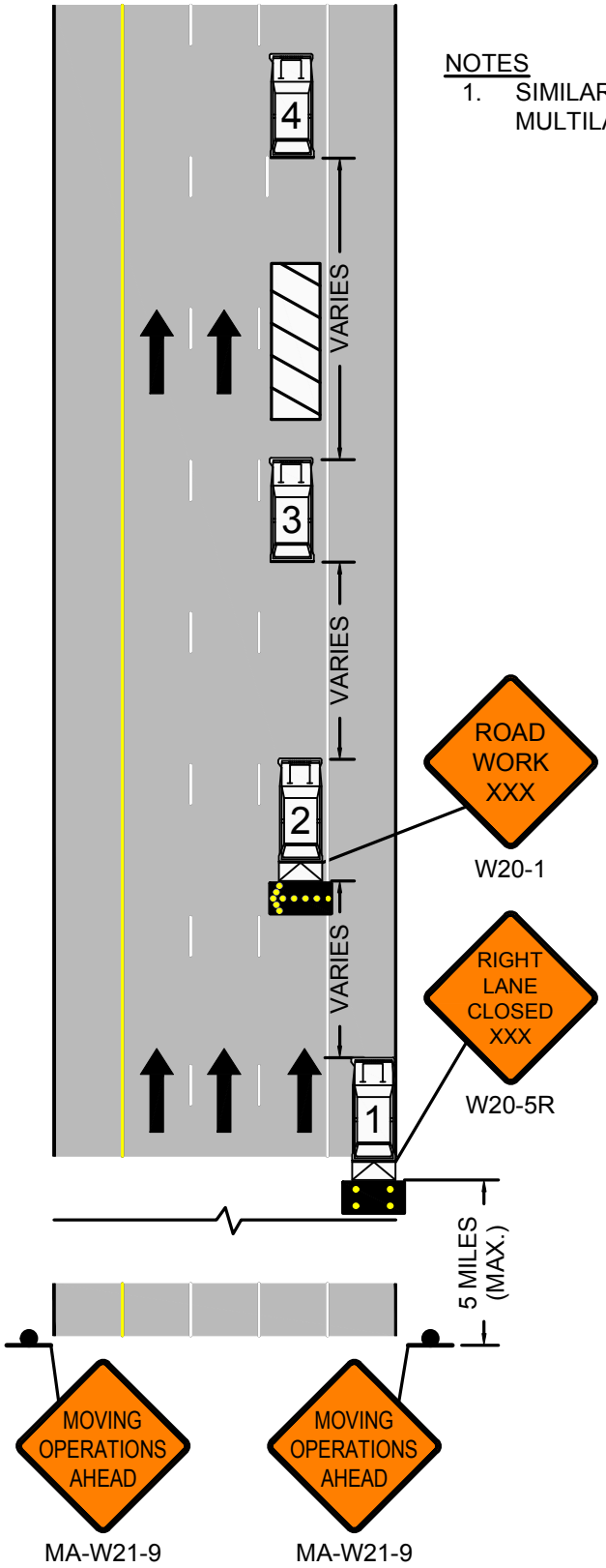
Work Zone Safety Standard Details and Drawings

FIGURE 30
MOBILE OPERATIONS
MULTILANE DIVIDED ROADWAY
RIGHT LANE



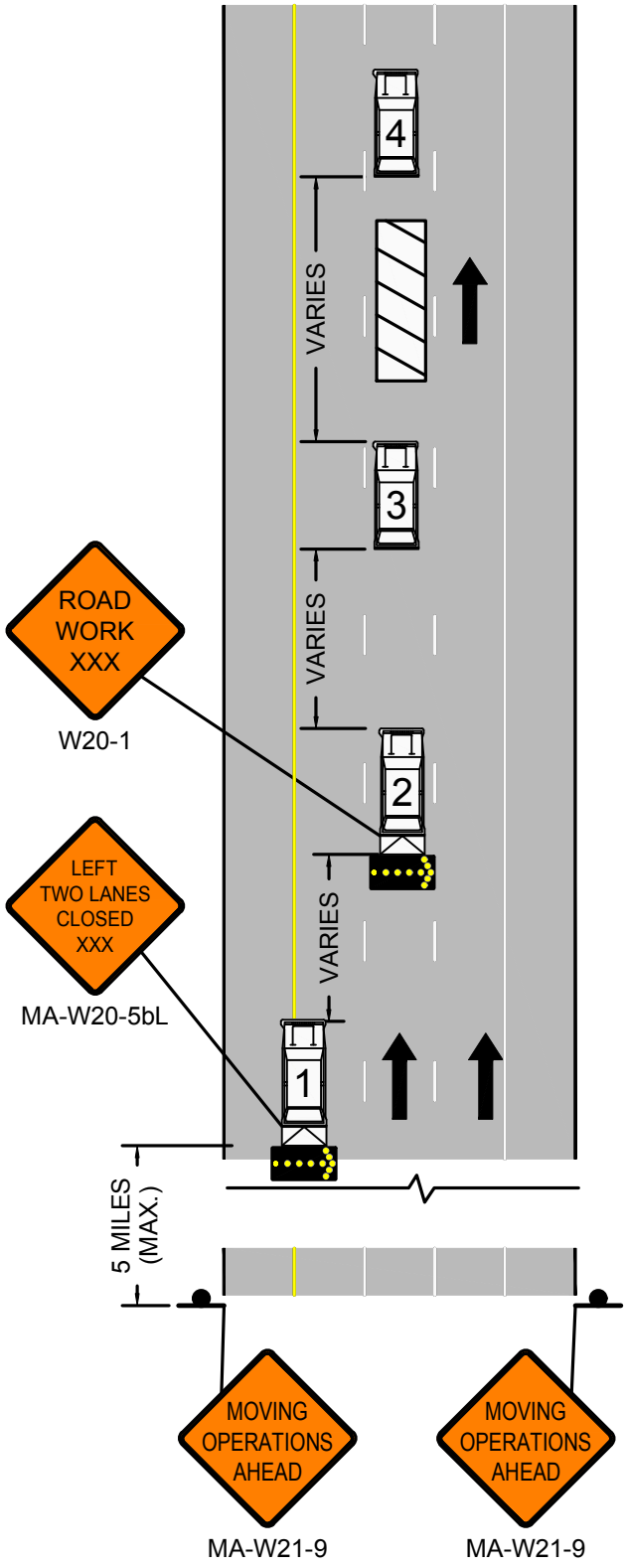
NOTES

1. SIMILAR SETUP MAY BE USED FOR A MULTILANE UNDIVIDED HIGHWAY.

LEGEND

- WORK ZONE
- SHADOW VEHICLE
- WORK VEHICLE
- FLASHING ARROW BOARD (WITH STATUS)

NOT TO SCALE



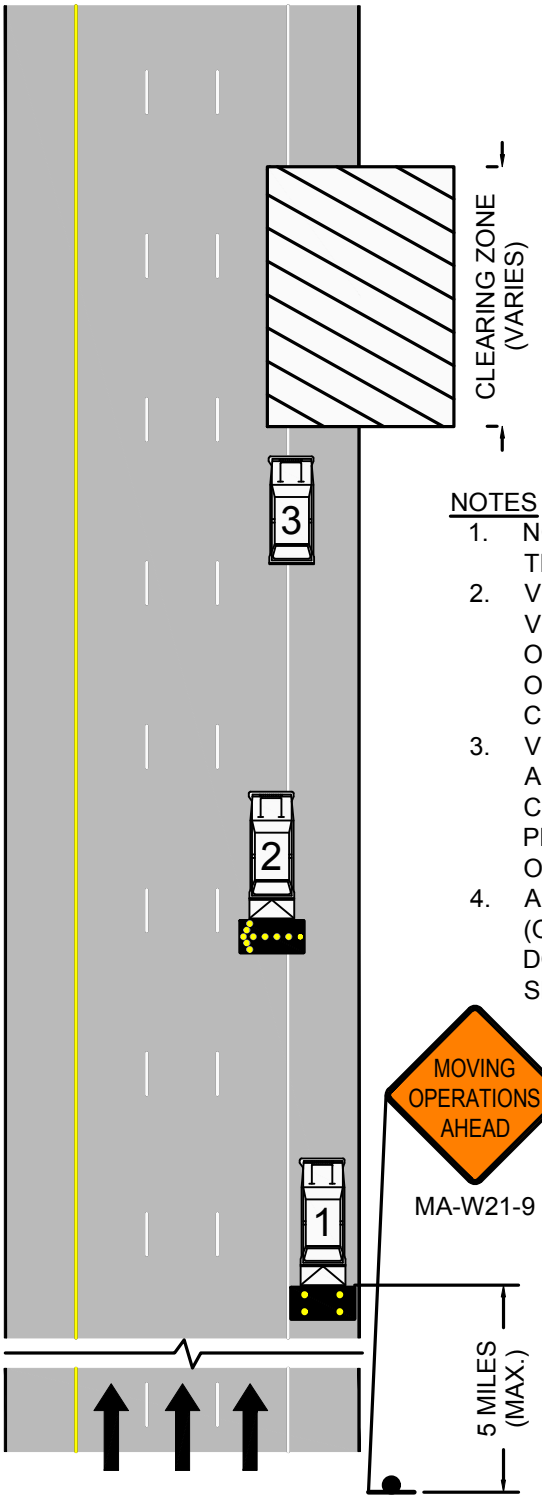
LEGEND

- WORK ZONE
- SHADOW VEHICLE
- WORK VEHICLE
- FLASHING ARROW BOARD (WITH STATUS)

NOT TO SCALE

massDOT Massachusetts Department of Transportation Highway Division PAGE 63	Work Zone Safety Standard Details and Drawings	FIGURE 31 MOBILE OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE

massDOT Massachusetts Department of Transportation Highway Division PAGE 64	Work Zone Safety Standard Details and Drawings	FIGURE 32 MOBILE OPERATIONS POST-STORM CLEANUP OPERATION



NOTES

1. NO OTHER NOTES ARE APPLICABLE TO THIS DETAIL.
2. VEHICLE #3 IS A SNOW/DEBRIS REMOVAL VEHICLE AND SHALL ALWAYS BE AWARE OF THE SURROUNDINGS. MORE THAN ONE VEHICLE MAY BE USED IN THE CLEARING ZONE.
3. VEHICLE #1 SHOULD BE EQUIPPED WITH A PCMS, A TMA, AND STAY IN VISUAL CONTACT WITH VEHICLE #3 WHILE PROVIDING AMPLE WARNING TO ONCOMING TRAFFIC.
4. A POLICE DETAIL WITH BLUE LIGHTS (OPTIONAL) SHALL REMAIN DOWNSTREAM OF VEHICLE #1 IN THE SHOULDER.

LEGEND

- WORK ZONE
- SHADOW VEHICLE
- WORK VEHICLE
- FLASHING ARROW BOARD (WITH STATUS)

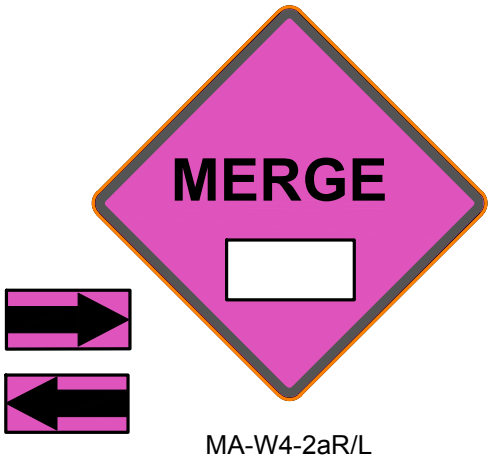
NOT TO SCALE

Notes for Traffic Emergency or Incident Operations

- The goal is to increase awareness of during traffic emergencies or incidents.
- These signs are to be used to differentiate from the traditional construction work zone and an emergency or incident.
- Upon arrival MassDOT First Responders shall assess the magnitude of the scene to determine if the incident is likely to last an hour or more in duration which would trigger the requirement to use these signs.
- Place the "Emergency Ahead" sign on the same side of the road as the incident, if possible, for up to an hour. Emergency response signs should be put up for all incidents and emergencies as soon as possible.
- Place the emergency sign 500 to 1000 feet before the first channelization devices.
- As an incident evolves this sign would be used as a secondary sign with all other emergency controls put in place.
- Only use "MERGE" signs where applicable (Not on 2 lane roads).
- Use MERGE signs on Multi-lane Roads to move traffic away from the incident and keep them in a safe lane.
- Place the MERGE sign about 500 feet before the closure.
- If additional signs are available, they should be placed accordingly as a sign informing people coming in the other direction or on the opposite side of the roadway.
- Use 12 emergency cones spaced 40 to 80 feet apart to form a taper and protect the scene.
- Sequential flashing lights/flares may be used in lieu of or to supplement cones.
- During a major incident that will last for a long duration, the EMERGENCY AHEAD sign should be moved back before an intersecting road or ramp to alert travelers and give them an option of using an alternate route. (Be sure all other devices are in place before moving this sign).

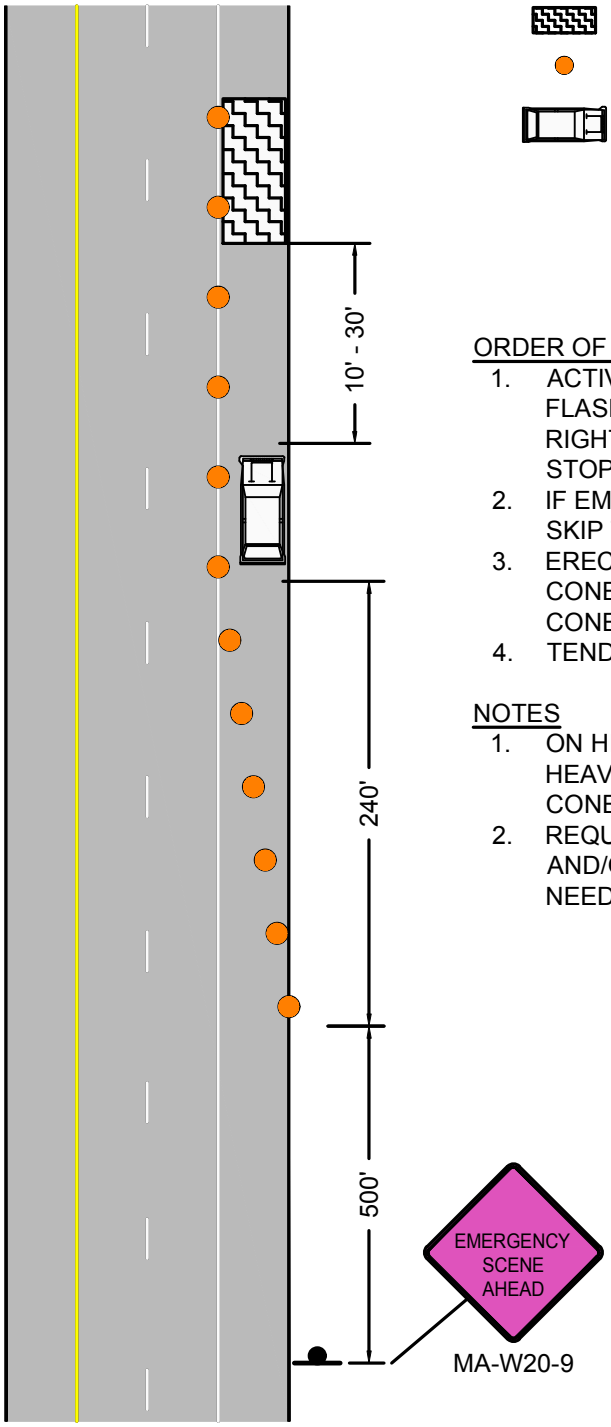
Standard Emergency Signs (36"x36" or 48"x48")

MA-W20-9



MA-W4-2aR/L

massDOT Massachusetts Department of Transportation Highway Division PAGE 66	Work Zone Safety Standard Details and Drawings	FIGURE 33 EMERGENCY RESPONSE ANY ROADWAY SHOULDER ENCROACHMENT



LEGEND

EMERGENCY AREA

CHANNELIZATION DEVICE

EMERGENCY RESPONSE VEHICLE

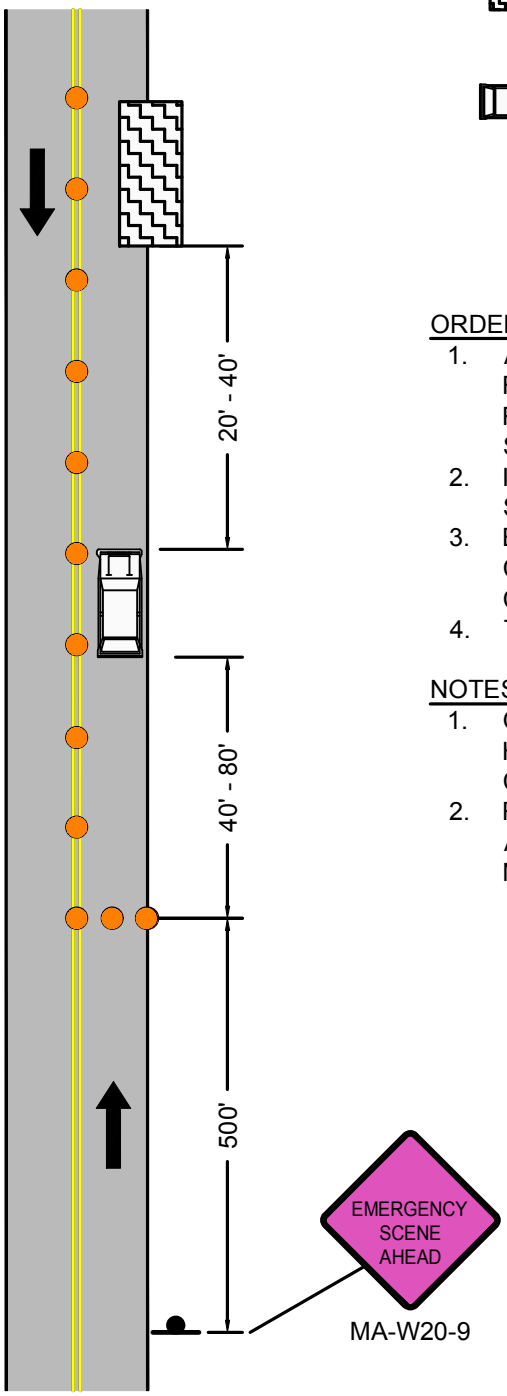
NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE RIGHT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



LEGEND

EMERGENCY AREA

CHANNELIZATION DEVICE

EMERGENCY RESPONSE VEHICLE

NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

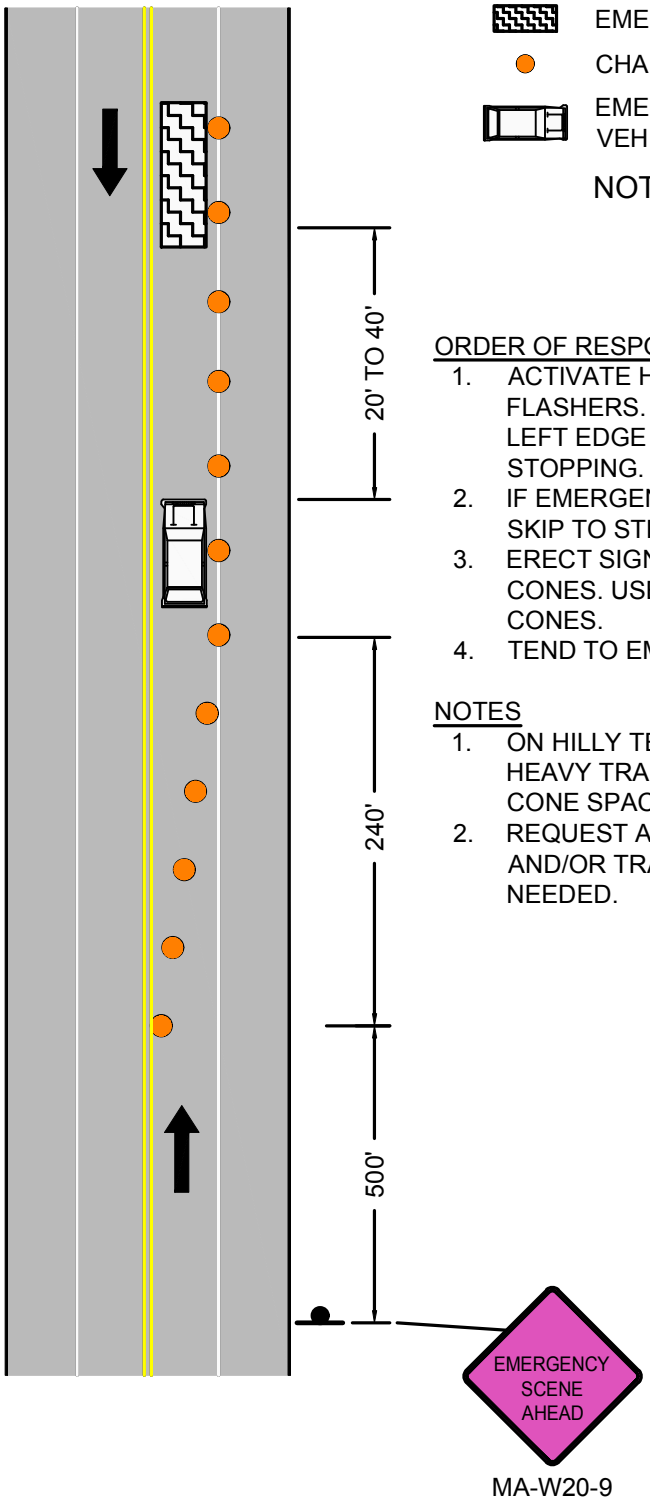
1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE RIGHT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.

massDOT Massachusetts Department of Transportation Highway Division PAGE 67	Work Zone Safety Standard Details and Drawings	FIGURE 34 EMERGENCY RESPONSE TWO LANE ROADWAY NO SHOULDER TRAVEL LANE ENCROACHMENT

massDOT Massachusetts Department of Transportation Highway Division PAGE 68	Work Zone Safety Standard Details and Drawings	FIGURE 35 EMERGENCY RESPONSE TWO LANE ROADWAY TRAVERSABLE SHOULDER SINGLE LANE ENCROACHMENT



LEGEND

- EMERGENCY AREA
- CHANNELIZATION DEVICE
- EMERGENCY RESPONSE VEHICLE

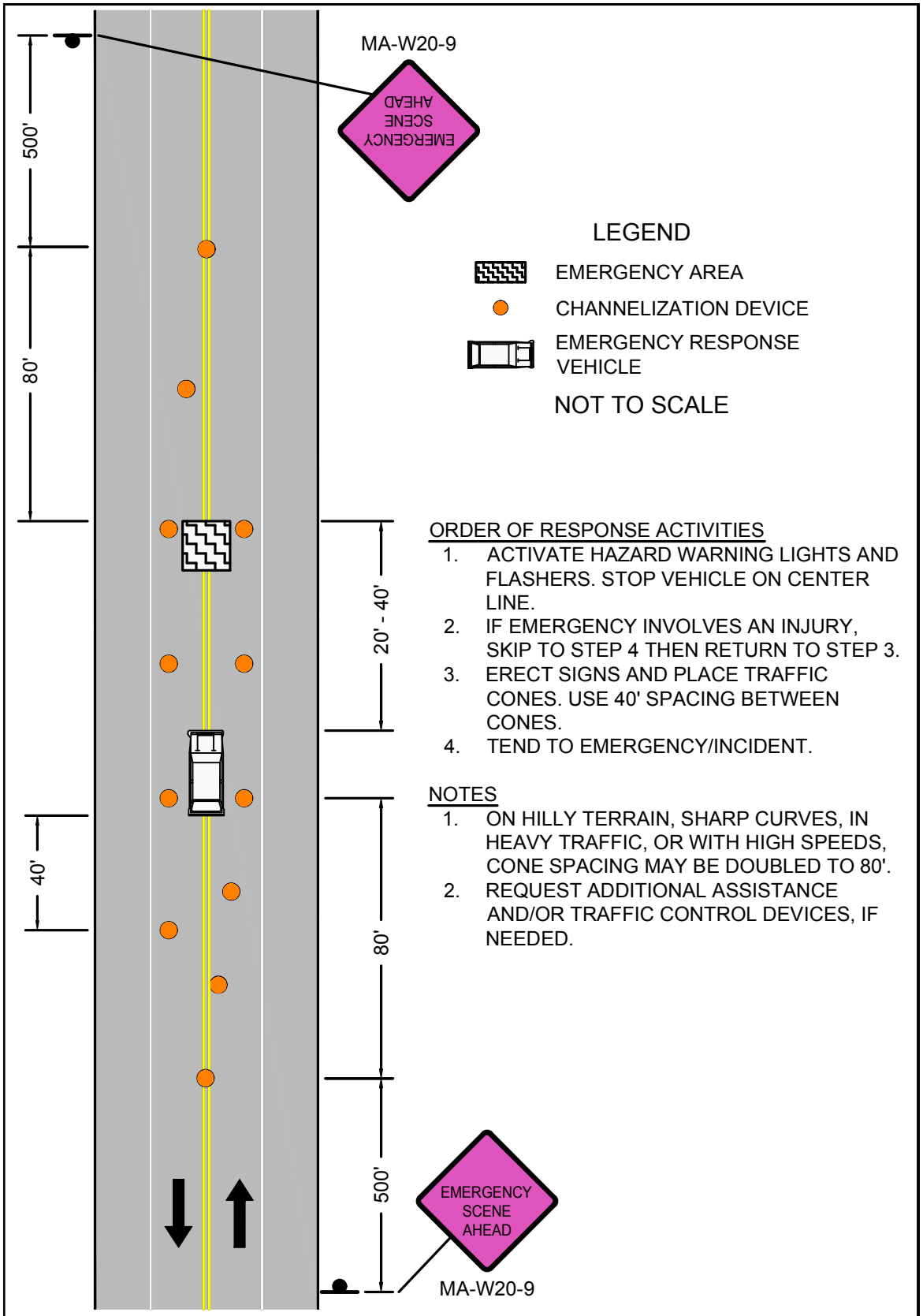
NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE LEFT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



ORDER OF RESPONSE ACTIVITIES

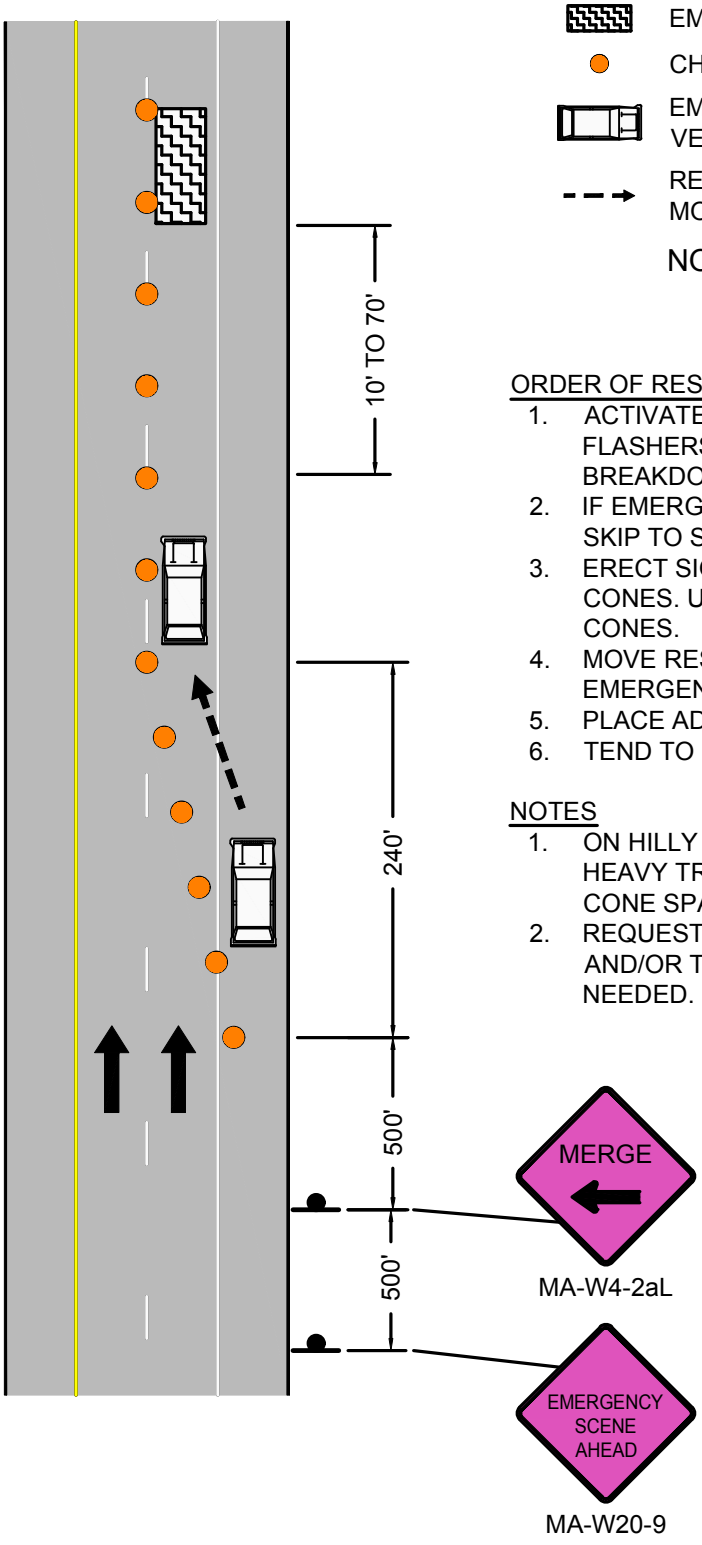
1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE ON CENTER LINE.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.

massDOT Massachusetts Department of Transportation Highway Division PAGE 69	Work Zone Safety Standard Details and Drawings	FIGURE 36 EMERGENCY RESPONSE TWO LANE ROADWAY TRAVERSABLE SHOULDER CENTER OF ROADWAY

massDOT Massachusetts Department of Transportation Highway Division PAGE 70	Work Zone Safety Standard Details and Drawings	FIGURE 37 EMERGENCY RESPONSE MULTILANE DIVIDED ROADWAY RIGHT LANE



LEGEND

- EMERGENCY AREA
- CHANNELIZATION DEVICE
- EMERGENCY RESPONSE VEHICLE
- RESPONSE VEHICLE MOVEMENT

NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE IN BREAKDOWN LANE.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 6 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. MOVE RESPONSE VEHICLE BEHIND EMERGENCY.
5. PLACE ADDITIONAL CONES.
6. TEND TO EMERGENCY.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.

LEGEND

EMERGENCY AREA

CHANNELIZATION DEVICE

EMERGENCY RESPONSE VEHICLE

RESPONSE VEHICLE MOVEMENT

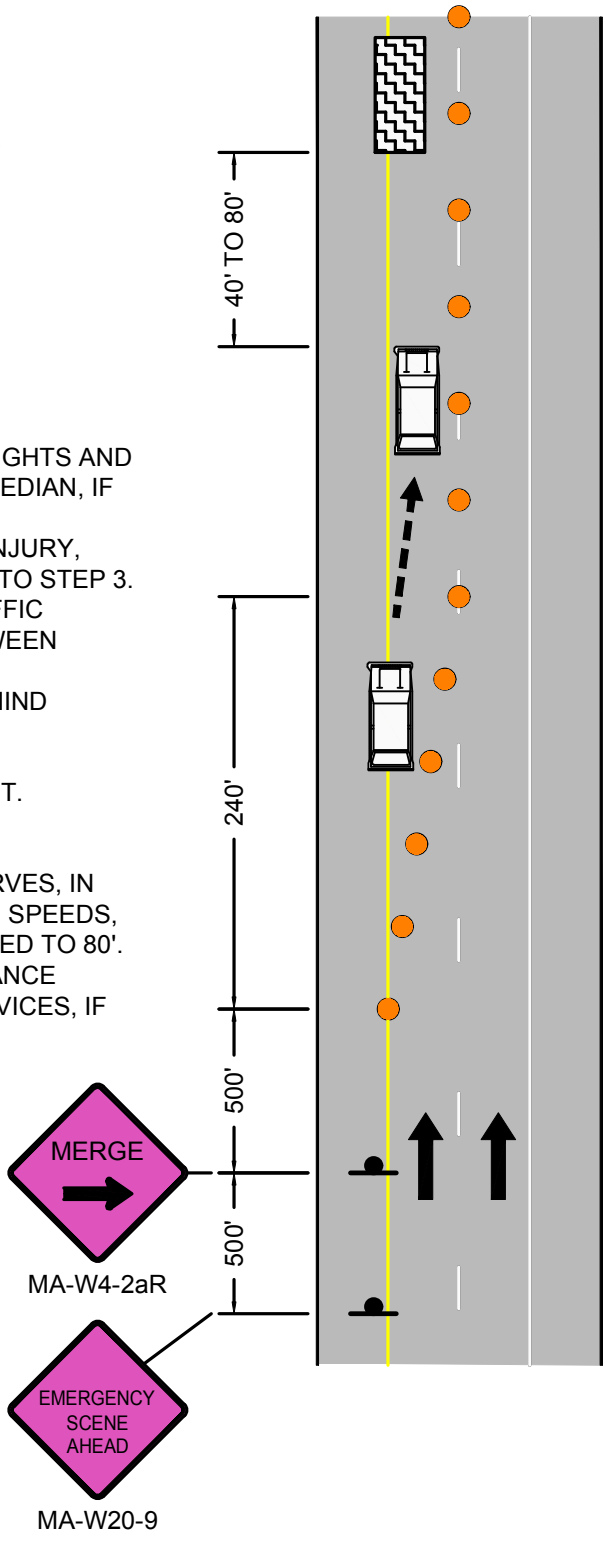
NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE IN MEDIAN, IF PRESENT.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 6 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. MOVE RESPONSE VEHICLE BEHIND EMERGENCY.
5. PLACE ADDITIONAL CONES.
6. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



massDOT Massachusetts Department of Transportation Highway Division

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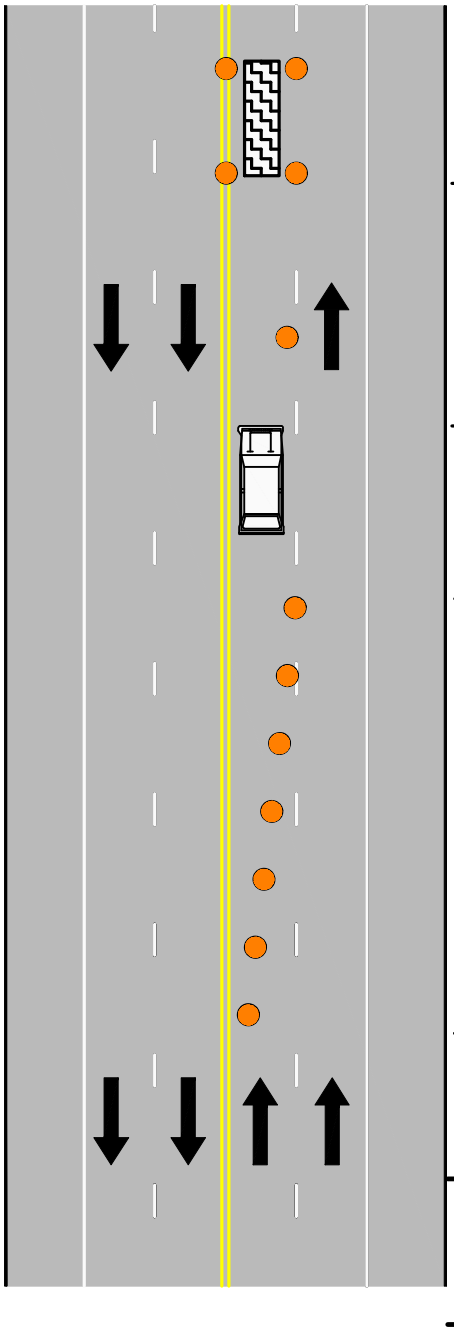
Work Zone Safety Standard Details and Drawings

FIGURE 38
EMERGENCY RESPONSE
MULTILANE DIVIDED ROADWAY
LEFT LANE

massDOT Massachusetts Department of Transportation Highway Division PAGE 72	Work Zone Safety Standard Details and Drawings	FIGURE 39 EMERGENCY RESPONSE MULTILANE UNDIVIDED ROADWAY LEFT LANE



LEGEND

- EMERGENCY AREA
- CHANNELIZATION DEVICE
- EMERGENCY RESPONSE VEHICLE

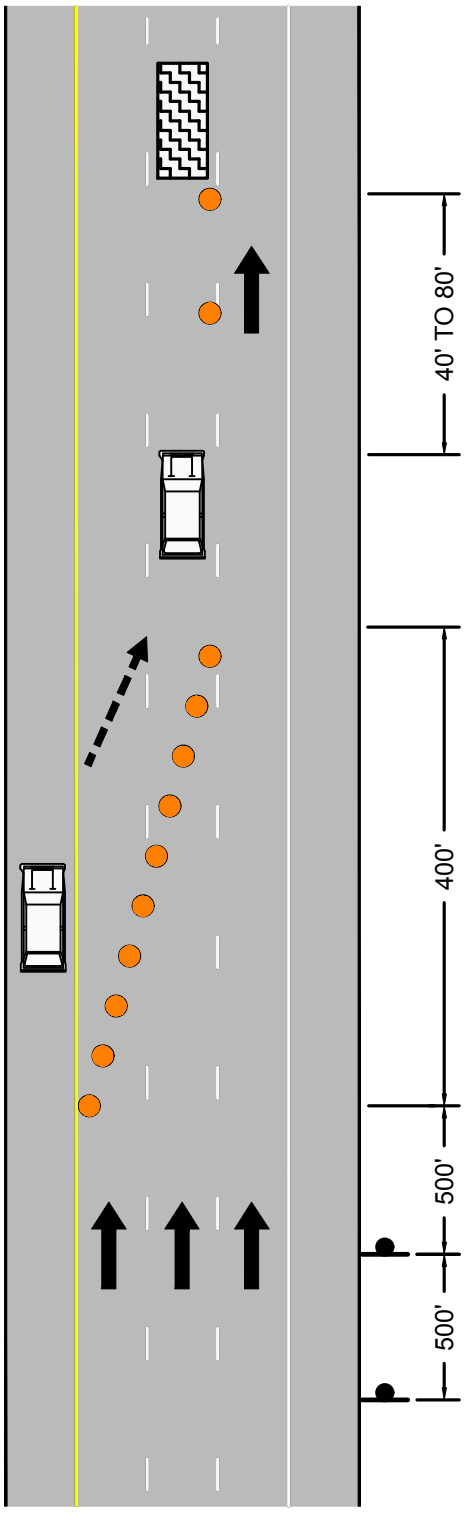
NOT TO SCALE

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE RIGHT EDGE OF BREAKDOWN LANE OR SHOULDER OR, IF NOT PRESENT, RIGHT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.



LEGEND

- EMERGENCY AREA
- CHANNELIZATION DEVICE
- EMERGENCY RESPONSE VEHICLE
- RESPONSE VEHICLE MOVEMENT

NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE IN MEDIAN, IF PRESENT.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 6 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. MOVE RESPONSE VEHICLE BEHIND EMERGENCY.
5. PLACE ADDITIONAL CONES.
6. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.

massDOT Massachusetts Department of Transportation Highway Division PAGE 73	Work Zone Safety Standard Details and Drawings	FIGURE 40 EMERGENCY RESPONSE MULTILANE DIVIDED ROADWAY MIDDLE LANE APPROACH FROM LEFT

massDOT Massachusetts Department of Transportation Highway Division

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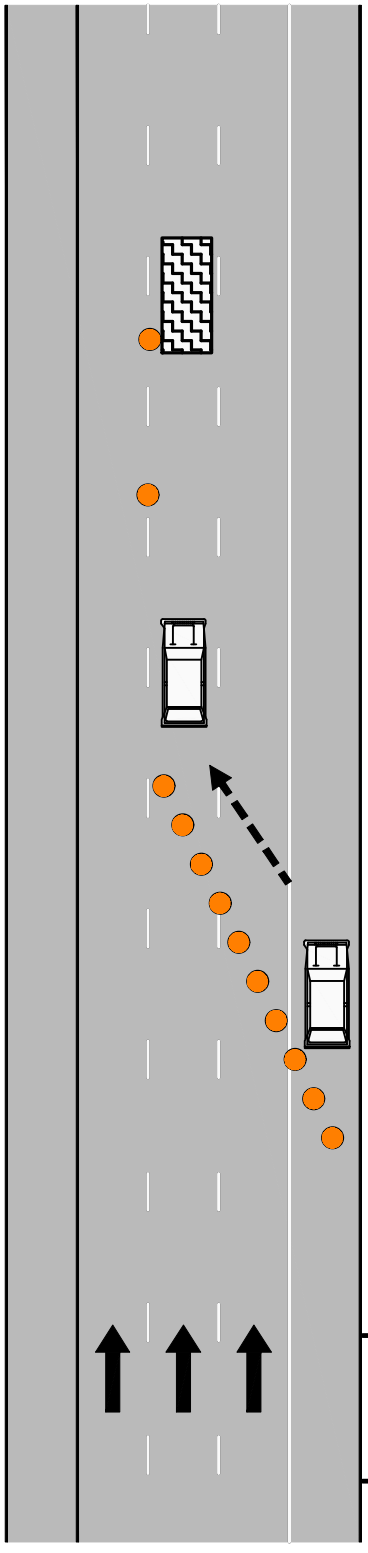
Work Zone Safety Standard Details and Drawings

FIGURE 41
EMERGENCY RESPONSE
MULTILANE DIVIDED ROADWAY
MIDDLE LANE
APPROACH FROM RIGHT



LEGEND

- EMERGENCY AREA
- CHANNELIZATION DEVICE
- EMERGENCY RESPONSE VEHICLE
- RESPONSE VEHICLE MOVEMENT

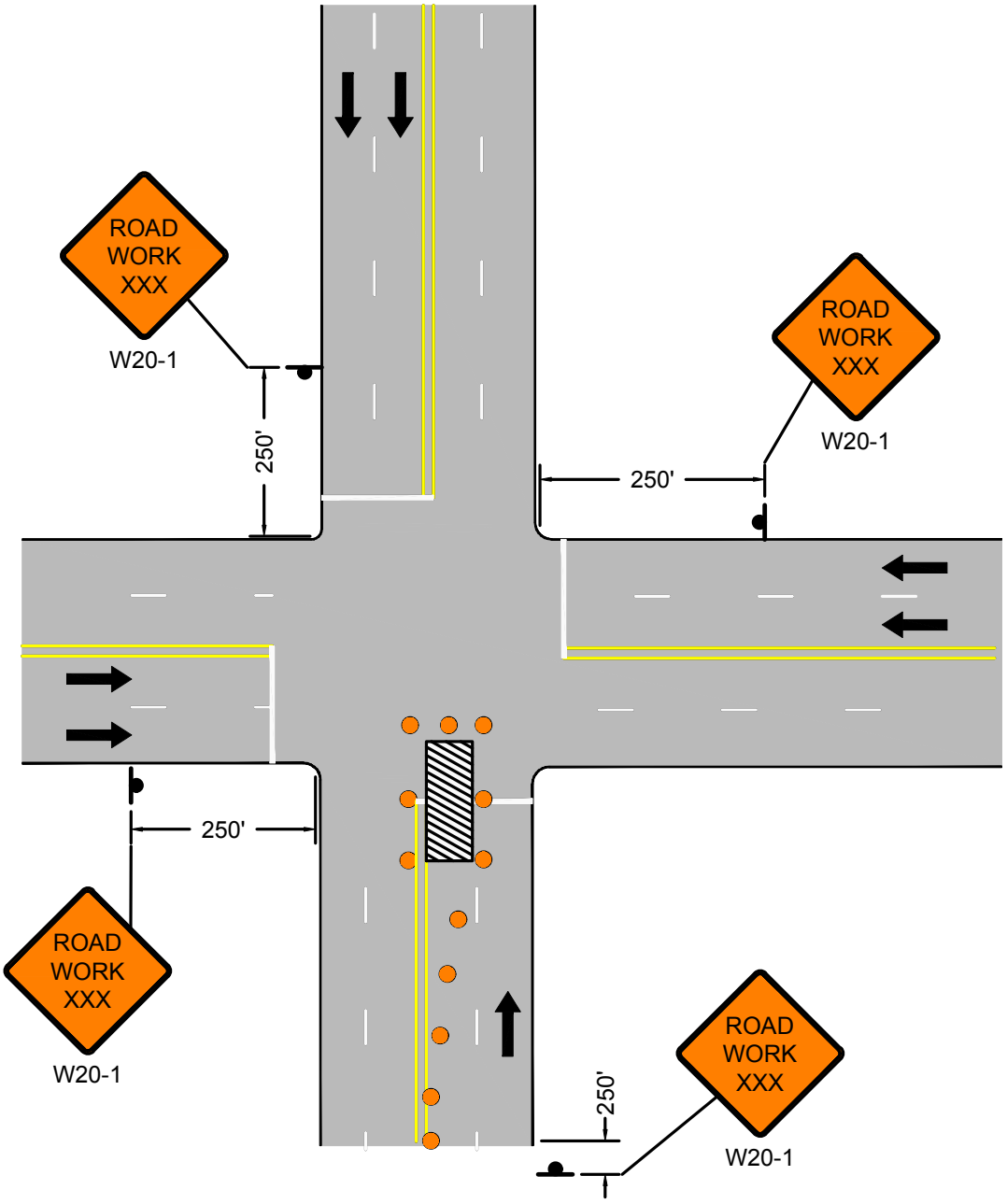
NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE IN BREAKDOWN LANE.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 6 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. MOVE RESPONSE VEHICLE BEHIND EMERGENCY.
5. PLACE ADDITIONAL CONES.
6. TEND TO EMERGENCY.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



LEGEND

WORK ZONE

CHANNELIZATION DEVICE

NOT TO SCALE

NOTES

1. DURATION OF WORK = 20 MINUTES OR LESS.
2. EQUIPMENT: 12 CONES + 4 PORTABLE SIGNS.
3. CONE SPACING IS 20 FEET.
4. SINGLE WORK VEHICLE PARKED/STOPPED.
5. POLICE DETAIL REQUIRED.

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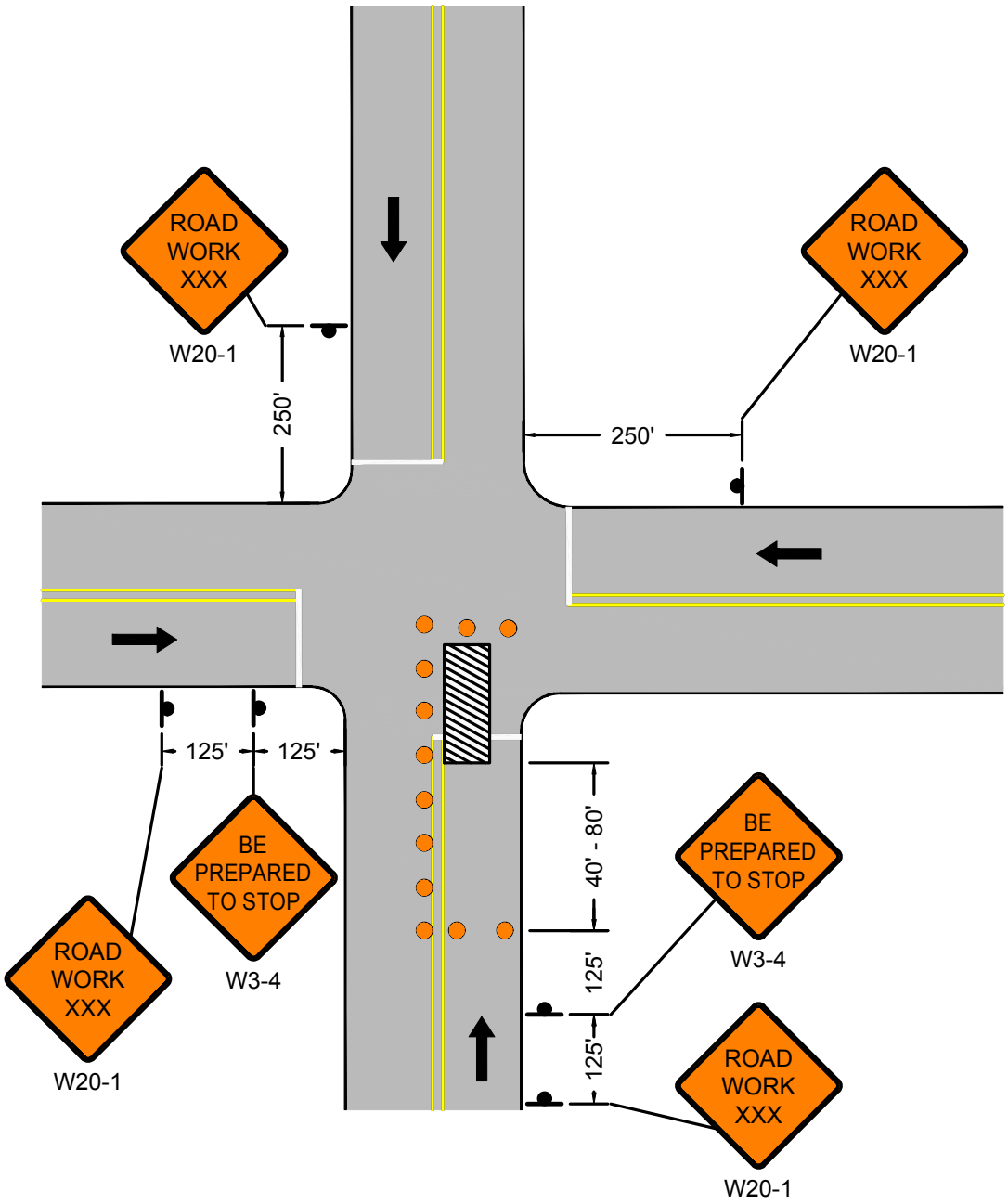
Work Zone Safety Standard Details and Drawings

FIGURE 42
TRAFFIC SIGNAL REPAIR WORK
MULTILANE UNDIVIDED ROADWAY
LEFTMOST OR LEFT TURNING LANE

massDOT Massachusetts Department of Transportation Highway Division PAGE 76	Work Zone Safety Standard Details and Drawings	FIGURE 43 TRAFFIC SIGNAL REPAIR WORK TWO LANE UNDIVIDED ROADWAY ONE LEG OF INTERSECTION



LEGEND

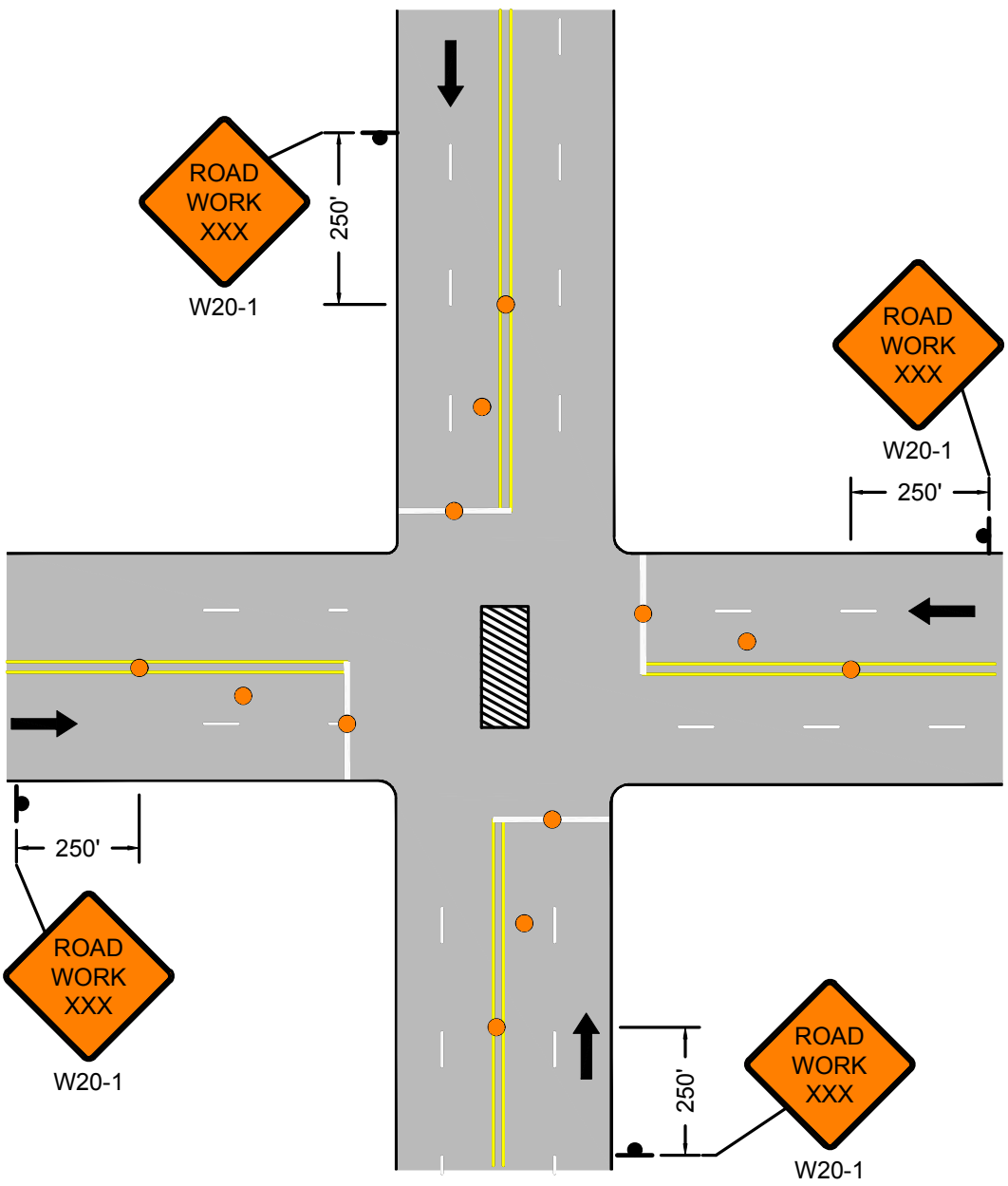
WORK ZONE

CHANNELIZATION DEVICE

NOT TO SCALE

NOTES

1. DURATION OF WORK = 20 MINUTES OR LESS.
2. EQUIPMENT: 12 CONES + 6 PORTABLE SIGNS.
3. CONE SPACING IS 20 FEET.
4. SINGLE WORK VEHICLE PARKED/STOPPED.
5. POLICE DETAIL REQUIRED.



LEGEND

WORK ZONE

CHANNELIZATION DEVICE

NOT TO SCALE

NOTES

1. DURATION OF WORK = 20 MINUTES OR LESS.
2. EQUIPMENT: 12 CONES + 4 PORTABLE SIGNS.
3. CONE SPACING IS 20 FEET.
4. SINGLE WORK VEHICLE PARKED/STOPPED.
5. POLICE DETAIL REQUIRED.

massDOT Massachusetts Department of Transportation Highway Division

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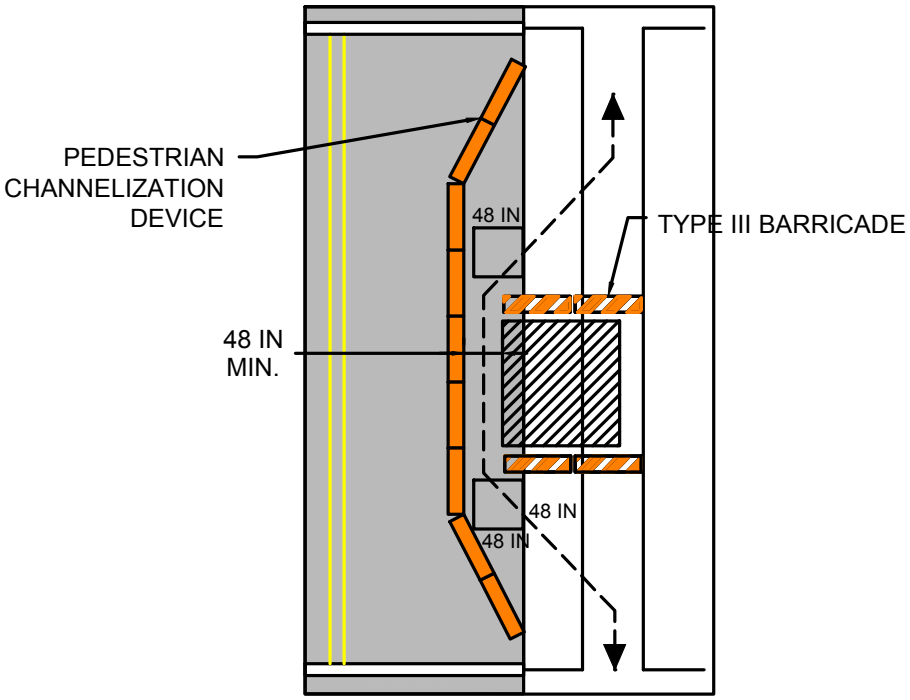
Work Zone Safety Standard Details and Drawings

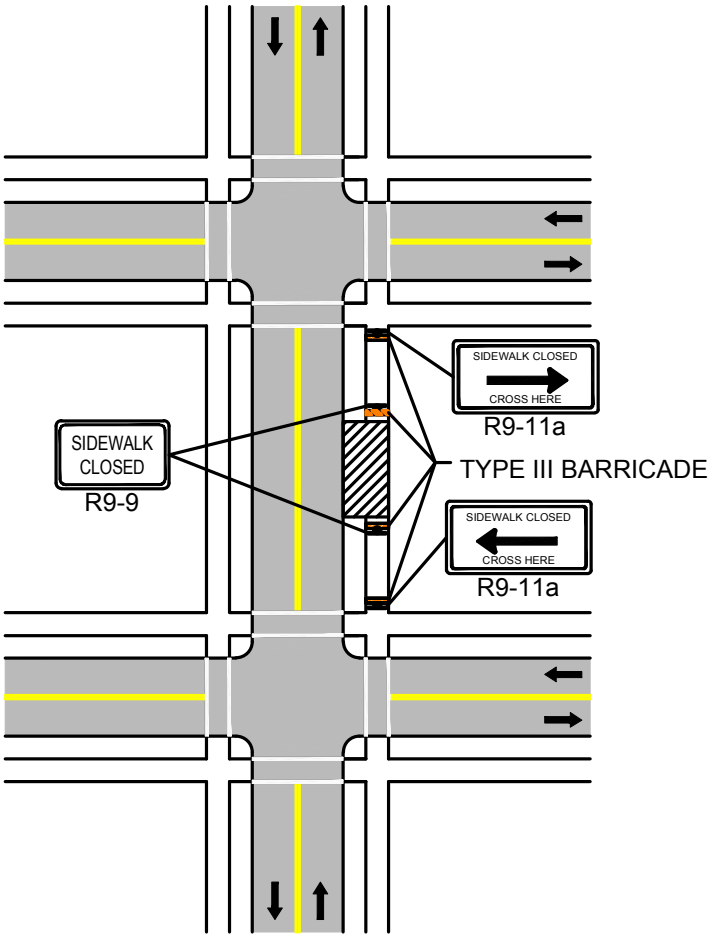
FIGURE 44
TRAFFIC SIGNAL REPAIR WORK
MULTILANE UNDIVIDED ROADWAY
CENTER OF INTERSECTION

massDOT Massachusetts Department of Transportation Highway Division PAGE 78	Work Zone Safety Standard Details and Drawings	FIGURE 45 PEDESTRIAN BYPASS



NOTES:

1. WHEN EXISTING PEDESTRIAN FACILITIES ARE DISRUPTED, CLOSED, OR RELOCATED IN A TTC ZONE, TEMPORARY FACILITIES SHALL BE PROVIDED AND THEY SHALL BE DETECTABLE AND INCLUDE ACCESSIBILITY FEATURES CONSISTENT WITH THE FEATURES PRESENT IN THE EXISTING PEDESTRIAN FACILITY.
2. A PEDESTRIAN CHANNELIZATION DEVICE THAT IS DETECTABLE BY A PERSON WITH A VISUAL DISABILITY TRAVELING WITH THE AID OF A LONG CANE SHALL BE PLACED ALONG THE FULL LENGTH OF THE TEMPORARY PEDESTRIAN ROUTE.
3. WHEN USED, TEMPORARY RAMPS SHALL COMPLY WITH AMERICANS WITH DISABILITIES ACT.
4. THE ALTERNATE PATHWAY SHOULD HAVE A SMOOTH CONTINUOUS HARD SURFACE FOR THE ENTIRE LENGTH OF THE TEMPORARY PEDESTRIAN FACILITY.
5. THE TEMPORARY SIDEWALK SHOULD BE A MINIMUM OF 4 FEET WIDE. IF THE SIDEWALK EXCEEDS 200 FEET THEN A 5 FOOT BY 5 FOOT PASSING ZONE SHALL BE PROVIDED NEAR THE MID-POINT OF THE CLOSURE.
6. THE PROTECTIVE REQUIREMENTS OF A TTC WORK ZONE MAY HAVE AN IMPACT IN DETERMINING THE NEED FOR TEMPORARY TRAFFIC BARRIERS AND THEIR USE IN PROVIDING PEDESTRIAN DELINEATION SHOULD BE BASED ON ENGINEERING JUDGMENT.
7. ON-DEMAND PEDESTRIAN ASSISTANCE PERSONNEL TO ASSIST WITH NAVIGATION AROUND THE CLOSURE/WORK AREA MAY BE CONSIDERED AS AN OPTION IN PLACE OF PROVIDING ADA/AAB DEVICES FOR WORK FOR CLOSURES LASTING 4 HOURS OR LESS.
8. CONTROLS ONLY FOR PEDESTRIAN TRAFFIC ARE SHOWN; VEHICULAR TRAFFIC SHOULD BE HANDLED AS SHOWN ELSEWHERE. THESE DETAILS ARE USED IN CONJUNCTION WITH THE PROPOSED LANE CLOSURE DETAILS AND DURING CONSTRUCTION STAGING, AS DETERMINED BY THE ENGINEER.



NOTES:

1. CLOSURE OF A SIDEWALK FACILITY SHALL CONSTITUTE THE PROVISION FOR MANAGING PEDESTRIAN TRAFFIC AND ACCOMMODATING ALL USERS. IF THE EXISTING PEDESTRIAN ACCESS ROUTE(S) CAN BE TEMPORARILY RELOCATED ALONG THE EXISTING SIDEWALK , AND SAID FACILITY PROVIDES A MINIMUM WIDTH OF 48-INCHES OF SOLID, SMOOTH UNOBSTRUCTED SURFACE, THEN NO DETOURING OF THE ROUTE SHALL BE REQUIRED. DELINEATION OF THE WORK AREA IS STILL REQUIRED.

2. IF IT IS NECESSARY TO DIVERT PEDESTRIAN TRAFFIC TO AN ALTERNATE ROUTE ACROSS THE ROADWAY FROM THE EXISTING FACILITY, THE FIGURE ABOVE SHALL BE FOLLOWED TO PROVIDE ADEQUATE DIRECTION TO PEDESTRIANS. ALTERNATE ROUTE SHALL PROVIDE THE SAME LEVEL OF ACCOMMODATION AS THE FACILITY THAT IS BEING DETOURED AND RETAIN ADA COMPLIANCE IN ITS ENTIRETY.

3. FOR EMERGENCY OR SHORT-DURATION SIDEWALK CLOSURES OF 4-HOURS OR LESS, IT IS OPTIONAL TO HAVE ON-DEMAND PEDESTRIAN ASSISTANCE PERSONNEL AVAILABLE AT ALL TIMES DURING THE CLOSURE TO ASSIST THOSE MOBILITY CHALLENGED PERSONS WHO REQUIRE ADDITIONAL ASSISTANCE TO SAFELY NAVIGATE AROUND THE WORK AREA IN LIEU OF A FULL DETOUR.

massDOT Massachusetts Department of Transportation Highway Division PAGE 80	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS BIKE LANE CLOSURE

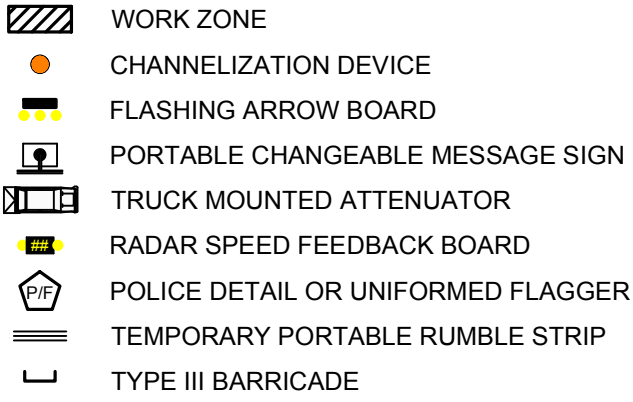
POSTED SPEED LIMIT (MPH)	SPACING FOR BIKE ADVANCE WARNING SIGNS (FT) (A,B))	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRANSITION LENGTH (L/3)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	150 / 150	100	305	20	45
45-55	150 / 150	220	495	40	35
60-65	150 / 150	260	645	40	40

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES

1. DETAIL SHALL BE USED IN CONJUNCTION WITH THE PROPOSED LANE CLOSURE DETAILS. SIGNING SHOWN ONLY FOR BIKE TRAFFIC. FOLLOW ALL OTHER RELEVANT DETAILS FOR TTC DEVICES FOR VEHICULAR TRAFFIC.
2. ** SIGN SHALL BE USED ONLY IF THERE IS A MARKED BIKE LANE.
3. *** SIGN SHALL BE USED ONLY IF THERE IS NO MARKED BIKE LANE.

LEGEND



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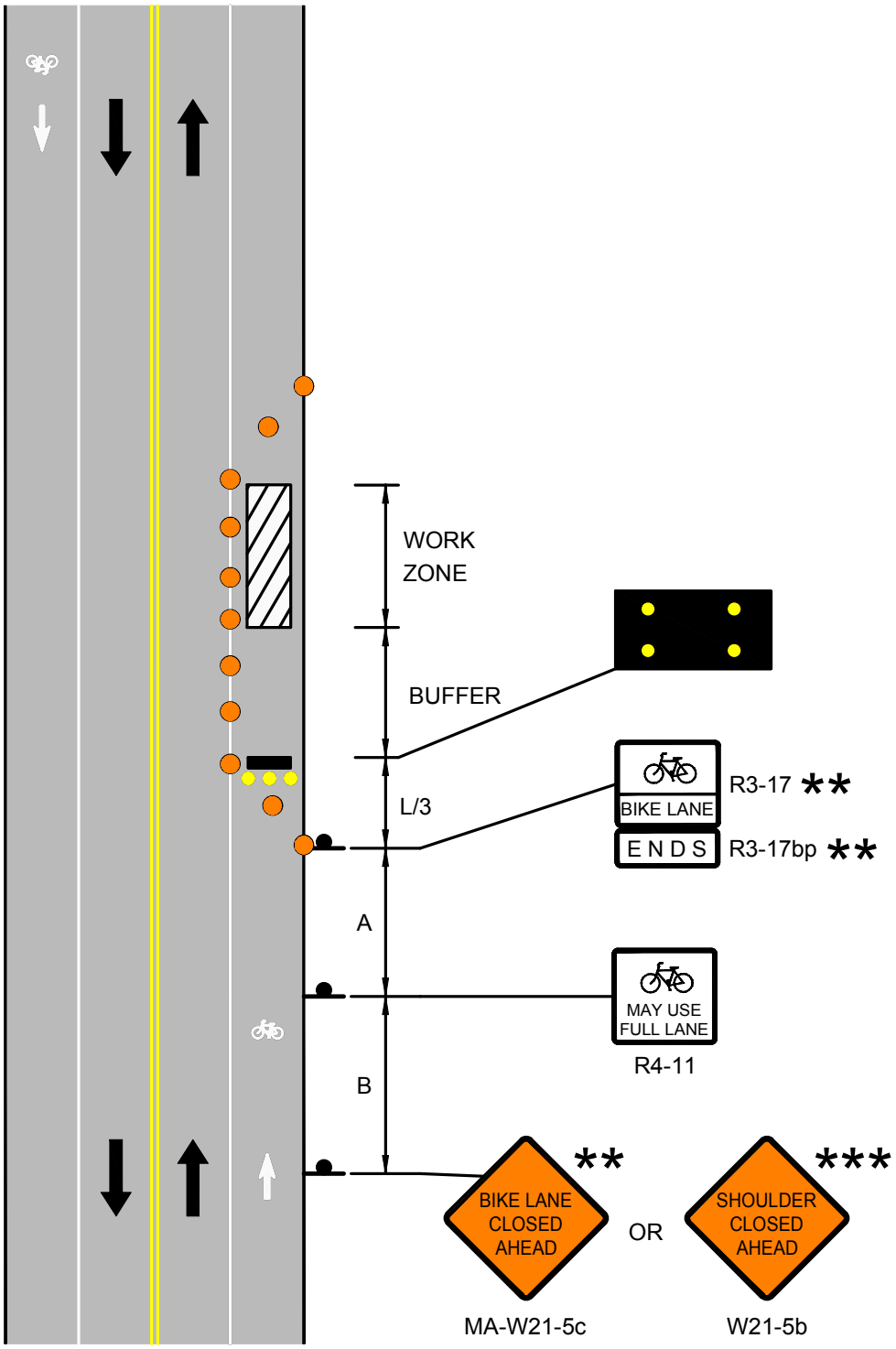

massDOT Massachusetts Department of Transportation Highway Division PAGE 81	Work Zone Safety Standard Details and Drawings	FIGURE 48 STATIONARY OPERATIONS BIKE LANE CLOSURE

Safety is everyone's business

Rev. June, 2017

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: WALES Project File Number: 608163

Contract Number: 128112

Project Description: Reconstruction & Improvements on Monson Road, from the Monson T.L. to Reed Hill Road (1.5 Miles)

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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United States Army Corps of Engineers

Pre-Construction Notification (PCN)

MassDOT Project 608163:

Monson Road Transportation Improvement Project

Town of Wales, MA

June 2024

Weston & Sampson

Weston & Sampson Engineers, Inc.
273 Dividend Road
Rocky Hill, Connecticut 06067

www.westonandsampson.com
Tel: 560-513-1473 Fax: 860-513-1483

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PCN Form

APPENDIX A: PROJECT NARRATIVE

APPENDIX B: ALTERNATIVES ANALYSIS

APPENDIX C: SITE MAPS

APPENDIX D: SITE PHOTOGRAPHS

APPENDIX E: SECTION 106 CONSULTATION

APPENDIX F: SECTION 7 CONSULTATION

APPENDIX G: WETLAND DELINEATION REPORT

APPENDIX H: APPLICABLE TECHNICAL SPECIFICATIONS

APPENDIX I: MAXIMUM EXTENT PRACTICABLE (MEP) ANALYSIS

APPENDIX J: STORMWATER MANAGEMENT REPORT

APPENDIX K: PROJECT PLANS

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

June 26, 2024

Mr. Dan Vasconcelos
U.S. Army Corps of Engineers
Regulatory Division
696 Virginia Road
Concord, Massachusetts 01742-2751

RE: Pre-Construction Notification (PCN) Submittal
MassDOT Project 608163: Monson Road Transportation Improvement Project
Wales, Massachusetts

Mr. Vasconcelos:

On behalf of the Town of Wales, Weston & Sampson Engineers, Inc. is hereby submitting a Pre-Construction Notification (PCN) for coverage under the U.S. Army Corps of Engineers Massachusetts General Permits for the Monson Road Transportation Improvement Project (the project). This application is being filed pursuant to Section 404 (33 U.S.C. 1344) of the federal Clean Water Act and its implementing regulations; as well as the Massachusetts Clean Water Act (MGL c. 21, § 26-53) for work proposed in Waters of the United States.

This Project consists of full depth pavement reconstruction within an approximately 1.5-mile stretch of Monson Road in Wales, Massachusetts. The Project includes the construction of new four-foot-wide shoulders all along the roadway for pedestrian and bicycle use with minor adjustments to the alignment to improve safety, including a realigned intersection with Reed Hill Road. The project additionally will involve upgrades to several of the existing stream crossings along this stretch of Monson Road, as many of the culverts are undersized and do not currently meet the Massachusetts Stream Crossing Standards.

The proposed roadway improvements and stream crossing improvements will result in unavoidable impacts to Waters of the U.S., specifically within Vegetated Wetlands and land below the Ordinary High Water Mark (OHW). This project proposes a total of approximately 4,454 SF of permanent impacts to Waters of the U.S., 783 linear feet of impacts to Bank, and 891 SF of permanent impacts to Vegetated Wetlands. The project will also result in 194 SF of temporary impacts to Waters of the U.S., and 333 SF of temporary impacts to Vegetated Wetlands.

Based on the proposed scope of work and impacts to Waters of the U.S., it is anticipated that the proposed project will utilize General Permit (GP) 23 for Linear Transportation Projects and Wetland/Stream Crossings.

A PCN is required for the project under GP 23, because the following conditions apply:

1. In non-tidal waters, the combined permanent and temporary impacts are:

   a) >5,000 SF;

   c) do not meet the Massachusetts River and Stream Crossing Standards.

As part of the filing, we have attached the following:

Appendix A: Project Description
Appendix B: Alternatives Analysis
Appendix C: Site Maps
Appendix D: Site Photos
Appendix E: Section 106 Consultation
Appendix F: Section 7 Consultation
Appendix G: Wetland Delineation Report
Appendix H: Applicable Technical Specifications
Appendix I: Maximum Extent Practicable (MEP) Analysis
Appendix J: Stormwater Management Report
Appendix K: Project Plans

The applicant for this proposed project is:

Town of Wales – John Grasso
3 Hollow Road
Wales, MA 01081
select@townofwales.net; 413-245-7571

The authorized agent for this proposed project is:

Weston & Sampson Engineers – Mike Joyce
273 Dividend Road
Rocky Hill, CT 06067
joyce.michael@wseinc.com; 860-616-6495

The project proponent hereby requests that the certifying authority review and take action on this CWA 404 application within the applicable reasonable period of time.

The project proponent hereby certifies that all information contained herein is true, accurate, and complete to the best of my knowledge and belief.

If you have any questions regarding this submittal, please contact me.

Very truly yours,

WESTON & SAMPSON ENGINEERS, INC.

Michael Joyce
Senior Team Leader - Transportation

cc: Wales Conservation Commission
Heidi Davis, MassDEP
Tyler Lewis, MassDEP
Ryan Hale, MassDEP

Courtney Walker, MassDOT
Melissa Lenker, MassDOT
Kimberly Sloan, MassDOT

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 - John Middle - Last - Grasso
Company - Town of Wales
E-mail Address - select@townofwales.net

8. AUTHORIZED AGENT'S NAME AND TITLE (*agent is not required*)
First - Mike Middle - Last - Joyce
Company - Weston & Sampson Engineers
E-mail Address - joyce.michael@wseinc.com

6. APPLICANT'S ADDRESS:
Address- 3 Hollow Road
City - Wales State - MA Zip - 01081 Country - USA

9. AGENT'S ADDRESS:
Address- 273 Dividend Road
City - Rocky Hill State - CT Zip - 06067 Country - USA

7. APPLICANT'S PHONE NOs. with AREA CODE
a. Residence b. Business c. Fax d. Mobile
(413)245-7571 x 100

10. AGENT'S PHONE NOs. with AREA CODE
a. Residence b. Business c. Fax d. Mobile
860-616-6495

STATEMENT OF AUTHORIZATION

11. I hereby authorize, Weston & Sampson 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.

John A. Grasso Jr. — SIGNATURE OF APPLICANT
06.21.24 — DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME or TITLE (*see instructions*)
MassDOT Project 608163 Monson Road Transportation Improvement Project

13. NAME OF WATERBODY, IF KNOWN (*if applicable*)
Vinica Brook and Unnamed

14. PROPOSED ACTIVITY STREET ADDRESS (*if applicable*)
Monson Road
City: Wales State: MA Zip: 01081

15. LOCATION OF PROPOSED ACTIVITY (*see instructions*)
Latitude: 42.058743°N Longitude: –72.244425° °W

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (*see instructions*)

State Tax Parcel ID: Unknown Municipality: Wales

Section: Township: Range:

17. DIRECTIONS TO THE SITE.

From US-20 W/Main St, Turn left onto New Holland Rd, after 0.1 miles turn right onto Haynes Hill Rd, after 0.3 miles turn left onto MA-19 S, after 1.6 miles turn right onto Monson Rd and continue to the intersection of Reed Hill Road for the project area.

18. IDENTIFY THE SPECIFIC GENERAL PERMIT(S) YOU PROPOSE TO USE:

GP 23. Linear Transportation Projects and Wetland/Stream Crossings

19. DESCRIPTION OF PROPOSED GENERAL PERMIT ACTIVITY (*see instructions*)

The project proposes roadway reconstruction of Monson Road including new four-foot-wide shoulders and roadway drainage improvements. The project will also involve upgrades to several of the existing stream crossings along Monson Road, as many of the culverts are undersized.

20. DESCRIPTION OF PROPOSED MITIGATION MEASURES (*see instructions*)

The project proposes to construct two wetland replication areas that will provide mitigation for permanent wetland impacts at a greater than 1:1 ratio. The project also proposes to improve numerous stream crossings. Please refer to the Project Description in Appendix A for additional information.

21. PURPOSE OF GENERAL PERMIT ACTIVITY (*Describe the reason or purpose of the project, see instructions*)

The purpose of the project is to make roadway, shoulder, and drainage improvements to an approximately 1.5-mile stretch of Monson Road. Currently, this section of roadway and associated culvert crossings are in poor condition with aging infrastructure and drainage issues.

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
333 SF (vegetated wetlands)			temporary	sediment controls
891 SF (vegetated wetlands)			permanent	culvert replacements,roadway widening
4,454 SF (streambed/WOTUS)		90 CY (dredge)	permanent	culvert and headwall installation
	783 LF (Bank)		permanent	culvert replacements
194 SF (streambed/WOTUS)			temporary	temporary cofferdams (dewatering)

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*)

N/A

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*)

The proposed project includes the replacement of existing culverts to provide increased passage as well as the construction of wetland replication areas to mitigate for proposed impacts to vegetated wetlands at a greater than 1:1 ratio.

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*)

Northern long-eared bat

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*)

According to the Massachusetts Cultural Resource Information System (MACRIS), three historic properties are present adjacent to the proposed project area. MassDOT Cultural Resources Unit staff have reviewed the project and have determined that the project will have no adverse effect on any National Register listed or eligible properties. See Appendix E for additional information and Section 106 correspondence.

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

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 [X] 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.

Individual 401 WQC - to be filed concurrently with PCN

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*)

See Appendix A project description.

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.

John A. Grasso Jr.	06.21.24	Michael J. Joyce, P.E.	06.26.24
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.

Appendix A

Project Narrative

Pre-Construction Notification Project Narrative
Monson Road Transportation Improvement Project

Introduction

On behalf of the Town of Wales and the Massachusetts Department of Transportation (MassDOT), Weston and Sampson is submitting this Pre-Construction Notification (PCN) for coverage under the U.S. Army Corps of Engineers Massachusetts General Permits for the Monson Road Transportation Improvement Project (the project). This application is being filed pursuant to Section 404 (33 U.S.C. 1344) of the federal Clean Water Act and its implementing regulations; as well as the Massachusetts Clean Water Act (MGL c. 21, § 26-53) for work proposed in Waters of the United States.

The purpose of the project is to make roadway, shoulder, and drainage improvements to an approximately 1.5-mile stretch of Monson Road in Wales. Currently, this section of roadway and associated culvert crossings are in poor condition with aging infrastructure and drainage issues. Stormwater collection does not meet current development standards. The existing culverts are undersized, and overtopping of the roadway occurs during large storms. Additionally, Monson Road in this area is experiencing deteriorating roadway conditions.

The project proposes several roadway improvements including full depth pavement reconstruction, new four-foot-wide shoulders along Monson Road for pedestrian and bicycle use, minor adjustments to the alignment to improve safety, and roadway drainage improvements. The project will also involve upgrades to several of the existing stream crossings along this stretch of Monson Road, as many of the culverts are undersized and do not currently meet the Massachusetts Stream Crossing Standards.

The proposed roadway improvements and stream crossing improvements will result in unavoidable impacts to Waters of the U.S., specifically within Vegetated Wetlands and land below the Ordinary High Water Mark (OHW), also defined and regulated as Bordering Vegetated Wetlands (BVW) and Land Under Water (LUW) under the Massachusetts Wetlands Protection Act (WPA). The project will also result in impacts to Bank associated with the stream crossing work.

The stream crossing work (culvert upgrades and replacements) is subject to Section 24 of the 2014 Transportation Bond Bill (approved 4/18/2014) and is therefore considered "bridge exempt." Accordingly, the proposed stream crossing work is not subject to Section 61 and Sections 62A to 62I, inclusive, of Chapter 30 of General Laws (the Massachusetts Environmental Policy Act), Chapter 91 (Waterways Act) of the General Laws and Section 40 of Chapter 131 of the General Laws (Wetlands Protection Act). For this reason, a Notice of Intent (NOI) has been filed with the Wales Conservation Commission for the roadway work, and a 401 Water Quality Certificate (WQC) application has been filed with the Massachusetts Department of Environmental Protection (MassDEP) for the stream crossing work.

This PCN application includes all of the proposed project activities, and defines proposed impacts to Waters of the United States associated with the whole project.

The project is anticipated to be advertised for construction in August or September of 2024 with the start of construction in Mid-March of 2025. Construction of the project is anticipated to be complete by Fall of 2026.

Additional anticipated permits and regulatory reviews include:

- Massachusetts Environmental Policy Act (MEPA) Environmental Notification Form (ENF) (roadway work)
- Notice of Intent (MA Wetlands Protection Act) – Wales Conservation Commission (roadway work only)
- Massachusetts Endangered Species Act (MESA) (concurrent review with NOI application)
- 401 Water Quality Certification – MassDEP (culvert work only)

Existing Conditions

Monson Road is a two-lane, Rural Major Collector. The Project is approximately 1.5 miles long and is located in the western part of Wales, beginning at the Monson Town line and continuing east just beyond the intersection of Monson Road and Reed Hill Road. The land use within the project route includes paved roadway and associated gravel shoulders, adjacent residential properties, wetlands and undeveloped woodlands. Refer to the locus maps provided in Appendix C for a depiction of the project site.

There are a number of wetland resource areas and stream crossings located adjacent to Monson Road within the project limits, including Vegetated Wetlands, intermittent streams, and perennial streams. A wetland delineation was conducted by Weston & Sampson in October 2023 and March 2024. A wetland delineation report including mapping depicting the limits of the delineated resource areas, along with wetland determination data forms, is included in Appendix G.

Currently the existing site has an open “country” drainage system consisting of stormwater runoff that sheets off the road into undefined swales and wetlands. Cross culverts convey a mix of stormwater runoff from the road and streamflow from overland areas. Roadside sediment deposits block some of the water from sheeting off the road, which causes water to flood the road and damage the road structure. There are also minimal water quality measures. There are nine culvert crossings that convey streams and roadside ditch water under Monson Road. These water courses eventually discharge into Vinica Brook. The existing culverts are undersized, and overtopping of the roadway occurs during large storms.

The existing outfalls are in relatively stable condition; however, adjacent to the outfalls in several areas the existing banks experience significant erosion which is contributing to poor water quality within the immediately adjacent resource areas.

Nine culvert crossings convey streams (unnamed except for the crossing at Sta. 50+72 which is locally known as Dunham Brook or Schoolhouse Brook) under Monson Road from north to south, and there is one culvert crossing at Sta. 55+20 which conveys a perched wet area from south to north. The eight north to south crossings are located at Sta. 15+32, Sta. 24+92, Sta. 43+75, Sta. 46+60, Sta. 50+72, Sta. 55+00, Sta. 82+07, and Sta. 86+00-87+00 (two culverts at this location, one under Monson Road and one under Reed Hill Road). These streams eventually discharge into Vinica Brook. The culverts also convey stormwater discharge from the northern drainage swales to the southern side of Monson Road.

The site is not located within the mapped 100-year floodplain, according to the current FEMA FIRM maps (refer to Figures 3.1 through 3.4 in Appendix C).

There is a discrete area of Priority and Estimated Habitat for Rare Species mapped by the Massachusetts Natural Heritage and Endangered Species Program (NHESP) between Peck Road and Maynard Road (see Figure 4 in Appendix C). The applicant is coordinating with NHESP under the streamlined Massachusetts Endangered Species Act (MESA) review through the NOI filing for the roadway work.

Three of the stream crossings within the project corridor are designated as coldwater fisheries resources by the Massachusetts Division of Fisheries and Wildlife (MADFW) (refer to Figure 4 in Appendix C). None of the streams are mapped as Outstanding Resource Waters. The project site is not located within an Area of Critical Environmental Concern (ACEC).

The proposed work area is not within 0.25 miles up or downstream of the designated main stem of, or in tributaries within 0.25 miles of the designated main stem of a National Wild and Scenic River; in “bordering and contiguous wetlands” that are adjacent to the designated main stem of a National Wild and Scenic River; and does not have the potential to alter flows within a river within the National Wild and Scenic River System including rivers officially designated by Congress as study rivers for possible inclusion while such rivers are in official study status.

The proposed work area is not within any federal lands including National Wildlife Refuges, National Forests, National Marine Sanctuaries, National Parks, or any other areas administered by the National Park Service, U.S. Fish and Wildlife Service, or U.S. Forest Service, and USACE project lands and easements.

Stream Crossings:

There are nine locations where streams cross the proposed project area. Existing conditions information on each stream crossing is provided in Table 1 below. Six of these stream crossings (seven pipes/culverts) are proposed to be replaced due to structural deficiencies and being undersized, as discussed more in the Proposed Conditions section of this narrative.

Table 1. Summary of Existing Stream Crossings

Location (Station)	Existing Culvert	Stream Classification	Existing Bankfull Width
15+32	40 feet of 12-inch corrugated plastic pipe (CPP)	Intermittent	No bankfull indicators. Wetted width 1-2 feet.
24+92	54 feet of 30-inch PVC 49 feet of 36-inch corrugated metal pipe (CMP)	Perennial	11.5 feet
43+75	49 feet of 12-inch CMP	Perennial	No bankfull indicators. Wetted width 1-2 feet.
46+60	41 feet of 12-inch CPP	Perennial	No bankfull indicators Wetted width 1-2 feet
50+72	61 feet of 36-inch PVC lined CMP	Perennial	15.0 feet
55+00	48 feet of 12-inch CMP	Intermittent	No bankfull indicators. Wetted width 2-3 feet upstream and 5-6 feet downstream.
82+07	43 feet of 12-inch CMP	Intermittent	No bankfull indicators. Wetted width 1-2 feet.
86+00 - 87+00	54 feet of 24-inch stone box culvert 108 feet of 24-inch stone box culvert	Intermittent	10.5 feet

The following sections describe the existing conditions at each stream crossing in more detail.

Station 15+32

The westernmost stream crossing located at Station 15+32 is a small drainage swale/intermittent stream that originates northeast of Lynch Road and flows west beneath Lynch Road, and along the north side of Monson Road before crossing south under Monson Road via the culvert. The existing culvert consists of a 12" corrugated plastic pipe (CPP). Bankfull indicators did not exist in the channel at the time of field evaluation. The stream was delineated and is depicted on the plans as bank flag series TOB C, TOB D, TOB BB, and TOB CC.

Station 24+92

The stream crossing at Station 24+92 conveys an unnamed, perennial tributary to Vinica Brook south under Monson Road. The existing crossing consists of a 30" PVC culvert which conveys the unnamed perennial stream and an adjacent 36" CMP relief culvert for storm water whose invert is located 1 ft higher than the perennial stream culvert. The

existing relief culvert is regularly dry with no flow present except for during storm events. The stream was delineated and is depicted on the plans as bank flag series TOB E and TOB F. Bankfull width was measured and determined to be approximately 11.5 feet. The stream is mapped by the Massachusetts Division of Fisheries and Wildlife (MADFW) as a coldwater fisheries resource.

Stations 43+75 and 46+60
The stream crossing located at Station 43+75 consists of an existing 12" CMP culvert which conveys an unnamed perennial stream. This existing culvert is collapsed and due to roadway flooding, the stream has split and diverted its flow path along the north side of Monson Road towards a secondary existing culvert which is a 12" CPP (Station 46+60). Bankfull indicators did not exist in the channel at the time of field evaluation. This stream was delineated and is depicted on the plans as bank flag series TOB I and TOB J. A portion of this stream is located within areas of Priority and Estimated Habitats for Rare Species mapped by the Massachusetts Natural Heritage and Endangered Species Program (NHESP).

Station 50+72
The stream crossing located at Station 50+72 consists of an existing 36" PVC line CMP culvert which conveys an unnamed, perennial tributary to Vinica Brook. Bankfull width was measured to be approximately 15.0 feet. The stream was delineated and is depicted on the plans as bank flag series TOB K and TOB L. The stream is mapped by the MADFW as a coldwater fisheries resource. This culvert is not proposed to be replaced as part of this project.

Station 55+00
The intermittent stream crossing is located just west of Maynard Road. The stream originates in a wetland south of Monson Road and flows north under Monson Road via a 12-inch CMP culvert. The stream was delineated and is depicted on the plans as bank flag series TOB M / TOB N and TOB AA / TOB BB. Bankfull indicators do not exist at this location. The typical wetted width of the channel is approximately 2 to 3 feet upstream and 5 to 6 feet downstream. Stream substrate consisted of mucky material. This stream crossing is not proposed to be replaced.

Station 82+07
The stream crossing at Station 82+07 conveys an unnamed intermittent stream south under Monson Road via a 12-inch CMP. The stream originates from a small farm/residential pond on the north side of Monson Road. The existing culvert is deteriorated and undersized. Bankfull indicators do not exist at this location. Based on observations by SLR Consulting on March 19, 2024 under normal spring flow, the typical wetted width of the channel is 1 to 2 feet, and the depth of the channel is 4 to 6 inches. The stream was delineated and is depicted on the plans as bank flag series TOB CC and TOB DD.

Station 86+00 - 87+00

An unnamed intermittent tributary to Vinica Brook flows south under Monson Road into a small depression at the intersection of Reed Hill Road and then flows under Reed Hill Road. This easternmost stream crossing located at Stations 86+00 through 87+00 consists of two disconnected sections of culvert which convey an unnamed intermittent tributary to Vinica Brook. The upstream culvert is a 24" concrete culvert which travels beneath Monson Road and daylights briefly before entering a second 24" concrete culvert that travels beneath Reed Hill Road. This stream was delineated and is depicted on the plans as flag series TOB KK and TOB LL (on the north side of Monson Road) and flag series TOB EE and TOB FF (on the south side of Monson Road). Bankfull width was measured and is approximately 10.5 feet at this crossing. This stream is mapped by the MADFW as a coldwater fisheries resource.

It is important to note that a small, roadside drainage ditch was also GPS-located on the north side of Monson Road, adjacent to intermittent stream TOB Series KK and TOB Series LL. The ditch is depicted as Series "WET N" on the plans, but was determined to be a non-jurisdictional upgradient intermittent stream channel. The channel receives roadway runoff from Monson Road, which discharges into intermittent stream Series KK/LL. The roadside drainage ditch did not contain wetland vegetation, nor did it contain hydric soils when examined during the delineation. The channel was also dry at the time of the delineation and did not contain any standing water.

The existing stream crossings are also described further in the Maximum Extent Practicable (MEP) Analysis in Appendix I prepared by SLR International on behalf of MassDOT.

Proposed Conditions

Roadway Reconstruction:

The project consists of full depth reconstruction of Monson Road within the project limits and widening of the road from 22 feet to 28 feet (10-foot wide lanes and 4-foot wide shoulders). The 4-foot wide shoulders will allow for safer bicycle and pedestrian use. The project includes sections of bituminous curb and new guardrail with up-to-date terminals for increased safety, proper signage, and new pavement markings. In order to complete the proposed project some tree clearing will be required adjacent to the existing roadway. Limited tree and vegetation removal is proposed within wetland areas, which is being mitigated to the maximum extent practicable with the proposed wetland replication areas, as shown on the plans.

Minor horizontal and vertical alignment changes are proposed to meet the current design standards and improve sight lines. The intersection with Reed Hill Road will be realigned to improve sight lines. Superelevation is also proposed along horizontal curves. Piped roadway drainage systems consisting of catch basins and manholes are proposed to meet the MassDOT drainage design standards and improve the existing drainage conditions.

Drainage swales are proposed in sections where there is no curbing. The swales will have a bottom width of 1 foot and side slopes of 2:1. Three swales will have grass linings, and

three swales will have modified rockfill linings. In total, 57 new catch basins are proposed where no catch basins and closed drainage systems currently exist within the project limits.

Culvert Replacements:

As described above, a number of the existing culverts along the project route exhibit structural deficiencies and many are undersized. A maximum extent practicable alternatives analysis and stream geomorphic assessment were conducted to assess the conditions at each stream crossing and develop proposed solutions for crossing replacements that would improve drainage and meet the Massachusetts Stream Crossing Standards to the maximum extent practicable. The MEP analysis is included in Appendix I.

Of the nine drainage crossings, six of the crossings (seven pipes/culverts) will be replaced with upgraded sizes and/or improved materials, one culvert will be removed, and two culverts will be retained. The proposed culvert replacements are summarized in Table 2 below. The selection of each stream crossing replacement is also discussed in more detail in the Culvert Alternatives Analysis included in Appendix B.

Table 2. Summary of Proposed Culvert Replacements

Location (Station)	Existing Culvert	Proposed Culvert
15+32	40 feet of 12-inch CPP	44 feet of 18-inch RCP
24+92	54 feet of 30-inch PVC 49 feet of 36-inch CMP	31.5 feet of 9-ft 10-inch (W) x 5 feet (H) Concrete Box Culvert embedded two feet below stream with wingwalls, parapets and stream channel creation / restoration with natural streambed material
43+75	49 feet of 12-inch CMP	41 feet of twin 12-inch RCPs
46+60	41 feet of 12-inch CPP	44 feet of 12-inch RCP
82+07	43 feet of 12-inch CMP	43 feet of 18-inch RCP Concrete headwalls and endwalls
86+45	54 feet of 24-inch stone box culvert 108 feet of 24-inch stone box culvert	46.8 feet of 8 feet (W) x 4.5 feet (H) Concrete Box Culvert embedded two feet below stream with wingwalls, parapets and stream channel creation / restoration with natural streambed material

For all of the crossings the design of the replacement culverts was advanced according to and consistent with the MEP analysis (See Appendix I).

The following sections describe the proposed work at each stream crossing location. Please refer to the project plans provided in Appendix K for additional detail.

Station 15+32

Impacts to the intermittent stream at this station will be for the installation of a new culvert and modified rock fill apron to replace the existing 12" CPP. The proposed crossing will consist of an 18" RCP culvert. This work will result in approximately 646 SF of permanent impacts to Waters of the U.S. associated with this watercourse. This culvert replacement will also result in permanent alterations to approximately 265 linear feet (LF) of bank.

Station 24+92

The proposed work at this stream crossing includes the installation of a 9-foot 10-inch wide 5-foot high box culvert which will replace both existing culverts. Both the upstream and downstream headwalls will be removed and replaced with wingwalls. This work will result in approximately 613 SF of permanent impacts to Waters of the U.S., 10 SF of temporary impacts to Waters of the U.S., 41 SF of permanent vegetated wetland impacts, and 9 SF of vegetated wetland impacts. Natural streambed material will be placed to restore the impacted watercourse within the construction limits and the culvert will be submerged 2-feet to allow for the installation of stream bed material. The box culvert installation at this location will also result in permanent alterations to 71 LF of bank.

Station 43+75 and Station 46+60

The intention at this split stream crossing is to restore perennial stream flow to the natural channel location at Station 43+75, which was diverted to Station 46+60 due to pipe failure, to allow for a secondary intermittent stream to remain on the north side of Monson Road to handle excess stormwater. Station 43+70 is being replaced with two 12" class five RCPs given the shallow elevations of the watercourse and related roadway profile. At 46+60, the existing pipe is being replaced with one 12" class five RCP. Modified rock fill aprons will provide permanent outlet protection and reduce sediment that is discharged into the streams at both locations.

Collectively, this work to restore the perennial stream back to its pre-existing configuration which will result in 1,581 square feet of permanent impact to Waters of the U.S., 89 square feet of temporary impacts to Waters of the U.S. (related to sediment control measures), and 289 square feet of permanent impacts to Vegetated Wetlands. While the impact to LUW is fairly high, this diverted perennial watercourse along the northern side of the road didn't exist prior to the failure of the crossing at 43+75. The resulting condition will increase the amount of Waters of the U.S. (streambed) associated with the intermittent stream by approximately 391 square feet. This work will result in 333 LF of permanent impacts to bank.

Station 82+07

The proposed project will replace the culvert with an 18" RCP with modified rock fill at the outlet and new headwalls at both the inlet and outlet. This work will result in approximately 97 SF of permanent alterations to Waters of the U.S., 34 SF of temporary alterations to Waters of the U.S. (from the dewatering activities), 75 SF of permanent alterations to Vegetated Wetlands, and 80 SF of temporary impacts to Vegetated Wetlands (from the

sediment control installation). The culvert replacement will also permanently impact 23 LF of bank.

Station 86+45

The proposed work at this crossing includes consolidating the two existing culverts between Stations 86+00 and 87+00 into a single box culvert at Station 86+45. Specifically, proposed work to this crossing includes relocating the intersection of Reed Hill Road such that only a single culvert will be needed to convey the intermittent stream. The proposed single culvert will be an 8-foot wide x 5-foot high, 47 foot long concrete box. There is currently no headwall on the upstream side, a proposed wingwall will be added. A headwall will also be incorporated into the downstream extent of the culvert as part of the Reed Hill Road relocation. This work will result in approximately 1,517 SF of permanent impacts to Waters of the U.S., 248 SF of permanent impacts to Vegetated Wetlands, and 110 SF of temporary impacts to Vegetated Wetlands. The stream crossing work at this station will also result in 91 LF of permanent impacts to bank.

Stormwater Management:

As a redevelopment project, the proposed project has been designed to meet the Massachusetts Stormwater Management Standards to the maximum extent practicable.

The proposed roadway improvements include roadway widening, roadway curbing, and super elevating sections of the roadway, which results in significant drainage revisions. Piped roadway drainage systems consisting of catch basins and manholes are proposed to meet the MassDOT drainage design standards and improve the existing drainage conditions. Approximately 0.88 acres of increase in impervious surface (pavement) is proposed as part of the project. The watershed areas remain consistent with the existing drainage patterns, as only slight modifications to the existing vertical and horizontal alignments are proposed.

Drainage swales are proposed in sections where there is no curbing. The swales will have a bottom width of 1 foot and side slopes of 2:1. Three swales will have grass linings, and three swales will have modified rockfill linings. In total, 57 new catch basins are proposed where no catch basins and closed drainage systems currently exist within the project limits.

Seven closed storm sewer systems are proposed along Monson Road. These systems will outfall near the existing cross culverts or proposed drainage swales. Modified rockfill aprons are proposed at outlets that do not directly discharge into the outlet protection for the culverts.

Of the nine drainage crossings, six of the crossings (seven pipes/culverts) will be replaced with upgraded sizes and/or improved materials, one culvert will be removed, and two culverts will be retained.

Please refer to the Stormwater Management Report in Appendix J for additional information.

Construction Access and Sequencing:

During construction, Monson Road will remain open to traffic at all times since there is no convenient detour route available for traffic. The majority of the roadway and drainage work can be constructed while maintaining two-way traffic. However, at the two larger box culvert crossings, staged construction and alternating one-way traffic through the use of temporary traffic signalization will be required. Detailed staged construction and temporary control of water plans have been provided with the permit documents.

Dewatering is not anticipated as part of the roadway work, but will be required for the stream crossing activities/culvert replacements. To facilitate the culvert replacement work, flow will be diverted through cofferdams and a temporary pipe downstream, and cofferdams and pumping will be used to dewater the excavation areas. All dewatering and related earthwork shall be conducted in such a manner as to prevent siltation or contamination of the waterway. The pumping discharge shall not be allowed to enter directly into the waterway. The water from the work areas shall be pumped to a settling tank before discharging into the bypass pipe. The tank shall be constructed so as to allow for the pumped water to pass through the tank with sediments settling out before outletting to an area enclosed by hay bales. Please refer to the Water Control plan sheets in the Project Plans in Appendix K (Plan Sheets 178 and 179) for additional detail regarding dewatering.

The means and methods of construction for this project will involve the use of various heavy equipment to ensure efficient and effective execution of the roadway improvements. Key equipment that will be utilized includes excavators for full-depth road reconstruction and the culvert replacements, bulldozers for grading and earthmoving activities, and graders to achieve precise grading for the roadway base and shoulder construction. Paving machines will be used for the application of new bituminous pavement, and rollers will compact the new pavement and subgrade materials.

Backhoes will be employed for trenching and drainage system installation, while dump trucks will transport materials such as gravel, asphalt, and excavation debris. Chainsaws and wood chippers will be used for tree and vegetation removal, and concrete mixers will be used for constructing the bituminous curb and other concrete elements. A crane or large excavator will be used for installing new guardrails and other heavy precast components, and hydroseeding equipment will be used for applying grass linings in drainage swales. Construction activities will be staged to minimize disruption to traffic and ensure safety. Traffic control measures will be implemented as necessary, including temporary signage, barriers, and flagging operations.

No long-term on-site stockpiling is planned as part of the proposed project. Materials will be brought in and taken from site on a daily basis. Short term stockpiling of materials immediately adjacent to the specific work area will be required at times.

Construction of the project is anticipated to begin in Spring of 2025 and is anticipated to continue through the Fall of 2026.

Proposed Impacts to Vegetated Wetlands and Waters of the U.S.

The project has been designed to avoid and minimize impacts to Waters of the U.S. to the maximum extent practicable through the project design including use of steeper slopes, minimizing the roadway width to the extent practicable, and placement of project features where possible to avoid fill or impacts in wetlands. The roadway design of 10-foot travel lanes and 4-foot shoulders was ultimately selected as it meets the design criteria and project goals, while limiting the increase in impervious area. Additionally, structural best management practices (BMPs) including deep sump catch basins have been incorporated into the stormwater design to reduce roadway erosion while improving stormwater quality.

Please refer to the alternatives analysis in Appendix B for additional detail regarding how this alternative was selected to balance the project purpose while minimizing impacts to Waters of the U.S.

This project proposes a total of approximately 4,454 SF of permanent impacts to Waters of the U.S. within intermittent and perennial streams, and 891 SF of permanent impacts to Vegetated Wetlands. The project will also result in 194 SF of temporary impacts to Waters of the U.S., and 333 SF of temporary impacts to Vegetated Wetlands.

The proposed permanent impacts to Waters of the U.S. are associated with the culvert replacements and associated headwall and rip rap apron installations. The proposed impacts to Vegetated Wetlands are associated with facilitating the culvert replacement work and the roadway reconstruction and widening. The proposed impacts to Waters of the U.S. are summarized below in Table 3.

Table 3. Summary of Proposed Impacts to Waters of the U.S.

Location (Approximate Station)	Proposed Activity	Vegetated Wetland Impact (SF)	Bank Impact (LF)	Waters of the U.S. Impact (SF)
15+32	Installation of a new culvert and modified rock fill apron	0 SF	265 LF (permanent)	646 SF (permanent)
24+92	Box culvert installation which will replace both existing culverts. Both the upstream and downstream headwalls will be removed and replaced with wingwalls	41 SF (permanent), 9 SF (temporary)	71 LF (permanent)	613 SF (permanent), 10 SF (temporary)

43+75 and 46+60	Culvert replacement, modified rockfill apron, temporary cofferdam	289 SF (permanent)	333 LF (permanent)	1,581 SF (permanent), 89 SF (temporary)
57+00	Stonewall relocation to accommodate roadway improvements; sediment control installation	217 SF (permanent), 74 SF (temporary)	0 LF	0 SF
58+00	Sediment control installation	6 SF (temporary)	0 LF	0 SF
82+07	Culvert replacement with modified rock fill at the outlet and new headwalls at both the inlet and outlet	75 SF (permanent), 80 SF (temporary)	23 LF (permanent)	97 SF (permanent), 34 SF (temporary
82+50	Roadway widening; sediment control installation	21 SF (permanent), 54 SF (temporary)	0 LF	0 SF
86+45	Box culvert installation, temporary cofferdam	248 SF (permanent), 110 SF (temporary)	91 LF (permanent)	1,517 SF (permanent) 61 SF (temporary)
CUMULATIVE		**891 SF (permanent), 333 SF (temporary)**	**783 LF (permanent)**	**4,454 SF (permanent), 194 SF (temporary)**

The proposed culvert crossing at Station 86+45 will result in the creation of new streambed within the new proposed box culvert. The proposed concrete box culvert will have 2 feet of natural streambed material placed within it. The streambed material will be a continuation of the material incorporated into the design of the resulting new upstream and downstream channels which will transition to the existing bankfull width dimensions, provide low flow channel features and significantly increase the area of new streambed (Waters of the U.S.) associated with this watercourse. This will result in the addition of approximately 1,500 SF of new/additional streambed/Waters of the U.S. at this crossing.

Because the project will result in over 200 linear feet of impacts to bank associated with the stream crossing improvements, MassDOT plans to conduct a Stream Visual Assessment Protocol. This assessment protocol provides a basic level of stream health evaluation.

The culvert replacement work will also result in dredging below the OHW within Waters of the U.S. at some of the stream crossing locations, which is quantified below in Table 4.

Table 4. Summary of Proposed Dredge Below Ordinary High Water (Stream Crossing Work)

Location (Station)	Waterbody Type	Total Impact (SF)	Total Dredge (CY)
15+32	Intermittent	502	1
24+92	Perennial	613	16
82+07	Intermittent	173	3
86+00 - 87+00	Intermittent	1,517	70
CUMULATIVE		2,805 SF	90 CY

The roadway improvements will also result in impacts to Vegetated Wetlands and Waters of the U.S. The roadway work will result in 238 SF of permanent alterations to Vegetated Wetlands. Specifically, approximately 21 SF of vegetated wetland impacts are proposed near Station 82+50 as a result of roadway widening, and approximately 217 SF of impacts are proposed near Station 57+00 as a result of relocating a stone wall to accommodate the roadway improvements. The roadway work will also result in 134 SF of temporary impacts to Vegetated Wetlands as a result of sediment control installation at the limits of work. The proposed impacts to these wetlands associated with the roadway improvements are summarized in Table 5 below.

Table 5. Summary of Impacts to Vegetated Wetlands associated with the Roadway Improvements

Location (Approximate Station)	Permanent Impact (SF)	Temporary Impact (SF)	Total Impact (SF)
57+00	217	74	291
58+00	0	6	6
82+07	21	54	75
CUMULATIVE	238	134	372

The proposed roadway improvements will result in the above impacts to Vegetated Wetlands, but will not impact waterways. Impacts to waterways are associated with the stream crossing activities only, described above.

Mitigation

The proposed project has been designed to minimize impacts to resource areas to the maximum extent practicable by utilizing more narrow culvert crossings wherever possible and by reducing the amount of impervious surface being added to the roadway to the extent practicable. The roadway design includes 10-foot travel lanes and 4-foot shoulders. This required a design criteria exception to provide the 4-foot shoulders instead of 5-foot

bikes lanes/shoulders or 5-foot buffered bike lanes/shoulders, which most MassDOT projects must provide in accordance with MassDOT's complete streets requirements. This limited the widening of the road to 28 feet wide instead of 30 feet or 34 feet.

The proposed impacts to Vegetated Wetlands will be mitigated through the construction of two wetland replication areas, one 217 SF replication area and one 1,204 SF replication area. The mitigation areas have been designed to provide significantly greater than 1:1 mitigation for the proposed permanent vegetated wetland impacts.

A planting schedule for the 1,204 SF wetland replication area initially depicted on Sheet 21 is provided on the Wetland Replication Area Detail plan (Sheet 180) in the plans in Appendix K. Proposed plantings include highbush blueberry (*Vaccinium corymbosum*), winterberry (*Ilex verticillata*), cinnamon fern (*Osmunda cinnamomea*), sensitive fern (*Onoclea sensibilis*), and a native wetland seed mix. The smaller 217 SF wetland replication area on Sheet 16 references the same native wetland seed mix indicated on Sheet 180 to be used for this small replication area.

Proposed temporary impacts areas within Vegetated Wetlands will be restored in situ after construction from the removal of sediment controls and restoration of these areas to pre-existing grades.

Additionally, the easternmost stream crossing will result in creation of additional streambed (Waters of the U.S.). The proposed culvert replacement will more naturally align the stream and resulting channel and will place natural streambed material within the new box culvert crossing. The streambed material will be a continuation of the material incorporated into the design of the resulting upstream and downstream channels which will transition to the existing bankfull width dimensions, provide low flow channel features and significantly increase the area of new land under water associated with this watercourse.

The project also proposes to plant 53 shade trees along the roadway corridor to provide additional mitigation for the roadway widening work. A summary of the proposed species is provided in Table 6 below. Please refer to the project plans in Appendix K for specific planting locations.

Table 6. Summary of Proposed Shade Tree Plantings along the Project Corridor

Scientific Name	Common Name	Caliper	Container	Remarks
Cercis canadensis	Eastern Redbud	2-2.5”	B&B	Single-stem
Amelanchier x grandiflora	Serviceberry	2-2.5”	B&B	Single-stem
Ulmus americana	American Elm	2-2.5”	B&B	

Additional mitigation proposed seeks to address roadside erosion. The existing roadway has significant sediment deposits and ponded areas. Pavement unraveling has led to erosion at the edge of the pavement. Curbing the proposed roadway will significantly reduce the erosion potential at the edge of the pavement and from adjacent properties. Sediment from the roadway runoff will be trapped in the 4-foot sumps of the proposed catch basins. Natural turf will be established within the graded areas adjacent to the roadway.

Under existing conditions many areas within the limit of work are experiencing significant roadside erosion which is entering adjacent wetland resource areas. The proposed project has been designed for anticipated flows with alterations to the overall grade of the roadway and the addition of closed drainage throughout the corridor. This drainage includes 57 new deep sump catch basins and approximately 3,500 linear feet (LF) of new pipe to support the closed drainage. All discharges adjacent to wetland resources include preformed scour holes to reduce unwanted erosion.

Sediment controls (compost filter tubes or similar) will be installed between the limits of work and adjacent wetlands to protect them during construction. Sediment controls are depicted on the project plans provided in Appendix K.

Coverage under the Massachusetts General Permits

Based on the proposed scope of work and impacts to Waters of the U.S., it is anticipated that the proposed project will utilize General Permit (GP) 23 for Linear Transportation Projects and Wetland/Stream Crossings.

A PCN is required for the project under GP 23, because the following conditions apply:

1. In non-tidal waters, the combined permanent and temporary impacts are:
   a) >5,000 SF;
   c) do not meet the Massachusetts River and Stream Crossing Standards.

Compliance with the applicable general conditions in the Massachusetts General Permits is described below.

Section IV. General Conditions: 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-streamcrossing-standards/download or https://www.nae.usace.army.mil/Missions/Regulatory/StateGeneral-Permits/Massachusetts-General-Permit/. Projects that do not conform to these guidelines shall be reviewed under PCN or IP procedures.

The proposed stream crossing replacements proposed as part of this project meet the stream crossing standards to the maximum extent practicable, as described in the section below.

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.

The proposed replacement culverts are generally larger than existing conditions in order to prevent the restriction of high flows and allow for movement of aquatic life. The proposed culverts do not seek to change low flow conditions and the proposed culvert inlets have been designed to match existing conditions, except at the 24+92 and 86+45 proposed box culvert locations. At these two locations, the proposed box culvert will be submerged to receive the placement of two feet of natural streambed material and the channel/culvert crossing section design includes provisions for accommodating low flow conditions. See plans and the maximum extent practicable (MEP) alternatives analysis provided in Appendix I.

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.

As indicated above, the proposed replacement culverts are generally larger than existing conditions in order to prevent the restriction of high flows and allow for movement of aquatic life. The proposed culverts do not seek to change low flow conditions and the proposed culvert inlets have been designed to match existing conditions, except at the Sta. 24+92 and 86+45 proposed box culvert locations. At these two locations, the proposed box culvert will be submerged to receive the placement of two feet of natural streambed material and the channel/culvert crossing section design includes provisions for accommodating low flow conditions. See plans and the maximum extent practicable (MEP) alternatives analysis provided in Appendix I.

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.

Natural mixed grain-size streambed material will be utilized where possible and especially at the culvert crossings at Sta. 24+92 and 86+45. See plans and the maximum extent practicable (MEP) alternatives analysis provided in Appendix I.

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.

No work is proposed in flowing water. Diversion pumping and bypass piping will be utilized to maintain flow during construction.

Compliance with Massachusetts Stream Crossing Standards

The project has been designed to meet the stream crossing standards to the maximum extent practicable. Compliance with the stream crossing standards is discussed below. Please refer to the MEP Analysis in Appendix I for additional information about the stream crossing design that was selected for each crossing.

1. Type of Crossing – Spans (bridges, 3-sided box culverts, open-bottom culverts or arches) are strongly preferred.

   The two proposed box culverts at Stations 24+92 and 86+45 will be four-sided box culverts for ease of installation, but will have natural streambed material placed along the bottom of the culvert to mimic an open bottom crossing. Thus, this standard is being met to the maximum extent practicable.

   Relative to the rest of the proposed crossings at Stations 15+32, 43+75, 46+60, and 82+07, these crossings will be replaced with 12" and 18" RCPs, as described in Table 2 above. Open bottom culverts are not feasible at these locations given site constraints and the intermittent nature of the stream crossings. Additionally, the replacement pipes will not be anticipated to have an effect on wildlife habitat, nor will they create habitat fragmentation since the channels are too small to have instream habitat. Wildlife in this area would be anticipated to cross the road.

2. Embedment – All culverts should be embedded (sunk into stream) a minimum of 2 feet, and round pipe culverts at least 25%. When embedment material includes elements >15 inches in diameter, embedment depths should be at least twice the D_{84} (particle width larger than 84% of particles) of the embedment material.

   The two proposed box culverts will have 2-foot embedment.

   Relative to the rest of the proposed crossings at Stations 15+32, 43+75, 46+60, and 82+07, these crossings will be replaced with 12" and 18" RCPs. Due to the fact that no bankfull width indicators were observed at these crossings, the crossings have been designed to improve hydraulic capacity. It is not feasible to achieve 25% embedment with pipes of this small size.

3. Crossing Span – Spans channel width (a minimum of 1.2 times the bankfull width of the stream).

This standard is met to the maximum extent practicable.

For the crossings at Stations 24+92 and 86+45, meeting the 1.2 bankfull standard was considered, but was determined to be cost and timeline-prohibitive.

Therefore, a concrete box with a span of 9-ft 10-inches and rise of 5.0 feet with 2 feet embedment (0.85 x bankfull width) is proposed at Station 24+92, which will have many benefits of a 1.2 bankfull structure such as passing sediment, large wood, and the design flood, yet at a reduced cost.

At Station 86+45, a single concrete box with a width of 8 feet (0.8 x bankfull channel width) is proposed. The proposed stream crossing will only cross Monson Road and replace the existing pair of culverts. The proposed alignment will allow for shortening of the crossing by daylighting approximately 100 LF of the channel upstream and approximately 80 LF of the channel downstream. This will reduce the size, costs, and impacts of the proposed structure. This proposed structure will have many benefits of a 1.2 bankfull structure such as transport of sediment and large wood at a reduced cost.

Enlarging the structures at Stations 24+92 and 86+45 to approximately 0.9 times the bankfull channel width achieves many of the benefits of a larger crossing structure. Flood conveyance, sediment transport, and large wood movement will all be improved. Fish passage will be restored, and small mammals will be able to pass through the structures during low flows.

Some of the stream crossings, including those at Stations 15+32, 43+75, 46+60, and 82+07 did not exhibit strong bankfull indicators. For this reason, the proposed replacement crossings at Stations 15+32, 43+75 and 46+60 have been designed to pass the design flow through the structures. At the proposed crossing at Station 82+07, the typical wetted channel width of the channel was observed to be between 12-24 inches and the depth of the channel is 4 to 6 inches based on observations made by SLR Consulting on March 19, 2024 under normal spring flow. To meet the stream crossing standards at this location, the proposed structure was sized based on the required hydraulic capacity to convey the design flood.

4. Openness - Openness ratio (cross-sectional area/crossing length) of at least 0.82 feet (0.25 meters). The crossing should be wide and high relative to its length.

The proposed box culvert at Station 24+92 will exceed the required openness ratio, as the proposed culvert has an openness ratio of 0.93 feet.

The proposed box culvert at Station 86+45 meets this standard to the maximum extent practicable, but ultimately could not achieve the 0.82-foot openness ratio. Several alternative alignments were evaluated for this crossing, given the skewed alignment of the channel and multiple pipe configuration of the existing crossings.

Initially the original watercourse inlet to outlet alignment was evaluated for the new culvert. However, given the skew angle and length of culvert needed to cross the realigned intersection, to meet a maximum span width no longer than 10', the resulting culvert opening width would be approximately 6' and well below the recommended width in the original MEP analysis. The extended length of the culvert would also negatively reduce the openness ratio.

A second alignment analysis pursued a more perpendicular crossing of Monson Road to achieve a culvert span just under 10' in length. While possible, this alternative created several sharp turns in the realigned channel both upstream and downstream of the culvert crossing which were deemed undesirable and inconsistent with the stream crossing standards, and furthermore would have increased wetland impacts and right-of-way impacts to private properties.

The third and preferred alignment for the crossing at Station 86+45 represents a balance of the two previous alternatives which strives to properly and more naturally align the stream and resulting channel trough the culvert, maximize the culvert opening width to 8', and reduce the culvert length as much as possible to maximize the resulting openness ratio. The outcome advances the design of the proposed 8' wide x 4.5' high concrete box culvert with 2' of natural streambed material placed within it. The streambed material will be a continuation of the material incorporated into the design of the resulting upstream and downstream channels which will transition to the existing bankfull width dimensions, provide low flow channel features and significantly increase the area of new land under water associated with this watercourse. Therefore, the openness ratio at Station 86+45 has been maximized to the extent practicable, based on site conditions.

Relative to the rest of the proposed crossings at Stations 15+32, 43+75, 46+60, and 82+07, these crossings will be replaced with 12" and 18" RCPs. Due to the fact that no bankfull width indicators were observed at these crossings, meet the stream crossing standards at this location, the crossings have been designed to improve hydraulic capacity.

5. **Substrate - Natural bottom substrate should be used within the crossing and it should match the upstream and downstream substrates. The substrate and design should resist displacement during floods and maintain an appropriate bottom during normal flows.**

   The two proposed box culverts will contain 2 feet of natural streambed material.

   Relative to the rest of the proposed crossings at Stations 15+32, 43+75, 46+60, and 82+07, these crossings will be replaced with 12" and 18" RCPs. Due to the size of the replacement pipes, natural bottom substrate is not proposed. The replacement pipes will not be anticipated to have an effect on habitat, nor will they

create habitat fragmentation since the channels are too small to have instream habitat. Wildlife in this area would be anticipated to cross the road.

6. Water Depth and Velocity - Water depths and velocities are comparable to those found in the natural channel at a variety of flows.

   Water depth and velocity at each stream crossing location will be comparable to those found in the natural channels. The culvert crossings have been designed to match the existing gradient of the watercourses between upstream and downstream.

Historic Resources

According to the Massachusetts Cultural Resource Information System (MACRIS), three historic properties are present adjacent to the proposed project area. MassDOT Cultural Resources Unit staff have reviewed the project under the terms of the 2004 Massachusetts Statewide Programmatic Agreement for Section 106 of the National Historic Preservation Act of 1966, and have determined that the project will have no adverse effect on any National Register listed or eligible properties.

MassDOT's Archaeologist found that the site has low archaeological sensitivity, likely as a result of past roadway, utility, and drainage construction, unfavorable conditions (slope and wetlands), and roadside development.

A copy of the Section 106 consultation information is included in Appendix E.

Rare Species

A portion of the proposed roadway work is located within NHESP-mapped Estimated Habitats of Rare Wildlife and Priority Habitats of Rare Species. As part of this proposed project, a Massachusetts Endangered Species Act (MESA) determination was previously sought and a determination was issued on February 9, 2018 which indicated that the project would not result in a prohibited Take of state-listed rare species. Since the previous submission, plans have changed and the previous determination has expired. As a result, the applicant will coordinate with NHESP through the streamlined MESA review process in conjunction with the Notice of Intent filing.

The U.S. Fish and Wildlife Service (USFWS) has developed the online Information for Planning and Consultation (IPaC) tool to help streamline the Section 7 consultation process under the Endangered Species Act of 1973 (ESA).

MassDOT conducted the Section 7 consultation and the USFWS issued a "may affect, but not likely to adversely affect" (NLAA) determination for the federally endangered Indiana bat (*Myotis sodalis*) and the federally endangered northern long-eared bat (*Myotis septentrionalis*). Because the USFWS did not notify the federal action agency or representative within 14 days of issuance of this determination, the applicant is allowed to

proceed with the proposed action under the terms of the NLAA concurrence provided in the Programmatic Biological Opinion.

A copy of this correspondence is included in Appendix F of this submission.

The proposed project will not include any critical habitat proposed and designated by NOAA Fisheries based on the NOAA Fisheries National Endangered Species Act (ESA) Critical Habitat Mapper.

Conclusion

Weston and Sampson is submitting this Pre-Construction Notification on behalf of the Town of Wales and MassDOT for the Monson Road Transportation Improvement Project. The purpose of the project is to make roadway, shoulder, and drainage improvements to an approximately 1.5-mile stretch of Monson Road. Currently, this section of roadway and associated culvert crossings are in poor condition with aging infrastructure and drainage issues. Stormwater collection does not meet current development standards. The existing culverts are undersized, and overtopping of the roadway occurs during large storms. Additionally, Monson Road in this area is experiencing deteriorating roadway conditions.

The proposed project will improve drainage conditions and provide for a safer roadway while also minimizing wetlands and waterways impacts to the maximum extent practicable. Mitigation has been provided for unavoidable impacts. Therefore, the applicant respectfully requests that the United States Army Corps of Engineers find these measures adequately protective of the interests identified in the Massachusetts General Permit and issue a Pre-Construction Notification approving the work shown on the accompanying plan set.

Appendix B

Alternatives Analysis

Culvert Alternatives Analysis

Weston & Sampson completed an alternatives analysis for the proposed culvert replacement associated with the Monson Road Transportation Improvements project in the Town of Wales, Massachusetts.

Alternatives considered for culvert sizing were based on the MEP analysis provided in Appendix I.

SUMMARY OF ALTERNATIVES CONSIDERED FOR THE PROJECT CULVERTS

The development of the proposed plan took into account the following alternatives:

- No Action Alternative.
- Replace In Kind
- Replace With Stream Crossing Compliant Culverts
- MEP Recommended Culvert Alternatives

No Action Alternative

The no action alternative was reviewed during the initial stages of the project development. This alternative would leave the roadways and culverts in poor condition with aging infrastructure and drainage problems. This proposed alternative would have no direct impact on wetland resource areas however, there would also be no improvement upon existing conditions. This proposed alternative does not meet the purpose or need for the project which is why it was not considered further.

Replace In Kind

Originally the project only recommended direct replacement of in kind structures in relation to hydraulic capacity. However, as the project evolved through coordination with MassDOT environmental review applicability of stream crossing standards were analyzed. Subsequently, an MEP analysis (provided in Appendix I) was prepared which identified the available alternatives for the culvert replacements in relation to the stream crossing standards.

Replace With Stream Crossing Compliant Culverts

According to stream crossing standards the optimal culvert sizing should be 1.2 times bankfull width of the existing natural stream conditions. For this project three of the seven existing crossings had defined bankfull characteristics and a more detailed alternatives assessment of these locations was performed (See Appendix I). At these locations the following bankfull width requirements were measured.

- Crossing at 24+92: Bankfull Width 11.5 feet. 1.2x Bankfull Width: 13.8 feet
- Crossing at 50+72: Bankfull Width 15 feet. 1.2x Bankfull Width: 18 feet
- Crossing at 86+45: Bankfull Width 10.5 feet. 1.2x Bankfull Width: 12.6 feet

As indicated above, the culvert crossings would require structures with spans greater than 10 feet in length, as defined in MassDOT's Bridge Manual. However, due to schedule and funding limitations, only culvert crossings that could be justified to be less than 10 feet in length under the MEP analysis were assessed and designed. This approach identified two crossings which would be replaced with culverts with spans less than 10' in length (station 24+92 and 86+45) and one crossing which would not be replaced (50+72) which could not be justified under the MEP analysis to be less than 10 feet.

MEP Recommended Culvert Alternatives

For all of the crossings the design of the replacement culverts were advanced according to and consistent with the MEP analysis (See Appendix I). For the culvert crossing at station 86+45 several alternative alignments were evaluated given the skewed alignment of the channel and multiple pipe configuration.

Initially the original watercourse inlet to outlet alignment was evaluated for the new culvert. However, given the skew angle and length of culvert needed to cross the realigned intersection, to meet a maximum span width no longer than 10' (measured along the direction of travel of Monson Road), the resulting culvert opening width would be approximately 6' and well below the recommended width in the original MEP analysis. The extended length of the culvert would also negatively reduce the openness ratio.

A second alignment analysis pursued a more perpendicular crossing of Monson Road to achieve a culvert span just under 10' in length. While possible, this alternative created several sharp turns in the realigned channel both upstream and downsteam of the culvert crossing which were deemed undesirable and inconsistent with the stream crossing standards, and furthermore would have increased wetland impacts and right-of-way impacts to private properties.

The third and preferred alignment, represents a balance of the two previous alternatives which strives to properly and more naturally align the stream and resulting channel trough the culvert, maximize the culvert opening width to 8', and reduce the culvert length as much as possible to maximize the resulting openness ratio. The outcome advances the design of the proposed 8' wide x 4.5' high concrete box culvert with 2' of natural streambed material placed within it. The streambed material will be a continuation of the material incorporated into the design of the resulting upstream and downstream channels which will transition to the existing bankfull width dimensions, provide low flow channel features and significantly increase the area of new land under water associated with this watercourse.

Roadway Alternatives Analysis

Weston & Sampson completed an alternatives analysis for Monson Road Transportation Improvements project in the Town of Wales, Massachusetts. The following information is presented below:

- Summary of Proposed Improvements
- Summary of Alternatives Considered for the Project

SUMMARY OF PROPOSED IMPROVEMENTS

The proposed project is a full depth reconstruction of Monson Road, which includes widening the roadway, intersection improvements, and drainage improvements. The proposed project will include addition of curbing and piped drainage systems to alleviate flooding and improve water quality within the project site.

The proposed plan includes the following elements:

- Reconstruct roadway (2 lanes; 10-foot wide lanes with 4-foot wide shoulders).
- Improve site lines with minor horizontal and vertical alignment changes.
- Add superelevation to curves.
- Install deep sump catch basins.
- Replace six (6) stream crossings (seven pipe/culvert replacements).
- Maintain erosion and sedimentation control measures throughout the project.

Drawings of the proposed project are included with the Pre-Construction Notification Application (See Appendix K). The proposed activities are improvements over existing conditions. Curbing sections of the proposed roadway, providing deep sump catch basins will reduce the amount of suspended solids in the stormwater discharge.

SUMMARY OF ALTERNATIVES CONSIDERED FOR THE PROJECT

The development of the proposed plan took into account the following alternatives:

- No action alternative.
- Road reconstruction with open drainage system.
- Road reconstruction with 32' wide roadway with closed drainage system.
- Road reconstruction with 28' wide roadway with open and closed drainage systems.

No Action Alternative

The no action alternative was reviewed during the initial stages of the project development. This alternative would leave the roadways and culverts in poor condition with aging infrastructure and drainage problems. Stormwater collection would not meet current development standards. This proposed alternative would have no direct impact on wetland resource areas however, there would also be no improvement upon existing conditions. This proposed alternative does not meet the purpose or need for the project which is why it was not considered further.

Road Reconstruction (Open Drainage System)

The existing conditions of Monson Road include stormwater that sheets off the road into undefined swales and wetlands. Maintaining the open drainage system was considered to reduce the cost of the installation of a piped system. The channels by themselves do not provide water quality treatment. Sediment forebays or equivalent Best Management Practices (BMPs) are required to be constructed with drainage channels to count toward stormwater treatment. Constructing these BMPs would require a sizeable amount of space, and potential property takes. Excavating defined channels would have increased wetland impacts comparable to the 28' wide roadway reconstruction alternative due to the property takes which would be necessary. This lateral expansion would move impacts further into adjacent wetland resources. This proposed alternative would also not result in an improvement over existing conditions which does not meet the riverfront area redevelopment performance standards.

Road Reconstruction (32' wide)

A roadway with 11' travel lanes and 5' wide shoulders (32' wide) was considered to meet the design criteria and improve pedestrian and bicycle accommodations. A closed drainage system with curbing was considered in this alternative along with replacing culverts and end walls. Widening the road from 22' to 32' would increase impervious cover, which would increase stormwater flow. Removing open drainage swales would reduce sedimentation into wetlands however this alternative would have increased wetland impacts comparable to the 28' wide roadway reconstruction alternative due to the property takes which would be necessary. This lateral expansion would move impacts further into adjacent wetland resources.

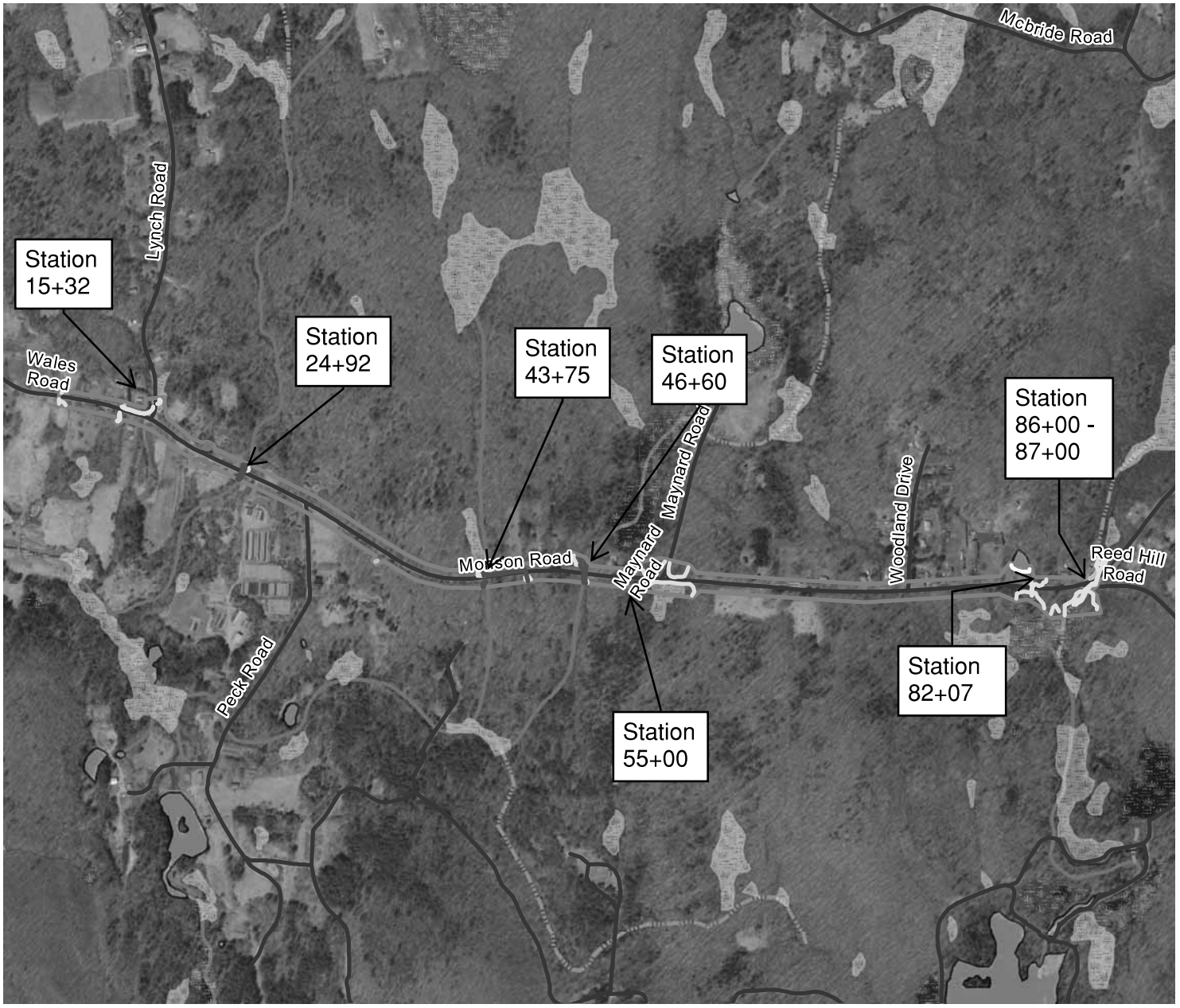
Road Reconstruction (28' wide)

A roadway with 10' travel lanes and 4' wide shoulders (28' wide) was considered to meet the design criteria while limiting the increase in impervious area. This alternative would mainly include a closed drainage system with deep sump catch basins. This alternative would also include replacing culverts and replacing end walls. Wetland impacts are the smallest with this proposed alterative as the lateral expansion is conservative. This options also reduces sedimentation from existing erosion into wetland resources resulting in and overall improvement over existing conditions.

The 28' wide roadway alternative was chosen because this alternative meets the design standards with the smallest increase in impervious area. This alternative also includes structural BMPs including deep sump catch basins. This alternative will reduce erosion of the road while improving stormwater quality.

Appendix C

Site Maps



Legend

- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.1

MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

Path: \\wse03.local\WSE\Projects\MA\Wales, MA\2170841 Monson Rd Reconstruction\Permits\Wetland Delineation 2023\GIS\Maps\Wetland Flags 1.2.mxd User: Herrick.Devin Saved: 4/15/2024 3:59:52 AM Opened: 4/15/2024 4:00:36 AM

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.2

MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

Path: \\wse03.local\WSE\Projects\MA\Wales, MA\2170841 Monson Rd Reconstruction\Permits\Wetland Delineation 2023\GIS\Maps\Wetland Flags 1.3.mxd User: Herrick.Devin Saved: 4/15/2024 4:01:11 AM Opened: 4/15/2024 4:01:40 AM

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.3

MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.4

MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.5

MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

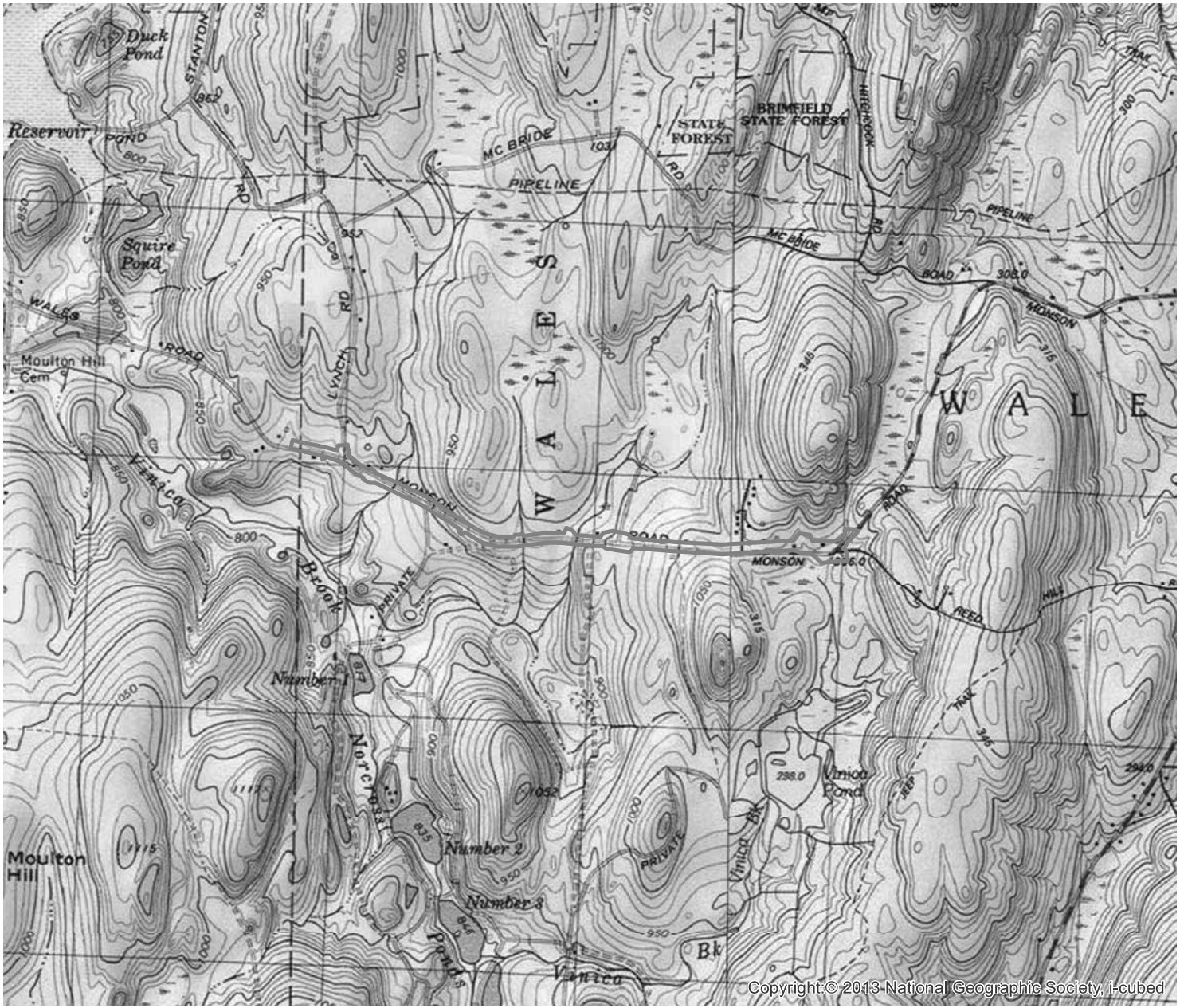
- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.6

MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson



N
W E
S

1,000 500 0 1,000
Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

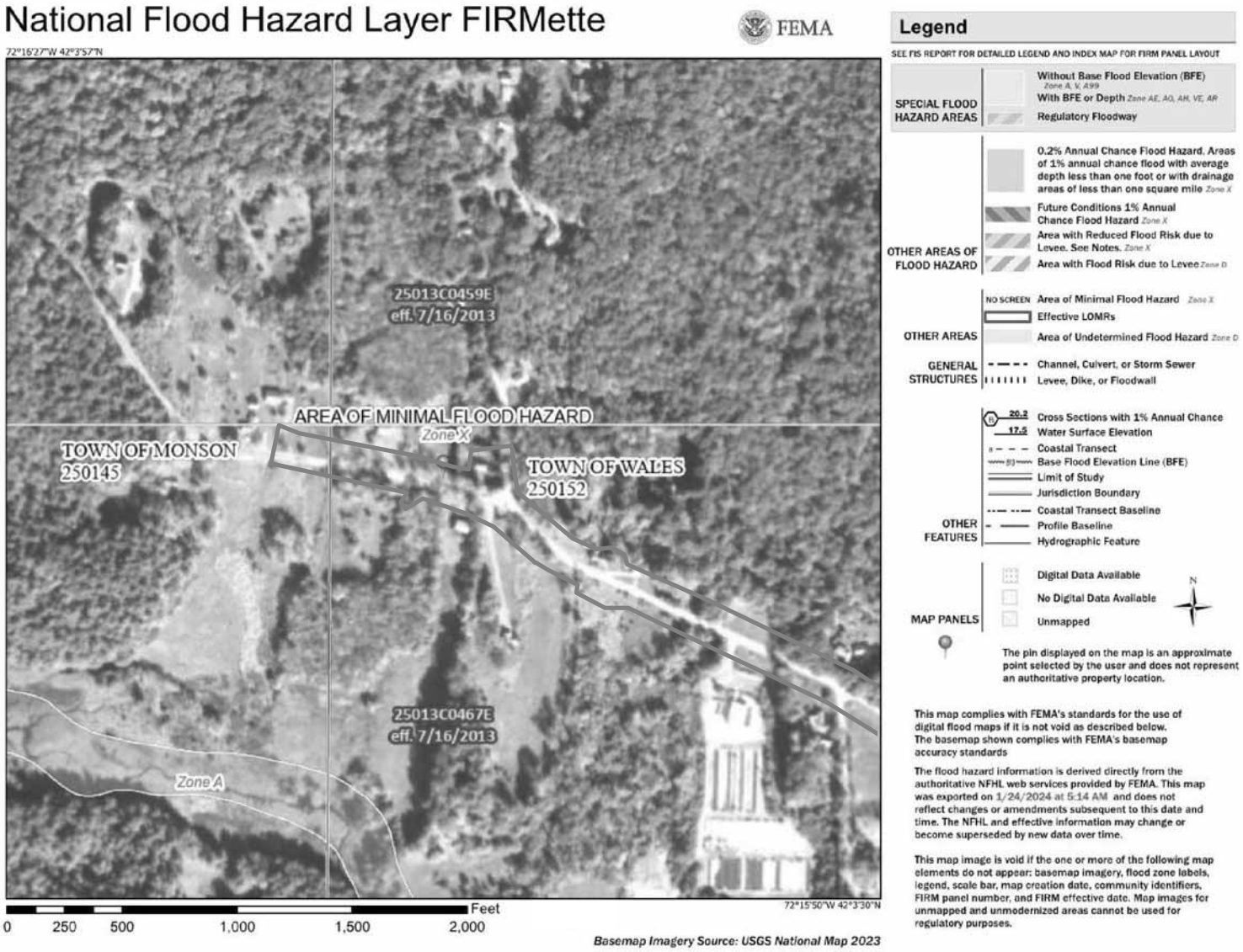
Investigation Area

FIGURE 2

MONSON ROAD
WALES MA

USGS TOPOGRAPHIC MAP

Weston & Sampson



Legend

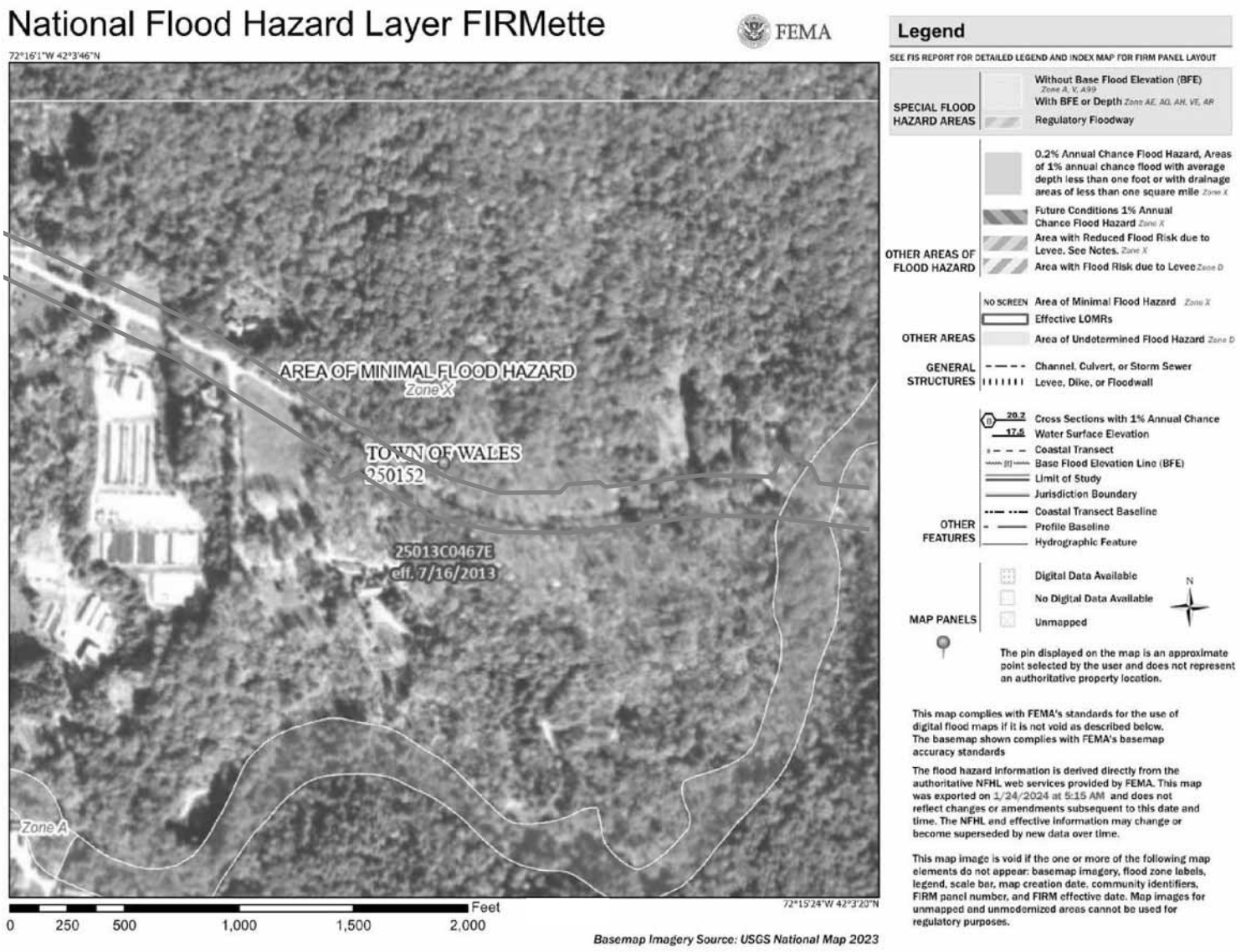
Investigation Area

FIGURE 3.1

MONSON ROAD
WALES MA

FEMA MAP

Weston & Sampson



Legend

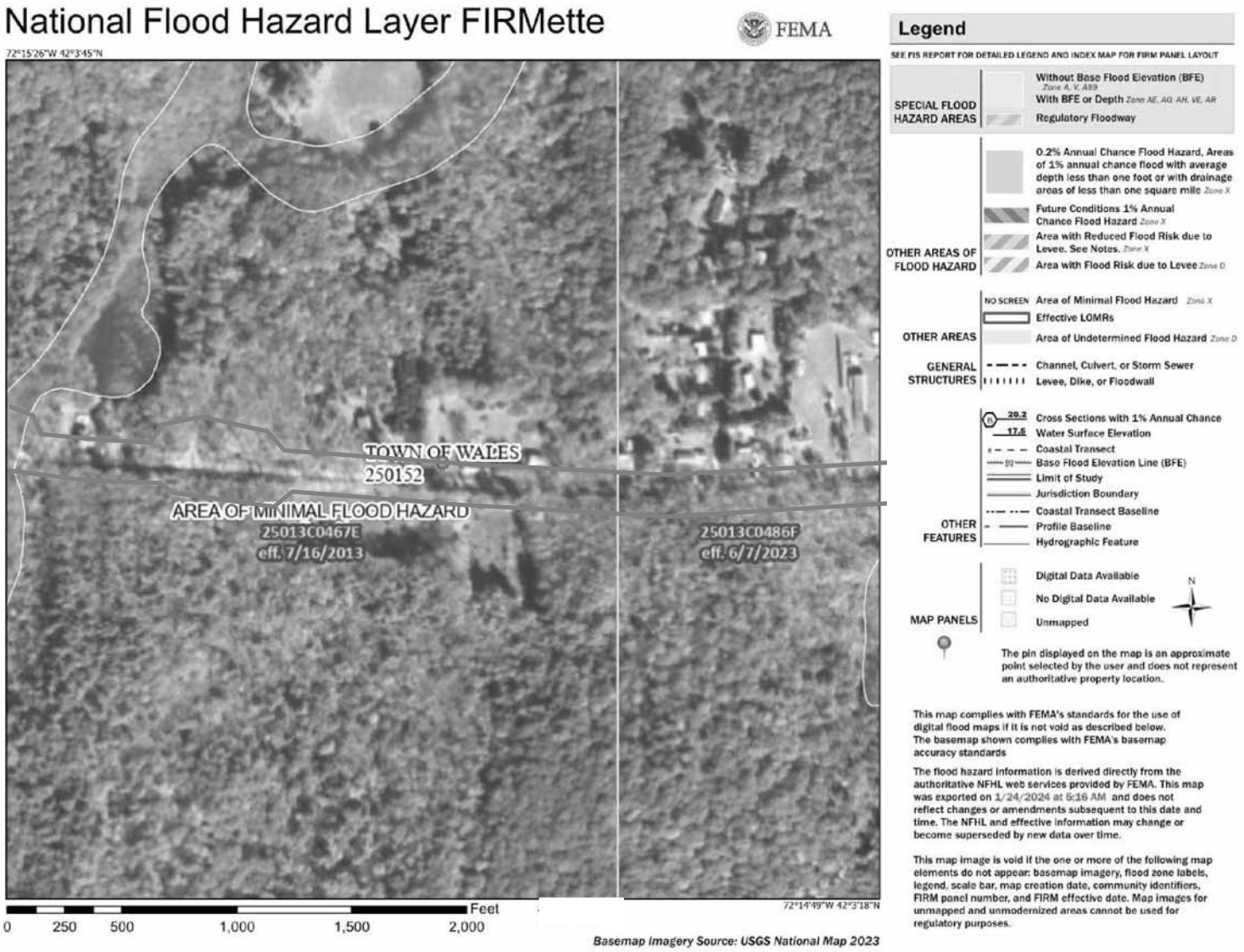
Investigation Area

FIGURE 3.2

MONSON ROAD
WALES MA

FEMA MAP

Weston & Sampson



Legend

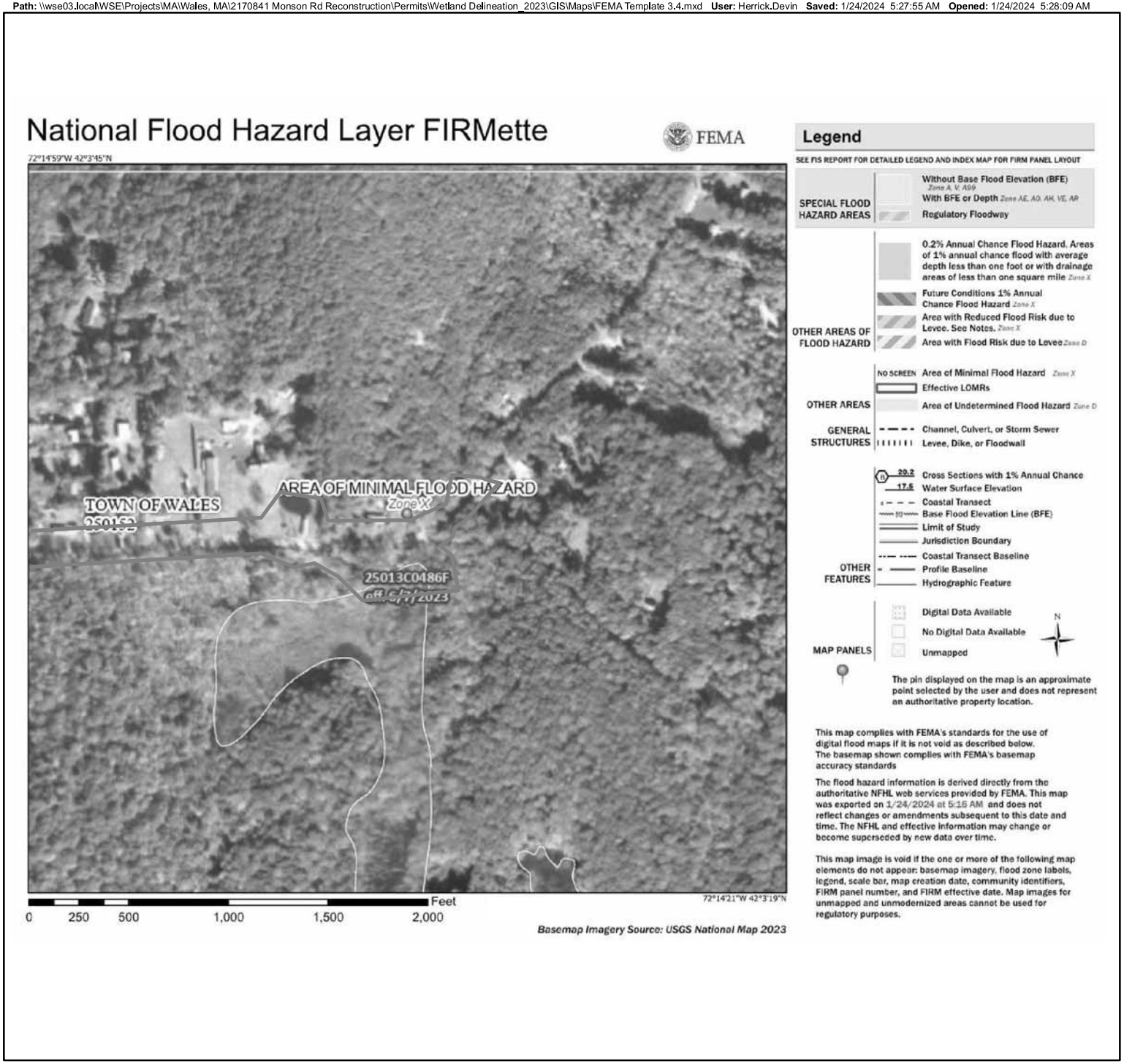
Investigation Area

FIGURE 3.3

MONSON ROAD
WALES MA

FEMA MAP

Weston & Sampson



Legend

Investigation Area

FIGURE 3.4

MONSON ROAD
WALES MA

FEMA MAP

Weston & Sampson

Path: \\wse03.local\WSE\Projects\MA\Wales, MA\2170841 Monson Rd Reconstruction\Permits\Wetland Delineation 2023\GIS\Maps\Environmental Receptor.mxd User: Herrick.Devin Saved: 4/15/2024 4:07:31 AM Opened: 4/15/2024 4:07:54 AM

Legend

- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- MassDOT Roads
- ACECs
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- Cold Water Fisheries
- Public Water Supply Contributor
- ORW for ACEC
- ORW for both Water Supply and Other
- Article 97 Land
- Community Groundwater Source

N W E S

1,000 500 0 1,000 Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

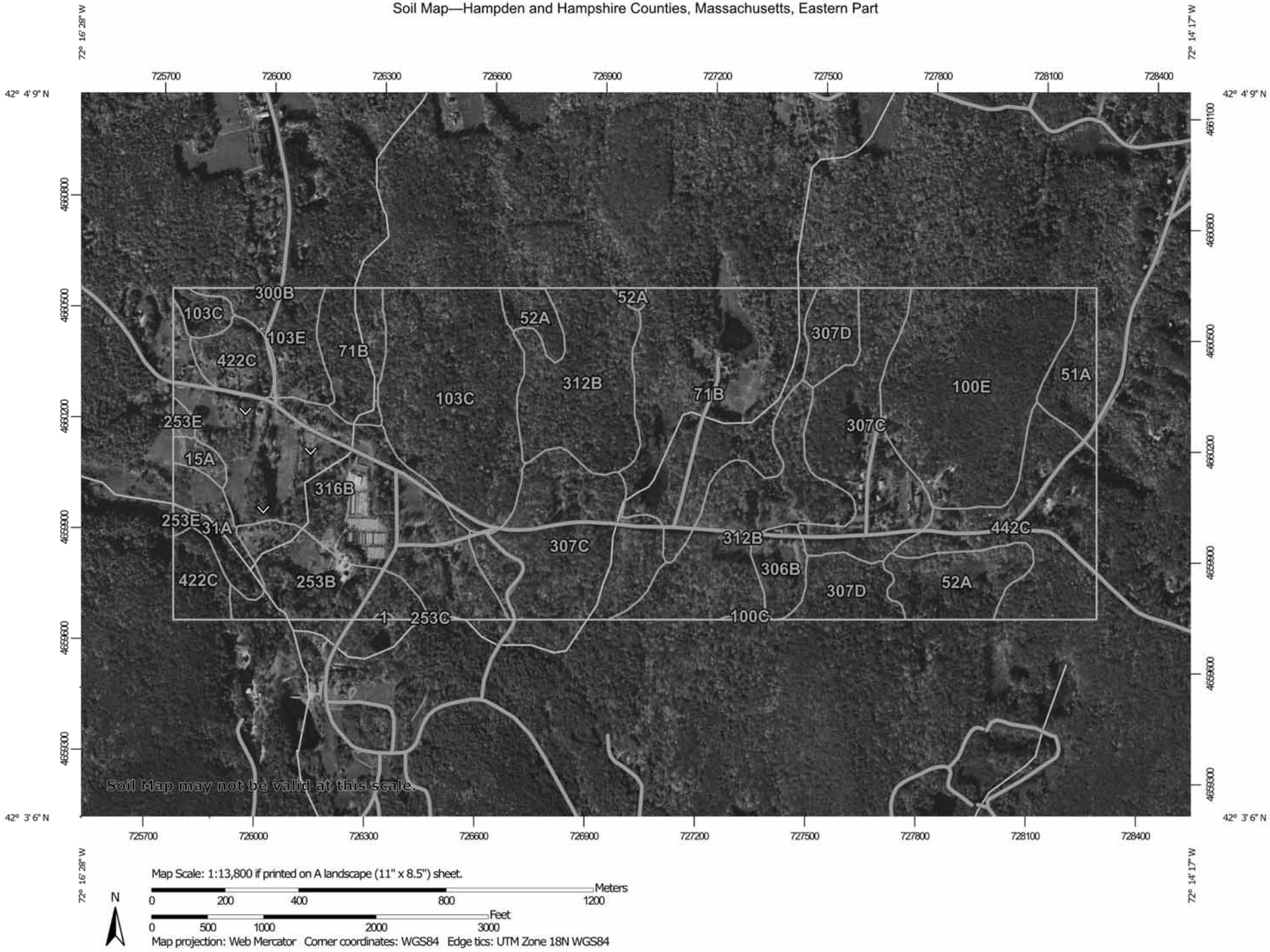
FIGURE 4

MONSON ROAD
WALES MA

ENVIRON. RESOURCES MAP

Weston & Sampson

Soil Map—Hampden and Hampshire Counties, Massachusetts, Eastern Part



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: Hampden and Hampshire Counties, Massachusetts, Eastern Part
Survey Area Data: Version 18, Sep 10, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 15, 2020—Oct 31, 2020

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 - 53

Proposal No. 608163 - 128112

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	0.2	0.0%
15A	Scarboro-Rippowam complex, 0 to 2 percent slopes, frequently flooded	2.8	0.5%
31A	Walpole sandy loam, 0 to 3 percent slopes	9.0	1.6%
51A	Swansea muck, 0 to 1 percent slopes	10.2	1.8%
52A	Freetown muck, 0 to 1 percent slopes	21.1	3.8%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	75.6	13.5%
100C	Brookfield-Brimfield-Rock outcrop complex, strongly sloping	0.4	0.1%
100E	Brookfield-Brimfield-Rock outcrop complex, steep	57.7	10.3%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	55.6	9.9%
103E	Charlton-Hollis-Rock outcrop complex, steep	13.5	2.4%
253B	Hinckley loamy sand, 3 to 8 percent slopes	22.0	3.9%
253C	Hinckley loamy sand, 8 to 15 percent slopes	0.1	0.0%
253E	Hinckley loamy sand, 25 to 35 percent slopes	2.0	0.4%
300B	Montauk fine sandy loam, 3 to 8 percent slopes	0.3	0.1%
306B	Paxton fine sandy loam, 0 to 8 percent slopes, very stony	7.3	1.3%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	76.2	13.6%
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	18.4	3.3%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	67.8	12.1%
316B	Scituate fine sandy loam, 3 to 8 percent slopes, very stony	66.5	11.9%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	16.6	3.0%
442C	Gloucester gravelly fine sandy loam, 8 to 15 percent slopes, extremely stony	36.0	6.4%
Totals for Area of Interest		**559.4**	**100.0%**

Appendix D

Site Photographs

Photo 1: Wet AA Flag Series

Photo 2: Wet BB Flag Series

Photo 3: TOB AA Flag Series

Photo 4: TOB BB and TOB CC Flag Series

Photo 5: TOB A and TOB B Flag Series

Photo 6: WET A Flag Series

Photo 7: WET B Flag Series

Photo 8: TOB E and TOB F Flag Series

Photo 9: BVW A Flag Series

Photo 10: TOB J and TOB I Flag Series

Photo 11: BVW B Flag Series

Photo 12: TOB K and TOB L Flag Series

Photo 13: BVW D Flag Series

Photo 14: TOB AA and TOB BB Flag Series

Photo 15: BVW G Flag Series

Photo 16: TOB AA and TOB BB Flag Series

Appendix E

Section 106 Consultation

Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Gina Fiandaca, Secretary & CEO
Jonathan L. Gulliver, Highway Administrator

massDOT
Massachusetts Department of Transportation
Highway Division

April 28, 2023

RE: WALES –Reconstruction & Improvements on Monson Rd. Project (608163)
Section 106 Review - No Adverse Effect
Section 4(f) Evaluation – Permanent Easements – *de minimis* impact
Section 4(f) Evaluation – Temporary Occupancies – No 4(f) Use

Ms. Brona Simon
State Historic Preservation Officer
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125

CONCURRENCE: Brona Simon 5/31/23
BRONA SIMON
STATE HISTORIC
PRESERVATION OFFICER
MASSACHUSETTS
HISTORICAL COMMISSION

RECEIVED
MAY 01 2023
MASS. HIST. COMM
RC.73167

Dear Ms. Simon:

The Massachusetts Department of Transportation, Highway Division (MassDOT) and the Town of Wales propose to expend federal funds to reconstruct a 1.45-miles segment of the Monson Road from the Wales/Monson town line easterly to Reed Hill Road. Monson Road will also be widened, existing culverts will be replaced, and stormwater and drainage improvements will be completed.

According to the MHC-Inventory form, the late-eighteen century **Cyrus Munger House (WAL.36)** is one of the oldest houses constructed in Wales for the Munger family, who were among the earliest recorded settlers in town. Mr. Munger is also reportedly a Revolutionary War Veteran.[1] It is the opinion of MassDOT Cultural Resources Unit (CRU) staff that the property is individually eligible for listing in the NRHP at the local level. MassDOT has reviewed this project under the terms of the 2004 Massachusetts Statewide Programmatic Agreement for Section 106 of the National Historic Preservation Act of 1966, as amended [36 CFR Part 800.3(a)(2)], and has determined that the project will have **No Adverse Effect** on any NR-listed or –eligible properties.

Monson Road Reconstruction & Improvements

Monson Road is currently 22'-wide with no roadway shoulders or bicycle/pedestrian accommodations. This project proposes full-depth reconstruction of Monson Road with a new 28'-wide cross-section, consisting of two 10' travels lanes with 4' shoulders. The new cross-section will improve driver sight-distances and provide bicyclists and pedestrians space as well.

The project will require some minor geometric improvements at selected intersections including the Monson Road/Lynch Road intersection, which is located directly to the east of the **NRE-Cyrus Munger House**. The roadway width at this intersection will be reduced by removing the small traffic island and narrowing the roadway. The freestanding stonewalls that line the edge of the NRE-property will not be affected by the nearby roadway work. The intersection of Monson

[1] *Munger Collection, 1776-1859*, Old Sturbridge Village Research Library, Sturbridge, MA (https://www.osv.org/content/uploads/2019/01/Munger-Collection.pdf)

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

Road/Reed Hill Road, at the easternmost end of the project corridor, will also be realigned to become a T-shaped intersection.

Other work within the project corridor includes replacing culverts and drainage structures and constructing a new closed drainage system. Selected trees and free-standing stone walls will be removed from within the roadway layout to facilitate the project work. Trees close to the roadway work will be protected during construction, and erosion control measures will be installed.

Archaeological Assessment

A review of the MHC's archaeological maps in MACRIS revealed no recorded sites in the vicinity of the Monson Road project area. It is the opinion of the MassDOT Archaeologist that low sensitivity can be ascribed to the project's direct area of potential effect (APE) based on the impacts of past roadway, utility, and drainage construction, unfavorable conditions (slope and wetlands), and roadside development. The project work will be confined to disturbed and unfavorable conditions within and immediately adjacent to the existing roadway layout. The majority of the Monson Road widening (approximately 10 – 20 ft. in width) will occur to the south of the roadway. The widening areas consist of sloped roadway shoulders, drainage swale/wetland areas, landscaped lawns, and dry laid stone/rubble walls. The stonewalls to be removed are currently located within the existing highway layout. The proposed drainage work will occur on existing drainage structures within wetland areas.

Section 4(f) Evaluation –Permanent Utility Easements – *de minimis* impact

This project will require two permanent utility easements from the NR-eligible **Cyrus Munger House (WAL.36)** parcel for overhead wires and the installation of a guy wire. Permanent utility easements are highlighted in yellow on the enclosed ROW plans.

Any permanent utility easement that results in the permanent incorporation of land from a public or private historic site into a transportation facility (e.g., roadway, public sidewalk) is regarded as a transportation use and must be evaluated and approved under Section 4(f) of the Department of Transportation Act of 1966, as amended [23 CFR Part 774].

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 4(f) Evaluation – Temporary Occupancies – No 4(f) use

The project requires temporary occupancies, also known as temporary construction easements, on the NR-eligible **Cyrus Munger House (WAL.36)** parcel. The temporary occupancies are necessary to facilitate grading and installing compost filters. The temporary occupancies are highlighted in green on the right of way plans.

It is MassDOT's opinion that the temporary occupancies on parcel occupied by the NR-eligible Cyrus Munger House will satisfy the five conditions required for a temporary occupancy not to constitute a "use" within the meaning of Section 4(f), pursuant to 23 CFR 774.13(d):

(1) Duration must be temporary, i.e., less than the time needed for construction of the project, and there should be no change in ownership of the land;
(2) Scope of the work must be minor, i.e., both the nature and the magnitude of the changes to the Section 4(f) property are minimal;
(3) There are no anticipated permanent adverse physical impacts, nor will there be interference with the protected activities, features, or attributes of the property, on either a temporary or permanent basis;
(4) The land being used must be fully restored, i.e., the property must be returned to a condition which is at least as good as that which existed prior to the project; and
(5) There must be documented agreement of the official(s) with jurisdiction over the Section 4(f) resource regarding the above conditions.

The SHPO is the official with jurisdiction over historic sites for the purposes of Section 4(f), pursuant to 23 CFR 774.17. Your concurrence with this letter will signify that your office agrees with MassDOT's assessment that the proposed temporary occupancies do not constitute a "use" of a historic site under Section 4(f) and that the conditions listed above have been satisfied, pursuant to Condition 5 above.

Summary of Section 106 Effect Findings

On behalf of MassDOT, Weston & Sampson sent early coordination letters to the Wales Historical Commission (dated October 12, 2018) and a copy of this letter was mailed to the MHC. No response has been received to date from the Commissions.

It is MassDOT's opinion that the proposed Monson Road Reconstruction and Improvements Project will have **No Adverse Effect** on the NRE-**Cyrus Munger House (WAL.36)**. MassDOT solicits your concurrence with our **No Adverse Effect** finding for the project 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 by email at mary.hafferty@state.ma.us.

Sincerely,

Mary Hafferty

Mary Hafferty
Cultural Resources Specialist
Environmental Services

c.c. C. Ostrander, FHWA (w/attachments)

encs: 75% Highway & Right of Way Plans
Maps & Photographs

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.

CASSANDRA CHASE OSTRANDER Digitally signed by CASSANDRA CHASE OSTRANDER
Date: 2023.07.14 07:55:53 -04'00'

Joi Singh, (or designee) Date
Division Administrator
Federal Highway Administration
Massachusetts Division

Hafferty, Mary H. (DOT)

From: Hafferty, Mary H. (DOT)
Sent: Thursday, May 4, 2023 9:32 AM
To: thpo@wampanoagtribe-nsn.gov; tcrm2@wampanoagtribe-nsn.gov
Cc: Harwood, Jameson (DOT)
Subject: Monson Road Reconstruction, Wales (MassDOT #608163)
Attachments: Wales -PNF.pdf; Wales 75% HWY -PNF.pdf; Wales -Maps & Photos.pdf

Dear Ms. Washington,

MassDOT is submitting the enclosed project information to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of the Federal Highway Administration and the 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@state.ma.us.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
***MassDOT* – Highway Division**
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

Hafferty, Mary H. (DOT)

From: Hafferty, Mary H. (DOT)
Sent: Thursday, May 4, 2023 9:33 AM
To: Robinson, David S (EEA)
Cc: Harwood, Jameson (DOT)
Subject: Monson Road Reconstruction, Wales (MassDOT #608163)
Attachments: Wales -PNF.pdf; Wales 75% HWY -PNF.pdf; Wales -PNF Maps.pdf

Dear Mr. Robinson,

MassDOT is submitting the enclosed project information to the Board of Underwater Archaeological Resources to meet the Section 106 consultation requirements of the U. S. 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@state.ma.us.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
***MassDOT* – Highway Division**
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

Hafferty, Mary H. (DOT)

From: Hafferty, Mary H. (DOT)
Sent: Thursday, May 4, 2023 9:33 AM
To: David.Weeden@mwtribe-nsn.gov
Cc: Harwood, Jameson (DOT)
Subject: Monson Road Reconstruction, Wales (MassDOT #608163)
Attachments: Wales -PNF.pdf; Wales 75% HWY -PNF.pdf; Wales -PNF Maps.pdf

Dear Mr. Weeden,

MassDOT is submitting the enclosed project information to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of the Federal Highway Administration and the 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@state.ma.us.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
***MassDOT* – Highway Division**
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

Hafferty, Mary H. (DOT)

From: Hafferty, Mary H. (DOT)
Sent: Thursday, May 4, 2023 9:33 AM
To: tashtesook@aol.com
Cc: Harwood, Jameson (DOT)
Subject: Monson Road Reconstruction, Wales (MassDOT #608163)
Attachments: Wales -PNF.pdf; Wales 75% HWY -PNF.pdf; Wales -PNF Maps.pdf

Dear Mr. Brown,

MassDOT is submitting the enclosed project information to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of the Federal Highway Administration and the 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@state.ma.us.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
***MassDOT* – Highway Division**
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A
MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name:	Reconstruction of Monson Road (#608163)
Location /Address:	Monson Road from Wales Town Line Easterly to Reed Hill Road
City/Town:	Wales

Project Proponent

Name:	Massachusetts Department of Transportation
Address:	10 Park Plaza
City/Town/Zip/Telephone:	Boston, MA 02116

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name	**Type of License or funding (specify)**
FHWA	Federal funding
Army Corps of Engineers	Sections 401 & 404 Permits

Project Description (narrative):

The Massachusetts Department of Transportation, Highway Division (MassDOT) and the Town of Wales propose to expend federal funds to reconstruct a 1.45-miles segment of the Monson Road from the Wales/Monson town line easterly to Reed Hill Road. Monson Road will also be widened, existing culverts will be replaced, and stormwater and drainage improvements will be completed.

Monson Road is currently 22'-wide with no roadway shoulders or bicycle/pedestrian accommodations. This project proposes full-depth reconstruction of Monson Road with a new 28'-wide cross-section, consisting of two 10' travels lanes with 4' shoulders. The new cross-section will improve driver sight-distances and provide bicyclists and pedestrians space as well.

The project will require some minor geometric improvements at selected intersections including the Monson Road/Lynch Road intersection, which is located directly to the east of the NR-eligible Cyrus Munger House. The roadway width at this intersection will be reduced by removing the small traffic island and narrowing the roadway. The freestanding stonewalls that line the edge of the NRE-property will not be affected by the nearby roadway work. The intersection of Monson Road/Reed Hill Road, at the easternmost end of the project corridor, will also be realigned to become a T-shaped intersection.

Other work within the project corridor includes replacing culverts and drainage structures and constructing a new closed drainage system. Selected trees and free-standing stone walls will be removed from within the roadway layout to facilitate the project work. Trees close to the roadway work will be protected during construction, and erosion control measures will be installed.

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A (continued)

A Section 404 General Permit from the U. S. Army Corps of Engineers is required for culvert replacements and drainage improvements.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

n/a

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.

n/a

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

n/a

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.

According to the MHC-Inventory form, the late-eighteen century Cyrus Munger House (WAL.36) is one of the oldest houses constructed in Wales for the Munger family, who were among the earliest recorded settlers in town. Records from the Old Sturbridge Village Research Library also indicate that Mr. Munger is also a Revolutionary War Veteran. It is the opinion of MassDOT Cultural Resources Unit (CRU) staff that the property is individually eligible for listing in the NRHP at the local level.

Archaeological Assessment

A review of the MHC's archaeological maps in MACRIS revealed no recorded sites in the vicinity of the Monson Road project area. It is the opinion of the MassDOT Archaeologist that low sensitivity can be ascribed to the project's direct area of potential effect (APE) based on the impacts of past roadway, utility, and drainage construction, unfavorable conditions (slope and wetlands), and roadside development. The project work will be confined to disturbed and unfavorable conditions within and immediately adjacent to the existing roadway layout. The majority of the Monson Road widening (approximately 10 – 20 ft. in width) will occur to the south of the roadway. The widening areas consist of sloped roadway shoulders, drainage swale/wetland areas, landscaped lawns, and dry laid stone/rubble walls. The stonewalls to be removed are currently located within the existing highway layout. The proposed drainage work will occur on existing drainage structures within wetland areas.

What is the total acreage of the project area?

			Productive Resources:		
Woodland		acres			
Wetland		acres	Agriculture		acres
Floodplain		acres	Forestry		acres
Open Space		acres	Mining/Extraction		acres
Developed		acres	Total Project Acreage		acres

What is the acreage of the proposed new construction? _____ acres

What is the present land use of the project area?

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A (continued)

The project corridor mainly runs through forested areas with sporadic areas of residential housing and agricultural land.

Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of person submitting this form: MHH **Date:** 5/4/2023

Name: Mary Hafferty, Cultural Resources Specialist MassDOT

Address: 10 Park Plaza, Room 4260

City/Town/Zip: Boston, MA 02717

Telephone: 857-368-8799

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

CC:

Appendix F

Section 7 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: September 14, 2023
Project code: 2023-0006669
Project Name: 608163 -WALES- RECONSTRUCTION & IMPROVEMENTS ON MONSON ROAD, FROM THE MONSON T.L. TO REED HILL ROAD

Subject: Concurrence verification letter for the '608163 -WALES- RECONSTRUCTION & IMPROVEMENTS ON MONSON ROAD, FROM THE MONSON T.L. TO REED HILL 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 September 14, 2023 to verify that the **608163 -WALES- RECONSTRUCTION & IMPROVEMENTS ON MONSON ROAD, FROM THE MONSON T.L. TO REED HILL ROAD** (Proposed Action) may rely on the concurrence provided in 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 (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 endangered northern long-eared bat (*Myotis septentrionalis*). Consultation with the Service pursuant to section 7(a)(2) of 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 assessment documented signs of bat use or occupancy, or an assessment failed to detect Indiana bats and/or NLEBs, yet are 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 any potential take. In these instances, potential incidental take of Indiana bats and/or NLEBs is covered under the Incidental Take Statement in the 2018 FHWA, FRA, FTA PBO (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.

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 and/or NLEB use or occupancy, yet bats are 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 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

608163 -WALES- RECONSTRUCTION & IMPROVEMENTS ON MONSON ROAD, FROM THE MONSON T.L. TO REED HILL ROAD

DESCRIPTION

608163 - WALES- RECONSTRUCTION & IMPROVEMENTS ON MONSON ROAD, FROM THE MONSON T.L. TO REED HILL ROAD (1.5 MILES)

This project will consist of roadway reclamation and pavement widening. The existing pavement will be widened for usable shoulder and improved bicycle accommodations, drainage deficiencies will be repaired, intersection and sight distance improvements, new signage and pavement markings.

Monarch Butterfly: Candidate Species only, no conservation measures at this time.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.060756049999995,-72.26589274528192,14z

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 endangered 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 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.

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

    - *608163_rpt_wales1_nleb_survey_20221011.pdf https://ipac.ecosphere.fws.gov/project/UO7QGV44ZFEVBBYVIAZMOBVU2Y/projectDocuments/118296426*

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.

   4.5

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 July 27, 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: 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

Appendix G

Wetland Delineation Report

Weston & Sampson

westonandsampson.com

55 Walkers Brook Drive, Suite 100
Reading, MA 01867
tel: 978.532.1900

Wetland Delineation Report

October 2023
Updated May 2024

Monson Road
Wales, MA

Wetland Delineation Conducted By:
Devin Herrick, CWS on 10/31/2023

Delineation Report Reviewed By:
Megan Kearns, PWS

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APPENDICES

Appendix A ..... ACOE Wetland Determination Data Forms

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1.0 SITE DESCRIPTION

On October 31, 2023 and March 17, 2024, the presence of wetland resources was investigated on Monson Road, in Wales, MA on a section of road approximately 1.5 miles in length. The western limit of investigation terminated at the intersection with Lynch Road while the eastern limit terminated at the intersection with Reed Hill Road. The area under consideration is in a rural community within a topographically variable landscape composed of glacial till transected by numerous streams running with north/south trajectories. Please see Figure 1.1-1.6 (Wetlands Field Map) and Figure 2 (USGS Topographic Map) attached to this report for the investigation area.

Wetland resource areas including bordering vegetated wetlands (BVW), isolated wetlands (IW), perennial streams, intermittent streams and a pond were identified and flagged in the field using pink flagging by a Weston & Sampson employee who is trained in the wetland delineation process using the Massachusetts Department of Environmental Protection (MassDEP) and the US Army Corps of Engineers methodologies. A further description of these wetland resource areas is presented in the following sections.

2.0 DELINEATION OF WETLAND RESOURCES

2.1 Site Observations

The Weston & Sampson wetland scientist, trained in the ACOE Wetland Delineation Manual and Massachusetts Department of Environmental Protection (MassDEP) Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetland Protection Act guidance document, observed the following protected wetland resources at the site:

- Bordering Vegetated Wetlands (BVW)
- Isolated Vegetated Wetland (IW)
- Bank – Perennial Stream
- Bank – Intermittent Stream
- Bank – Non-Jurisdictional Intermittent Stream

Field data were recorded on U.S. Army Corps of Engineers (ACOE) Wetland Determination Data Forms which are included in Appendix A.

2.2 Wetland Delineation Methodology

A wetland delineation assessment was conducted in accordance with the Massachusetts Wetland Protection Act Regulations (310 CMR 10.55(2)(c)), Massachusetts Department of Environmental Protection (MassDEP) Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands (Second Edition, September 2022), and ACOE Wetland Manual (Technical Report Y-87-1).

The bordering vegetated wetlands (BVW) delineation methodology included the characterization of vegetation, hydrologic conditions, and soil in both wetland and upland areas to identify the transitional area, which was used as the wetland limit. Pink flags with distinct flag numbers were left in the field to show wetland resource area limits.

Vegetation, hydrology and soils were assessed in both wetland and upland areas to accurately place the wetland limits at each site. The percentage of vegetative species was estimated by creating sample plots. Sample plot radius for trees, saplings, shrubs, groundcover and woody vine strata was 30', 15', 15', 5' and 30', respectively. After creating the sample plot areas, the percent basal area coverage of

each species within the monitoring plot was recorded. Using these field observations, the percent dominance of each species within its stratum was calculated. The 50/20 Rule was then used to determine dominance. Dominant species were considered the most abundant plant species (when ranked in descending order of abundance and cumulatively totaled) that immediately exceeds 50% of the total dominance measure (basal area) for the stratum, plus any additional species comprising 20% or more of the total dominance measure for the stratum. Once the dominant species were determined, they were treated equally to determine the presence of hydrophytic vegetation. If the number of dominant species with a Wetland Indicator Status of FAC (excluding FAC-), FACW or OBL is greater than, or equal to, the number of remaining dominant species, the area was considered a jurisdictional wetland resource area based on vegetation.

A soil sample from each wetland sample plot were also taken. Each soil sample goes to a depth of at least 12-24 inches. The soil was characterized to determine if the soil sample was considered a hydric (wetland) soil. Soil samples, including mottles, were characterized based on color using Munsell Soil-Color charts as a color reference.

The general area was then assessed for hydrologic conditions, including, but not limited to, site inundation, depth to free water, depth of soil saturation, water marks, drift lines, sediment deposits, water stained leaves.

2.3 Bordering Vegetated Wetlands (BVW)

A total of sixteen BVW series were delineated at the site. The limits of the BVW resource areas were determined by locating the transitional areas between wetlands and uplands vegetation, soils and hydrologic conditions. Wetland flags left in the field included:

- BVW-A1 through BVW-A6 (Bordering Vegetated Wetland “A” Series)
- BVW-B1 through BVW-B10 (Bordering Vegetated Wetland “B” Series)
- BVW-C1 through BVW-C6 (Bordering Vegetated Wetland “C” Series)
- BVW-D1 through BVW-D4 (Bordering Vegetated Wetland “D” Series)
- BVW-E1 through BVW-E6 (Bordering Vegetated Wetland “E” Series)
- BVW-F1 through BVW-F3 (Bordering Vegetated Wetland “F” Series)
- BVW-G1 through BVW-G11 (Bordering Vegetated Wetland “G” Series)

- BVW-H1 through BVW-H12 (Bordering Vegetated Wetland "H" Series)
- BVW-I1 through BVW-I10 (Bordering Vegetated Wetland "I" Series)
- BVW-J1 through BVW-J13 (Bordering Vegetated Wetland "J" Series)
- BVW-K1 through BVW-K4 (Bordering Vegetated Wetland "K" Series)
- BVW-L1 through BVW-L15 (Bordering Vegetated Wetland "L" Series)
- BVW-M1 through BVW-M10 (Bordering Vegetated Wetland "M" Series)
- BVW-O1 through BVW-O3 (Bordering Vegetated Wetland "O" Series)
- BVW-AA1 through BVW-AA4 (Bordering Vegetated Wetland "AA" Series)
- BVW-BB1 through BVW-BB4 (Bordering Vegetated Wetland "BB" Series)

Dominant vegetation within this resource area included red maple (*Acer rubrum*), winterberry (*Ilex verticillate*), crested fern (*Dryopteris cristata*), sensitive fern (*Onoclea sensibilis*), and riverbank grape (*Vitis riparia*), all species that thrive in wet conditions. Soils within the BVW were considered sandy mucky mineral. Other indicators of wetland hydrology included surface water, water-stained leaves, drainage patterns, highwater table and saturation.

Dominant upland vegetation next to this BVW included red oak (*Quercus rubra*) and Japanese barberry (*Berberis thunbergii*). Soil in the upland area consisted of dry sandy loam, with no evidence of mottling or hydrology within the top 12 inches.

BVWs are subject to a 100-foot buffer under the Massachusetts Wetland Protection Act per 310 CMR 10.02(2)(b).

2.4 Isolated Vegetated Wetland (IW)

Two isolated wetlands were delineated at the site. The limit of the IW resource area was determined by locating the transitional area between wetland and upland vegetation, soils and hydrologic conditions. Vegetation, hydrology and soils were assessed in the same manner as described above for identifying BVW. Wetland flags left in the field included:

- WET-A1 through WET-A10 (Isolated Wetland "A" Series)
- WET-B1 through WET-B11 (Isolated Wetland "B" Series)

Dominant vegetation within this resource area included reed canary grass (*Phalaris arundinacea*), rough-leaved goldenrod (*Solidago patula*), and grass-leaved goldenrod (*Euthamia graminifolia*), all species that thrive in wet conditions. Soils within the wetland limits were considered sandy loam (sandy redox). Indicators of wetland hydrology included surface water, soil saturation, and oxidized rhizospheres.

Dominant upland vegetation next to this isolated wetland included red oak (*Quercus rubra*). Soil in the upland area consisted of dry sandy loam. No indicators of wetland hydrology were observed.

The Massachusetts Wetland Protection Act does not protect isolated vegetated wetlands.

2.4 Bank

Water bodies, including perennial streams, intermittent streams, ponds and lakes, have banks which are protected by the Massachusetts Wetland Protection Act. Bank is a wetland resource area defined by 310 CMR 10.54(2)(a) as "the portion of land surface which normally abuts and confines a water body. It occurs between a waterbody and a vegetated bordering wetland and adjacent floodplain, or, in absence of these, it occurs between a waterbody and an upland." Vegetated banks provide valuable functions such as flood control, stormwater prevention, fisheries protection, and water quality protection. The limit of this resource area is identified by Top of Bank (TOB) which is located at the first observable break in slope or the Mean Annual Flood Level (MAFL), whichever is lower. TOB is easily identified in the field so that indicator was utilized for this wetland delineation.

Perennial Stream Banks

Three perennial streams were identified within the investigation area. All three of these perennial streams are unnamed. These streams are shown as perennial on the current United States Geographical Survey (USGS) map which classifies them as perennial per 310 CMR 10.58 (2)(a)(1)(b-c). The boundaries of the perennial streams were identified by the first observable break in slope (TOB). Wetland flags left in the field included:

- TOB-E1 through TOB-E8 (Perennial Stream Bank "E" Series)
- TOB-F1 through TOB-F9 (Perennial Stream Bank "F" Series)
- TOB-I1 through TOB-I17 (Perennial Stream Bank "I" Series)
- TOB-J1 through TOB-J18 (Perennial Stream Bank "J" Series)

- WET-C1 through WET-C8 (Perennial Stream Bank “C” Series)
- TOB-K1 through TOB-K6 (Perennial Stream Bank “K” Series)
- TOB-L1 through TOB-L6 (Perennial Stream Bank “L” Series)

Perennial streams are subject to a 200-foot Riverfront Area under the Massachusetts Wetland Protection Act per 301 CMR 10.58(2)(a)(2)(c).

Intermittent Stream Banks (Jurisdictional)

Five jurisdictional intermittent streams were identified within the investigation area. Four of these intermittent streams are unnamed and not shown on the current United States Geographical Survey (USGS) map. The easternmost intermittent stream is shown on the current United States Geographical Survey (USGS) map and called Vinica Brook. These intermittent streams have a watershed size less than 0.5 square miles in size according to USGS Stream Stats which classifies the streams as intermittent per 310 CMR 10.58 (2)(a)(1)(b-c). The boundaries of the intermittent streams were identified in the field by the first observable break in slope (TOB). Wetland flags left in the field included:

- TOB-A1 through TOB-A5 (Intermittent Stream Bank “A” Series)
- TOB-B1 through TOB-B5 (Intermittent Stream Bank “B” Series)
- TOB-C1 through TOB-C5 (Intermittent Stream Bank “C” Series)
- TOB-D1 through TOB-D5 (Intermittent Stream Bank “D” Series)
- TOB-CC1 through TOB-CC3 (Intermittent Stream Bank “CC” Series)
- TOB-DD1 through TOB-DD3 (Intermittent Stream Bank “DD” Series)
- TOB-GG1 through TOB-GG2 (Intermittent Stream Bank “GG” Series)
- TOB-HH1 through TOB-HH2 (Intermittent Stream Bank “HH” Series)
- TOB-AA1 through TOB-AA3_March 2024 (Intermittent Stream Bank “AA” Series)
- TOB-BB1 through TOB-BB15_March 2024 (Intermittent Stream Bank “BB” Series)
- TOB-CC1 through TOB-CC16_March 2024 (Intermittent Stream Bank “CC” Series)
- TOB-KK1 through TOB-KK9 (Intermittent Stream Bank “KK” Series)
- TOB-LL1 through TOB-LL6 (Intermittent Stream Bank “LL” Series)
- TOB-EE1 through TOB-EE6 (Intermittent Stream Bank “EE” Series)
- TOB-FF1 through TOB-FF6 (Intermittent Stream Bank “FF” Series)
- TOB-M1 through TOB-M4 (Intermittent Stream Bank “M” Series)

- TOB-N1 through TOB-N4 (Intermittent Stream Bank "N" Series)
- TOB-AA1 through TOB-AA3 (Intermittent Stream Bank "AA" Series)
- TOB-BB1 through TOB-BB3 (Intermittent Stream Bank "BB" Series)
- TOB-JJ1 through TOB-JJ6 (Intermittent Stream Bank "JJ" Series)

Intermittent stream banks are subject to a 100-foot buffer under the Massachusetts Wetland Protection Act per 310 CMR 10.02(2)(b).

Intermittent Stream Banks (Non-Jurisdictional)

Three intermittent streams were identified within the investigation area which do originate within a wetland resource area. Per 310 CMR 10.04 Stream means "*a body of running water, including brooks and creeks, which moves in a definite channel in the ground due to a hydraulic gradient, and which flows within, into or out of an Area Subject to Protection under M.G.L. c. 131, § 40. A portion of a stream may flow through a culvert or beneath a bridge. Such a body of running water which does not flow throughout the year (i.e., which is intermittent) is a stream except for that portion upgradient of all bogs, swamps, wet meadows and marshes*". Since these streams are located upgradient of any wetland there are non-jurisdictional. Wetland flags left in the field included:

- TOB-G1 through TOB-G2 (Intermittent Stream Bank "G" Series)
- TOB-H1 through TOB-H2 (Intermittent Stream Bank "H" Series)
- WET-N1 through WET-N8 (Intermittent Stream Bank "N" Series)
- TOB-DD1 through TOB-DD2_March 2024 (Intermittent Stream Bank "DD" Series)
- TOB-EE1 through TOB-EE2_March 2024 (Intermittent Stream Bank "EE" Series)

Pond Bank

A single unnamed pond was located within the investigation area. According to the Massachusetts Wetland Protection Act a pond is defined as "any body of fresh water with a surface area observed or recorded within the last ten years of at least 10,000 square feet". Based on aerial imagery the unnamed pond identified on site is approximately 14,000 SF. According to the Massachusetts Wetland Protection Act "ponds may be either naturally occurring or human made by impoundment, excavation or otherwise". Wetland flags left in the field included:

- TOB-II1 through TOB-II3 (Pond Bank "II" Series)

Pond banks are subject to a 100-foot buffer under the Massachusetts Wetland Protection Act per 310 CMR 10.02(2)(b).

2.5 Other Protected Areas

Weston & Sampson created environmental resources maps (see Figure 4) of the site to determine the presence of other protected areas. The data source of these map layers was the Massachusetts Geographic Information System (MassGIS). These areas included:

- NHESP Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Certified and Potential Vernal Pools
- Areas of Critical Environmental Concern (ACEC)
- Outstanding Resource Waters (ORW)
- Coldwater Fisheries
- Article 97 Land

Wetland resources identified in the field were also added to these maps. Based on the MassGIS information, a portion of the investigation area is located within NHESP Priority Habitats of Rare Species, and NHESP Estimated Habitat of Rare Wildlife. Additionally, the three perennial streams identified on site are shown as coldwater fisheries.

FEMA Flood Insurance Rate Maps (FIRM) were created online from the FEMA website to determine if there is a 100-year flood zone at the site. See Figure 3 for FIRM map. Based on FEMA flood maps the investigation area is not located within the 100-year flood zone.

3.0 SUMMARY

On October 31, 2023 and March 17, 2024, the presence of wetland resources was investigated on Monson Road, in Wales, MA. Wetland resource areas including bordering vegetated wetlands (BVW), isolated wetlands (IW), perennial streams, intermittent streams and a pond were identified and flagged in the field.

Additional environmental mapping was conducted using MassGIS data layers and FEMA FIRM mapping. This additional mapping indicates that a portion of the investigation area is located within NHESP Priority Habitats of Rare Species, and NHESP Estimated Habitat of Rare Wildlife. Additionally, the three perennial streams identified on site are shown as coldwater fisheries.

4.0 REFERENCES

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Wojtec, Michael, Bard – A field Guide to Trees of the Northeast.

New England Hydric Soils Technical Committee, 2019, Version 4, *Field Indicator of Identifying Hydric Soils in New England*. New England Interstate Water Pollution Control Commission, Lowell, MA.

.

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.1

MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

Path: \\wse03.local\WSE\Projects\MA\Wales, MA\2170841 Monson Rd Reconstruction\Permits\Wetland Delineation 2023\GIS\Maps\Wetland Flags 1.2.mxd User: Herrick.Devin Saved: 4/15/2024 3:59:52 AM Opened: 4/15/2024 4:00:36 AM

Legend

- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.2

MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.3

MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.4

MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

Path: \\wse03.local\WSE\Projects\MA\Wales, MA\2170841 Monson Rd Reconstruction\Permits\Wetland Delineation 2023\GIS\Maps\Wetland Flags 1.5.mxd User: Herrick.Devin Saved: 4/15/2024 4:03:43 AM Opened: 4/15/2024 4:04:34 AM

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.5

MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

Path: \\wse03.local\WSE\Projects\MA\Wales, MA\2170841 Monson Rd Reconstruction\Permits\Wetland Delineation 2023\GIS\Maps\Wetland Flags 1.6.mxd User: Herrick.Devin Saved: 4/15/2024 4:05:23 AM Opened: 4/15/2024 4:05:43 AM

N
W E
S

100 50 0 100
Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

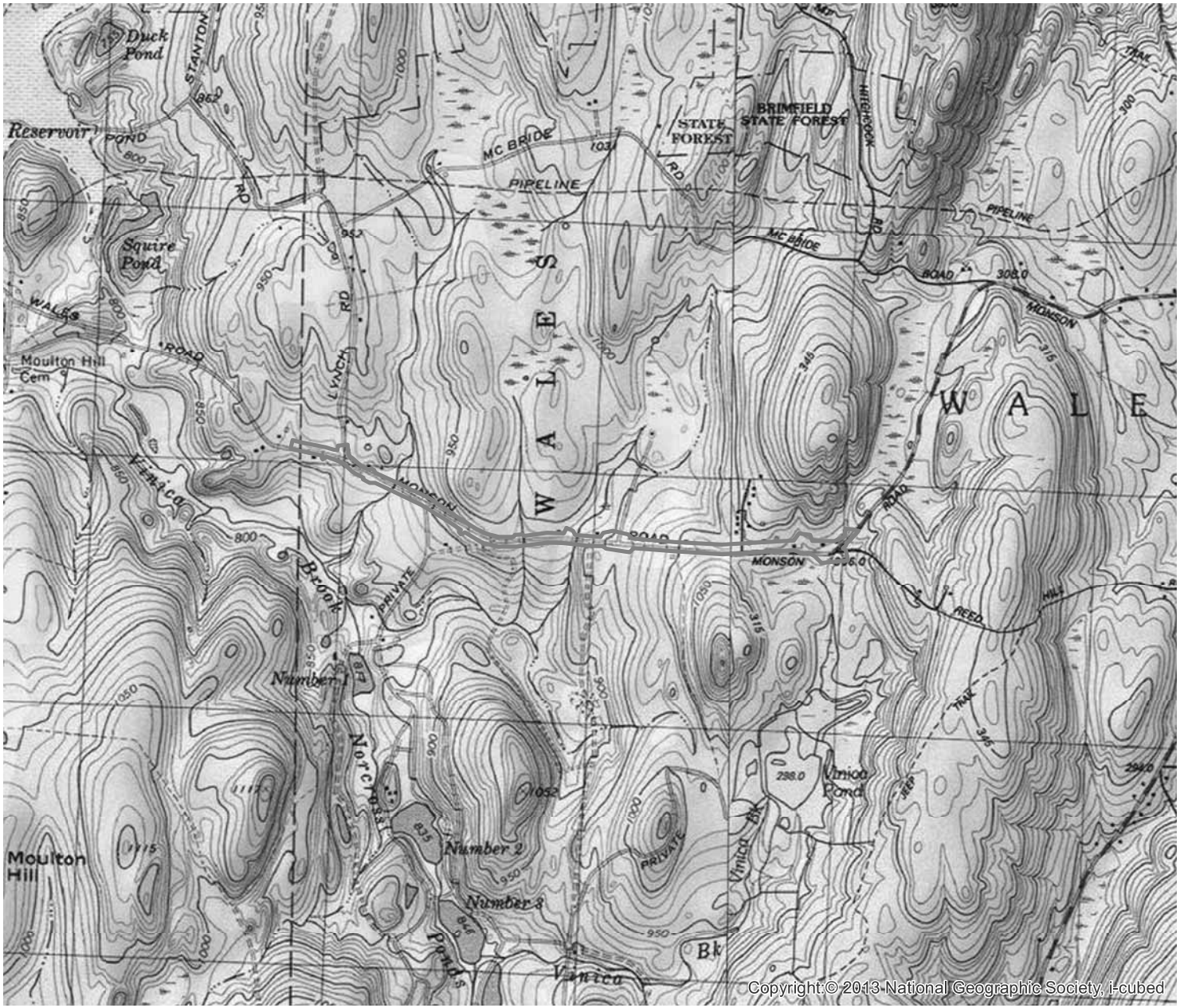
- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.6

MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson



N
W E
S

1,000 500 0 1,000
Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

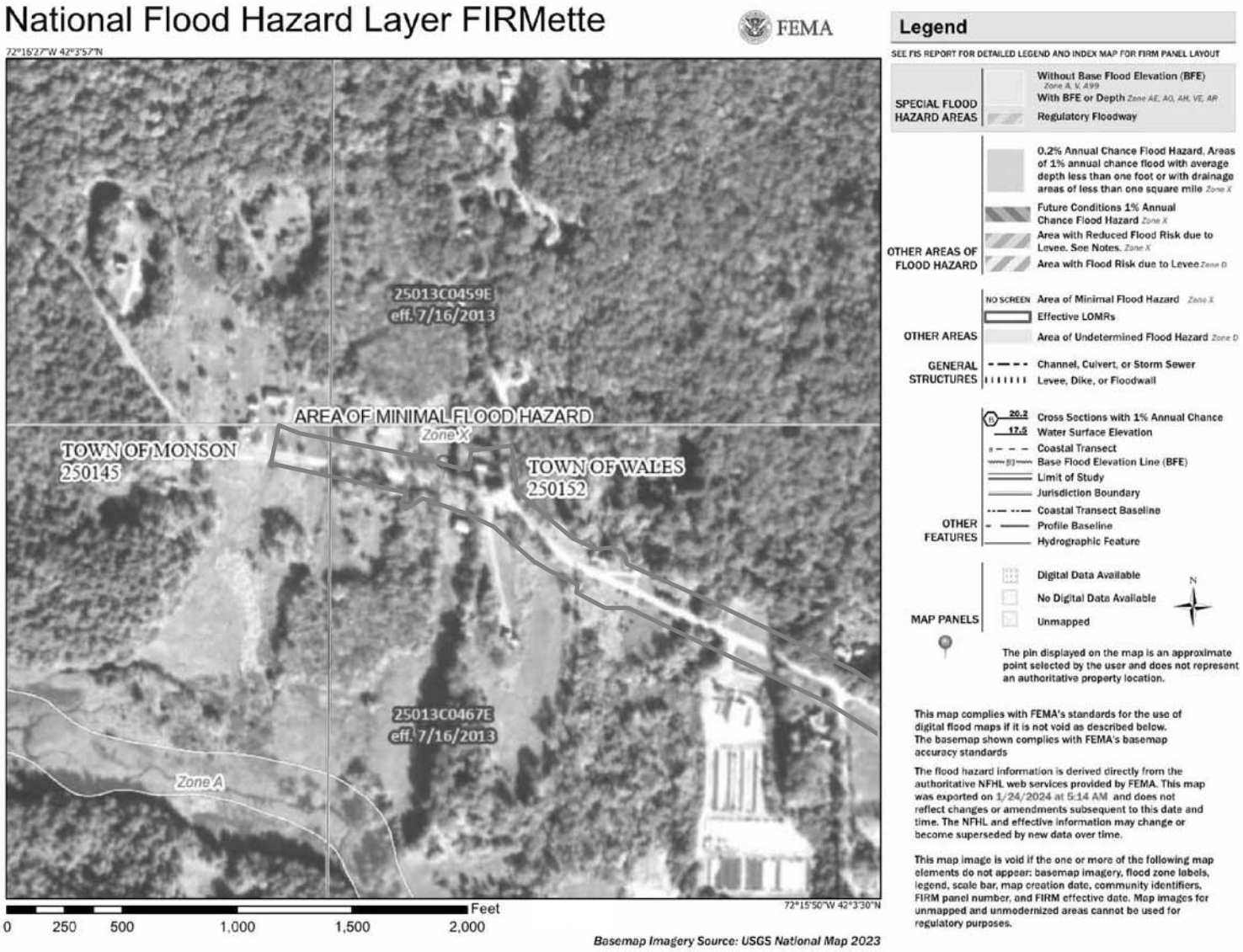
Investigation Area

FIGURE 2

MONSON ROAD
WALES MA

USGS TOPOGRAPHIC MAP

Weston & Sampson



Legend

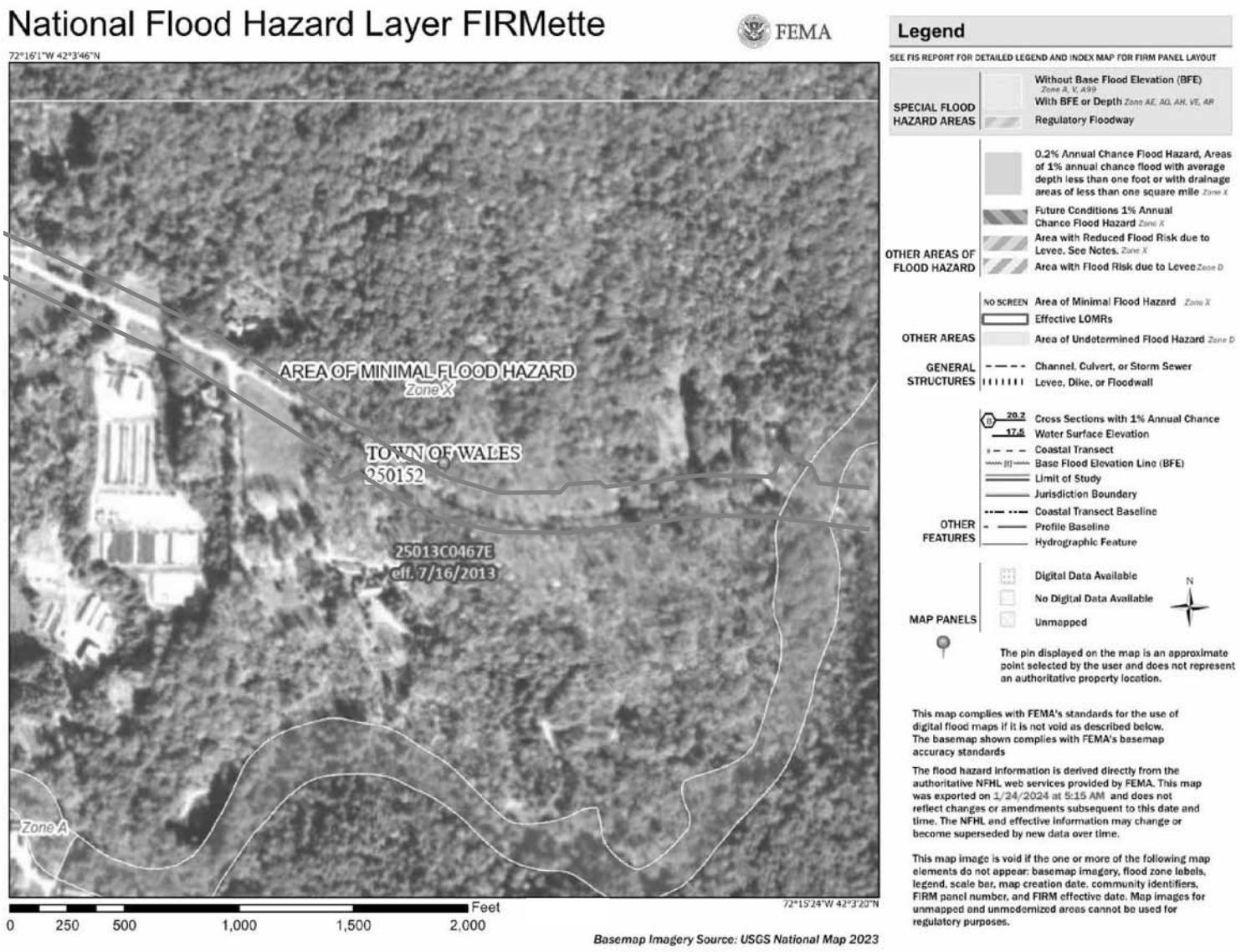
Investigation Area

FIGURE 3.1

MONSON ROAD
WALES MA

FEMA MAP

Weston & Sampson



Legend

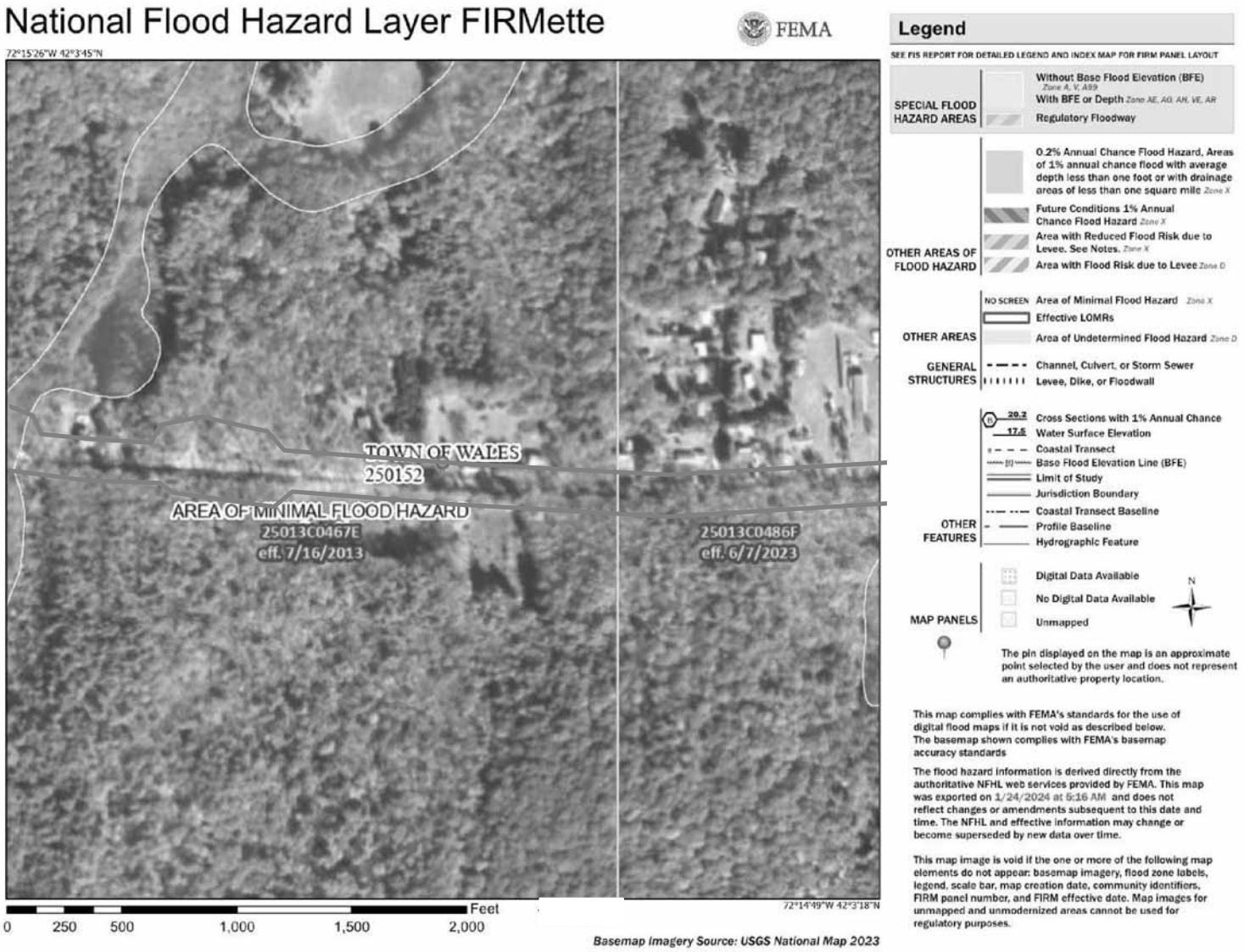
Investigation Area

FIGURE 3.2

MONSON ROAD
WALES MA

FEMA MAP

Weston & Sampson



Legend

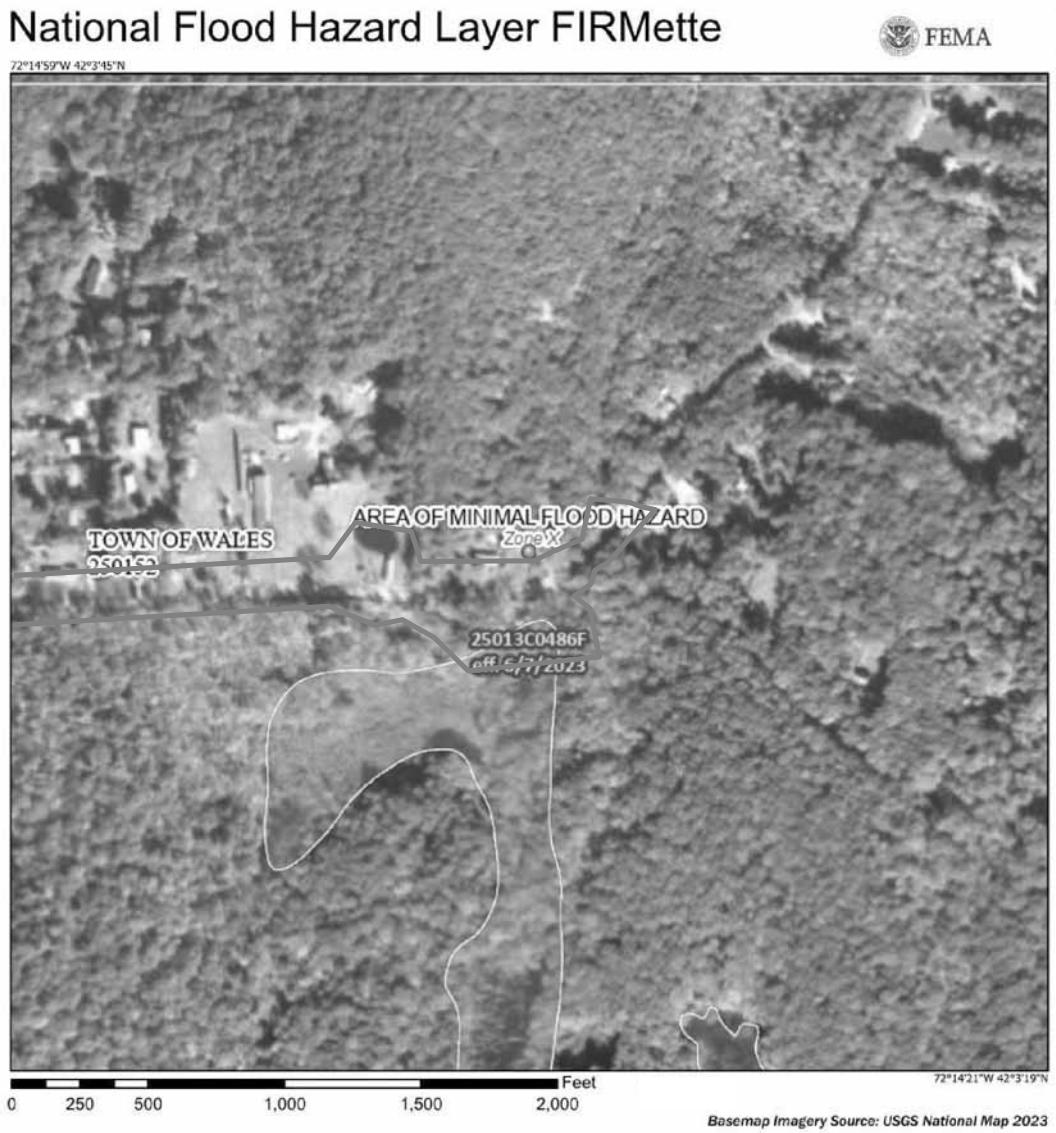
Investigation Area

FIGURE 3.3

MONSON ROAD
WALES MA

FEMA MAP

Weston & Sampson



Legend

Investigation Area

FIGURE 3.4

MONSON ROAD
WALES MA

FEMA MAP

Weston & Sampson

Path: \\wse03.local\WSE\Projects\MA\Wales, MA\2170841 Monson Rd Reconstruction\Permits\Wetland Delineation 2023\GIS\Maps\Environmental Receptor.mxd User: Herrick.Devin Saved: 4/15/2024 4:07:31 AM Opened: 4/15/2024 4:07:54 AM

Legend

- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- MassDOT Roads
- ACECs
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- Cold Water Fisheries
- Public Water Supply Contributor
- ORW for ACEC
- ORW for both Water Supply and Other
- Article 97 Land
- Community Groundwater Source

N W E S

1,000 500 0 1,000 Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

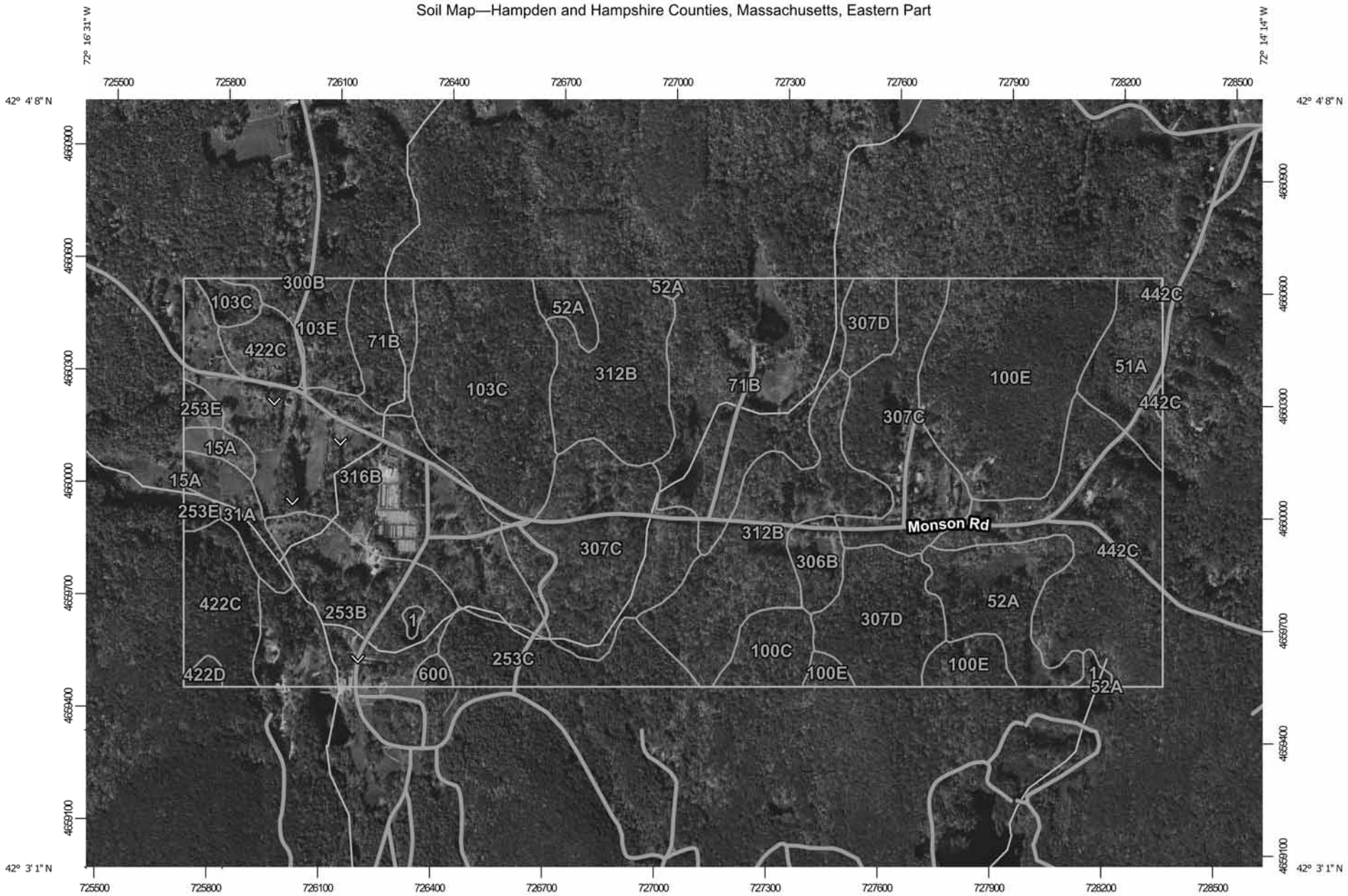
FIGURE 4

MONSON ROAD
WALES MA

ENVIRON. RESOURCES MAP

Weston & Sampson

Soil Map—Hampden and Hampshire Counties, Massachusetts, Eastern Part



Map Scale: 1:14,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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: Hampden and Hampshire Counties, Massachusetts, Eastern Part
Survey Area Data: Version 18, Sep 10, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 15, 2020—Oct 31, 2020

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 - 116

Proposal No. 608163 - 128112

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	2.2	0.3%
15A	Scarboro-Rippowam complex, 0 to 2 percent slopes, frequently flooded	3.6	0.5%
31A	Walpole sandy loam, 0 to 3 percent slopes	10.2	1.4%
51A	Swansea muck, 0 to 1 percent slopes	17.8	2.5%
52A	Freetown muck, 0 to 1 percent slopes	29.2	4.1%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	74.9	10.5%
100C	Brookfield-Brimfield-Rock outcrop complex, strongly sloping	10.6	1.5%
100E	Brookfield-Brimfield-Rock outcrop complex, steep	66.3	9.3%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	55.2	7.8%
103E	Charlton-Hollis-Rock outcrop complex, steep	13.1	1.8%
253B	Hinckley loamy sand, 3 to 8 percent slopes	44.5	6.3%
253C	Hinckley loamy sand, 8 to 15 percent slopes	22.3	3.1%
253E	Hinckley loamy sand, 25 to 35 percent slopes	4.6	0.6%
300B	Montauk fine sandy loam, 3 to 8 percent slopes	0.2	0.0%
306B	Paxton fine sandy loam, 0 to 8 percent slopes, very stony	7.3	1.0%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	81.2	11.4%
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	32.3	4.6%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	76.3	10.7%
316B	Scituate fine sandy loam, 3 to 8 percent slopes, very stony	71.3	10.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	27.2	3.8%
422D	Canton fine sandy loam, 15 to 35 percent slopes, extremely stony	1.6	0.2%
442C	Gloucester gravelly fine sandy loam, 8 to 15 percent slopes, extremely stony	56.5	8.0%
600	Pits, gravel	1.7	0.2%
Totals for Area of Interest		**710.0**	**100.0%**

APPENDIX A

ACOE Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-A16 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills, ground moraines, drumlins Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 30.71" N Long: 72° 15' 19.2" W Datum: NAD 1983

Soil Map Unit Name: Paxton fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X Surface Water (A1)
- X Water-Stained Leaves (B9)
- ___ High Water Table (A2)
- ___ Aquatic Fauna (B13)
- ___ Saturation (A3)
- ___ Marl Deposits (B15)
- ___ Water Marks (B1)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Sediment Deposits (B2)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Drift Deposits (B3)
- ___ Presence of Reduced Iron (C4)
- ___ Algal Mat or Crust (B4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Iron Deposits (B5)
- ___ Thin Muck Surface (C7)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Other (Explain in Remarks)
- ___ Sparsely Vegetated Concave Surface (B8)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-A16 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	90	Yes	FAC
2. green ash (*Fraxinus pennsylvanica*)	10	No	FACW
3. white pine (*Pinus Strobus*)	10	No	FACU
4. shagbark hickory (*Carya ovata*)	10	No	FACU
5.			
6.			
7.			
	120	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 feet)			
1. common winterberry (*Ilex verticillata*)	80	Yes	FACW
2. Japanese barberry (*Berberis thunbergii*)	15	No	FACU
3.			
4.			
5.			
6.			
7.			
	95	= Total Cover	

Herb Stratum (Plot size: 5 feet)			
1. crested fern (*Dryopteris cristata*)	30	Yes	FACW
2. sensitive fern (*Onoclea sensibilis*)	20	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50	= Total Cover	

Woody Vine Stratum (Plot size: 30 feet)			
1. riverbank grape (*Vitis riparia*)	10	Yes	FAC
2.			
3.			
4.			
	10	= 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: 5 (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	140	x 2 =	280
FAC species	100	x 3 =	300
FACU species	35	x 4 =	140
UPL species		x 5 =	
Column Totals:	275 (A)		720 (B)

Prevalence Index = B/A = 2.61

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-A16 (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 - 8	10YR 2/1	90	10YR 5/2 & 2.5YR 2.5/4	10	C/D	M	sandy muck	could not get below 8" due to stones

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

Soils were saturated. Could not sample below 8 inches as materials were very stoney.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-A16 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills, ground moraines, drumlins Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 30.71" N Long: 72° 15' 19.2" W Datum: NAD 1983

Soil Map Unit Name: Paxton fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-A16 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red oak (Quercus rubra)	70	Yes	FACU
2. white pine (*Pinus Strobus*)	20	No	FACU
3. shagbark hickory (*Carya ovata*)	20	No	FACU
4.			
5.			
6.			
7.			
	110	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 feet)			
1. Japanese barberry (*Berberis thunbergii*)	15	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	

Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	

Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species	125	x 4 =	500
UPL species		x 5 =	
Column Totals:	125 (A)		500 (B)

Prevalence Index = B/A = 5.0

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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 X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-A16 (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 - 14	10YR 4/3	100					sandy loam	soils moist to dry

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-B1 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Marshes, depressions, kettles, bogs, swamps Local relief (concave, convex, none): Concave

Slope (%): 0 - 1 Lat: 42° 3' 30.23" N Long: 72° 14' 43.53" W Datum: NAD 1983

Soil Map Unit Name: Freetown muck NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X 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)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-B1 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	70	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	70	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. common winterberry (*Ilex verticillata*)	30	Yes	FACW
2. highbush blueberry (*Vaccinium corymbosum*)	30	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	60	= Total Cover	
Herb Stratum (Plot size: 5 feet)			
1. unidentified sedge	60	Yes	
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60	= Total Cover	
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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 60	x 2 = 120
FAC species 70	x 3 = 210
FACU species	x 4 =
UPL species	x 5 =
Column Totals: 130 (A)	330 (B)

Prevalence Index = B/A = 2.54

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-B1 (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 2/1	100					muck	saturated soils

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- X 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 (TF2)
- ___ 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 X No _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-B1 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 30.23" N Long: 72° 14' 43.53" W Datum: NAD 1983

Soil Map Unit Name: Gloucester gravelly fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-B1 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer rubrum*)	60	Yes	FAC
2. shagbark hickory (*Carya ovata*)	40	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	100	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. Japanese barberry (*Berberis thunbergii*)	15	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	
Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	60	x 3 =	180
FACU species	55	x 4 =	220
UPL species		x 5 =	
Column Totals:	115 (A)		400 (B)

Prevalence Index = B/A = 3.47

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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 X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-B1 (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 - 14	10YR 3/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-C1 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range:

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 32.21" N Long: 72° 14' 44.56" W Datum: NAD 1983

Soil Map Unit Name: Gloucester gravelly fine sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X 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)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-C1 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	60	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	60 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. mulitflora rose (Rosa multiflora)	20	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	20 = Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. broad-leaved cattail (*Typha latifolia*)	10	Yes	OBL
2. sensitive fern (*Onoclea sensibilis*)	15	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	25 = Total Cover		
Woody Vine Stratum (Plot size: 30 feet)			
1. riverbank grape (*Vitis riparia*)	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: 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	10	x 1 =	10
FACW species	15	x 2 =	30
FAC species	70	x 3 =	210
FACU species	20	x 4 =	80
UPL species		x 5 =	
Column Totals:	115 (A)		330 (B)

Prevalence Index = B/A = 2.87

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-C1 (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					sandy muck	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-C1 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 32.21" N Long: 72° 14' 44.56" W Datum: NAD 1983

Soil Map Unit Name: Gloucester gravelly fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-C1 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	30	Yes	FAC
2. red oak (*Quercus rubra*)	40	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	70	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	
Herb Stratum (Plot size: 5 feet)			
1. manicured lawn	60		
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60	= Total Cover	
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species 30	x 3 = 90
FACU species 40	x 4 = 160
UPL species	x 5 =
Column Totals: 70 (A)	250 (B)

Prevalence Index = B/A = 3.57

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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 X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-C1 (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 3/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-D5 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range:

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 31.03" N Long: 72° 14' 39.5" W Datum: NAD 1983

Soil Map Unit Name: Gloucester gravelly fine sandy loam NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)
- X 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)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 6
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-D5 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	70	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	70 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. highbush blueberry (*Vaccinium corymbosum*)	15	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	15 = Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. crested fern (*Dryopteris cristata*)	15	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	15 = Total Cover		
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
	= 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 30	x 2 = 60
FAC species 70	x 3 = 210
FACU species	x 4 =
UPL species	x 5 =
Column Totals: 100 (A)	270 (B)

Prevalence Index = B/A = 2.7

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-D5 (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					saturated loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-D5 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 31.03" N Long: 72° 14' 39.5" W Datum: NAD 1983

Soil Map Unit Name: Gloucester gravelly fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-D5 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer rubrum*)	40	Yes	FAC
2. red oak (*Quercus rubra*)	60	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	100	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 feet)			
1. Japanese barberry (*Berberis thunbergii*)	100	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	100	= Total Cover	

Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	

Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	40	x 3 =	120
FACU species	160	x 4 =	640
UPL species		x 5 =	
Column Totals:	200 (A)		760 (B)

Prevalence Index = B/A = 3.8

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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 X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-D5 (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 - 14	10YR 3/2	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-E1 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills, ground moraines, drumlins Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 32.76" N Long: 72° 15' 35.47" W Datum: NAD 1983

Soil Map Unit Name: Paxton fine sandy loam NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X 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)
- X 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)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 2
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: BVW-E1 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	70	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	70	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	

Herb Stratum (Plot size: 5 feet)			
1. crested fern (*Dryopteris cristata*)	15	Yes	FACW
2. sensitive fern (*Onoclea sensibilis*)	10	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	25	= Total Cover	

Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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	25	x 2 =	50
FAC species	70	x 3 =	210
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	95 (A)		260 (B)

Prevalence Index = B/A = 2.74

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-E1 (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 3/2	95	10YR 5/6	5	C/CS		sandy loam	saturated

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-E1 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills, ground moraines, drumlins Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 32.76" N Long: 72° 15' 35.47" W Datum: NAD 1983

Soil Map Unit Name: Paxton fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-E1 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	30	Yes	FAC
2. red oak (*Quercus rubra*)	60	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	90	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	

Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	

Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species 30	x 3 = 90
FACU species 60	x 4 = 240
UPL species	x 5 =
Column Totals: 90 (A)	330 (B)

Prevalence Index = B/A = 3.67

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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 X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-E1 (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 3/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: WA-B1 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 3 - 8 Lat: 42° 3' 41.54" N Long: 72° 16' 0.47" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X 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)
- X 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)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 3
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WA-B1 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	50	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	50 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. silky dogwood (*Cornus amomum*)	40	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	40 = Total Cover		
Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
	= 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 40	x 2 = 80
FAC species 50	x 3 = 150
FACU species	x 4 =
UPL species	x 5 =
Column Totals: 90 (A)	230 (B)

Prevalence Index = B/A = 2.56

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-B1 (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 - 5	10YR 2/2	100					sandy muck	could not get below 5" due to stones

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

Soils were saturated. Could not sample below 5 inches as materials were very stony.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: WA-B1 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 3 - 8 Lat: 42° 3' 41.54" N Long: 72° 15' 0.47" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WA-B1 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. black cherry (*Prunus serotina*)	20	Yes	FACU
2. white pine (*Pinus Strobus*)	10	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	30	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 feet)			
1. Japanese barberry (*Berberis thunbergii*)	10	Yes	FACU
2. American red raspberry (*Rubus idaeus*)	15	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	25	= Total Cover	

Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	

Woody Vine Stratum (Plot size: 30 feet)			
1. American bittersweet (*Celastrus scandens*)	15	Yes	FACU
2.			
3.			
4.			
	15	= 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: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species 70	x 4 = 280
UPL species	x 5 =
Column Totals: 70 (A)	280 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-B1 (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 3/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

Materials stony below 10 inches.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: WA-C4 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range:

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, concave

Slope (%): 3 - 8 Lat: 42° 3' 39.5" N Long: 72° 16' 0.64" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: WA-C4 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. reed canarygrass (*Phalaris arundinacea*)	80	Yes	FACW
2. rough-leaved goldenrod (*Solidago patula*)	20	No	OBL
3. grass-leaved goldenrod (*Euthamia graminifolia*)	20	No	FAC
4. broadleaf cattail (*Typha latiifolia*)	20	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	140 = Total Cover		
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
	= 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: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	40	x 1 =	40
FACW species	80	x 2 =	160
FAC species	20	x 3 =	60
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	140 (A)		260 (B)

Prevalence Index = B/A = 1.86

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-C4 (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					sandy muck	saturated

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: WA-C4 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, concave

Slope (%): 3 - 8 Lat: 42° 3' 39.5" N Long: 72° 16' 0.64" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WA-C4 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. white pine (*Pinus strobus*)	15	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	15 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. unidentified upland grass	90	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
	90 = Total Cover		
Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
	= 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: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species 15	x 4 =	60
UPL species 90	x 5 =	450
Column Totals: 105 (A)		510 (B)

Prevalence Index = B/A = 4.86

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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 X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-C4 (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 - 14	10YR 3/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: WA-A3 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range:

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, concave

Slope (%): 3 - 8 Lat: 42° 3' 44.81" N Long: 72° 16' 13.87" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X 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)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: WA-A3 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. reed canarygrass (*Phalaris arundinacea*)	60	Yes	FACW
2. rough-leaved goldenrod (*Solidago patula*)	20	Yes	OBL
3. grass-leaved goldenrod (*Euthamia graminifolia*)	20	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
	= 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 20	x 1 = 20
FACW species 60	x 2 = 120
FAC species 20	x 3 = 60
FACU species	x 4 =
UPL species	x 5 =
Column Totals: 100 (A)	200 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-A3 (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	98	2.5YR 3/6	2	CS	PL	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: WA-A3 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, concave

Slope (%): 3 - 8 Lat: 42° 3' 44.81" N Long: 72° 16' 13.87" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: WA-A3 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red oak (*Quercus rubra*)	20	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	20	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. unidentified upland grass	90	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
	90	= Total Cover	
Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species	20	x 4 =	80
UPL species	90	x 5 =	450
Column Totals:	110 (A)		530 (B)

Prevalence Index = B/A = 4.82

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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 X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-A3 (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 - 14	10YR 2/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: IW-B6 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, concave

Slope (%): 3 - 8 Lat: 42° 3' 43.76" N Long: 72° 16' 14.55" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)	X Water-Stained Leaves (B9)	Secondary Indicators (minimum of two required)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	___ Surface Soil Cracks (B6)
___ Saturation (A3)	___ Marl Deposits (B15)	X Drainage Patterns (B10)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Moss Trim Lines (B16)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Dry-Season Water Table (C2)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Crayfish Burrows (C8)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Saturation Visible on Aerial Imagery (C9)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Stunted or Stressed Plants (D1)
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)	___ Geomorphic Position (D2)
___ Sparsely Vegetated Concave Surface (B8)		___ Shallow Aquitard (D3)
		___ Microtopographic Relief (D4)
		___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: IW-B6 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. reed canarygrass (*Phalaris arundinacea*)	70	Yes	FACW
2. rough-leaved goldenrod (*Solidago patula*)	20	No	OBL
3. grass-leaved goldenrod (*Euthamia graminifolia*)	20	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	110 = Total Cover		
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
	= 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: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	70	x 2 =	140
FAC species	20	x 3 =	60
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	110 (A)		220 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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.

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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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: IW-B6 (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	98	2.5YR 3/6	2	CS	PL	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: IW-B6 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, concave

Slope (%): 3 - 8 Lat: 42° 3' 43.76" N Long: 72° 16' 14.55" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: IW-B6 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	15 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. unidentified upland grass	90	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
	90 = Total Cover		
Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
	= 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	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species 90	x 5 = 450
Column Totals: 90 (A)	450 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: IW-B6 (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 - 14	10YR 2/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

Appendix H

Technical Specifications

ENVIRONMENTAL PERMITTING

If Contractor erection, demolition, storage, or other procedures not originally allowed by existing environmental permits require work to occur in or otherwise impact water, wetland resource areas, buffer zones, etc., 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 #2 Highway Director and Resident Engineer in writing a minimum of 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 through the District #2 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.

ORDER OF CONDITIONS

This project is subject to the Massachusetts General laws, Chapter 131, Section 40 as amended, and has been issued an Order of Conditions ("Order") by the Wales Conservation Commission. The Order and Notice of Intent are to be considered part of this contract and a copy of the Order and all plans/attachments shall be on-site while activities regulated by the Order are being performed. The Contractor is hereby notified that s/he will be responsible and held accountable for performing any/all work necessary to satisfy and comply with the entire Order and Notice of Intent.

The Contractor is advised that no additional compensation will be allowed for work required to establish, achieve, and maintain compliance with the Order and Notice of Intent, as payment for the work shall be included in the respective bid items, unless specified elsewhere.

TREE REMOVAL

The removal of existing trees shown on the plans, or directed by the Engineer, 9 inches in diameter or smaller shall be considered incidental to the project. The Contractor shall coordinate with the Town of Wales Tree Warden prior to marking or removal of any trees within the project limits and will not mark or remove any tree within the project limits without approval from the Town of Wales or MassDOT.

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, the 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.

NORTHERN LONG-EARED BAT PROTECTION

The U.S. Fish and Wildlife Service (USFWS) has listed the northern long-eared bat (NLEB) as endangered under the Endangered Species Act (ESA) and the following requirements exist to protect the bat and its habitat. 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.

On behalf of FHWA, the lead federal agency for Section 7 consultation, MassDOT submitted a FHWA, FRA, FTA 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 May Affect, Not Likely to Adversely Affect (NLAA) determination (see **Document A00870 USFWS NLAA**). Therefore, the project has completed Section 7 consultation through the ESA. The following Avoidance and Minimization Measures (AMMs) must be strictly adhered to in order to protect NLEB 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, including all applicable AMMs. NLEB Bat information (https://www.fws.gov/midwest/endangered/mammals/nleb/) 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.**

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.**
- In order to protect female northern long-eared bats and their young during the maternity roosting season, **no tree cutting shall be conducted during the active season**: **April 1 to October 31**.
- Do not remove **documented** or NLEB 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, 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.

ITEM 102.51 INDIVIDUAL TREE PROTECTIONS EACH

GENERAL

The purpose of this item is to prevent damage to branches, stems and root systems of existing individual trees to remain and to ensure their survival. Provisions under this item include steps to minimize soil and root disturbance and to construct protection measures for trees close to construction areas.

The work under this item shall conform to the relevant provisions of Sections 101 and 771 and the following:

Examination of Conditions

The Contractor shall be solely responsible for judging the full extent of the work requirements, including, but not necessarily limited to any equipment and materials necessary for providing tree protection.

Prior to any construction activities, the Contractor and Arborist shall walk the site with the Engineer and Town Tree Warden to identify which trees will require protection and to determine approved measures. The Arborist shall make recommendations as to appropriate methods to trees. The Engineer will have final decision as to trees and methods.

The Contractor is responsible for the protection of all existing trees and plants within and immediately adjacent to the construction area that are not designated to be removed for the length of the construction period.

Incidental to the cost of these items, the Contractor shall retain the services of a certified arborist, who shall make recommendations as to the specific appropriate treatment of trees within or near the work zone.

SUBMITTALS

Incidental to this item, the Contractor shall provide to the Engineer one (1) copy each of the American National Standards Institute (ANSI) Standard Z-133.1 and A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance, Part 1: Pruning. These references shall be kept by the Engineer at his office for the length of the Contract.

Prior to start of work, the Contractor shall submit to the Engineer the name and certification number of the Massachusetts Certified Arborist referenced herein. Cost for Certified Arborist for all activities pertaining to this Item shall be incidental to this item.

MATERIALS

Fence and temporary fence posts shall be subject to the approval of the Engineer.

Staking for individual tree protection fencing shall be steel posts or 2x4 inch stock as directed and approved by the Engineer.

Wood chips shall conform to provisions of Wood Chip Mulch under Materials Section M6.04.3.

Trunk protection shall be 2x4 inch cladding, at least 8 feet in length, clad together with wire. Trunk protection shall include burlap.

Incidental to these items, the Contractor shall provide water for maintaining plants in the construction area that will have exposed root systems for any period during construction.

CONSTRUCTION METHODS

To the extent possible, to avoid soil compaction within the root zone, construction activities including, but not limited to, vehicle movement, excavation, embankment, staging and storage of materials or equipment shall not occur underneath the canopy (drip line) of trees to remain. Where these activities will occur within 10 Feet of the canopy of trees, the Contractor shall provide Individual Tree Protection as specified herein.

Tree Fencing and Armoring

For individual tree protection, the Contractor shall set posts and fencing at the limits of the tree canopy. Where construction activities closer to the trees is unavoidable, the contractor shall tie branches out of the way and place wood chips to a depth of 6 inches on the ground to protect the root systems. The Contractor shall wrap the area of the trunk of the tree with burlap prior to armoring with 2x4 inch cladding. Cladding for tree trunks shall extend from the base of the tree to at least 8 feet from the base.

Where excavation within canopy is unavoidable, the Contractor shall use equipment and methods that shall minimize damage to the tree roots, per recommendations of the Certified Arborist. Such methods may require root pruning prior to, as well as during, any excavation activities.

All fencing, trunk protection, branch protection, and woodchips shall be maintained throughout the duration of the contract. Protective fencing shall be repaired and woodchip mulch replaced as necessary during the duration of the contract at no additional cost.

Cutting and Pruning

Some pruning of roots and branches may be a necessary part of construction. Pruning will be performed on the same side of the tree that roots have been severed.

The Contractor shall retain the services of a Massachusetts State Certified Arborist to oversee any cutting of limbs, stem or roots of existing trees. All cuts shall be clean and executed with an approved tool. Under no circumstances shall excavation in the tree protection area be made with mechanical equipment that might damage the existing root systems.

Any tree root area exposed by construction shall be covered and watered immediately. Exposed tree roots shall be protected by dampened burlap at all times until they can be covered with soil.

Watering

Water each tree within the construction area where work is in progress twice per week until the surrounding soil of each tree is saturated for the duration of construction activities.

Removal of Protection

After all other construction activities are complete, but prior to final seeding, wood chips, temporary fencing, branch protection, and trunk protection materials shall be removed and disposed of off-site by the Contractor at no additional cost.

Tree Damage

The Contractor shall be held responsible for the health and survival of the existing trees in the immediate vicinity of the of the construction area. Damage that, in the Engineer's opinion, can be remedied by corrective measures shall be repaired immediately. Broken limbs shall be pruned according to industry standards. Wounds shall not be painted. Trees or shrubs that are damaged irreparably shall, at the Engineer's discretion, be replaced per the requirements of Division I of these Special Provisions. Cost of replacement trees shall be borne by the Contractor.

BASIS OF PAYMENT

Where the plans show specific, individual trees to remain and where grading or other disturbance is shown within the drip line of these trees or where the Engineer determines that an individual tree must be protected, these trees shall be protected and paid for under ITEM 102.51, Individual Tree Protection.

Item payment shall be scheduled throughout the length of contract: 30 percent of value shall be paid upon installation, 30 percent approximately halfway through the contract, and the remainder to be paid at the end of the contract after completion of construction operations that would disturb plants and after the protection materials have been removed and properly disposed of off-site by the Contractor.

Compensation for Individual Tree Protection will be paid for at the contract unit price PER EACH under Item 102.51. This shall include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work, including the services of a certified arborist, water and fertilizer, and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract.

Cost of wood chips, as required, shall be incidental to these items.

ITEM 691.01 BALANCE STONE WALL REMOVED AND REBUILD FT

The work under this Item shall conform to the applicable provisions of Sections 685, 690, 901, of the Standard Specifications, the Plans, and the following:

DESCRIPTION

The work under this heading consists of carefully dismantling, stockpiling stone, and rebuilding selected fieldstone balance stone walls in new locations within the project area. Balance stone walls to be removed and rebuilt as identified on the plans. Locations of new walls shall comply with all ROW and clear recovery requirements.

To allow mason greatest selection of local fieldstone in rebuilding balance wall, no stones from balance stone walls shall be discarded from project area until all rebuilt balance walls on project are complete.

The work shall include the total volume of adjusted wall, disassembly of existing wall, and reconstructing wall in new location complete as shown on the plans and as directed by the Engineer.

The work shall include but not be limited to digging and trenching, removal of vegetation, labor, tools, equipment and all incidentals required to complete the work as stated herein, shown on the contract plans, and as directed by the Engineer. 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.

MATERIALS

Stone from existing project area balance walls shown to be removed shall be used. Ideally stone from segments of wall shall simply be relocated. No stone from walls not to be removed shall be used.

Most stones are dry laid but vary in size. Some stones may be boulders embedded in the ground.

Any supplemental stones that are required shall be field stones which match the size, color, and texture of the existing stones as closely as is feasible.

Stones from existing walls should not require cleaning. Natural staining or patches of lichen growth is acceptable.

No mortar shall be used anywhere or for any reason in reconstructing dry laid balance walls.

SUBMITTALS

The stonework shall be done by masons who are experienced in construction of dry laid stone walls. At least one of the masons shall have 10 years or more experience constructing mortarless, dry-laid balance stone walls. Resume and projects showing experience shall be

submitted to Engineer and MassDOT Landscape Section for approval.

CONSTRUCTION METHODS

Prior to the disassembly of the existing wall, photographs of the existing conditions of the wall shall be taken to serve as a guide for its reconstruction.

The Contractor shall take care not to damage the existing stones during the disassembly and reconstruction of the wall.

The Contractor shall provide a secure location for stockpiling stone prior to reconstruction, so that stones will not be damaged, lost or stolen.

The rebuilt walls shall maintain a linear appearance and irregular character of local early agricultural farmer walls to as great a degree as possible.

To prepare the base, remove vegetation and excavate a trench up to 12 inches deep as needed to achieve stable, unfrozen soil. Place the bottom row of stones in the trench. Stones from select, existing dismantled walls, shall be used to rebuild the new walls.

The open spaces about the base of the wall shall be filled with the materials excavated from the trench. Surplus excavation shall be used as directed in location or disposed.

The stones shall be laid in a two-over-one, one-over-two pattern so as to break joints and all vertical spaces shall be packed full with spalls or chinking stones. No spalls or chinking shall be allowed in the beds and at least 25% of the stones in the face shall be headers evenly distributed throughout the wall.

Additional available stone may be used to increase height of wall if needed. The walls shall not exceed four feet in height.

Upon completion of all walls, stone shall be disposed of or stockpiled at *(show location here)* as coordinated by Engineer and Municipality.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work under this Item shall be paid for at the Contract unit price per foot for Item 691.01 – Balance Stone Walls Removed and Rebuilt complete and to the satisfaction of the Engineer. Balance Stone Walls Removed and Rebuilt will be measured in place and shall be the length of balance stone walls rebuilt.

Excavation at the new location will be paid for at the contract unit price per cubic yard under the item for Class A Trench Excavation or Class B Rock Excavation. The cost for this work shall include full compensation for, including, but not limited to, all labor, equipment, worker protection, environmental compliance, vegetation removal, materials, tools, material testing, transportation/hauling and any incidentals required to complete the work to the satisfaction of the Engineer in accordance will all requirements of the contract.

ITEM 697.1 SILT SACK EACH

GENERAL

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.

Sack shall be manufactured by one of the following or an approved equal:

ACF Environmental
ACF Environmental ACF Environmental (ferguson.com)
(800)-448-3636

Siltsack® SI Geosolutions:
www.sigeosolutions.com
(800)621-0444

Dandy Sack™ Dandy Products Inc.
P.O. Box 1980
Westerville, Ohio 43086
Phone: 800-591-2284
Fax: 740-881-2791
Email: dlc@dandyproducts.com
Website: www.dandyproducts.com

FLeXstorm Inlet Filters Inlet & Pipe Protection
24137 W. 111th St - Unit A
Naperville, IL 60564
Telephone: (866) 287-8655
Fax: (630) 355-3477

Construction

Silt sacks shall be installed in retained existing and proposed catch basins within the project limits and as required by the Resident 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 directed 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 and maintain the condition of silt sacks after each rainstorm and during major rain events and in accordance with Part 4.2 Inspection Requirements of the 2022 Construction General Permit (CGP). 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 Contractors 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 debris accumulated in inlet sedimentation control devices shall be handled and disposed of as specified in Subsection 227 of the Standard Specifications.

All curb openings shall be blocked to prevent stormwater from bypassing the device.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

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

GENERAL

The work under this item shall conform to the requirements of Section M9.50.0 for separation of the Standard Specifications. Construction and installation shall be in accordance with AASHTO M 288 and the following:

This work will consist of furnishing and placing geotextile fabric for separation under stone for pipe ends and under revetment stone slope protection at the locations shown on the Construction Details or as required by the Engineer.

CONSTRUCTION

Atmospheric exposure of the geotextile fabric to the elements following lay down shall be a maximum of 14 days.

For seams that are sewn in the field, the Contractor shall provide at least a six-foot length of sample sewn seam for the approval of the Engineer before the geotextile fabric is installed. The seams sewn for sampling shall be sewn using the same type of equipment and procedures as will be used for the production seams. If seams are sewn in both the machine and cross machine direction, samples of seams for both directions shall be provided. The seam assembly description shall be submitted by the Contractor along with the seam samples. This description shall include the seam type, stitch type, sewing thread, and stitch density. If the Contractor elects to sew seams instead of overlap, colored thread must be used.

Geotextile shall be placed in intimate contact with soils without wrinkles or folds, and shall be anchored on a smooth graded surface approved by the Engineer. The geotextile shall be placed in such a manner that placement of the overlaying materials will not excessively stretch or tear it.

Adjacent geotextile sheets shall be joined by either sewing or overlapping. At roll ends, overlapped seams shall overlap a minimum of 12 inches, except when placed under water, where they shall overlap a minimum of 3 feet. Adjacent rolls shall overlap a minimum of 12 inches.

Care shall be taken during installation to prevent damage to the geotextile as a result of the installation process. Should the geotextile be damaged, a geotextile patch shall be placed over the damaged area extending a minimum of 3 feet beyond the limits of the damage.

Any section of fabric that is damaged shall be repaired in accordance with the manufacturer's requirements and AASHTO M 288 and to the satisfaction of the Engineer or it shall be replaced at no cost to the state.

Bedding and Slope Protection:

> The geotextile shall be placed and anchored on a prepared surface approved by the Engineer. The geotextile shall be laid loosely so that placement of the overlaying materials will not stretch or tear the geotextile. The backfill placement shall begin at the toe and proceed up the slope. Successive geotextile sheets shall be overlapped in such a manner that the upstream sheet is placed over the downstream sheet.

Riprap shall not be dropped onto the geotextile from a height greater than 12 inches. Slope protection and smaller sizes of stone filling shall not be dropped onto the geotextile from a height exceeding 3 feet.

The surface upon which the geotextile is to be placed shall be within reasonable conformity to the proposed grade.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 698.3 will be measured for payment by the number of Square Yards actually installed at the locations shown on the plans, in accordance with these specifications, or as directed by the Engineer. Overlapping for seams and joints shall be measured as one layer of fabric. Any

embedment or wrapping at the toe or top of the slope, applied per manufacturer's installation recommendations or the Engineer's direction shall be measured for payment.

Item 698.3 will be paid for at the contract bid price per Square Yard of fabric, complete in place. The price so shall constitute full compensation for furnishing and installing geotextile fabric, all miscellaneous associated assembly material, and all other labor, equipment, material, and incidental costs necessary to complete the work as specified and as directed by the Engineer.

ITEM 755.35 INLAND WETLAND REPLICATION AREA LUMP SUM

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

GENERAL

The work under this item shall conform to the relevant provisions of Sections 120, 770, 771 of the Standard Specifications and the following:

Work under this item shall include furnishing material and the construction and maintenance of inland wetland replication areas as shown on the drawings and as required by the Engineer. Inland Wetland Replication Area shall hereafter be referred to as Replication Area. All work shall be in coordination with an approved Wetland Specialist as specified under that item.

Wetland Restoration work shall be as specified and compensated under that item. Construction of tidal wetlands shall be as specified under the appropriate item for tidal wetland mitigation.

The Replication Area shall be constructed prior to wetland impacts unless otherwise approved by the Engineer, specified herein, or specified in permit conditions and approvals. Construction schedule shall be appropriate to planting and seeding season (see below). Changes to this schedule will require written approval from the Engineer.

Construction of the Replication Area shall be completed as shown on the drawings at the following location (See ITEM 755.44 Wetland Restoration I:

Area at Station: ***85+50*** Area = ***1204*** sf.

Replication Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, - U.S. Army Corps of Engineers Permit.

The Contractor is responsible for protection and preservation of natural areas adjacent to the Replication Area both within and outside the project limits and for the duration of the Contract; including but not limited to damage to soils or vegetation due to erosion, sedimentation, compaction, trampling, vehicles, storage of materials, or other negligence shall be repaired to the satisfaction of the Engineer and at the Contractor's expense.

The Wetland Specialist overseeing the Wetland Replication construction work shall not be from the same company as that which is performing planting, seeding, or participating in any aspect of the Wetland Replication construction.

SUBMITTALS - DOCUMENTS

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): As specified below, shall be submitted to the Engineer for distribution to appropriate regulatory agencies.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.75 and 755.76.

SUBMITTALS - MATERIAL

Soil and Amendments

No soil, compost, or other soil amendment imported to the work site shall contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants.

At least sixty (60) days prior to installation and prior to ordering, the Contractor shall submit for approval sources of soil, compost, and amendments. Submittal shall include the supplier and location of the source. Off-site sources shall be identified and available for inspection by the Wetland Specialist prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Samples of tested and approved wetland soil and soil amendments for soil texture, organic carbon content or other routine soil analysis parameters (e.g., pH, Cation Exchange Capacity, Percent Base Saturation) and Soil Organic Matter Analysis will be required if requested by the Engineer. The grab samples shall be collected by the Contractor or Wetland Specialist from multiple representative locations in the wetland topsoil mix following the “UMASS Soil and Plant Tissue Testing Laboratory Sampling and Collection Protocols” (or equivalent certification paperwork provided by the soil supplier). The lab analysis shall be provided to the Engineer along with written certification from the Contractor or Wetland Specialist that the wetland topsoil was collected per the referenced protocol and meets the desired specification. The analysis and written certification of same shall be provided to the Engineer prior to placing the wetland topsoil in the Replication Area.

Seed Mix

Certificate of Materials from the supplier shall be submitted 30 days prior to seeding and must be approved prior to ordering materials. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

Bill of lading or notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Plant Certification

Plant Certification shall be per the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the Standard Specifications. The nursery source shall certify the provenance or origin of all plants.

Other Material: Submittals shall be per the respective item.

MATERIALS

Sediment Control Barrier and Erosion Prevention Measures
Sediment control barriers shall be per Item 767.121.

Erosion prevention measures for disturbed areas adjacent to the Replication Area shall include but not necessarily be limited to compost blankets, jute mesh, seeding, and/or combinations thereof as approved by the Engineer.

Sediment controls and erosion prevention devices and measures shall be compensated under the respective items.

Wetland Soil

Soil appropriate for the Replication Area may be either hydric soil excavated from the impacted wetland, a manufactured mix of compost and on-site borrow, or a combination thereof, as approved by the Engineer.

Hydric soil from the impacted wetland area may be spread on the surface of the constructed Replication Area as an inoculant or can be placed in a bulk fashion in a roughly 1:1 ratio of area and depth. Soil shall be handled such that the original soil structure is preserved and shall not be compacted, screened, or otherwise processed.

Hydric soil from the impacted wetland that is infested with invasive plant species identified on the Massachusetts Invasive Plant Advisory Group (MIPAG) shall not be used in the Replication Area unless approved by the Wetland Specialist and Engineer. To the extent possible, infested soil shall be disposed of within the project limits in an upland area outside of regulated areas and as approved by the Invasive Plant Management Strategy item (if in the contract) or by the Engineer.

A manufactured mix suitable for wetlands shall consist of on-site borrow from the proposed Replication Area (if approved by the Wetland Specialist and Engineer) thoroughly mixed with compost to achieve a target organic carbon content of 10-12% (up to 21% percent organic matter) by dry weight. The organic material used for mixing shall be well or partially decomposed. Clean leaf compost is the preferred soil amendment to achieve these standards though other materials may be used if approved by the Wetland Specialist and Engineer. Note that "clean" refers both to a negligible amount (<1%) of physical contaminants such as plastic and to the lack of chemical contaminants that might pose a hazard to plants or animals. Off-site borrow may be used for mixing if approved in advance by the Engineer.

No soil or soil amendment shall be brought on site without approval of the material source by the Wetland Specialist and the Engineer. Soils used in the replacement area shall be free of rocks greater than 4 inches in diameter.

Plants

Plant material shall conform to the applicable requirements of Section 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the latest edition of the Standard Specifications and as amended below.

Plants shall be native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion.

Plant species and sizes to be included in the Replication Area shall be:

- as specified in the plan schedule provided on the construction plans.

Requests for substitutions shall be submitted in writing to the Engineer for review by the Wetland Specialist, MassDOT Landscape Architect, and, if required, the relevant regulatory agency at least thirty (30) days prior to planting. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries that have been inspected by state and/or federal agencies.

Seed Mix

Mix 765.552 Wetland Mix – Obligate Mix

	Botanical Name	Common Name	% PLS By Weight
Grass			
	Carex vulpinoidea	Fox Sedge	26.50%
	Carex lurida	Shallow Sedge	15.00%
	Sparganium eurycarpum	Giant Bur Reed Eco PA	10.00%
	Carex lupulina	Hop Sedge	7.00%
	Carex crinita	Fringed Sedge	6.00%
	Scirpus cyperinus	Woolgrass	4.00%
	Juncus effusus	Soft Rush	3.00%
	Carex comosa	Bearded Sedge	3.00%

Scirpus atrovirens	Green Bulrush	3.00%
Sparganium americanum	Burrweed	2.50%
Scirpus validus	Bulrush, soft-stem	2.00%
Carex stricta	Tussock Sedge	1.00%
Glyceria canadensis	Manna Grass	1.00%
		84.00%
Herb/Forb		
Verbena hastata	Blue Vervain	4.00%
Aster puniceus	Aster - Swamp	2.00%
Eupatorium maculatum	Joe-pye Weed	1.50%
Eupatorium perfoliatum	Boneset	2.00%
Iris versicolor	Blue Flag Iris	2.00%
Alisma subcordatum	Mud Plaintain	1.00%
Vernonia noveboracensis	New York Ironweed	1.00%
Bidens cernua	Nodding Burr Marigold	1.00%
Solidago patula	Roughleaf goldenrod	0.50%
Mimulus ringens	Monkey Flower	0.50%
Chelone glabra	White Turtlehead	0.50%
		16.00%
		100.00%

Seeding Rate:
Species ecotype shall be as native to New England region as possible.
Apply this mix at 20 lbs PLS/acre.

Seeding shall conform to the Standard Specifications Section M6, ROADSIDE DEVELOPMENT MATERIALS.

Fertilizers shall not be used.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

Mulch/Compost Blanket for Seeding

Hydromulch shall be per the manufacturer’s recommendations and shall be wood fiber or straw mulch only. Mulch shall be incidental to seeding.

Compost Blanket may be used in lieu of mulch for seeding. Compost Blanket shall meet the material and submittal requirements of that Item and shall be applied as specified below. Compost Blanket shall be compensated under that item.

CONSTRUCTION METHODS

SITE PROTECTION MEASURES

Minimizing Damage

The Contractor shall plan and execute operations in a manner minimizing the amount of excavated and exposed fill or other foreign materials that could be washed or otherwise carried into Replication Area and nearby resource areas.

Construction of and access to the Replication Area shall minimize damage to existing vegetation and soils as specified herein. Damage to soils or vegetation shall be repaired to the satisfaction of the Engineer and at the Contractor's expense. If required for soil remediation, tilling and the addition of compost shall be at the Contractor's expense.

Wetland topsoil shall be deposited and graded in the Replication Area in a manner that minimizes travel and subsequent compaction of the subgrade (including any specified pit and mound topography) to the extent practicable, including use of track mounted excavators as appropriate. Should soils be compacted, they shall be loosened by a method such as disking, spring-tooth harrowing and/or rototilling. The Contractor shall use boards, timber or composite mats, or other approved materials as necessary, to protect existing and/or new wetlands from compaction due to heavy foot traffic or if equipment is required to travel over wetland soil. All labor and materials required for protection and preservation of site shall be incidental to this item.

Stockpiling of Soil

Stockpiling of soil, including hydric soil for replication, shall be at least 100 feet from the edge of the bordering and isolated vegetated wetlands and inland banks, unless approved otherwise by the Engineer. Stockpiled soils shall be securely stabilized and contained. Any areas of exposed soil or stockpiles within and adjacent to the Replication Area that will remain inactive for more than 7 calendar days shall be sown with a mix of rapid germinating annual grasses (e.g., annual rye) covered with a layer of straw mulch applied at a rate of 90 pounds per 1,000 square feet. As necessary, the mulch shall be anchored with a tacking coat (non-tar) applied by a hydro seeder or other method recommended by the Wetland Specialist in consultation with the Engineer. In the event that there is excess borrow, it shall be disposed of under Excavation, Item 120.1.

Sediment Barriers

Placement: Sediment barriers shall be installed along the downslope perimeter of the Replication Area beginning and ending in the surrounding upland so that no excavated material or disturbed soil can enter adjacent wetlands or waters. Where construction work is immediately upgradient of the wetland, barriers shall be located so as to protect the Replication Area until slopes are stabilized. Sediment barriers shall be in place and approved by the Engineer prior to excavation work. No work shall take place outside the barriers.

Maintenance: The Contractor shall ensure that all sediment barriers function as intended and at all times per the specifications of those respective items.

Existing Trees to Remain

Tree protection shall be per the relevant specifications and as shown on the plans or as required by the Engineer. To protect root systems of existing trees to remain, the limits of the Replication Area may be adjusted, but the total area of replication required by the permits shall not be reduced. Access route may be adjusted as required.

Trees to be retained as snags (upright dead or dying trees left for wildlife habitat) within or adjacent to the Replication Area shall be as shown on the plans or as directed by the Wetland Specialist or Landscape Architect during the initial site walk. Trees to remain as snags shall be clearly marked prior to clearing. Trees that pose a potential fall hazard (i.e., are near a roadway) should have limbs and trunk cut such that the tree does not pose a fall hazard.

Coarse woody debris in the form of cut trees, stumps, logs, and brush shall be incorporated as shown on the plans or as directed by the Wetland Specialist or Landscape Architect. On site material shall be selected and marked by the Wetland Specialist, retained on the project site, and placed as specified below under Placement of Coarse Woody Debris.

All trees, stumps, or brush not specified to remain shall be removed and shall not be stockpiled in the wetland resource areas while awaiting disposal.

Work shall be coordinated with Clearing or Tree Removal Item and compensated under that Item.

PRE-WETLAND CONSTRUCTION SITE WALK

Delineating the Replication Area and Access Route. The Contractor shall stake out the Replication Area boundaries and the intended access route and set grade stakes for approval by the Wetland Specialist and Engineer. Following staking and demarcation of areas, the Engineer and Wetland Specialist shall approve or modify as necessary the limits of work, the access route, final location and configuration of replication, grade stake elevations, proposed location of sediment barriers, and review proposed construction methods.

As part of the delineation and approval process, the Wetland Specialist shall mark trees to be converted to snags, select course woody debris to be retained for re-use, and select rocks or other elements to be used for habitat features.

Invasive Plants: As part of the initial site walk, the wetland to be impacted and the proposed replication site shall be inspected for the presence of invasive plants. If invasive plants are found, they shall be addressed as described herein under Invasive Plants.

SOIL WORK

Final grades in the Replication Area shall meet the target elevations as shown on the Plans or as adjusted by the Wetland Specialist to achieve the desired hydrology and micro-habitat. If adjustments are required, a Request for Information (RFI) shall be submitted to the Engineer for approval. Adjustments shall be documented and included in the As-Built plans (if required) and/or other applicable required documents.

<u>Excavation & Grading</u>

When required by permits, the Wetland Specialist shall notify MADEP and the ACOE (as applicable) at least 72 hours prior to excavation.

Soil in the proposed wetland areas that must be removed for grades to conform to the proposed elevations shall be stripped and disposed of, or, if suitable for reuse, be stockpiled in an approved location. Stockpiled soils shall be kept wet and not allowed to dry out. Procedures for maintaining appropriate moisture levels shall be documented by the Wetland Specialist and provided to the Engineer and the Contractor.

Replication area shall be excavated as shown on the drawings. Where replication area is adjacent to existing reference wetland, finish grade of replication shall generally match existing grades and micro-topography, notwithstanding any deviations that are necessary to achieve the desired hydrology and habitat in the Replication Area.

Prior to placement of backfill, scarify subgrade to a depth of 4 to 6 inches.

Placement of Wetland Soil

Following excavation, scarification, and grading of sub-grade, and after the sub-grade elevations are approved by the Wetland Specialist, suitable soil previously removed or an evenly mixed organic/mineral soil created on-site shall be spread to the design depth and thickness over the proposed wetland areas as shown on the plans and as directed by the Wetland Specialist.

Vehicles used to transport soil from offsite shall be washed or cleaned with air pressure to prevent exotic or invasive seeds or root fragments from contaminating the Replication Area.

Final Grading

The finished grade of the Replication Area shall be at an elevation that will provide an unrestricted hydrologic connection between the Replication Area and adjacent resource areas. The hydrologic connection should be in keeping with restoring the intended function of the replacement wetland relative to the impacted reference wetland. The Contractor shall verify that this elevation is not at a level that could negatively alter the hydrology of an adjacent wetland. Microtopography in the form of hummocks, pits and mounds shall be as shown on the plans or as adjusted by the Wetland Specialist. Final elevations and grading of wetland soil shall be approved by the Wetland Specialist and the Engineer.

To avoid compaction once soil has been placed, no heavy equipment shall travel across placed soil and no work shall occur in wet or moist soil. Soil that is compacted due to construction activities shall be replaced with soil as specified herein and at the Contractor’s expense.

Installation of Monitoring Wells in Replication Area

For a constructed Replication Area over 1,000 square feet, a representative number of monitoring wells shall be installed in locations as shown on the Plans. Monitoring wells shall include data loggers. For purposes of this specification, a data logger refers to a battery powered device that records groundwater level. Data shall be collected by the Wetland Specialist and submitted with Monitoring Reports and as required by applicable permits. Wells shall be installed immediately following completion of construction of the Wetland Replication Area.

Wells shall be installed in accordance with USDA/NRCS technical report entitled: "Sprecher, S.W. 2008. Installing monitoring wells in soils (Version 1.0). National Soil Survey Center, Natural Resources Conservation Service, USDA, Lincoln, NE." or equivalent methodology approved by Engineer.

RESTORING VEGETATION

Placement of Coarse Woody Material

If specified within this Contract or if directed by the Wetland Specialist or Landscape Architect during the initial site walk, woody debris shall be placed in the Replication Area and/or adjacent upland buffer. Material shall be placed as shown on the plans or as directed following placement of wetland soil and prior to application of compost and/or seed. Woody material shall cover a minimum of 5-20 percent of the Replication Area, depending on whether it is a meadow or woodland wetland and how much wood is available from construction clearing. Where trees are cut for construction purposes, logs of a minimum length of 8 feet must comprise a minimum of 50% of the woody material left on site. Brush shall be included along with logs and stumps as directed. Woody material shall be placed in a deliberate and naturalistic manner.

Planting

Following placement of wetland soil and approval of final grade and conditions, Replication Area shall be planted. Planting shall conform to SECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER of the Division I Standard Specifications and as amended below.

Planting Season shall be May 15-June 15 and September 1-November 1 unless otherwise specified in applicable permit conditions.

Prior to planting, the Wetland Specialist shall approve the condition of the plant material and the method of installation and shall oversee the planting work. Replication Area shall be planted in the dry. Plants shall be placed according to the planting details and within the range of target elevations and at the spacing shown on the Plans or, if spacing is not indicated on the Plans, at the direction of the Wetland Specialist. Unless otherwise noted on the Plans, final plant locations shall be determined on site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer or Wetland Specialist and shall be replaced at the Contractor's expense.

Plant material shall be furnished and installed as indicated including all labor, materials, plants, equipment, incidentals, re-setting of plants (frost heaves, etc.), irrigation, re-planting and clean up. If previously approved species are not available at the time of planting, the Wetland Specialist may propose substitutions relative to species, size, and quantities for review and approval by the MassDOT Landscape Architect. Upon approval by MassDOT, substitutions shall be approved by the regulating authority, if and as necessary. Provisions shall be made for a growth warranty of at least two (2) calendar years from the date of Conditional Acceptance as described below or as required by permits.

Seeding

Following placement of wetland soil and planting (if included), the Replication Area shall be seeded using one of the following methods:

- Broadcast by hand or with a hand-held spreader followed by application of straw mulch. If necessary, seed shall be lightly raked to insure good seed-to-soil contact.
- Hydro-seeded with hydro mulch per the Standard Specifications and per the manufacturer's directions.
- Hand broadcast seed with Compost Blanket pneumatically applied at the same time to ensure light cover of soil topdressing over seed.

If spring conditions are drier than usual, supplemental watering may be required. If sowing during the summer months, supplemental watering will likely be required until germination.

If required, seeding limits for different seed mixes shall be determined by the Wetland Specialist.

PLANT ESTABLISHMENT AND INVASIVE MANAGEMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by May 15 after fall planting shall be replaced within the immediate or next planting period and at the Contractor's expense.

Seeding that fails to establish according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

Invasive Plants: Corrective measures shall be taken to remove or treat invasive plant species in the Replication Areas. Invasive plants shall include those listed as invasive by Massachusetts Invasive Plant Advisory Group (MIPAG) and the US Army Corp of Engineer's New England District's Compensatory Mitigation Guidance

The strategy for chemical and/or manual removal shall be as directed by the Wetland Specialist, shall continue for the duration of the monitoring period, and shall be incidental to this item.

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland construction work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist demonstrating that the wetland replication construction work was done according to plans (or how modified) and meets required permit conditions. The narrative shall include photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Replication Area and surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The final finished target elevations have been met and maintained relative to the approved plans and reference wetland. Areas that are too high or too low should be identified along with suggested corrective measures.
- Hydrology meets performance standards.
- Specified seed mix has been seeded. If inspected 30 or more days after seeding, seeded species in the wetland and adjacent upland shall show signs of good germination and healthy growth.
- Planted woody and herbaceous species meet specifications and are establishing well.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- There are no invasive plants visible in the replication area.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Replication work is not approved, MassDOT will issue a rejection letter requiring corrective actions. The Wetland Specialist shall recommend corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Wetland Specialist shall be compensated under Item 755.75.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

REQUEST FOR CERTIFICATE OF COMPLIANCE

If required, a request for a Certificate of Compliance (Partial or Full) pursuant to the Massachusetts Wetlands Protection Act regulations shall be prepared and submitted to MassDOT within 30 days following Conditional Acceptance.

The Request for Certificate of Compliance shall include the following:

- A brief narrative of the work on company letterhead signed by the Wetland Specialist. Narrative shall be prepared as a MS Word document and shall include substantive explanation that demonstrates compliance with EACH relevant permit condition. Narrative shall note variations from the originally permitted design.
- As-built Drawings signed by the Contractor's PE registered in the Commonwealth of Massachusetts. As-built drawings shall show hydrologic conditions, status of plantings and seeding, and shall include a narrative and minimum of 4 photographs documenting site conditions. Plans should note variations from the originally permitted design.

  When required, drawings shall meet the Army Corp of Engineer's New England District's Compensatory Replication Guidance, including: scale in the range of 1"=20' to 1" = 100', contours at 1' intervals, spot elevations for intermediate elevations, and polygons outlining each Replication Area, and, as applicable, plant community types. The As-built Drawings shall be provided to the Engineer electronically in Portable Document Format (PDF). If requested by the Engineer, the Drawings shall be provided

in printed paper format (11" x 17" sheets, unless otherwise directed). Drawings must be scalable.

- Other documents as required.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Contractor, Wetland Specialist and regulatory representative (if required) shall assess the Replication Area. Final Acceptance will initiate the start of the Wetland Monitoring Period.

The following conditions shall be inspected and approved for acceptance and payment.

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover at least 95 percent of the Replication Area, excluding areas of open water areas or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

If the mitigation work does not meet the above condition and is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions. Work not approved will be addressed by the Contractor at no extra cost.

Wetland Specialist shall be compensated under Item 755.75.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 95 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.35 will be paid for at the Contract unit price per Lump Sum, which price shall include all labor, materials, equipment, submittals, maintenance, all required soil, site preparation, grading, wetland seeding, planting, mulching, watering, monitoring wells, registered surveyor, as-built plans, Request for Certificate of Compliance, and all incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 60% upon Conditional Acceptance.
- 20% after receipt and acceptance of Certificate of Compliance by the Engineer and once all permit construction requirements have been met and approved.
- 20% upon Final Acceptance.

Excavation will be paid under Item 120.1
Sediment Control Barrier will be paid under Item 767.121
Wetland Specialist will be paid under Item 755.75
Wetland Monitoring Reports for follow-up monitoring will be paid under Item 755.76

ITEM 755.45 WETLAND RESTORATION SQUARE YARD

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

DESCRIPTION

The work under this item shall conform to the relevant provisions of Subsections 120, 751, 765, 767, and 771 of the Standard Specifications and the following:

The work under this item shall include all labor and furnishing of materials to complete the work specified herein to protect and restore existing inland wetland areas that will be temporarily impacted as shown on the drawings and as required by the Engineer.

Inland Wetland Replication work shall be as specified and compensated under that item. Tidal wetland mitigation shall be as specified under the appropriate item for tidal wetlands.

Restoration Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers General Permit.

All work shall be in coordination with an approved Wetland Specialist. Wetland Specialist qualifications and requirements shall be per Item 755.75, Wetland Specialist.

SUBMITTALS – DOCUMENTS

Survey: To establish or confirm pre-construction baseline elevation of temporarily impacted area(s), a survey shall be submitted to the Engineer prior to any fill or other land disturbance.

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): If applicable, request for a Certificate of Compliance shall be submitted to the Engineer for distribution to appropriate regulatory agencies as specified below.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.76 Wetland Monitoring Reports.

ASSOCIATED ITEMS AND MATERIALS

Compost shall be in accordance with Subsection 751 and M1.06.0 Organic Soil Additives of the Standard Specifications. Compost shall not contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants. Off-site sources shall be identified and available for inspection prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Compost Blanket shall be as specified under that item.

Seed Mix

Required submittals include:

- Certificate of Materials from the supplier shall be submitted and approved 30 days prior to ordering seed. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

- Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

- Bill of lading or a notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Seed mix shall be:

Mix 765.552 Wetland Mix – Obligate Mix

	Botanical Name	Common Name	% PLS By Weight
Grass			
	Carex vulpinoidea	Fox Sedge	26.50%
	Carex lurida	Shallow Sedge	15.00%
	Sparganium eurycarpum	Giant Bur Reed Eco PA	10.00%
	Carex lupulina	Hop Sedge	7.00%
	Carex crinita	Fringed Sedge	6.00%
	Scirpus cyperinus	Woolgrass	4.00%
	Juncus effusus	Soft Rush	3.00%
	Carex comosa	Bearded Sedge	3.00%
	Scirpus atrovirens	Green Bulrush	3.00%
	Sparganium americanum	Burrweed	2.50%
	Scirpus validus	Bulrush, soft-stem	2.00%
	Carex stricta	Tussock Sedge	1.00%
	Glyceria canadensis	Manna Grass	1.00%
			84.00%
Herb/Forb			
	Verbena hastata	Blue Vervain	4.00%
	Aster puniceus	Aster - Swamp	2.00%
	Eupatorium maculatum	Joe-pye Weed	1.50%
	Eupatorium perfoliatum	Boneset	2.00%
	Iris versicolor	Blue Flag Iris	2.00%
	Alisma subcordatum	Mud Plaintain	1.00%
	Vernonia noveboracensis	New York Ironweed	1.00%
	Bidens cernua	Nodding Burr Marigold	1.00%
	Solidago patula	Roughleaf goldenrod	0.50%
	Mimulus ringens	Monkey Flower	0.50%
	Chelone glabra	White Turtlehead	0.50%
			16.00%
			100.00%

Seeding Rate:
Species ecotype shall be as native to New England region as possible.
Apply this mix at 20 lbs PLS/acre.

Fertilizers shall not be used.

Straw mulch or hydromulch shall be per Section M6 of the Standard Specifications.

Plants

Plant material shall conform to the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the Standard Specifications and as amended below.

Plant Certifications shall be submitted at the time of delivery and shall conform to the Standard Specifications. Plants shall be native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion. The nursery source shall certify the provenance or origin of all plants.

Plant species and sizes to be included in the Restoration Area shall be as specified on the plans.

Requests for substitutions shall be submitted in writing to the Engineer for review by the MassDOT Landscape Architect, and, if required, the relevant regulatory agency at least thirty (30) days prior to planting. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries.

Dead and failing plants shall be replaced per the requirements of Subsection 771 of the Standard Specifications.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

CONSTRUCTION METHODS & SEQUENCE

Site Protection Prior to Impacts

Prior to any land work, as part of the initial site-walk, the Wetland Specialist shall photo-document the site and provide a summary report of existing conditions as outlined under Item 755.75 Wetland Specialist.

Where and as required vegetation shall be cut flush and area surveyed to establish pre-construction elevations.

Following the cutting and surveying, temporary separation fabric or timber matting shall be placed as required to protect soil and vegetation from compaction, contamination, and/or other damages. Fabric and timber mats shall be placed as specified under the respective items and the Engineer shall approval placement.

Restoration Upon Completion of Roadway Construction Work

Sediment Barriers

If required for sediment control during Restoration work (i.e, tilling is required to restore soil), sediment barriers shall be installed along the downslope perimeter of the Restoration Area beginning and ending in the surrounding upland so that no disturbed soil can enter adjacent wetlands or waters. Sediment barriers shall be in place and approved by the Engineer prior to any soil disturbance. No work shall take place outside the barriers.

Removal of Fill and Grading

Fill and temporary separation fabric or mats shall be removed and disposed of as specified under the respective items.

If required, grades shall be restored to pre-construction elevations as shown in the baseline survey or as required by the Engineer and Wetland Specialist to restore hydrologic functions. Final elevations shall be approved by the Engineer prior to soil preparation and seeding. Grading shall be incidental to this item.

Following approval of grading to elevations required, soil shall be prepared and seeded as follows.

Soil Scarification

Compacted soil shall be scarified with equipment approved by the Engineer. Upon approval of soil scarification, the area shall ***be seeded with mulch.***

Seeding with Mulch

Upon approval of prepared soil, area shall be seeded. Seeding shall be hand broadcast with straw mulch applied per the Standard Specifications and per the manufacturer's directions. Hydromulch shall be straw or wood fiber only and shall be per the manufacturer's recommendations.

Planting

Planting shall conform to SECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER of the Division I Standard Specifications and as amended below.

Planting Season is May 15-June 15 and September 1-November 1 unless otherwise specified in applicable permit conditions.

Restoration Area shall be planted in the dry. Plants shall be placed according to the planting details and within the range of target elevations and at the spacing shown on the Plans or, if spacing is not indicated on the Plans, at the direction of the Wetland Specialist or the MassDOT Landscape Architect. Unless otherwise noted on the Plans, final plant locations shall be determined on site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer and shall be replaced at the Contractor's expense.

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by June 1 after fall planting shall be replaced at the Contractor's expense.

Plant material shall be furnished and installed as indicated including all labor, materials, plants, equipment, incidentals, re-setting of plants (frost heaves, etc), irrigation, re-planting and clean up.

If previously approved species are not available at the time of planting, the MassDOT Landscape Architect will propose substitutions relative to species, size, and quantities. Substitutions shall then be approved by the regulating authority if necessary. Provisions shall be made for a growth warranty as described below or as required by permits.

PLANT AND SEED ESTABLISHMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by May 15 after fall planting shall be replaced within the immediate or next planting period and at the Contractor's expense.

Seeding that fails to establish according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland restoration work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist (if applicable to project) demonstrating that the wetland restoration work was done according to plans (or how modified) and meets required permit conditions (if applicable). The narrative shall include, photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Restoration Area and the surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The target elevations have been restored per the survey or adjusted per the Engineer. Areas that are too high or too low should be identified along with suggested corrective measures.
- Soil compaction has been mitigated.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- Hydrology meets performance standards and has been adequately restored.
- Specified seed mix has been seeded and seeded species in the wetland and adjacent upland show signs of good germination and healthy growth.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no invasive plants visible in the restored wetland area.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Restoration work is not approved, MassDOT will issue a rejection letter requiring corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Wetland Specialist and regulatory representative (if required) shall assess the Restoration Area. Final Acceptance will initiate the start of the Monitoring Period (if required).

The following conditions shall be inspected and approved for acceptance and payment:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 100 percent of the restoration area, excluding areas of open water, large boulders or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no visible invasive plants.

If the restoration work is not approved, MassDOT will issue a rejection letter requiring corrective action. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation. Work not approved shall be addressed by the Contractor at no extra cost.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended, relative to the preexisting condition of the restored wetland.
- Seeded species are establishing well and cover 100 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.45 will be paid for at the Contract unit price per Square Yard, which price shall include all labor, materials, compost and amendments, seed, mulch, equipment, submittals, maintenance, grading, and incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 50% upon completion of soil preparation and seeding
- 25% upon Conditional Acceptance
- 25% upon Final Acceptance or approval of the Engineer

Excavation of temporary fill will be paid under Item 120.1
Geotextile Fabric for Temporary Soil Protection will be paid under Item 698.31
Sediment Control Barrier will be paid under Item 767.121
Compost Blanket will be paid under Item 751.73
Timber Mat will be paid under Item 767.91
Wetland Specialist will be paid under Item 755.75
Wetland Monitoring Reports for follow-up monitoring will be paid under Item 755.76
Plants will be paid under the respective items.

ITEM 755.75 WETLAND SPECIALIST HOUR

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

Work under this Item shall be for services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications hereafter referred to as the "Wetland Specialist."

"Wetland Mitigation" shall be used herein for applicable wetland work. For this project, applicable wetland work is for: Item 755.35 Inland Wetland Replication Area.

The Wetland Specialist shall demonstrate knowledge and expertise to coordinate and oversee all work associated with the Wetland Mitigation as defined herein, as shown on the Plans, as required by permits, and as specified under the relevant Wetland Mitigation items.

Regulatory monitoring reports following Final Acceptance of the Wetland Mitigation shall be per Item 755.76, Wetland Monitoring Reports.

For all onsite work, the Wetland Specialist shall sign in and sign out with the Engineer.

The Wetland Specialist shall not be from the same company as the company responsible for planting, seeding, and/or maintaining the wetland.

QUALIFICATIONS

The Wetland Specialist shall have a minimum of five (5) years of experience with construction and monitoring of wetland mitigation areas similar in size, type, and complexity to the Contract mitigation. When required by permits, at least ten (10) years of experience may be required. The Wetland Specialist shall be thoroughly versed in the Commonwealth of Massachusetts Wetlands Protection Act (MGL C.131, s.40), U.S. Army Corps of Engineers New England District Compensatory Mitigation Guidance, and all other relevant regulations of the Massachusetts Department of Environmental Protection and the U.S. Army Corps of Engineers New England District.

SUBMITTALS - QUALIFICATION

Within sixty (60) days following the Notice to Proceed, the Contractor shall provide proof of qualifications for the Wetland Specialist to the Engineer for approval. Submittals shall include, but not be limited to, the following:

- Resume of the individual on-site implementing the Wetland Specialist work. If the Wetland Specialist changes over the course of the project, the new individual shall submit resume and qualifications for approval 30 days prior to doing any work on-site.
- Resume of any personnel working on-site in place of the Wetland Specialist. Individual shall be approved prior to work on-site.
- Narrative describing the company, its expertise, technical qualifications and experience with wetland construction.
- At least three (3) references from prior work of a similar nature completed in the last five (5) years and by the individuals who will perform the work. Provide contact information for each reference including address, phone number and email.
- A summary of each reference project including nature of the work, project size, dates, and period of construction and monitoring, methodologies used, and summary of success (or not) in terms of meeting performance objectives. Summary shall include a minimum of one before and one after photo for each project.

SUBMITTALS – DOCUMENTATION AND REPORTS

Wetland Construction Oversight

Wetland Specialist shall provide documentation of pre-existing conditions and wetland construction as specified below and as part of fulfilling the Scope of Work described below. Documentation shall include photos that are clear and legible. Photos are incidental to this item.

- ***Site Walk Prior to Disturbance and Construction of Wetlands:*** Provide brief assessment with photos, including documentation of the existing wetlands to be impacted (both permanent and temporary), proposed wetland replication area, and reference/model wetland areas (typically an adjacent undisturbed wetland or the existing wetland to be impacted). Photos of existing wetlands that will be temporarily impacted shall include a view from at least 3 angles.
- ***Excavation and Grading:*** Documentation shall include minimum of two photos of the

excavated wetland and two photos after final grading prior to planting and seeding. For restoration areas, photos shall show soil preparation (i.e, tilling and grading), if applicable.

- ***Approval of Subgrades**:* The Wetland Specialist shall inspect the sub-grade of the Replication Area to ensure that proper hydrology is likely to be established and shall provide the Engineer with written confirmation and photographs upon completion of subgrade excavation work. Written confirmation shall include recommended field adjustments, based on field observations, to achieve the desired hydrology and designed wetland system.
- ***Planting and Seeding:*** Provide assessment and photos of vegetation upon completion of planting and seeding work.
- ***Data logger output from Monitoring Wells*** shall be submitted with reports, if applicable and requested.

Wetland construction documentation and reports shall be submitted with Request for Conditional Acceptance and for the Order of Conditions, Water Quality Certifications, and other regulatory permits as required.

Requests for Acceptance of Work & Regulatory Compliance

The Wetland Specialist shall submit the following documents if and as specified herein and under Item the relevant Wetland Mitigation items:

- Request for Conditional Acceptance.
- Request for Certificate of Compliance (Partial or Full) when applicable.
- Request for Final Acceptance.

SCOPE OF WORK

In the event of discrepancies with the applicable permits, the Wetland Specialist shall submit a Request for Information (RFI) to the Engineer.

General

The Wetland Specialist shall be responsible for the following:

- Review and have a comprehensive knowledge of the environmental permits relevant to the specific mitigation work being done so as to ensure compliance throughout the duration of the contract.
- Identify and inform the Contractor and Engineer of unique site conditions which may require adjustments to the schedule, design, or construction methods. For example, wildlife nesting, illegal dumping, or rare species.
- Identify and inform the Contractor and Engineer of any sediment or erosion control problems observed within mitigation areas.
- Advise so as to avoid impacts to adjacent areas and regulated wetland resources.
- Participate in necessary meetings as required by permits and when requested by the Engineer.

Inspections & Construction Oversight

The Wetland Specialist shall be responsible for, but not limited to, the following:

- Pre-Construction Site Walk
    - Following surveying, flagging, and staking of all relevant boundaries and elevations by the Contractor, the Wetland Specialist shall walk the site with the Engineer and the Contractor to review existing and proposed conditions, recommend changes if necessary, and approve the following: location and boundaries of the Mitigation Area, target elevations and grades, location of tree protection associated with the Mitigation Area, and final layout and limits of clearing for access route.
    - Select and mark snags, logs, and woody material to be retained for placement in the Wetland Mitigation, as appropriate.
    - Note invasive plants in and adjacent to Wetland Mitigation.
    - Provide summary report if and as specified under Wetland Mitigation items.
- Excavation, Soil Placement, Grading for Replication Areas
    - Approve excavated depth and grading for appropriate wetland hydrology, subsoil preparation, and finished grade of placed wetland soil.
    - Adjust grades as required and approve microtopography. If grades need to be adjusted, submit an RFI to the Engineer.
    - If requested by the Engineer, the Wetland Specialist shall inspect stockpiled wetland soil for moisture content and signs of undesirable weeds.
- Soil Protection and Restoration Measures for Restoration Areas
    - Review and approve methods of soil protection and restoration if required.
    - Confirm decompaction will adequately restore appropriate wetland hydrology. If decompaction measures need to be adjusted, submit an RFI to the Engineer.
- Re-vegetation of Mitigation Area
    - Placement of woody material to be re-used.
    - Verify seed used complies with specifications and site conditions, determine limits for wetland seeding based on elevations, approve seeding and mulching methods, and collect seed tags to submit with Request for Conditional Acceptance.
    - Review planting methods (if applicable) prior to installation and oversee layout of wetland plants.

Conditional Acceptance

Upon completion of construction of the wetland, as part of the Request for Conditional Acceptance, the Wetland Specialist shall provide a brief narrative demonstrating that the wetland construction work was done according to plans (or how modified) and meets the conditions required for acceptance as specified under the Wetland Mitigation items. Submittal shall include a report and photo documentation of pre-construction conditions, construction work, seeding, planting, and other work as specified under the Wetland Mitigation items. Photos of completed Wetland Restoration areas shall include the same views as the pre-construction reference photos.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the Wetland Mitigation and surrounding area to ensure that it meets the conditions specified under the Wetland Mitigation items.

Upon approval, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Mitigation work is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

Request for Certificate of Compliance

If required, a Request for Certificate of Compliance shall be prepared and submitted to the Engineer immediately following Conditional Acceptance. Request shall be as specified under the relevant Wetland Mitigation items.

Request for Final Acceptance

Following one full growing season, the Wetland Specialist shall provide a brief narrative of the status of the Wetland Mitigation to be submitted with the Request for Final Acceptance.

Upon receipt of the Request, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the Wetland Mitigation and surrounding area to ensure that it meets the conditions specified under the relevant Wetland Mitigation items.

If the Wetland Mitigation is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

METHOD OF MEASUREMENT

Item 755.75 Wetland Specialist shall be measured per hour for on-site service provided by the Wetland Specialist.

Work shall include all inspections, photos, submittals, and associated tasks for construction and restoration oversight, narratives for Conditional and Final Acceptance, Request for Certificate of Compliance (Partial or Full) if required, documentation required for permits, and all other work specified above. Payment shall not include travel time or time spent off-site on reports. Decimal Pay Limits will be 0.25 hours.

BASIS OF PAYMENT

Item 755.75 Wetland Specialist shall be paid at the Contractor bid price for each hour, or fraction thereof, spent on-site to perform the work as described above. Reports and photo documentation are required for payment.

Post wetland construction reports shall be per Item 755.76, Wetland Monitoring Reports.

ITEM 755.76 WETLAND MONITORING REPORTS LUMP SUM

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

Work under this item shall be for the submittal of Wetland Monitoring Reports following the completion of wetland construction and shall include all inspections, photos, and other work required to complete those reports as specified herein.

"Wetland Mitigation" shall be used herein for applicable wetland work, whether Wetland Replication (creation of a new wetland) and/or Wetland Restoration (restoration after temporary impacts).

The Contractor shall retain the services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications, hereafter referred to as the "Wetland Specialist," to complete the Wetland Monitoring reports. Wetland Specialist shall meet requirements specified under Item 755.75 Wetland Specialist.

All on-site Wetland Specialist services required to complete the construction and revegetation of the wetland replication, including preparation and submission of monitoring reports during construction, shall be per Item 755.75 Wetland Specialist.

SCOPE OF WORK

Post-Construction Wetland Monitoring Reports

Final Acceptance of the wetland construction work as specified under item 755.35 and/or 755.45 shall initiate the beginning of the Monitoring Period.

Inspections and reports shall be performed to ensure compliance with mitigation requirements defined under the relevant Wetland Mitigation items and with all applicable environmental permits. Monitoring reports shall cover the following:

- Identification of all plant species present
- Percent cover for each plant species and overall percent surface area cover by indigenous wetland plant species for replication area and upland
- Description of the viability, health, and vigor of installed plants as well as volunteer plant species within the replication areas
- Description of remedial measures taken to ensure criteria are met
- Depth to apparent water table and/or depth of surface inundation, both as measured from the soil surface and data loggers, as appropriate.
- A conclusion regarding the success of the wetland mitigation area relative to the performance standards at 310 CMR 10.55(4)(b) (unless varied), the design plans, and performance criteria established by MADEP in the variance conditions (when applicable), and the reference wetland.
- Recommendation for a corrective plan of action if needed.

Reports shall be submitted to the Engineer as a digital copy in Portable Document Format (PDF) unless otherwise requested. Hard copies shall be provided as requested by the Engineer. All reports shall be marked with the applicable permit numbers and identifying information as required in the permits. Reports shall include photo documentation of the wetland/s being monitored and shall include a minimum of 3 views from different orientations. Views shall be labeled.

Spring Reports, when required, shall be submitted to the Engineer by July 1 for dispersal to the appropriate permitting agencies.

End of Year Reports (which may serve as the Fall Report) shall be based on inspections that

occur prior to October 15th. Reports shall be submitted to the Engineer no later than November 1 of each year.

Monitoring Reports shall be as follows for ***XX*** years: ***[Select/amend as required for permits. If monitoring is required beyond 2 years after expected close of construction contract, please coordinate with MassDOT Environmental].***

- *MassDEP: # Reports - (note if spring and/or 1 end of year).*
- *ACOE: # Reports (note if spring and/or 1 end of year).*
- *Conservation Commission: # Reports (note if spring and/or 1 end of year).*
- *Other: # Reports (note if spring and/or 1 end of year).*

BASIS OF PAYMENT AND METHOD OF MEASUREMENT

Item 755.76 Wetland Monitoring Reports and associated inspections shall be at the Contract unit price per Lump Sum and shall include all labor, materials, equipment, and all incidental costs required to complete the work. Lump Sum will be paid in equal installments of the Lump Sum divided by the number of reports submitted. Payment shall be upon submittal and acceptance of each report, based on the following schedule:

- Year 1 = ***2 Reports***
- Year 2 = ***2 Reports***

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 penalty 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.

ITEM 756. (Continued)

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.

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. The 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.

This Item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, and preparation of monthly reports. In addition, any erosion controls beyond those specified in bid items which are selected by the Contractor to facilitate and/or address the Contractor's schedule, methods and prosecution of the work shall be considered incidental to this item.

ITEM 756. (Continued)

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.

Compensation

Payment for all work under this Item shall be made at the contract unit price, lump sum, which shall include all work detailed above, including Plan preparation, required revisions, revisions/addenda during construction, monthly reports and filing fees.

Payment of fifty (50) % of the contract price shall be made upon acceptance of the NPDES Stormwater Pollution Prevention plan. Payment of forty (40) % of the contract price shall be made in equal installments over the expected duration of stormwater pollution prevention measures. Payment of the final ten (10) % of the contract price shall be paid upon satisfactory submission of a Notice of Termination (NOT) when final stabilization has been achieved.

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. The 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. Photo-biodegradable fabric shall not be used.

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, sedimentation fence shall be used in addition to compost filter tubes and straw bales and shall be compensated under that 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. If necessary to accommodate field conditions and to maximize effectiveness, barrier locations may be shifted with approval from the Engineer. 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.

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 runoff will flow either through or over the barrier but not around it.

Sedimentation Fence

Materials and Installation shall be per Subsection 670.40 and 670.60 of the Standard Specifications and the following:

Sedimentation 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 (despite fabric decay) 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 sedimentation fence, shall be removed and disposed off-site by the Contractor.

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).
- Sedimentation 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.

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 Contractor's expense.

ITEM 767.9 JUTE MESH SQUARE YARD

REV. 2022.02.01 (REV. DATE TO BE REMOVED BY CONTRACTS)

The work under this item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following.

The work under this item shall consist of furnishing and installing jute mesh fabric to prevent soil erosion. Jute mesh shall be placed over all areas of exposed soil in locations shown on the plans or as required by the Engineer.

MATERIALS

Jute netting or similar material shall be new, unused, undyed, and unbleached 100% biodegradable yarn (no polypropylene) and of uniform plain weave. The materials should weigh approximately 1.0 (+/- 5%) pounds per linear yard (assuming a 4-foot width).

Shall meet the following minimum requirements:

Open Area:	70-75%
Mesh Size:	approximately 1/2 inch with an open area of 60-65%.
Roll Weight:	approximately 1.0 (+/- 5%) pounds per linear yard
Warp Ends:	78 per linear yard
Weft Ends:	41 per linear yard
Recommended flow:	6 fps (1.8 m/s)
Functional Longevity:	6-9 months

Anchoring devices shall be 11-gauge steel staples 6-inch minimum length. In loose soils the length of the staples shall be 9-inches.

For areas that will be routinely mowed anchoring devices shall consist of minimum 8" wooden stakes. Longer stakes shall be used where loose soils or other conditions obligate, as required by the Engineer.

CONSTRUCTION METHODS

Area shall be seeded prior to installation of jute netting.

Installation shall be such as to ensure continuous contact with soil without folds or wrinkles. Jute netting shall be laid such that upslope fabric is placed over lower slope fabric by a minimum of 3 feet. Adjoining rolls shall be overlapped a minimum 6 inches. The netting shall extend beyond at least 1 foot beyond the edge of the seeded area.

The Contractor shall bury the ends of the jute netting 6-8 inches in anchor trenches at top and bottom of slopes.

Jute netting shall be anchored in place with vertically driven metal staples. The staples shall be driven in until their tops are flush with the soil. Staples shall be placed at 12-inch intervals along the top of a slope and in staggered courses along the face of the slope to achieve a minimum of 3 staples per square yard, or at manufacturer's recommendations for the given site conditions.

Contractor shall reseed all trenched and otherwise disturbed areas with specified seed mix. The Contractor shall maintain the jute netting and make satisfactory repairs of any areas damaged until acceptance of seed establishment.

METHOD OF MEASUREMENT

Jute Mesh will be measured by the number of Square Yards complete in place, including anchoring, as measured across the surface of grade and does not include buried or overlapped portions. The quantity measured for payment shall not exceed that shown on the plans or as directed by the Engineer.

Mesh that becomes loose or that is not otherwise functioning to stabilize soil shall be repaired and new or additional jute matting installed as required at the Contractor's expense. Soil erosion shall be repaired, and area shall be raked and reseeded with the original specified mix as required by the Engineer at the Contractors expense.

BASIS OF PAYMENT

Item 767.9 will be paid for at the contract unit price per Square Yard, which price shall include all labor, materials, equipment, trenching, placing, and stapling of jute fabric, reseeding of trenched and disturbed areas, and all incidental costs required to complete the work.

ITEM 983.522 NATURAL STREAMBED MATERIAL CUBIC YARD

DESCRIPTION

The purpose of this item is to provide natural streambed material to naturalize the channel in the proposed culvert, and in the channel where finer sediment is encountered.

The work to be done under this item shall conform to the relevant provisions of Section 983 of the Standard Specifications and the following:

This work shall consist of furnishing and placing streambed material inside, upstream and downstream of a culvert to set the desired channel profile, establish a natural bed, and maintain aquatic organism passage.

The ultimate product will to the extent possible replicate the function and appearance of natural areas of the existing stream adjacent to the culvert.

The streambed material is an important element to comply with environmental permits issued for the project. In order to satisfy those requirements and ensure the restoration is constructed as designed, MassDOT Environmental Services will be providing a Fluvial Geomorphologist (Geomorphologist) to provide on-site oversight and assistance during streambed restoration.

At least 30 days prior to the commencement of construction, the Contractor or Resident Engineer shall coordinate with MassDOT's Geomorphologist. At this meeting, the Geomorphologist will provide an overview of the channel restoration work, and will discuss the Contractor's proposed streambed restoration material source, anticipated means, methods, and schedule.

Related Items:

Stone for Pipe Ends. Shall conform to the requirements of Item M2.02.3 Stone for Pipe Ends and shall be paid for under item 258.

The Geomorphologist will be on site periodically during construction to assist the Contractor and Resident Engineer on installation of the streambed material in accordance with the environmental permits.

MATERIAL

The streambed material is to be installed as depicted on the plans.

Any stone excavated from the existing streambed during the project shall be stockpiled and reused for streambed restoration, provided the excavated stone is characteristic of the existing stream material upstream and downstream of the work area, or meets the below criteria.

If the excavated material is not suitable or there is not enough material, the streambed material shall be locally sourced, rounded river stone, that matches the composition of the native riverbed. The following gradation may be used as a guide.

Streambed Material Gradation

Stone/Sieve Size	% Finer
900 mm (36 inches)	90-100
300 mm (12 inches)	75-90
150 mm (6 inches)	30-75
4.75 mm (No. 4)	4-30
75 µm (No. 200)	0-4

The streambed material shall be well graded and shall be approved by the Resident Engineer and Geomorphologist prior to use.

Stone placed inside of the culvert shall be placed such that the structure is not damaged. Care shall be taken to limit segregation of the materials. Add sand borrow item as needed to seal the bed and prevent subsurface flow. There shall be no subsurface flow upon final inspection.

Larger material will project up through the bed to create habitat and hydraulic roughness.

CONSTRUCTION METHODS

See the plans for construction details for the natural streambed material over the riprap in the culvert, and for the natural material in the channel, as needed.

The streambed material shall fill / choke the voids in the underlying riprap. The riprap shall be choked with finer streambed material, and shall consist of a well-graded mix of cobble, gravel, sand and silt that represents the local streambed. Fill voids by hand tamping with metal tamping rods, by shaking stone with the teeth of an excavator bucket, and/or by spraying water to settle fines between large stones. Plate compactors shall not be used. The purpose for filling the voids is to prevent subsurface flow where water disappears into the large voids in the stone fill below the channel bed surface.

The material shall be installed during dewatered conditions in accordance with the environmental permits. Boulders that are part of the natural streambed material shall project above the bed to maintain a natural level of hydraulic roughness and to re-establish fish habitat.

Once all material has been placed in the culvert and approved by the Geomorphologist and Resident Engineer, the Contractor shall restore flow in such a way to slowly wet the stream to minimize the initial sediment pulse. Every attempt shall be made to minimize the downstream movement of sediment.

The final streambed in the culvert and approaches shall look like a natural riverbed, shall match nearby river reaches, and there shall be minimal subsurface flow upon final inspection by the Project Engineer and Geomorphologist.

The Contractor shall submit to the Resident Engineer for approval prior to the start of operations, a placement plan and method of placement.

METHOD OF MEASUREMENT

The quantity of streambed material to be measured for payment will be the number of cubic yards
streambed material imported to the site and installed in the complete and accepted work, measured within
the limits shown on the Plans or as directed by the Engineer.

BASIS OF PAYMENT

The accepted quantity streambed material will be paid for at the Contract unit price per cubic yard.

Payment will be full compensation for furnishing, transporting, and placing the material specified and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Measurement and Payment for streambed material will be measured for payment by the cubic yard, complete in place. Streambed material will be paid for at the Contract unit price per cubic yard, which price shall include all labor, materials, equipment, transportation and incidental costs required to complete the work.

Excavation required for the streambed material, including stockpiling of on-site materials, shall be considered as included under the work for this item.

The Geomorphologist will be provided by MassDOT at no cost to the Contractor.

ITEM 991.1	**CONTROL OF WATER – LOCATION 1**	**LUMP SUM**
ITEM 991.2	**CONTROL OF WATER – LOCATION 2**	**LUMP SUM**
ITEM 991.3	**CONTROL OF WATER – LOCATION 3**	**LUMP SUM**
ITEM 991.4	**CONTROL OF WATER – LOCATION 4**	**LUMP SUM**
ITEM 991.5	**CONTROL OF WATER – LOCATION 5**	**LUMP SUM**

GENERAL

The work to be performed under this Item shall include all pumping, cofferdam, sandbagging, earth and bridge excavation, by-pass piping and other measures, inclusive of optional sheeting not otherwise included under Item 953.1 for Temporary Support of Excavation, necessary for sufficient water control to accomplish the removal of the existing structure and the construction of the proposed structure and its associated excavation within the channel and the placement of natural streambed material as depicted on the plans.

Dewatering shall be conducted to ensure that all structural concrete is placed and cured in the dry. For demolition purposes, dewatering shall be conducted on an as needed basis as determined by the Contractor.

It is the responsibility of the Contractor to determine the need and extent of dewatering required and to submit methods and materials the Contractor proposes to use for the Engineer's approval.

All necessary permitting, documents and fees required for all dewatering work shall be the responsibility of the contractor and shall be included in the cost of this item.

CONSTRUCTION METHODS

Plans and calculations for all sandbagging, pipes, dikes, optional sheeting and other water control measures shall be developed by the Contractor for this Item. These plans and calculations shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts and shall be submitted for the approval of the Engineer prior to the start of construction.

The Contractor shall use such equipment and shall perform his/her operations in such a manner that boiling or other disturbances of the soil in the foundation area will be prevented and that turbidity is not released into the river or wetland. The Contractor shall keep the area being excavated dry by such means that water will be prevented from entering from the adjacent soils and adversely affecting the stability of the foundation material or supporting soils.

All dewatering and related earthwork shall be conducted in such a manner as to prevent siltation or contamination of the waterway.

The pumping discharge shall not be allowed to enter directly into the waterway. The water from the work areas shall be pumped to a settling tank before discharge into the bypass pipe. The tank shall be constructed so as to allow for the pumped water to pass through the tank with sediments settling out before outletting to an area enclosed by hay bales. Storage volume shall be determined by the following formula: Cubic feet of storage required = Pump discharge rate x 16. The tank can be constructed of concrete, fiberglass or any other material that will meet the following:

1. Approximately 70 percent sedimentation trapping efficiency shall be achieved with a typical tank to ensure that the tanks are adequately sized to prevent overtopping from dewatering and to provide the required filtering.
2. The outlet from the settling tank shall not cause erosion of the surrounding area. An approved method of controlling erosion, such as an erosion control blanket, stone, etc., shall be used at the outlet of the tank.

The settling tanks shall be maintained as follows:

1. Inspect at least twice daily during dewatering operations.
2. Repair any damage immediately.
3. Clean tank outlet daily. Remove any debris immediately.
4. Remove sediments when deposits reach 8 inches below the outlet invert.
5. Dispose sediments outside of wetland areas at a location approved by the Engineer.

The Contractor shall inspect compost filter tubes or hay bales that surround the outlet daily and shall immediately replace any that are damaged.

Pumping shall be conducted in a manner, which will not adversely affect the freshly placed

concrete within the excavation.

The Contractor shall provide and maintain ample pumps, pipes and other devices to promptly and continually remove and dispose of water from the excavation areas. The size and configuration of pumps and pipes shall be selected by the Contractor. Continuous power supply (including back-up) shall be provided for operation of water control pump(s).

The Contractor shall provide the means of removing all sediment from water pumped from the excavation areas; this shall include the use of sedimentation basins, check dams, sedimentation fences or tanks as directed as directed by the Engineer. The Contractor shall provide a dewatering filter basin sized to have a minimum retention time of 24 hour.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

There will be no measurement under this item. Payment of 75% of the lump sum bid price of this item will be made upon complete installation to the satisfaction and approval of the Engineer. The remaining 25% of the lump sum bid price of this Item will be paid following proper complete removal of all temporary water control measures from the site, as determined by the Engineer.

ITEM 995.011	**CULVERT STRUCTURE, CULVERT NO. 1**	**LUMP SUM**
ITEM 995.021	**CULVERT STRUCTURE, CULVERT NO. 2**	**LUMP SUM**

This work shall consist of designing, fabricating, furnishing, and installing a precast concrete box culvert, precast cut-off and return walls as shown on the Plans.

The culvert sections shall be manufactured in accordance with the applicable requirements of Section 901 of the Standard Specifications, Supplemental Specifications, the Plans, and this Special Provision.

MATERIALS

The following materials shall meet the requirements specified in the following Subsection of Division III, Materials, unless indicated otherwise on the Construction Drawings:

Precast Concrete Box Culvert	M4.02.14
Reinforcing Bars	M8.01.0
Welded Steel Wire Fabric	M8.01.2

Preformed flexible joint sealants between precast units shall be in accordance with AASHTO M 198-B.

Bituminous Damp-proofing shall be in accordance with Section 970 of the Standard Specifications.

The work shall also include the designing, detailing, fabricating and installing of a precast concrete box culvert at the locations indicated on the Contract Plans by the Contractor.

Manufacturers offering prefabricated precast concrete box culvert which meet the basic geometric requirements indicated on the Contract Plans include, but are not limited to, the following:

Old Castle Infrastructure
41 Almeida Road
Rehoboth, MA 02769

Concrete Systems, Inc.
14 Park Avenue
Hudson, NH 03051

Precast concrete box culvert design shall conform to the AASHTO LRFD Bridge Design Specifications 9th edition 2020 and the MassDOT Bridge Design Manual. The design and fabrication shall comply with the following material standards:

- Epoxy coated reinforcing steel bars shall meet the requirements of AASHTO M 31 and AASHTO M 284.
- Cement shall meet the requirements of AASHTO M 85.
- Aggregates shall meet the requirements AASHTO M 6/M 80.
- Air-entraining admixtures shall meet the requirements of AASHTO M 154.
- Admixtures other than the air-entraining shall meet the requirements of AASHTO M 194.
- Concrete minimum compressive strength at 28 days shall be 5000 psi, Type III standard gray cement with local sand and aggregates unless otherwise directed by the Engineer.
- Bituminous damp-proofing shall be Sonneborn Hydrocide 700B and shall meet the requirements of ASTM D1227, Type 2, Class 1, and ASTM D1187 Type 1.

All steel components and fasteners shall be galvanized in accordance with Subsection M7.10.0 of Division III, Materials.

DESIGN

The Contractor shall submit design computations for the culvert units to the Engineer for review and approval. The computations shall be prepared in accordance with the AASHTO LRFD Bridge Design Specifications and the latest MassDOT LRFD Bridge Manual and HL-93 live loading. The calculations shall include load ratings prepared in accordance with the MassDOT Bridge Manual. To expedite the review and approval process, submissions containing computer computations shall include electronic copies of the actual input and output files. The design computations shall consider all loadings as are appropriate for each stage of fabrication, shipment, construction, and upon completion. Design computations and shop drawings shall be prepared and stamped by a Structural Professional Engineer with experience in culvert design and licensed to practice in the Commonwealth of Massachusetts.

Prior to fabrication, eight sets of complete shop drawings showing, as a minimum, the following information shall be submitted to the Engineer for approval:

1. Professional Engineer stamp licensed to practice in the Commonwealth of Massachusetts.
2. Plan layout of the structure indicating the piece mark of each unit.
3. Complete details of all precast units, including all dimensions and tolerances, locations and types of reinforcement, finish treatments, and concrete strengths at lifting and at 28 days.
4. Joint dimensions and details including type and brand of joint sealing materials.
5. Locations and methods of forming lifting holes, type and location of lifting devices, and the method of handling and transporting all precast units to the job site.

The minimum cover of concrete over the reinforcement shall be 2 inches or as indicated on the plans.

MANUFACTURE

Slump and air content tests shall be taken and recorded for every manufactured culvert section along with four (4) test cylinders.

Any of the methods of curing as stipulated in Section M4.02.14 of the Standard Specifications shall be used and the preferred method of curing shall be submitted to the Engineer for approval.

Handling devices shall be permitted in each unit for the purposes of handling and placing. Each culvert cell section shall contain the necessary temporary hardware so it may be connected and drawn and held to the adjacent culvert section. Bolts shall conform to ASTM Designation A307. After the full length of culvert for each stage of construction has been connected and drawn tight as approved by the Engineer, all temporary hardware and bolts shall be removed.

Any inserts on the inside surface of the culvert shall be recessed into the wall and grouted over after assembly in order to maintain a smooth, unbroken inside wall surface. Each culvert section shall contain a suitable number of reinforced lifting fixtures to insure safe and level handling and to prevent any damage during fabrication, handling, transportation and installation.

Unless otherwise shown on the plans, each separate culvert cell section shall have a male and female ship-lap joint with not less than 1-1/2 in. of concrete overlap. Each section shall have one pre-placed 1 in. preformed flexible joint sealant cemented to the joint surface.

Repairs

Culvert sections shall be repaired because of occasional imperfections in manufacture or handling damage and will be acceptable if, in the opinion of the Engineer, the repairs are sound, properly finished and cured, and the repaired sections conform to the requirements of this specification.

Inspection

Inspection shall be performed in accordance with Section M4.02.14 Paragraph G.

Rejection

Culvert sections shall be subject to rejection due to the failure to conform to any of the specification requirements. Individual sections may be rejected because of any of the following:

1. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint;
2. Defects that indicate imperfect proportioning, mixing and molding;
3. Excessive honeycombed or open texture;
4. Damaged ends at time of delivery, where such damage would prevent making a satisfactory joint.

Marking

The following information shall be clearly marked on the interior of each section by indentation, waterproof paint, or other approved means:

1. Date of manufacture and lot number;
2. Name and trademark of the manufacturer.

Installation

The precast concrete culvert system shall be installed in a workmanlike manner in accordance with the lines and grades indicated on the Plans and the requirements described in the Plans and specification. The contractor shall supply competent workmen and equipment sufficient to install the sections in a safe, accurate, workmanlike manner.

The Contractor shall ensure the stability of the precast box culvert units during transportation and construction.

Backfilling operations shall not begin until the following check(s) have been made:

1. All joint seals are properly placed.

Backfill shall be paid for under separate items. The backfilling procedures shall be in accordance with Sections 120, 150, and 170 of the Standards.

996.01 ENDWALL STRUCTURE, WALL NO. 1 LUMP SUM

GENERAL

This item shall consist of furnishing and placing Portland cement concrete endwall unit on a prepared subgrade or sub-base in accordance with these specifications and in reasonably close conformity with the lines, grades and dimensions shown on the plans.

MATERIALS

Materials shall meet the requirements specified in the following Subsections of Division III,

Materials:
Cement and Cement Concrete Materials.....M4
Precast Concrete Highway Units.....M4.02.14
High Performance Concrete.....M4.06.1
Steel Reinforcement.....M8.01.0
Epoxy Coated Reinforcing Bars M8.01.7

CONSTRUCTION METHODS

The subgrade shall be properly shaped and compacted as specified in Subsection 170: Grading.

The Endwall Structure unit shall be placed on a previously compacted gravel foundation.

Finishing, Curing, and Protective Sealing

The Endwall Structure unit shall be finished, cured, and sealed according to the applicable specifications of M4.02.14: Precast Concrete Highway Units.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Endwall Strucutre, Wall No. 1 will be measured and paid for as an individual unit, as shown on the plans, which includes full compensation for all labor, equipment; materials including finishing, curing, protective sealing, reinforcing steel, and all incidental work necessary to complete the work as specified.

Gravel borrow for the foundation of the barriers and between the sections will be paid for under Item 151; Gravel Borrow.

Appendix I

Maximum Extent Practicable (MEP) Analysis

Memorandum

To: Courtney Walker, Melissa Lenker, Dave Paulson, and Tim Dexter – MassDOT

Michael Joyce – Weston & Sampson

From: Roy Schiff and Elizabeth Richards – SLR Consulting

Date: March 21, 2024

Subject: MEP Analysis
608163 WALES Monson Road

Introduction

A maximum extent practicable (MEP) alternatives analysis started by Weston & Sampson has been expanded by SLR following a rapid stream geomorphic assessment (see the SLR memorandum dated March 1, 2023). Three perennial crossings (24+92, 50+72 and 86+00/87+00) have been evaluated that are all located on mapped Coldwater Fish Resources according to the Massachusetts Division of Fisheries and Wildlife. Other crossings are located in drainage swales (15+30) or wetland areas (43+75/46+60, 55+20, and 82+07). A site visit with MassDOT, Town of Wales, Weston & Sampson, and SLR was conducted on July 31, 2023 to discuss the designs.

Station 15+30

The western-most crossing is a small drainage swale that was dry at the time of the visit. This culvert conveys intermittent flow under Monson Road from a wetland to the east of Lynch Road that passes under Lynch Road in a 12-inch metal pipe outside of the project limits. The flow than enters a narrow swale just west of Lynch Road and then travels along Monson Road to the crossing (Figure 1). Bankfull indicators do not exist in the channel and thus meeting the stream crossing standards will primarily rely on passing the design flow through the structure. The crossing is currently a 12-inch corrugated plastic pipe that will be replaced with an 18-inch reinforced concrete pipe as part of the project.

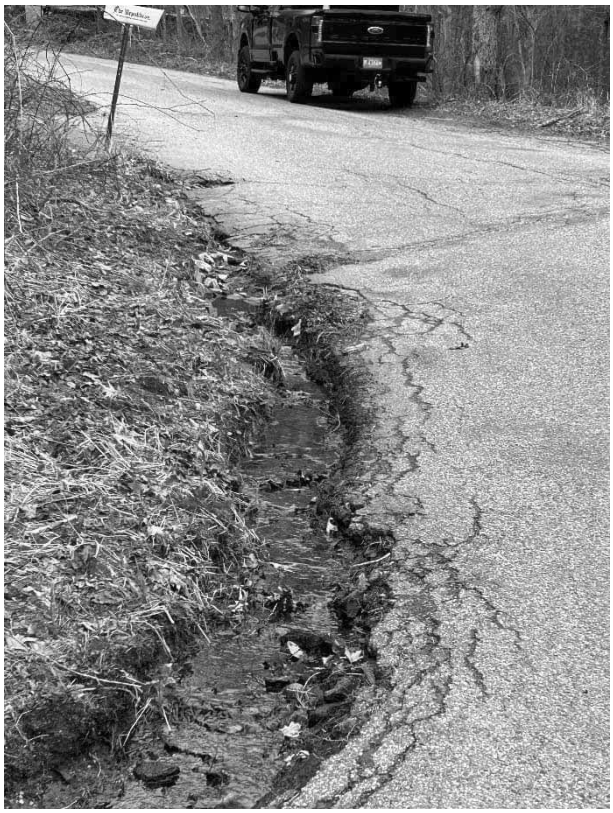

Figure 1: Drainage swale west of Lynch Road upstream of the Monson Road crossing at 15+30

Station 24+92

The tributary of Vinica Brook has a drainage area of 0.9 square miles at the crossing and appears to be a perennial channel with well-defined banks and bedforms (Figure 2). The bankfull channel width was measured in the field to be 11.5 feet.

Meeting the 1.2 bankfull standard was determined to be cost and timeline-prohibitive due to the need for bridge review for structures over 10 feet (Appendix A). Therefore, a concrete box with a span of 9.8 feet and rise of 5.0 feet with 2 feet embeddment (0.85 x bankfull width) is recommended (Table 1). This structure would have many benefits of a 1.2 bankfull structure such as passing sediment, large wood, and the design flood, yet at a reduced cost.

Figure 2: Culvert outlet at 24+92

Table 1: Proposed Structures 24+92

Existing Structure	Proposed
36” Dia. CMP w Overflow CMP	0.85 x Bankfull Concrete Box (9.8’ x 5.0’ w embeddment)

Depending on available cover, a thicker top to the box culvert may be necessary. This size box culvert will still pass most sediment and large wood, and will be hydraulically adequate for the design flood. This replacement will require limited channel restoration near the structure due to deposition upstream of the structure and scour downstream. Survey may be necessary to determine if a grade control structure is needed to eliminate the outlet drop and to protect the upstream woods road culvert that is outside of the Town right-of-way.

Station 43+75 / 46+60

The intermittent channel in this location flows through a stone wall upstream of Monson Road (Figure 3) and then is diverted into a roadside drainage swale as the culvert under the road is reported to be clogged. The downstream channel is currently dry (Figure 4). The wetted channel width upstream of the road was measured to be 1 to 2 feet. The banks of the small channel are poorly formed and thus repeat measurements were not made. Good bankfull indicators do not exist due to the intermittent nature of this wetland channel. Meeting the stream crossing standards will primarily rely on passing the design flow through the structures. 12-inch reinforced concrete pipes are proposed at both crossing locations.

Figure 3: Wetland and intermittent channel upstream of Monson Road at 43+75

Figure 4: Dry intermittent channel downstream of Monson Road at 43+75

Station 50+72

The perennial stream in this location is a woodland drainage that is a tributary of Vinica Brook. The channel passes under a tall road embankment in a 30-inch thick walled smooth plastic pipe (Figure 5). An outlet drop exists that is about 1 foot tall. The bankfull channel width was measured to be 15.0 feet. A large deposit of wood exists upstream of the crossing.

Currently a new structure is not proposed at this location. This crossing requires a large structure, and therefore it is recommended to decouple this structure replacement from the current project. The existing structure is very undersized and should be replaced with a bridge (Table 2).

Figure 5: Culvert Outlet at 50+72

Table 2: Proposed Structure 50+72

Existing Structure	Proposed
30" Dia. CMP	Bridge with 18-Foot Span

Due to this structure replacement being decoupled from the Monson Road Improvement project, timeline is not considered a limitation. Therefore, it is recommended that a 1.2 bankfull structure is installed at a minimum (Appendix B). Due to the tall road embankment and large volume of fill, a bridge is likely the best option at this site. The bridge would pass the accumulation of sediment and large wood located upstream of the crossing.

Station 55+20

The outflow from a wetland flows north under Monson Road through a 12-inch corrugated metal pipe (Figure 6). Overland flow takes place in the wetland. The channel is a function of the concentrated overland flow in the culvert and not migrating channel processes. Bankfull indicators do not exist. The typical wetted width of the channel is 2 to 3 feet upstream and 5 to 6 feet downstream. To meet stream crossing standards, structure sizing at this location should be determined by required hydraulic capacity to convey the design flood.

Figure 6: Existing culvert inlet upstream of Monson Road

Station 82+07

The outflow from a small farm / residential pond flows towards Monson Road into a depression (Figure 7) and then passes under the road in a small, deteriorated culvert. The flow then enters a wetland with a small channel (Figure 8). Overland flow takes place in the wetland. The channel is a function of the concentrated overland flow in the culvert and not migrating channel processes. Bankfull indicators do not exist. Based on observations made by SLR Consulting on March 19, 2024 under normal spring flow, the typical wetted width of the channel is 12 to 24 inches and the depth of the channel is 4 to 6 inches. To meet stream crossing standards, structure sizing at this location should be determined by required hydraulic capacity to convey the design flood. The existing 12-inch corrugated metal pipe will be replaced with an 18-inch reinforced concrete pipe.

Figure 7: Ponding upstream of Monson Road

Figure 8: Wetland channel

Station 86+00/87+00

A tributary of Vinica Brook crosses Monson Road in this location. The woodland channel flows under the road into a small depression at the intersection of Reed Hill Road and then flows under Reed Hill Road (Figure 9). The channel farther downstream appears to have been straightened. The measured bankfull channel width is 10.5 feet.

For this site, meeting the 1.2 bankfull standard was considered, but was determined to be cost and timeline-prohibitive due to the need for bridge review for structures over 10 feet (Appendix C). Therefore, a single concrete box with a width of 9.6 feet (0.9 x bankfull channel width) is recommended (Table 3). The structure is skewed to naturalize the stream alignment and shorten the culvert length and thus the effective hydraulic opening width of the proposed culvert is 8 feet. The stream crossing would only cross Monson Road and replace the existing pair of culverts. The proposed new alignment will allow for shortening the crossing by daylighting 20 to 30 feet of the channel on each end of the structure. This would reduce the size, costs, and impacts of the proposed structure. This structure would have many benefits of a 1.2 bankfull structure such as transport of sediment and large wood at a reduced cost.

Figure 9: Culvert outlet at 86+00/87+00

Table 3: Proposed Structures 86+00/87+00

Existing Structure	Proposed
24” Dia. CMP (2 Segments)	0.9 x Bankfull Concrete Box (9.6’ x 4.5’ w 2’ embedment, Length 46.8 feet)

General Design Recommendations

- It has been determined that increasing the sizes to fully meet the 1.2 bankfull width standard is not possible given the existing timeline and budget of the road improvement project. However, based on the updated maximum extent practicable (MEP) analysis, enlarging two structures (24+92 and 86+00/87+00) to approximately 0.9 times the bankfull channel width achieves many of the benefits of a larger crossing structure. Flood conveyance, sediment transport, and large wood movement will all be improved. Fish passage will be restored, and small mammals will be able to pass through the structures during low flows.

- The structure replacement at 50+72 should be a bridge that has a span of at least 1.2 the bankfull channel width. This crossing upgrade should be decoupled from the road improvement project and performed in the future.

- Small channels cross Monson Road at 15+30, 43+75 / 46+60, and 82+07. These drainage channels are not formed by bankfull alluvial processes, but by concentrated overland drainage. To meet stream crossing standards, these crossings shall be sized according to conveyance of the design flood.

- A streambed restoration special provision to excavate, stockpile, and reuse the native bed material at the crossing structures is recommended to naturalize the channel in and around the proposed structures.

APPENDIX A

MEP Table for Crossing 15+30

Station	Stream	Notes
15+30	Drainage swale	Intermittent. From wetland east of Lynch Road.

Bankfull Width = N/A
Bankfull Depth = N/A

SLR field notes from initial site visit

The flow than enters a narrow swale just west of Lynch Road and then travels along Monson Road to the crossing. Bankfull indicators do not exist in the channel and thus meeting the stream crossing standards will primarily rely on passing the design flow through the structure.

Upstream

MEP Criteria			WS Alternative 1 - Replace 12-inch corrugated plastic pipe with 18-inch reinforced concrete pipe
1	Flooding	The potential for downstream flooding	No anticipated change to downstream flooding are anticipated in this headwater setting.
2	Habitat	Upstream and downstream habitat (in-stream habitat, wetlands)	No change to habitat is expected as the pipe sizes are similar. The wetland is on the east side of Lynch Road, while the crossing under Monson Road is on the west side of Lynch Road, separated by culvert outside of the project limits.
3	Erosion	Potential for erosion and head-cutting	This pipe replacement should reduce potential erosion along the edge of Monson Road. Headcutting is not anticipated in this intermittent water course.
4	Stream stability	Stream stability	This structure is located on an intermittent watercourse that is a drainage swale along the road and thus will not influence stability of stream channels.
5	Fragmentation	Habitat fragmentation caused by the crossing	This structure does not fragment habitat as the channel is too small and intermittent to have instream habitat. Wildlife in this rural area will cross the road.
6	Reconnection	The amount of stream mileage made accessible by the improvements	None exist and none are proposed.
7	Flooding	Storm flow conveyance	The larger culvert would improve flood conveyance to pass the design storm.
8	Constraints	Engineering design constraints specific to the crossing	The pipe sits high, just under the road so a reinforced concrete pipe is needed.
9	Hydrology	Hydrologic constraints specific to the crossing	With such little flow, there is no storage located at this structure.
10	Wetlands	Impacts to wetlands that would occur by improving the crossing	This structure does not influence wetlands given the upstream culvert under Lunch Road lies between the subject culvert and the wetland.
11	Property and infrastructure	Potential to affect property and infrastructure	It is unlikely that this culvert influences property. Allowing more water to drain out of the swale will reduce saturation along the edge of the road embankment.
12	Cost	Cost of replacement	The proposed culvert is a cost-effective approach to improve local drainage at Monson Road.
Summary			**This structure will improve local drainage in this intermittent watercourse.**

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APPENDIX B

MEP Table for Crossing 24+92

Station	Stream	Notes
24+92	Tributary of Vinica Brook	Perennial. Upstream woods road crossing. Two culverts exist. Proposed is likely a single culvert.

Bankfull Width = 11.5 ft
Bankfull Depth = 0.9 ft

SLR field notes from initial site visit

The tributary of Vinica Brook has a drainage area of 0.89 square miles at the crossing and appears to be a perennial channel with well-defined banks and bedforms (Figure 4). The estimated bankfull channel width is 14.3 feet (Table 1). The bankfull channel width was measured in the field to be 11.5 feet (Table 2). The existing twin pipe culverts should be converted to a single structure with a width of 13.8 feet to meet the 1.2 bankfull standard. An embedded, closed-bottom pipe may be a cost-effective solution. Otherwise, a maximum extent practicable (MEP) alternatives analysis should take place to identify if a smaller structure is possible (310.cmr10.53(8)).

Downstream

	MEP Criteria		SLR Alternative 2 - 0.85 x bankfull concrete box (9.8' x 5.0' w 1.5 to 2' embedded)	SLR Alternative 1 - 1.2 x bankfull concrete box (13.8' x 6.5' w 2' embedded)	W&S Alternative 3: Meet minimum applicable "Stream Crossing Standards 6'x6.5 box (with 2' stone)	W&S Alternative 2: Meet General Performance "Standards for Bank and LUWW 2 pipes with 24" Diameter	W&S Alternative 1 (Selected): Replace in-kind 36" Diameter
1	Flooding	The potential for downstream flooding	A larger box will naturalize the pulses of water, sediment, large wood, and ice moving through system. No anticipated change to downstream flooding in this headwater setting. Due to having a span smaller than BFW, it will be slightly more difficult for this box to pass large wood.	A larger box will naturalize the pulses of water, sediment, large wood, and ice moving through system. No anticipated change to downstream flooding in this headwater setting.	Significantly larger opening. Higher potential for downstream flooding due to larger culvert passage size.	Larger cumulative culvert openings. Higher potential for downstream flooding due to larger culvert passage size.	No Change. Potential for downstream flooding is minimal as current conditions do not show downstream flooding.
2	Habitat	Upstream and downstream habitat (in-stream habitat, wetlands)	Any project at this site will need channel restoration and wetland protection to ensure the presence of in-stream habitat. Any adequate replacement will include channel restoration, and sizing that allows for passage of large wood.	Any project at this site will need channel restoration and wetland protection to ensure the presence of in-stream habitat. Any adequate replacement will include channel restoration, and sizing that allows for passage of large wood.	Stream simulation within crossing and higher organism passage. Water will continue to flow freely.	Larger cumulative culvert openings could allow for additional organism passage. Water will continue to flow freely.	No Change. Conditions to remain the same. Water currently flows freely with no backup.
3	Erosion	Potential for erosion and head-cutting	With proper consturction techniques, erosion potential and head-cutting will be reduced. A grade control weir may be needed to set the channel profile.	With proper consturction techniques, erosion potential and head-cutting will be reduced. A grade control weir may be needed to set the channel profile.	Decrease potential for erosion with stream simulation.	Decrease potential for erosion with splash pad.	No Change. Conditions to remain the same. No evidence of current scour.
4	Stream stability	Stream stability	A large structure will increase channel stability with bank lines that run through the structure and a more natural uniform profile where a wide range of flows can pass through the structure. *This structure is slightly undersized according to standard, and therefore there is minimal room for natural shelves running through the structure.*	A large structure will increase channel stability with bank lines that run through the structure and a more natural uniform profile where a wide range of flows can pass through the structure.	Decrease potential for erosion with stream simulation.	Decrease potential for erosion with splash pad.	No Change. Conditions to remain the same. No evidence of current scour.
5	Fragmentation	Habitat fragmentation caused by the crossing	The larger structure would reduce local habitat fragmentation. The natural channel would pass through the structure allowing bed features and sediment to exist.	The larger structure would reduce local habitat fragmentation. The natural channel would pass through the structure allowing bed features and sediment to exist.	Reduced habitat fragmentation by providing maximum span.	Larger cumulative culvert openings could allow for additional organism passage and decreased fragmentation.	No Change. Conditions to remain the same. No evidence of current fragmentation.
6	Reconnection	The amount of stream mileage made accessible by the improvements	A small woods road culvert exists upstream that is a block to aquatic organism passge during high flows. The culvert is partially backwatered and thus passable during low and normal flows. A velocity barrier would exist due to the small contraction during higher flows.	A small woods road culvert exists upstream that is a block to aquatic organism passge during high flows. The culvert is partially backwatered and thus passable during low and normal flows. A velocity barrier would exist due to the small contraction during higher flows.	The size could potentially allow recreational accessibility.	The culverts not large enough to allow recreational accessibility.	No Change. Conditions to remain the same. The culvert is not large enough to allow recreational accessibility.
7	Flooding	Storm flow conveyance	The larger culvert would improve flood conveyance, especially in terms of sediment and large wood. *This box culvert will have less additional space for material transport, but will likely still pass most debris and will be hydraulically adequate for the design flood.*	The larger culvert would improve flood conveyance, especially in terms of sediment and large wood. The box culvert would have space beyond the design flood for material transport, and also be able to pass larger floods that are occuring in our region more these days.	Box opening could allow for additional storm flow conveyance.	Larger cumulative culvert openings could allow for additional storm flow convey	No Change. Conditions to remain the same. Water currently flows freely with no backup.
8	Constraints	Engineering design constraints specific to the crossing	Removing the twin pipes for a single box culvert does not have constraints. The box would be placed lower in the channel and thus road profile. Depending on available cover, a thicker top to the box culvert may be needed for less cover application. A single culvert will be easier to maintain once installed.	Removing the twin pipes for a single box culvert does not have constraints. The box would be placed lower in the channel and thus road profile. Depending on available cover, a thicker top to the box culvert may be needed for less cover application. A single culvert will be easier to maintain once installed.	Box opening would mean the road needs to be raised to provide minimum cover over pipes and impacts to adjacent properties likely.	Larger culverts would mean the road needs to be raised to provide minimum cover over pipes.	No Change. Conditions to remain the same.
9	Hydrology	Hydrologic constraints specific to the crossing	The crossing has limited, short-term flood storage so hydrology is not a concern with enlarging the structure at this crossing location.	The crossing has limited, short-term flood storage so hydrology is not a concern with enlarging the structure at this crossing location.	Box opening could allow for additional storm flow conveyance.	Larger cumulative culvert openings could allow for additional storm flow conveyance.	No Change. Conditions to remain the same. Water currently flows freely with no backup.
10	Wetlands	Impacts to wetlands that would occur by improving the crossing	The box culvert would restore the streambed resulting in more Land Under Water.	The box culvert would restore the streambed resulting in more Land Under Water.	Box opening would mean more Land under Water.	Larger cumulative culvert openings would mean more Land under Water and more Bank.	No Change. Conditions to remain the same. No increase in wetland resource areas.
11	Property and infrastructure	Potential to affect property and infrastructure	It is unlikely that the box culvert will impact properties beyond the ROW because it is mostly located under the roadway.	It is unlikely that the box culvert will impact properties beyond the ROW because it is mostly located under the roadway.	Box culvert would mean additional road changes that could require obtaining an easement from adjacent properties to complete the work.	Larger culverts would mean additional road changes that could require obtaining an easement from adjacent properties to complete the work.	No Change. Conditions to remain the same.
12	Cost	Cost of replacement	The 0.85 bankfull width culvert will likely achieve most of the benfits of the 1.2 bankfull culvert at a reduced cost. Modeling should be used to verify hydraulic performance, and costing could be used to realize the actual cost savings.	This is the primary concern for this alternative in that the culvert will be a high cost, and an increase in installation cost is likely over smaller structures. *Additionally, a box of this size will require bridge review.* However, recent flooding shows that maintenance and replacement costs are reduced in the long term when a 1.2x bankfull width culvert is installed.	Twice as expensive as Alternative 2.	Moderately Expensive	Least expensive
	Summary		**This structure has many benefits of a 1.2 bankfull structure (good habitat connectivity but with a lower openness ratio), at a reduced cost. This structure is more likely to fit in the project timeline due to not requiring bridge review. Therefore, this is the recommended alternative.**	**This option would result in the most resilient structure with the least maintenance, and would best connect upstream and downstream habitat. However, it is cost and timeline-prohibitive, and therefore is not recommended.**	**This structure is not recommended as it would leave the crossing undersized and likely require more maintenance. At a structure width of 56% of the measured bankfull channel width the crossing could have issues with transport of large wood. Permitting may be complicated.**	**This structure is not recommended as it would leave the crossing severely undersized and require more maintenance. At a combined structure width of 35% of the measured bankfull channel width the crossing could have issues with transport of large wood. The stagnation point between the twin pipes would increase clogging potential. Permitting may be complicated.**	**This structure is not recommended as it would leave the crossing severely undersized and require more maintenance. At a combined structure width of 26% of the measured bankfull channel width the crossing could have issues with transport of large wood. The stagnation point between the twin pipes would increase clogging potential. Permitting may be complicated.**

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APPENDIX C

MEP Table for Crossing 43+75/46+60

Station	Stream	Notes
43+75/46+60	**Drainage swale**	**Intermittent. From wetland North of Monson Road.**

Bankfull Width = N/A
Bankfull Depth = N/A

SLR field notes from initial site visit

The intermittent channel in this location flows through a stone wall upstream of Monson Road and then is diverted into a roadside drainage swale as the culvert under the road is reported to be clogged. The downstream channel is currently dry. The wetted channel width upstream of the road was measured to be 1 to 2 feet. The banks of the small channel are poorly formed and thus repeat measurements were not made. Good bankfull indicators do not exist due to the intermittent nature of this wetland channel. Meeting the stream crossing standards will primarily rely on passing the design flow through the structures.

Upstream

MEP Criteria			WS Alternative 1 - Replace existing damaged pipes with 12-inch reinforced concrete pipes
1	Flooding	The potential for downstream flooding	No anticipated change to downstream flooding is anticipated in this headwater setting.
2	Habitat	Upstream and downstream habitat (in-stream habitat, wetlands)	No change to habitat is expected as the pipe sizes are similar and flow is regulated by a stacked stone wall upstream of the pipes.
3	Erosion	Potential for erosion and head-cutting	This pipe replacement should reduce potential erosion along the edge of Monson Road. Headcutting is not expected in this intermittent water course.
4	Stream stability	Stream stability	This structure is located on an intermittent watercourse that is a drainage swale along the road and thus will not influence stability of stream channels.
5	Fragmentation	Habitat fragmentation caused by the crossing	This structure does not fragment habitat as the channel is too small and intermittent to have instream habitat. Wildlife in this rural area will cross the road.
6	Reconnection	The amount of stream mileage made accessible by the improvements	None exist and none are proposed.
7	Flooding	Storm flow conveyance	Two functioning culverts would improve flood conveyance to pass the design storm.
8	Constraints	Engineering design constraints specific to the crossing	The pipe sits high, just under the road so a reinforced concrete pipe is needed.
9	Hydrology	Hydrologic constraints specific to the crossing	With such little flow, there is no storage located at this structure. The storage is located further upstream in the wetland.
10	Wetlands	Impacts to wetlands that would occur by improving the crossing	This structure will not change the wetland hydrology.
11	Property and infrastructure	Potential to affect property and infrastructure	It is unlikely that this culvert influences property. Allowing more water to drain out of the swale will reduce saturation along the edge of the road embankment.
12	Cost	Cost of replacement	The proposed culvert is a cost-effective approach to improve local drainage at Monson Road.
Summary			**This structure will improve local drainage in this intermittent watercourse.**

APPENDIX D

MEP Table for Crossing 50+72

Station	Stream	Notes
50+72	Tributary of Vinica Brook	Perennial. Tall road embankment. Upstream large wood build up. One culvert exists. Proposed is likely a single large culvert or small bridge.

Bankfull Width = 15 ft
Bankfull Depth = 0.9 ft

SLR field notes from initial site visit
The perennial stream in this location is a woodland drainage that is a tributary of Vinica Brook (Figure 8). The ch
annel passes under a tall road embankment in a 30
inch thick walled smooth plastic pipe (Figure 9). An outlet perch exists that is about 1 foot tall. The estimated bankfull channel width is 14.5 feet (Table 3). The bankfull width of the channel was measured to be 15.0 feet (Table 4). A deposit of large wood exists upstream of the crossing in a local flat spot in the channel (Figure 10). This material appears to be a long-term accumulation and should be removed if the structure is changed.

At this time a new crossing is not proposed as it will be large and expensive. A bridge is the ideal structure for this setting with a tall road embankment to eliminate the large floodplain fill. Also, a bridge will pass the high volume of large wood and sediment that exists at the project site, some of which will need to get removed during construction.

Downstream

Upstream

	MEP Criteria		SLR Alternative 3 - 1.0 x bankfull concrete box (15' x 6.0' w 2' embedded)	SLR Alternative 2 - 1.2 x bankfull concrete box (18' x 6.5' w 2' embedded)	SLR Alternative 1 - Bridge with 18' Span	No W&S Alternatives
1	Flooding	The potential for downstream flooding	The channel is steep and thus the potential flood storage and release behind this culvert is small. A larger box will naturalize the pulses of water, sediment, large wood, and ice moving through system. No anticipated change to downstream flooding.	The channel is steep and thus the potential flood storage and release behind this culvert is small. A larger box will naturalize the pulses of water, sediment, large wood, and ice moving through system. No anticipated change to downstream flooding.	The channel is steep and thus the potential flood storage and release behind this culvert is small. A bridge will naturalize the pulses of water, sediment, large wood, and ice moving through system. No anticipated change to downstream flooding is anticipated. The downstream corridor is undeveloped so some limited floodplain inundation is acceptable.	
2	Habitat	Upstream and downstream habitat (in-stream habitat, wetlands)	Will improve upstream and downstream habitat through the reestablishment of sediment and large wood transport.	Will improve upstream and downstream habitat through the reestablishment of sediment and large wood transport.	*A bridge will best improve upstream and downstream habitat through the reestablishment of sediment and large wood transport, and improved fish and wildlife passage.*	
3	Erosion	Potential for erosion and head-cutting	With proper construction techniques, erosion potential and head-cutting will be reduced. A grade control weir may be needed to set the channel profile.	With proper construction techniques, erosion potential and head-cutting will be reduced. A grade control weir may be needed to set the channel profile.	With proper construction techniques, erosion potential and head-cutting will be reduced. A bridge will establish a uniform grade through the structure.	
4	Stream stability	Stream stability	A large structure will increase channel stability with bank lines that run through the structure and a more natural uniform profile where a wide range of flows can pass through the structure. *This structure is slightly undersized according to standard, and therefore there is minimal room for natural shelves running through the structure.*	A large structure will increase channel stability with bank lines that run through the sturcture and a more natural uniform profile where a wide range of flows can pass through the structure.	A large structure will increase channel stability with bank lines that run through the sturcture and a more natural uniform profile where a wide range of flows can pass through the structure.	
5	Fragmentation	Habitat fragmentation caused by the crossing	The larger structure would reduce local habitat fragmentation. The natural channel would pass through the structure allowing bed features and sediment to exist.	The larger structure would reduce local habitat fragmentation. The natural channel would pass through the structure allowing bed features and sediment to exist.	The larger structure would reduce local habitat fragmentation. The natural channel would pass through the structure allowing bed features and sediment to exist.	
6	Reconnection	The amount of stream mileage made accessible by the improvements	McBride Road Bridge is approximately 1 mile upstream. The passability at this structure is unknown.	McBride Road Bridge is approximately 1 mile upstream. The passability at this structure is unknown.	McBride Road Bridge is approximately 1 mile upstream. The passability at this structure is unknown.	
7	Flooding	Storm flow conveyance	The larger culvert would improve flood conveyance, especially in terms of sediment and large wood. The box culvert would have space beyond the design flood for material transport, and also be able to pass larger floods that are occuring in our region more these days.	The larger culvert would improve flood conveyance, especially in terms of sediment and large wood. The box culvert would have space beyond the design flood for material transport, and also be able to pass larger floods that are occuring in our region more these days.	The larger culvert would improve flood conveyance, especially in terms of sediment and large wood. The bridge would have space beyond the design flood for material transport, and also be able to pass larger floods that are occuring in our region more these days.	
8	Constraints	Engineering design constraints specific to the crossing	This channel passes under a tall road embankment that would need to be excavated to remove and replace the structure. *There is enough cover available to meet minimum requirements for fill over the structure, but will require extensive excavation as well as backfilling to install a box.*	This channel passes under a tall road embankment that would need to be excavated to remove and replace the structure. *There is enough cover available to meet minimum requirements for fill over the structure, but will require extensive excavation as well as backfilling to install a box.*	This channel passes under a tall road embankment that would need to be excavated to remove and replace the structure. *A bridge will be the best option at this location due to the amount of fill.*	
9	Hydrology	Hydrologic constraints specific to the crossing	The crossing has limited, short-term flood storage so hydrology is not a concern with enlarging the structure at this crossing location.	The crossing has limited, short-term flood storage so hydrology is not a concern with enlarging the structure at this crossing location.	The crossing has limited, short-term flood storage so hydrology is not a concern with enlarging the structure at this crossing location.	
10	Wetlands	Impacts to wetlands that would occur by improving the crossing	The box culvert would restore the streambed so more Land Under Water.	The box culvert would restore the streambed so more Land Under Water.	The bridge would restore the streambed so more Land Under Water.	
11	Property and infrastructure	Potential to affect property and infrastructure	*The box culvert is mostly located under the roadway, however, due to the extent of the excavation, there may be issues with ROW or property easements for construction.*	*The box culvert is mostly located under the roadway, however, due to the extent of the excavation, there may be issues with ROW or property easements for construction.*	*The bridge will benefit nearby property by preventing upstream ponding, sedimentation, and large wood accumulation at the existing culvert.*	
12	Cost	Cost of replacement	*The bankfull width culvert will likely achieve most of the benefits of the 1.2 bankfull culvert at a reduced cost.* Modeling should be used to verify hydraulic performance, and costing could be used to realize the actual cost savings.	*This structure cost may be in the same order of magnitude as a bridge replacement (pending comparison). An increase in installation cost is likely over smaller structures.* However, recent flooding shows that maintenance and replacement costs are reduced in the long term when a 1.2x bankfull width culvert is installed.	*This is the primary concern for this alternative in that the bridge may be the highest cost alternative, pending comparison with a culvert of equal span.* An increase in installation cost is likely over smaller structures. However, recent flooding shows that maintenance and replacement costs are reduced in the long term when a 1.2x bankfull width bridge is installed rather than undersized culverts.	
	Summary		**This structure will slightly reduce the cost of the replacement, however, the actual amount of savings may not be worth the loss of benefits present in a 1.2 bankfull width bridge or larger culvert. Therefore, this alternative is not recommended.**	**Due to the size of the structure and the amount of excavation required, this alternative may not present cost savings compared to a bridge, and therefore is not recommended.**	**This option would result in the most resilient structure with the least maintenance, and would best connect upstream and downstream habitat. This would allow for the large amount of upstream large wood to begin to move through the stream system. This replacement is decoupled from the Monson Road project but is recommended for the future.**	

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APPENDIX E

MEP Table for Crossing 55+20

Station	Stream	Notes
55+20	Drainage swale	Intermittent. From wetland North of Monson Road.

Bankfull Width = N/A
Bankfull Depth = N/A

SLR field notes from initial site visit

The outflow from a wetland flows north under Monson Road through a 12-inch corrugated metal pipe. Overland flow takes place in the wetland. The channel is a function of the concentrated overland flow in the culvert and not migrating channel processes. Bankfull indicators do not exist. The typical wetted width of the channel is 2 to 3 feet upstream and 5 to 6 feet downstream. To meet stream crossing standards, structure sizing at this location should be determined by required hydraulic capacity to convey the design flood.

Upstream

MEP Criteria			WS Alternative 1 - Retain existing pipe
1	Flooding	The potential for downstream flooding	No anticipated change to downstream flooding is anticipated in this headwater setting.
2	Habitat	Upstream and downstream habitat (in-stream habitat, wetlands)	No change to habitat is expected.
3	Erosion	Potential for erosion and head-cutting	No change anticipated.
4	Stream stability	Stream stability	This structure is located on an intermittent watercourse and thus will not influence stability of stream channels.
5	Fragmentation	Habitat fragmentation caused by the crossing	This structure does not fragment habitat as the channel is too small and intermittent to have instream habitat. Wildlife in this rural area will cross the road.
6	Reconnection	The amount of stream mileage made accessible by the improvements	None exist and none are proposed.
7	Flooding	Storm flow conveyance	No change anticipated. Current culvert properly sized based on hydrology analysis.
8	Constraints	Engineering design constraints specific to the crossing	The pipe sits high, just under the road so shallow cover exists.
9	Hydrology	Hydrologic constraints specific to the crossing	With such little flow, there is no storage located at this structure. The storage is located further upstream in the wetland.
10	Wetlands	Impacts to wetlands that would occur by improving the crossing	No change anticipated
11	Property and infrastructure	Potential to affect property and infrastructure	It is unlikely that this culvert influences property. Allowing more water to drain out of the swale will reduce saturation along the edge of the road embankment.
12	Cost	Cost of replacement	The proposed culvert is a cost-effective approach to improve local drainage at Monson Road.
Summary			**Retain existing structure.**

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APPENDIX F

MEP Table for Crossing 82+07

Station	Stream	Notes
82+07	Drainage swale	Intermittent. From pond North of Monson Road.

Bankfull Width = N/A
Bankfull Depth = N/A

SLR field notes from initial site visit

The outflow from a small farm / residential pond flows towards Monson Road into a depression and then passes under the road in a small, deteriorated culvert. The flow then enters a wetland with a small channel. Overland flow takes place in the wetland. The channel is a function of the concentrated overland flow in the culvert and not migrating channel processes. Bankfull indicators do not exist. Based on observations made by SLR Consulting on March 19, 2024 under normal spring flow, the typical wetted width of the channel is 12 to 24 inches and the depth of the channel is 4 to 6 inches. To meet stream crossing standards, structure sizing at this location should be determined by required hydraulic capacity to convey the design flood.

Downstream wetland channel

MEP Criteria			WS Alternative 1 - Replace existing 12-inch plastic corrugated pipe with an 18-inch reinforced concrete pipes
1	Flooding	The potential for downstream flooding	No anticipated change to downstream flooding is anticipated in this headwater setting.
2	Habitat	Upstream and downstream habitat (in-stream habitat, wetlands)	No change to habitat is expected as the pipe sizes are similar.
3	Erosion	Potential for erosion and head-cutting	This pipe replacement should reduce potential erosion along the edge of Monson Road. Headcutting is not expected in this intermittent water course.
4	Stream stability	Stream stability	This structure is located on an intermittent watercourse that is a pond outlet and thus will not influence stability of stream channels.
5	Fragmentation	Habitat fragmentation caused by the crossing	This structure does not fragment habitat as the channel is too small and intermittent to have instream habitat. Wildlife in this rural area will cross the road.
6	Reconnection	The amount of stream mileage made accessible by the improvements	None exist and none are proposed.
7	Flooding	Storm flow conveyance	A larger culvert would improve conveyance and likely limit flow over the embankment.
8	Constraints	Engineering design constraints specific to the crossing	The pipe sits high, just under the road so a reinforced concrete pipe is needed.
9	Hydrology	Hydrologic constraints specific to the crossing	With such little flow, there is no storage located at this structure. The storage is located in the wetlands.
10	Wetlands	Impacts to wetlands that would occur by improving the crossing	This structure will not change the wetland hydrology.
11	Property and infrastructure	Potential to affect property and infrastructure	It is unlikely that this culvert influences property.
12	Cost	Cost of replacement	The proposed culvert is a cost-effective approach to improve local drainage at Monson Road.
Summary			**This structure will improve local drainage in this intermittent watercourse.**

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APPENDIX G

MEP Table for Crossing 86+00 / 87+00

Station	Stream	Notes
86+00/87+00	Tributary of Vinica Brook	Two structures exist that flow from upstream channel into median area and then to downstream channel. Road alignment change proposed.

Bankfull Width = 10.5 ft
Bankfull Depth = 0.7 ft

SLR field notes from initial site visit
A tributary of Vinica Brook crosses Monson Road in this location. The small woodland channel flows under Monson Road into a small depression at the intersection of Reed Hill Road and then flows under Read Hill Road (Figure 11). The channel farther downstream appears to have been straightened (Figure 12). It is not clear if this channel is perennial or intermittent based on winter field observations.
The estimated bankfull channel width is 10.4 feet (Table 5). The measured bankfull channel width is 10.5 feet (Table 6). Many measurements in this area are not ideal, reflecting either over-widened or confined conditions. The new structure should have a width of 12.6 feet to meet the 1.2 bankfull standard. Otherwise, an MEP alternatives analysis should take place to identify if a small structure is possible (310.cmr10.53(8)).

	MEP Criteria		SLR Alternative 3 - Single 0.9 x bankfull concrete box (9.6' x 4.5' w 1.5 to 2' embedded) - Realigned for a length of approx. 50'	SLR Alternative 2 - Single 1.2 x bankfull concrete box (12.6' x 5.5' w 2' embedded) - Length appr. 50'	SLR Alternative 1 - Single Approx. 40' Span Bridge on Monson Road with Additional Changes to Reed Hill intersection	W&S Alternative 3: Meet Min Stream and Crossing Standards - 6'x6.5 box w 2' stone	W&S Alternative 2 (Selected): Meet General Performance Standards for Bank and LUWW - 42" Diameter Culvert - Length appr. 120'	W&S Alternative 1: Replace in kind - 2 (in line) x 24" Diameter Culvert Segments
1	Flooding	The potential for downstream flooding	A larger box will naturalize the pulses of water, sediment, large wood, and ice moving through system. No anticipated change to downstream flooding in this headwater setting.	A larger box will naturalize the pulses of water, sediment, large wood, and ice moving through system. No anticipated change to downstream flooding in this headwater setting.	A bridge will naturalize the pulses of water, sediment, large wood, and ice moving through system. No anticipated change to downstream flooding in this headwater setting.	Significantly larger opening. Higher potential for downstream flooding due to larger culvert passage size.	Larger culvert opening. Higher potential for downstream flooding due to larger culvert passage size.	No Change. Potential for downstream flooding is minimal as current conditions do not show downstream flooding.
2	Habitat	Upstream and downstream habitat (in-stream habitat, wetlands)	Any project at this site will need channel restoration and wetland protection to ensure the presence of in-stream habitat. Any adequate replacement will include channel restoration, and sizing that allows for passage of large wood.	Any project at this site will need channel restoration and wetland protection to ensure the presence of in-stream habitat. Any adequate replacement will include channel restoration, and sizing that allows for passage of large wood.	*A bridge will best improve upstream and downstream habitat through the reestablishment of sediment and large wood transport, and improved fish and wildlife passage.*	Stream simulation within crossing and higher organism passage. Water will continue to flow freely.	Larger culvert opening could allow for additional organism passage. Water will continue to flow freely.	No Change. Conditions to remain the same. Water currently flows freely with no backup.
3	Erosion	Potential for erosion and head-cutting	With proper construction techniques, erosion potential and head-cutting will be reduced. A grade control weir may be needed to set the channel profile.	With proper construction techniques, erosion potential and head-cutting will be reduced. A grade control weir may be needed to set the channel profile.	With proper construction techniques, erosion potential and head-cutting will be reduced. A grade control weir may be needed to set the channel profile.	Decrease potential for erosion with stream simulation.	Decrease potential for erosion with splash pad.	No Change. Conditions to remain the same. No evidence of current scour.
4	Stream stability	Stream stability	A large structure will increase channel stability with bank lines that run through the structure and a more natural uniform profile where a wide range of flows can pass through the structure. *This structure is slightly undersized according to standard, and therefore there is minimal room for natural shelves running through the structure.*	A large structure will increase channel stability with bank lines that run through the structure and a more natural uniform profile where a wide range of flows can pass through the structure.	A large single structure will increase channel stability with bank lines that run through the sturcture and a more natural uniform profile where a wide range of flows can pass through the structure.	Decrease potential for erosion with stream simulation.	Decrease potential for erosion with splash pad.	No Change. Conditions to remain the same. No evidence of current scour.
5	Fragmentation	Habitat fragmentation caused by the crossing	A long culvert will have a lower openness ratio than a bridge, and therefore has the potential to disrupt habitat connectivity, along with fish and wildlife movement. However, this is an improvement over the suggested length of 120'. Channel would be daylighted an additional 20-30' on either side of the road. Any larger structure should reduce habitat fragmentation if channel restoration also takes place at the intersection of Monson Road and Reed Hill Road. *The 0.9xBFW structure allows less space for natural shelves for wildlife passage.* Vinica Brook and its tributaries are Coldwater Fish Resources according to the Div of Fisheries and Wildlife.	A long culvert will have a lower openness ratio than a bridge, and therefore has the potential to disrupt habitat connectivity, along with fish and wildlife movement. However, this is an improvement over the suggested length of 120'. Channel would be daylighted an additional 20-30' on either side of the road. Any larger structure should reduce habitat fragmentation if channel restoration also takes place at the intersection of Monson Road and Reed Hill Road. *A 1.2xBFW structure would allow space for natural shelves for wildlife passage.* Vinica Brook and its tributaries are Coldwater Fish Resources according to the Div of Fisheries and Wildlife.	*A bridge will have the highest openness ratio, and therefore provide the best passage for fish and wildlife. A bridge would allow space for natural shelves for wildlife passage.* Vinica Brook and its tributaries are Coldwater Fish Resources according to the Division of Fisheries and Wildlife.	Reduced habitat fragmentation by providing maximum span.	Larger culvert opening could allow for additional organism passage and decreased fragmentation.	No Change. Conditions to remain the same. No evidence of current fragmentation.
6	Reconnection	The amount of stream mileage made accessible by the improvements	The fish and wildlife passage would be improved to the headwaters.	The fish and wildlife passage would be improved to the headwaters.	The fish and wildlife passage would be improved to the headwaters.	The size could potentially allow recreational accessibility.	The culverts not large enough to allow recreational accessibility.	No Change. Conditions to remain the same. The culvert is not large enough to allow recreational accessibility.
7	Flooding	Storm flow conveyance	The larger culvert would improve flood conveyance, especially in terms of sediment and large wood. The box culvert would have space beyond the design flood for material transport, and also be able to pass larger floods that are occuring in our region more these days.	The larger culvert would improve flood conveyance, especially in terms of sediment and large wood. The box culvert would have space beyond the design flood for material transport, and also be able to pass larger floods that are occuring in our region more these days.	The larger structure would improve flood conveyance, especially in terms of sediment and large wood. The bridge would have *the most* space beyond the design flood for material transport, and also be able to pass larger floods that are occuring in our region more these days.	Box opening could allow for additional storm flow conveyance.	Larger culvert opening could allow for additional storm flow conveyance.	No Change. Conditions to remain the same. Water currently flows freely with no backup.
8	Constraints	Engineering design constraints specific to the crossing	The box would be placed lower in the channel and thus road profile. Depending on available cover, a thicker top to the box culvert may be needed for less cover application. A single culvert will be easier to maintain than current two culverts once installed. *This option will not require any more changes to the road geometry than are already being proposed.*	The box would be placed lower in the channel and thus road profile. Depending on available cover, a thicker top to the box culvert may be needed for less cover application. A single culvert will be easier to maintain than current two culverts once installed. *This option will not require any more changes to the road geometry than are already being proposed.*	The small woodland channel flows under Monson Road into a small depression at the intersection of Reed Hill Road and then flows under Reed Hill Road, any replacement will include road realignment. The bridge would negate the need for cover over a box. A single bridge will be easier to maintain than two culverts. *This alternative would require additional changes to geometry of the Reed Hill Road approach.*	Box opening would mean the road needs to be raised to provide minimum cover over pipes and impacts to adjacent properties likely.	Larger culverts would mean the road needs to be raised to provide minimum cover over pipes.	No Change. Conditions to remain the same.
9	Hydrology	Hydrologic constraints specific to the crossing	The crossing has limited, short-term flood storage so hydrology is not a concern with enlarging the structure at this crossing location.	The crossing has limited, short-term flood storage so hydrology is not a concern with enlarging the structure at this crossing location.	The crossing has limited, short-term flood storage so hydrology is not a concern with enlarging the structure at this crossing location.	Box opening could allow for additional storm flow conveyance.	Larger culvert opening could allow for additional storm flow conveyance.	No Change. Conditions to remain the same. Water currently flows freely with no backup.
10	Wetlands	Impacts to wetlands that would occur by improving the crossing	The box culvert would restore the streambed for 20-30' on either side of the crossing and result in more Land Under Water.	The box culvert would restore the streambed for 20-30' on either side of the crossing and result in more Land Under Water.	The bridge would restore the streambed and result in more Land Under Water. It is likely that riparian wetlands would return arund the edges of the bridge.	Box opening would mean more Land under Water. Daylighting next to Reed Hill Road.	Larger culvert opening would mean more Land under Water. Daylighting next to Reed Hill Road.	No Change. Conditions to remain the same. No increase in wetland resource areas.
11	Property and infrastructure	Potential to affect property and infrastructure	*New shorter layout may require additional easements and ROW issues at the culvert inlet.*	*New shorter layout may require additional easements and ROW issues at the culvert inlet.*	The bridge would require that the Reed Hill Road intersection move further east, impacting the properties on that side of the intersection. *ROW issues could emerge.*	Box culvert would mean additional road changes that could require obtaining an easement from adjacent properties to complete the work.	Larger culverts would mean additional road changes that could require obtaining an easement from adjacent properties to complete the work.	No Change. Conditions to remain the same.
12	Cost	Cost of replacement	*The 0.9 bankfull culvert will likely achieve most of the benefits of the 1.2 bankfull culvert at a reduced cost.* Modeling should be used to verify hydraulic performance, and costing could be used to realize the actual cost savings.	*This is the primary concern for this alternative in that the culvert will be a high cost, and an increase in installation cost is likely over smaller structures.* However, recent flooding shows that maintenance and replacement costs are reduced in the long term when a 1.2x bankfull width culvert is installed.	*This approach is expensive and likely a stand-alone project from the road reconstruction.* However, maintenance costs are likely lower and the risk of future flood damages is lower.	Twice as expensive as Alternative 2	Moderately Expensive	Least expensive
	Summary		**This structure has many benefits of a bridge (good habitat connectivity but with a lower openness ratio), at a reduced cost. This structure is more likely to fit in the project timeline due to not requiring bridge review. The channel alginment is naturalized and the culvert can be shorter that improves the stream channel conditions and passage. Therefore, this is the recommended alternative.**	**This structure has many benefits of a bridge (with a lower openness ratio), at a reduced cost. However, this structure is likely also not feasible in the required timeline due to bridge review.**	**This option would result in the most resilient structure with the least maintenance, and would best connect upstream and downstream habitat. However, it is cost and timeline-prohibitive, and therefore is not recommended.**	**This structure is not recommended as it would be very long and leave the crossing undersized and likely require more maintenance. At a structure width of 62% of the measured bankfull channel width the crossing could have issues with transport of large wood. Permitting may be complicated.**	**This structure is not recommended as it would be very long and leave the crossing severely undersized and likely require more maintenance. At a structure width of 33% of the measured bankfull channel width the crossing could have issues with transport of large wood. Permitting may be complicated.**	**This structure is not recommended as it would be very long and leave the crossing severely undersized and likely require more maintenance. At a structure width of 20% of the measured bankfull channel width the crossing could have issues with transport of large wood. Permitting may be complicated.**

Appendix J

Stormwater Management Report

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REPORT

June 2024

TOWN OF
Wales
MASSACHUSETTS

STORMWATER MANAGEMENT REPORT
Monson Road Reconstruction
Project File No.608163

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1.0 INTRODUCTION

This Stormwater Management Report has been developed on behalf of the Town of Wales, MA for the Monson Road Transportation Improvement Project (TIP). Monson Road is a two-lane, Rural Major Collector. The project is located along Monson Road beginning at the Wales/Monson town line and traveling east about 1.5 miles to Reed Hill Road. See Attachment A for a Locus Map of the Project Location. This project consists of full depth reconstruction of Monson Road within the project limits and widening the road from 22' to 28' (10' wide lanes and 4' wide shoulders). Minor horizontal and vertical alignment changes are proposed to meet the current design standards and improve sight lines. Superelevation is also proposed along horizontal curves.

Currently the existing site has an open "country" drainage system consisting of stormwater runoff that sheets off the road into undefined swales and wetlands. Cross culverts convey a mix of stormwater runoff from the road and streamflow from overland areas. Roadside sediment deposits block some of the water from sheeting off the road, which causes water to flood the road and damage the road structure. There are also minimal water quality measures. There are nine culvert crossings that convey streams and roadside ditch water under Monson Road. These water courses eventually discharge into Vinica Brook. The existing culverts are undersized, and overtopping of the roadway occurs during large storms.

The proposed project includes grass and modified rockfill lined swales in addition to closed drainage systems and curbing. Six of the existing culverts will be modified as described in Section 4.0. These drainage improvements will alleviate flooding and improve water quality within the project site. The project site is considered to be categorized as a redevelopment project according to the definition within volume 2, chapter 3 of the Massachusetts Stormwater Handbook. The project involves maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving.

The drainage requirements are summarized in the Stormwater Checklist found in Attachment B.

2.0 DESIGN METHODOLOGIES

The survey performed for this project has been used in conjunction with the Mass GIS LIDAR Data to delineate drainage area limits for this project. The watershed area for each structure (both existing and proposed) was finalized based on a detailed field investigation.

The Massachusetts Highway Department Project Development & Design Guide - Chapter 8 (Drainage and Erosion Control) has been used as a guideline for the roadway drainage design. Rational Method is used for determining runoff peak flows and design spreads of the road drainage system for a 10-year frequency design storm. The storm drainage systems were evaluated and designed using *Hydraflow Storm Sewers Extension for AutoCAD Civil 3D 2023*. An IDF curve for the project site was derived to depict the current precipitation intensities as summarized in the NOAA Atlas 14 Precipitation Data.

A proposed drainage area spreadsheet was composed to compute total areas and C-values for each catch basin. The runoff coefficients used are 0.9 for paved areas, 0.3 for grassy areas and 0.2 for unimproved areas (woods). A minimum time of concentration of 5 minutes was used for paved areas.

The hydraulic flow capacity of each drainage system was determined through gutter flow, storm sewer design, and hydraulic grade line analyses. The results of these calculations are presented using the Hydraflow Storm Sewers Program (see Attachment C for Drainage Report).

The culverts that cross Monson Road are designed for a 25-year frequency design storm because Monson Road is a Rural Major Collector. The existing and proposed culverts were analyzed and designed using HY-8 Culvert Hydraulic Analysis Program version 7.50. The HY-8 Reports are included in the Drainage Report in Attachment C.

3.0 EXISTING DRAINAGE CONDITIONS

The existing drainage at Monson Road includes stormwater sheeting into undefined drainage swales and streamflow to culvert crossings. There are no existing closed drainage systems within the project area. The total impervious area of the existing roadway within the project limits is 4.2 acres and the total pervious area consisting mainly of lawn, brush and lightly wooded areas is 4.5 acres. Sediment deposits cause the stormwater to flood the road, which causes the pavement to unravel. Nine culvert crossings convey brooks (unnamed except for the crossing at 50+72 which is locally known as either Dunham or Schoolhouse Brook) under Monson Road from north to south, and there is one culvert crossing at Sta. 55+20 which conveys a perched wet area from south to north. The eight north to south crossings are located at Sta 15+32, Sta. 24+92, Sta. 43+75, Sta. 46+60, Sta. 50+72, Sta 82+07, Sta 86+00, and Sta. 87+00. These brooks eventually discharge into Vinica Brook. The culverts also convey stormwater discharge from the northern drainage swales to the southern side of Monson Road. The existing culverts were modeled with HY-8. The models show that stormwater overtops the road for most of the culverts during a 25-year design storm. See Attachment C for Drainage Report and HY-8 output.

4.0 PROPOSED DRAINAGE CONDITIONS

The proposed roadway improvements include roadway widening, roadway curbing, and super elevating sections of the roadway, which results in significant drainage revisions. Piped roadway drainage systems consisting of catch basins and manholes are proposed to meet the MassDOT drainage design standards and improve the existing drainage conditions. The proposed impervious area within the project limits is 5.3 acres and the total pervious area consisting mainly of lawn, brush and lightly wooded areas is 3.8 acres. 0.70 acres of the proposed pavement is new impervious area. The watershed areas remain consistent with the existing drainage patterns as only slight modifications to the existing vertical and horizontal alignments is proposed. Based on site investigations, historical records, and GIS data, the proposed drainage areas were determined which can be found in the Drainage Report in Attachment C.

Drainage swales are proposed in sections where there is no curbing. The swales will have a bottom width of 1 FT and side slopes of 2:1. Three swales will have grass linings, and three swales will have modified rockfill linings. See Attachment C for the Drainage Report that describes each swale and contains swale design calculations. The swales were designed to withstand the shear stress from a 10-year design frequency storm.

Seven closed storm sewer systems are proposed along Monson Road. See Attachment C for the Drainage Report that describes each system and contains Hydraflow Storm Sewer Reports. These

systems shall outfall near the existing cross culverts or proposed drainage swales. Modified rockfill aprons are proposed at outlets that do not directly discharge into the outlet protection for the culverts.

The nine drainage crossing locations will remain the same, but six of the culverts will be replaced with upgraded sizes and/or improved materials, one culvert will be removed, and two culverts will be retained. See Attachment C for the Drainage Report which contains the proposed culvert reports. The culvert crossings are sized to convey a 25-year storm as described in Section 2 Design Methodologies. The 12" CPP culvert at STA 15+32 will be replaced by an 18" RCP culvert. The two twin pipe culverts at STA 24+92 will be replaced by an R.C.C box culvert of span 9-ft,10-in and rise 5 ft. The 15" culvert of unknown material at STA 34+50, which does not convey any streams or connect any wetland areas, will be removed and the flow will be conveyed by the proposed roadside swale and overland flow to the crossing at 24+92. The 12" CMP culvert at STA 43+75 will be replaced with twin 12" RCP culverts with flared ends on both the inlet and outlet. The 12" CPP culvert at STA 46+60 will be replaced by a 12" RCP culvert with a flared end at both the inlet and outlet. The 36" PVC pipe culvert at STA 50+72 will remain and the 12" CMP crossing at STA 55+20 will also remain. The 12" CMP crossing at STA 82+07 will be replaced by an 18" RCP culvert. Finally, two separate sections of 24" stone box culvert which cross diagonally under Monson Road and Reed Hill Road near Sta. 86+00 and Sta. 87+00, respectively, will be replaced by a concrete box culvert of span 8 ft and rise 4.5 ft at Sta. 86+45. A newly proposed 18" RCP cross culvert will be installed under the re-aligned Reed Hill Road at Sta. 1+50. The box culverts proposed at Sta. 24+92 and 86+45 will both be submerged 2-ft to allow for the placement of natural stream bed material, consistent with the upstream and downstream channel restoration.

Outlet protection will be provided for all culvert crossings. The existing scour hole at STA 24+92 will be preserved and enhanced with native streambed material. The existing scour hole at STA 50+72 will be preserved and not modified. The outfalls at STA 15+32, STA 43+75, STA 46+60, STA 73+25, and STA 82+07 will have proposed modified rockfill aprons for outlet protection. Outlet Protection Calculations are in the Drainage Report in Attachment C.

Water Quality:

The existing roadway has significant sediment deposits and ponded areas. Pavement unraveling led to erosion at the edge of the pavement. Curbing the proposed roadway will significantly reduce the erosion potential at the edge of the pavement and from adjacent properties. Sediment from the roadway runoff will be trapped in the 4-foot sumps of the proposed catch basins. Natural turf will be established within the graded areas adjacent to the roadway. Street sweeping will be conducted on a regular basis.

At the existing outfalls, there is no evidence of erosion. All banks are stable with heavy vegetation and scour holes containing large rocks. A long-term Pollution Prevention Plan/ Operation and Maintenance Plan is included in Attachment D. This plan clearly identifies that the Town Highway maintenance will be responsible for inspections and periodic maintenance, which includes street sweeping and sediment removal.

5.0 THE STORMWATER MANAGEMENT STANDARDS

The Massachusetts Department of Environmental Protection (MassDEP) developed the Stormwater Policy that includes the ten Stormwater Management Standards. These standards address water quality and water quantity. It should be noted that the upstream watershed areas are unchanged. Minor

increases in flows will have negligible effect on the discharges in Vinica Brook. This roadway redevelopment project was designed to comply with the standards up to the maximum extent practicable. See Attachment B for the Stormwater Checklist.

Standard 1: *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

The proposed project will create seven new closed drainage systems, but none of these systems will include new untreated discharges. The redevelopment project includes widening Monson Road and adding a shoulder for the safety of pedestrians and bikes. The total increase in impervious area is 0.88 acres, and the total increase in flow for a 10-yr storm event is 3.83%. The new pipe discharges will be treated by standard water quality measures to the maximum extent practicable as indicated in the Standard 4 explanation. Modified rockfill outfall protection is proposed for each new outfall and is summarized with backup calculations in the Drainage Report in Attachment C.

Standard 2: *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.*

The proposed project will include roadway widening with the addition of 4-ft shoulders to improve safety conditions and meet the requirements of MassDOT. Retention or detention is not practicable within the roadway right of way. The total increase in flows is 1.7 cfs for the 10 Year storm, which is a 3.83% increase over the pre-development peak discharge rate. The total increase in flows for the 2 Year storm is 1.2 cfs. The increase in flow is distributed across multiple outfalls and culvert crossings as shown in Tables 1 and 2 below. The increase in flow was calculated with the Rational Method based on the increase in impervious area per drainage area. This flow will be treated with catch basins with deep sumps as well as natural grass and lined swales. The flow will discharge to areas with outlet protection (level spreaders, modified rockfill aprons, or scour holes), which will reduce the velocity of the flow allowing sediment to deposit and decrease potential erosion.

Table 1. Increase in Flows for 10-year Design Frequency Storm

Drainage Area	Existing Flow (cfs)	Proposed Flow (cfs)	Increase in Flow (cfs)
Sta 11+50 to 14+10	4.47	4.56	0.09
Sta 15+32 Crossing	8.21	8.42	0.21
Sta 24+92 Crossing	8.15	8.41	0.26
Sta 31+62 Outlet/ Runoff	5.39	5.61	0.22
Sta 43+75 Crossing	1.42	1.52	0.10
Sta. 46+60 Crossing	1.82	1.76	-0.05
Sta 50+72 Crossing	5.34	5.65	0.31
Sta 73+23 Outlet/ Runoff	3.36	3.50	0.13
Sta 82+07 Outlet/ Runoff	4.57	4.85	0.28
Sta 85+72 Outlet/ Crossing	2.20	2.36	0.16
Total	**44.9**	**46.6**	**1.7**

The largest increase in flow is 0.31 cfs at the 50+72 crossing. The flow will be dissipated by an existing scour hole before traveling downstream to an unnamed brook. At all the crossings with proposed improvements, there will be a reduction in velocity due to increased openness ratios in the box culverts and larger proposed pipe diameters.

Table 2. Increase in Flows for 2-year Design Frequency Storm

Drainage Area	Existing Flow (cfs)	Proposed Flow (cfs)	Increase in Flow (cfs)
Sta 11+50 to 14+10	3.05	3.11	0.06
Sta 15+30 Crossing	5.60	5.75	0.15
Sta 24+92 Crossing	5.55	5.73	0.18
Sta 31+62 Outlet/ Runoff	3.67	3.82	0.15
Sta 43+75 Crossing	0.96	1.03	0.07
Sta. 46+60 Crossing	1.24	1.20	-0.04
Sta 50+72 Crossing	3.64	3.85	0.21
Sta 73+23 Outlet/ Runoff	2.29	2.38	0.09
Sta 82+07 Outlet/ Runoff	3.11	3.30	0.19
Sta 85+72 Outlet/ Crossing	1.50	1.61	0.11
Total	30.6	31.8	1.2

This roadway project requires road widening, which causes an increase in flow. The site does not contain areas to detain or retain stormwater runoff due to lack of available space within the public layout. The stormwater is treated before discharge, and the outlets contain outlet protection to reduce potential erosion. This roadway redevelopment project will comply with this standard up to the maximum extent practicable.

Standard 3: *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration to the maximum extent possible. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type*

Due to the limitations of right-of-way and existing utilities, there is insufficient space for the installation of recharge BMPs. Efforts were made to reduce the amount of curbing to allow roadway runoff into pervious areas. Roadside swales, including natural grass swales as well as modified rockfill lined swales are proposed along the corridor to help promote infiltration and provide disconnection. Additionally, the creation of approximately 75 linear feet of re-routed and daylighted stream channel increases the land under water area and promotes further recharge. Due to this project being a redevelopment, this standard complies to the maximum extent practicable.

Standard 4: *For new development, stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS)*

This project is a limited project that does not include modifications to the upstream watersheds, but only improvements to the existing roadway and storm drainage systems. All proposed drainage structures will have 4' deep sumps. Natural grass and lined swales are proposed to the maximum extent practicable to keep stormwater off of the roadway, promote infiltration, and contribute to TSS removal.

Standard 5: *Stormwater discharges from areas with higher potential pollutant loads require the use of specific stormwater management BMPs. The use of infiltration practices without pretreatment is prohibited*

This standard is not applicable because roadways are not among the areas classified as having higher potential pollutant loads.

Standard 6: *Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas*

The three perennial brooks crossing Monson Road within the project are designated as Cold-Water Fisheries. These crossings are Vinica Brook at the Reed Hill Road intersection, Schoolhouse Brook (STA 50 +72) and the unnamed brook at STA 24+92. Stormwater discharges have been proposed near existing outfall locations in order to maintain the existing drainage patterns. All new outfalls are proposed outside of wetlands and streams and outfall protection is proposed in advance of the critical areas in order to reduce erosion and excess sediment. Additionally deep sump catch basins are proposed throughout the entire proposed closed drainage system(s) as an approved pretreatment BMP. This proposed BMP together with the proposed roadway improvements represent a significant improvement over the existing conditions given the lack of existing pretreatment of roadway runoff and roadside embankment erosion which is contributing to poor stormwater quality especially near the resource and critical areas immediately adjacent to each culvert crossing.

Regarding other BMPs such as dry water quality swales, wet water quality swales, bioretention cells, and drainage channels, insufficient space within the public layout restricts the installation of additional water quality measures. Linear stormwater infiltration practices, like the ones listed above, were considered for the project, however, due to the relocation of the existing stone walls within the remaining town layout limits to reduce the total length of removal of stone walls below the MEPA threshold, many of the stone walls occupy locations where excavated infiltration swales could be installed without more significant right-of-way impacts. Additionally, in many areas long, linear and parallel wetlands and watercourses run along the roadway and occupy portions of the roadway town layout which also normally be considered for linear practices. Lastly, in order to qualify as a linear stormwater practice, the design would need to provide a certain depth and width in order to provide the minimum quality volume characteristics which significantly increase the easements needed on the abutting private properties which include single family developed and undeveloped residential and large parcels of undeveloped wildlife sanctuary property all of which are densely vegetated with mature shade and other tree species.

Standard 7: *Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. However, if it is not practicable to meet all the standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.*

This project qualifies as a redevelopment project according to the definition within volume 2, chapter 3 of the *Massachusetts Stormwater Handbook.* The project involves maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving.

Piped stormwater systems and roadside swales are proposed to improve the conveyance and quality of stormwater. Stormwater water quality measures including deep sump catch basins are included to increase the removal of total suspended solids. Provision of structural SCMs beyond deep sump catch

basins such as linear infiltration was investigated for this project however provision of such measures is not feasible due to lack of available space within the project right of way.

Standard 8: *Erosion and Sedimentation Controls must be implemented to prevent impacts during construction or land disturbance activities*

A detailed Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is included in Attachment E. The location of proposed erosion control measures and installation details are shown on the plans. These measures include inlet protection on all catch basins and sediment barriers down gradient of all disturbances within the wetland buffer zones. Because the project will disturb more than an acre of land the contractor will request coverage under the NPDES Construction General Permit and will provide a Stormwater Pollution Prevention Plan (SWPPP).

Standard 9: *All stormwater management systems must have an operation and maintenance plan to ensure that systems function as designed*

An Operation and Maintenance Plan is provided in Attachment D.

Standard 10: *All illicit discharges to the system are prohibited*

Illicit discharges are not permitted in the Town of Wales. The project's stormwater management system, as shown on the plans submitted with this report, have been designed in full compliance with Standard 10. The project area does not have any known illicit connections. Any illicit connections to the stormwater management system found in the project limit of work during construction will be removed and/or resolved through MassDOT's Illicit Discharge Detention and Elimination (IDDE) Program. The Long-Term Pollution Prevention Plan, provided in Appendix E, includes measures to prevent illicit discharges.

6.0 EROSION & SEDIMENTATION CONTROL MEASURES

To protect the adjacent properties from construction related activities, a Soil Erosion and Sediment Control Plan has been developed in accordance with the latest Massachusetts Department of Environmental Protection (MassDEP) Erosion and Sediment Control Guidelines. This plan will be implemented prior to the start of any site disturbance and will involve the combined use of compost filter tubes, silt fencing, silt sacks, and vegetative stabilization. Refer to Design Plans for soil erosion and sediment control notes and details.

Once a construction schedule has been established, a responsible person shall be named who will be responsible for implementation of sediment and erosion control measures. This responsibility includes the acquisition of materials, installation, and maintenance of erosion and sediment structures, and the communication and detailed explanation of the requirements and objectives of the erosion and sediment control measures to all people involved in the site work.

Weston & Sampson shall be notified at 1-860-616-6495 of any proposed alteration to the erosion and sediment control plan prior to altering, in order to ensure the feasibility of the addition, subtraction, or change in the plan.

7.0 SUMMARY

The proposed project will improve the roadway, traffic and drainage conditions at the project site. The proposed roadway redevelopment will comply with the standards to the maximum extent practicable. The proposed project shall satisfy the stormwater requirements of the Massachusetts Stormwater Handbook.

Registered Professional Engineer's Certification

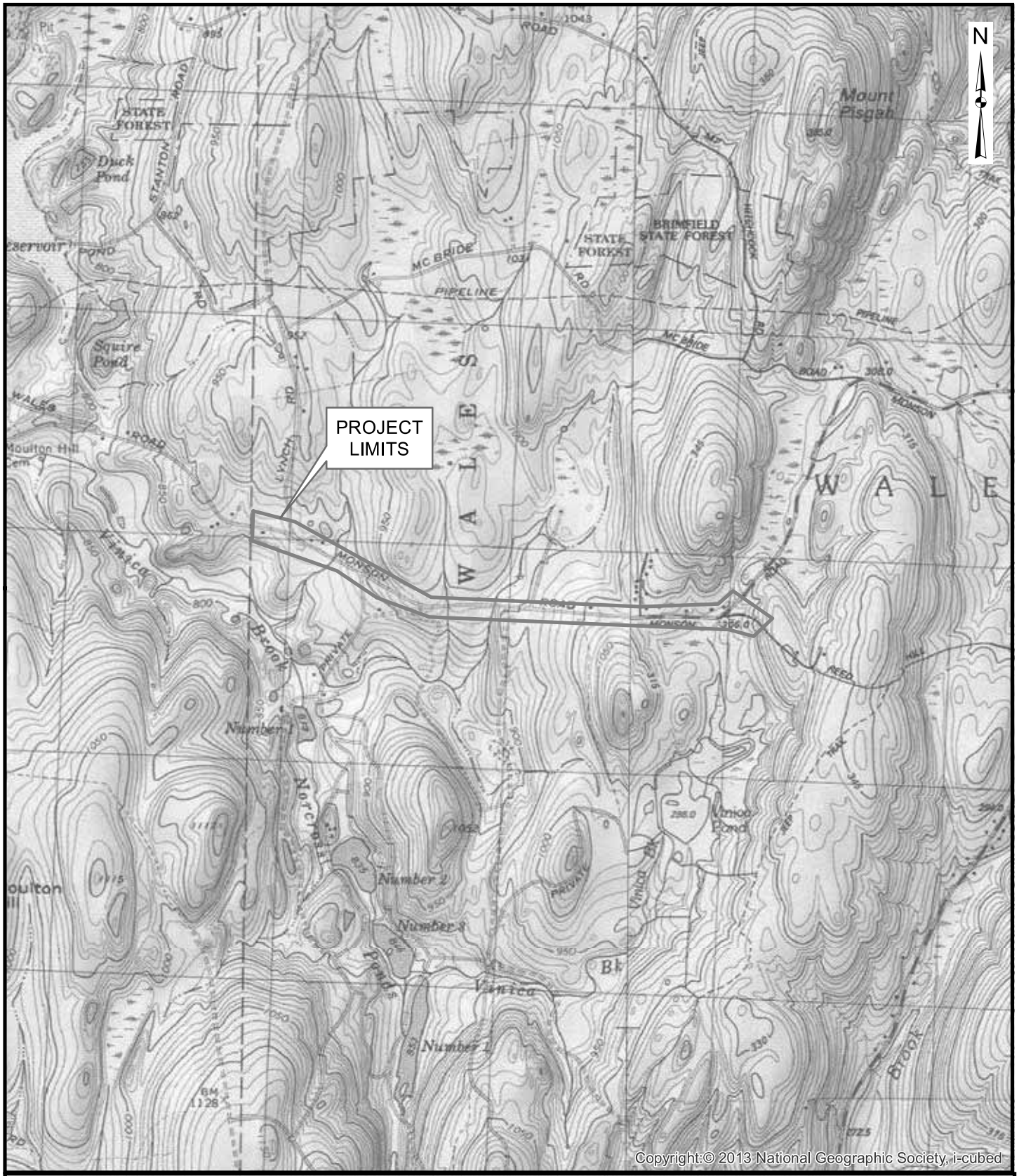
I have reviewed the Stormwater Management Report, including the soils information, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan, the Long-term Post-Construction Operation and Maintenance Plan, and the plans showing the stormwater management system, and have assessed that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also assessed that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date 6/4/2024

ATTACHMENT A

Figures



Project Limits

FIGURE 1
MONSON ROAD IMPROVEMENTS
Wales, MA

LOCUS MAP

1 inch = 2,000 feet

1,000 0 1,000

Scale In Feet

Weston & Sampson

Path: P:\MA\Wales, MA\2170841 Monson Rd Reconstruction\CAD\GIS\LocusMap.mxd User: ColesL Saved: 1/31/2018 2:49:29 PM Opened: 1/31/2018 2:49:49 PM

ATTACHMENT B

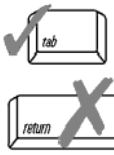
Stormwater Checklist

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

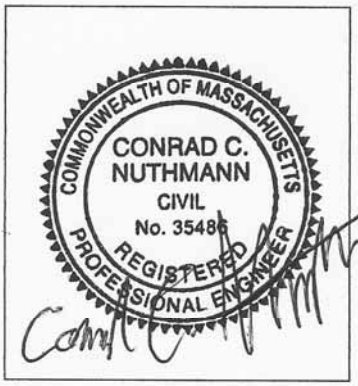
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Conrad C. Nuthmann 6/5/2024
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☒ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☐ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☐ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☒ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☒ Critical areas and BMPs are identified in the Stormwater Report.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

☐ Limited Project

☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.

☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area

☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff

☐ Bike Path and/or Foot Path

☒ Redevelopment Project

☐ Redevelopment portion of mix of new and redevelopment.

☒ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☒ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

ATTACHMENT C

Drainage Report

Weston & Sampson

westonandsampson.com

712 Brook Street, Suite 103
Rocky Hill, CT 06067
tel: 860.513.1473

REPORT

April 2024

TOWN OF
Wales
MASSACHUSETTS

DRAINAGE REPORT
Monson Road Reconstruction
Project File No.608163

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1.0 INTRODUCTION

This Drainage Report was developed on behalf of the Town of Wales, MA for the Monson Road Transportation Improvement Project (TIP). Monson Road is a two-lane, Rural Major Collector. The project is located along Monson Road beginning at the Wales/Monson town line and traveling east about 1.5 miles to Reed Hill Road. This project consists of full depth reconstruction of Monson Road within the project limits and widening the road from 22' to 28' (10' wide lanes and 4' wide shoulders). Minor horizontal and vertical alignment changes are proposed to meet the current design standards and improve sight lines. Superelevation is also proposed along horizontal curves.

Currently the existing site has stormwater sheet off the road into undefined swales and wetlands. Drainage issues include roadside sediment deposits that cause water to flood the road, which damages the road structure. Pavement unraveling causes erosion at the edge of the pavement. There are also minimal water quality measures. There are nine culvert crossings that convey unnamed streams under Monson Road. The culverts also convey stormwater runoff that travels via roadside swales. These streams eventually discharge into Vinica Brook, which closest point is located approximately 1,000-ft to the south of the Monson Road intersection with Lynch Road. The existing culverts are inadequately sized, and overtopping of the roadway occurs during large storms.

The proposed project includes grass and modified rockfill lined swales in addition to closed drainage systems and curbing. Six of the existing culverts will be modified as described in Section 5.0. These drainage improvements will alleviate flooding and improve water quality within the project site. The project involves maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving.

This report summarizes the existing drainage conditions and issues, the methodology used to perform the drainage analysis, and the proposed improvements to the storm drainage system.

2.0 METHODOLIGIES

Watershed areas were established through the use of project topographic survey, Mass GIS LIDAR Data, and site visits to verify watershed area limits. Site investigation of the entire project area included review of the condition of existing roads, utilities, culverts, and general surroundings. Field observations provided a better understanding of drainage patterns, watershed areas, and structures not included on mapping. Following site investigations, the layout of each drainage system was finalized and mapped. See Appendix A for Drainage Area Maps.

The Rational Method was used to determine the peak surface runoff rate of this watershed. The Rational Method involves three factors: the drainage area, the runoff coefficients based on surface features, and rainfall intensity based on the time of concentration of the drainage area. Individual peak surface runoff rates were determined for each catch basin where storm water is collected. The individual runoff rates were then combined into an overall system to represent the existing conditions. This was done for each of the systems studied, and the findings are discussed in the following sections.

Hydraflow Storm Sewers Extensions for AutoCAD Civil 3D 2023 was used to model the proposed piped drainage systems. The computer program used the Rational Method to determine peak flow rates based

on specific parameters input by the user. The capacity of each pipe was analyzed and compared to the flow in cubic feet per second (cfs) through the system. The software also computed gutter spreads and hydraulic grade lines. The Rational Method input is attached in Appendix B. Hydraflow results are included in Appendix C. The proposed systems were finalized to improve drainage conditions in a cost-effective manner, improve water quality, minimize property impacts, and maintain roadway conditions in the future.

The existing and proposed culverts were analyzed and designed using HY-8 Culvert Hydraulic Analysis Program version 7.50. HY-8 is a computerized implementation of Federal Highway Administration (FHWA) culvert hydraulic design. The program calculates the capacity of the culvert with headwater and tail water influences. The program also calculates energy dissipation. The HY-8 Reports are included in Appendix D.

3.0 DESIGN SUMMARY

The closed drainage systems and cross culverts were designed to meet MassDOT Standards.

3.1 Drainage Regulations

- The Massachusetts Highway Department Project Development & Design Guide - Chapter 8 (Drainage and Erosion Control) has been used as a guideline for the roadway drainage design.
- The roadway storm drain system is designed for a 10-year design storm frequency based on the recommendations for a Rural Major Collector in the Design Guide. A 25-year design storm frequency was checked for systems with low points.
- The cross culverts are designed for a 25-year design storm frequency based on the recommendations for a Rural Major Collector in the Design Guide.

3.2 Rational Method Factors

- Drainage Area - The properties within the watershed limits of the storm drainage systems consist of woods and residential and commercial lots.
- Runoff coefficients were based on land cover obtained from aerial photography, survey, and field observations. The following runoff coefficients were used:
  - Impervious Areas (Asphalt, Concrete, Roofs, Etc.) = 0.90
  - Grass (open space) = 0.3
  - Woods = 0.2
- Precipitation data is based on the most current information taken from NOAA Atlas 14, Volume 10, Version 2, Precipitation Frequency Data Server for Wales, MA.
- Time of concentrations were based on the TR-55 method. A 5-minute minimum time of concentration was used for paved areas. The time of concentrations range from five minutes to twenty-four minutes.

4.0 EXISTING CONDITIONS

The existing drainage at Monson Road includes stormwater sheeting into undefined drainage swales and streamflow to culvert crossings. There are no existing closed drainage systems within the project area. The total impervious area of the existing roadway within the project limits is 4.6 acres and the total pervious area consisting mainly of lawn, brush and lightly wooded areas is 4.5 acres. Sediment deposits cause the stormwater to flood the road, which causes the pavement to unravel. Eight culvert crossings convey unnamed brooks under Monson Road from north to south, and there is one culvert crossing at Sta. 55+20 which conveys a perched wet area from south to north. The eight north to south crossings are located at Sta 15+33, Sta. 24+92, Sta. 34+50 Sta. 43+76, Sta. 46+65, Sta. 50+72, Sta 82+07, and Sta 86+53. These unnamed brooks eventually discharge into Vinica Brook. The culverts also convey stormwater discharge from the northern drainage swales to the southern side of Monson Road. The existing culverts were modeled with HY-8. The models show that stormwater overtops the road for most of the culverts during a 25-year design storm. See Appendix D for existing culvert reports.

5.0 PROPOSED CONDITIONS

The proposed roadway improvements include roadway widening, roadway curbing, and super elevating sections of the roadway, which results in significant drainage revisions. Piped roadway drainage systems consisting of catch basins and manholes are proposed to meet the MassDOT drainage design standards and also improve the existing drainage conditions. The proposed impervious area within the project limits is 5.3 acres and the total pervious area consisting mainly of lawn, brush and lightly wooded areas is 3.8 acres. 0.70 acres of the proposed pavement is new impervious area. The watershed areas remain consistent with the existing drainage patterns as only slight modifications to the existing vertical and horizontal alignments is proposed. See utility plans under separate cover.

5.1 Drainage Swales

Drainage swales are proposed in sections where there is no curbing. The swales will have a bottom width of 1 FT and side slopes of 2:1. Three swales will have grass linings, and three swales will have modified rockfill linings. See Appendix E for Swale Calculations. The swales were designed to withstand the shear stress from a 10-year design frequency storm.

The modified rockfill swale from STA 14+50 to 17+00 has two sections: the first part conveys water from Sta. 17+00 into the culvert crossing at STA 15+25 and the second part continues west of the culvert crossing to outlet into the 15" RCP under the two residential driveways. This 15" RCP outlets into the grass swale which runs from STA 13+50 to STA 11+50. The existing grade from STA 11+00 to 11+50 carries the water from the swale into the existing wetlands. Curbing is provided from STA 13+50 to 15+00 on the south side of the road to protect runoff from getting in the yard of the house at 170 Monson Road. From STA 15+25 to STA 17+25, due to the superelevation of the roadway and the existing drainage patterns, the flow all sheets off to the southwest into the outlet area of the 18" RCP cross culvert at STA 15+25.

A modified rockfill drainage swale is proposed from STA 31+75 to 39+50 (flowing to the west) to catch the large amount of runoff traveling from the north side of Monson Road down into the project site. There will be no curbing on the northern side of the road to allow the runoff from the road to enter the swale. In addition, there will be no curbing on the south side of the road to allow any water on the high side of

the superelevation to naturally sheet off and follow the existing drainage patterns. At the high point of the roadway, STA 40+30, the modified rockfill swale will tie into a proposed grass swale which will flow to the east to outlet into the twin 12" RCP cross culverts.

After the initiation of the design project, the Town of Wales dug a roadside ditch from Sta. 44+00 to Sta. 46+65 to divert flow away from the existing plugged culvert at Sta. 43+76. The Town then installed a 12" CPP crossing at Sta. 46+65 to convey the diverted flow across Monson Road. This diversion created new wetlands along the side of the road as well as on the south side of the road where the 12" CPP outlets. The proposed conditions will replace the culvert at Sta. 43+76 with twin 12" RCPs and maintain the roadside ditch to divert a portion of the flow away from Sta. 43+76 during large storm events, so stormwater can travel east to the existing low point off the roadway at Sta. 46+65 and enter a proposed 12" RCP culvert to cross Monson Road to the south side. These proposed conditions will maintain the newly created wetlands as well as the existing drainage patterns.

A modified rockfill swale is proposed on the south side of the road from STA 70+50 to the outfall location at STA 73+25. This area of the project site, based on the natural topography, has water travelling onto the roadway from the south. This proposed swale will catch a large area of runoff before it can reach the roadway.

5.2 Storm Sewer Systems

Seven closed storm sewer systems are proposed along Monson Road. See Appendix B for drainage area information and see Appendix C for the Hydraflow Storm Sewer Reports. These systems shall outfall into streams or wooded areas. Modified rockfill aprons are proposed at outlets that do not directly discharge into the outlet protection for the culverts. See Appendix F for outlet protection calculations.

System Sta. 22+25

This system contains six catch basins and 12" or 15" reinforced concrete pipes (RCP). The system captures approximately 650 feet of roadway drainage along Monson Road between Lynch Road and the culvert at STA 24+93.This system also captures off-road drainage which is currently settling in the front yard of property 155 Monson Rd. This system discharges into the modified rockfill outlet protection at Sta. 22+25 directly before the flagged B-series wetlands.

System Sta. 25+50

This system contains two catch basins, and pipes are 12" RCP. The system captures approximately 700 feet of roadway drainage along the southern lane of Monson Road between the culvert at STA 24+93 and Sta. 30+00 (Peck Road). This system discharges into the outlet protection area of the two cross culverts near STA 25+00.

System Sta. 50+50

This system contains six catch basins, and pipes are 12" RCP. The system captures approximately 400 feet of roadway drainage along Monson Road between STA 48+00 and STA 52+00. The low point is located at STA 50+38 where this system outfalls into the proposed outlet protection near the existing 36" PVC cross culvert.

System Sta. 51+24

This system contains fourteen catch basins, and pipes are 12" RCP. The system captures approximately 1835 feet of roadway drainage along of Monson Road between STA 52+00 and STA

70+35. This system flows to the west and outlets into the proposed outlet protection for the existing 36" PVC cross culvert at STA 51+24.

System Sta. 73+30

This system contains five catch basins, and pipes are 12" RCP. The system captures approximately 500 feet of roadway drainage along Monson Road between STA 70+35 and STA 75+33. This system outfalls near the low point of the roadway at STA 73+25 with a proposed modified rockfill apron as outlet protection. The proposed swale on the south side of the road also outlets at the same location.

System Sta. 81+97

This system contains four catch basins, and pipes are 12" RCP. The system captures approximately 590 feet of roadway drainage along Monson Road between STA 75+35 and STA 81+25. There is no curb on the south side of the roadway from STA 76+50 to STA 79+20 so that water can sheet of naturally and eventually flow into the wetlands. At the low point at STA 82+75, there is no curb on either side of the road to allow water to sheet off into the adjacent wetlands. The water from the closed system discharges onto a modified rockfill apron which is part of the outlet protection for the 18" RCP culvert crossing at STA 82+05.

System Sta. 85+72

This system contains four catch basins, and pipes are 12" RCP. The system captures approximately 315 feet of roadway drainage along Monson Road between Sta 83+85 and Sta. 87+00. This system is located at a low point (STA 85+85) and outfalls into the graded rockfill channel which is in the place of the existing Reed Hill Rd. intersection. The adjacent wetland replication area adjoins the existing wetlands to accept the water from this closed system in addition to the box culvert coming from the north side of Monson Road and the proposed 18" culvert which crosses the relocated Reed Hill Road intersection. A proposed grass swale also helps convey water on the south side of Monson Road from STA 84+50 into the wetland replication area.

5.3 Cross Culverts

The nine drainage crossing locations will remain the same, but six of the culverts will be replaced with upgraded sizes and/or improved materials, one culvert will be removed, and two culverts will be retained. See Appendix D for proposed culvert reports. The culvert crossings are sized to convey a 25-year storm as described in Section 3 Design Summary. The 12" CPP culvert at STA 15+33 will be replaced by an 18" RCP culvert. The two twin pipe culverts at STA 24+92 will be replaced by an R.C.C box culvert of span 9.5 ft and rise 6.5 ft. The 15" culvert of unknown material at STA 34+50, which does not convey any streams or connect any wetland areas, will be removed and the flow will be conveyed by the proposed roadside swale and overland flow to the crossing at 24+92. The 12" CMP culvert at STA 43+76 will be replaced with twin 12" RCP culverts with flared ends on both the inlet and outlet. The 12" CPP culvert at STA 46+65 will be replaced by a 12" RCP culvert with a flared end at both the inlet and outlet. The 36" PVC pipe culvert at STA 50+72 will remain. The 12" CMP crossing at STA 55+20 was modeled using Hydraflow, which shows that a 12" pipe has enough capacity to convey the small contributing drainage area during a 25-year storm event, therefore the existing pipe will remain. The 12" CMP crossing at STA 82+07 will be replaced by an 18" RCP culvert. Finally, the 24" stone box culvert which crossed diagonally under Monson Road near STA 86+53 will be replaced by a well-defined box culvert of span 8 ft and rise 4.5 ft. A newly proposed 18" RCP cross culvert will be installed under the re-aligned Reed Hill Road at Sta. 1+50.

Outlet protection will be provided for all culvert crossings. The existing scour hole at STA 24+92 will be preserved and enhanced with native streambed material. The existing scour hole at STA 50+72 will be preserved and not modified. The outfalls at STA 15+33, STA 43+76, STA 46+65, STA 73+25, and STA 82+07 will have proposed modified rockfill aprons for outlet protection. Outlet Protection Calculations are in Appendix F.

5.4 HY-8

The primary software used for hydraulic analysis of culvert is HY-8. The crossings at STA 1+50, 15+33, 43+76, 46+65 and 82+07 were analyzed for existing and proposed conditions. The FHWA Culvert Hydraulic Analysis Program (HY-8) enables to analyze culvert performance for a crossing that has multiple culvert barrels that share the same tailwater and roadway overtopping.
Refer Appendix D for detailed results.

5.5 HEC-RAS

Culvert crossings at St. 24+92, 50+72 and 86+53 were evaluated using HEC-RAS program. Water surface profiles for the brook's 2, 10, 25, 50, and 100-year return frequency flood events were developed in a manner consistent with the standards used to develop water surface profiles under the NFIP. Survey information acquired for the project base plans was input using the HEC-RAS computer application and used as a basis for assembling a flood elevation profile hydraulic model of the project site. In the completed model, the channel and overbanks were assigned roughness coefficients (Manning's "n"). These values were selected based on aerial maps and field visit. All flood simulations performed with the project HEC-RAS model were done in a mixed flow mode and employed the upstream and downstream stream slope as the upstream and downstream boundary condition respectively.

A detailed hydraulic analysis was performed for the culvert crossings (both existing and proposed) in order to evaluate for 2, 5, 10, 25-year storm design. This investigation was conducted in a manner consistent with American Association of State Highway Officials (AASHTO), Federal Highway Administration (FHWA), and Massachusetts Department of Transport (MassDOT) guidelines for preparation of hydraulic studies at bridge sites.

The HEC-RAS model was performed for both existing as well as proposed conditions for the crossing 24+92, the existing crossing at 50+72 and the proposed crossing at 83+56. The geometry data, manning's constant and culvert data were input. Refer Appendix D for output data.

At Station (24+92): A four-sided precast concrete box culvert is proposed at this crossing. The span of culvert is 9.5 ft and rise of 6.5 ft. Two feet of the box culvert will be filled with natural stream bottom material. The results show this crossing will handle up to a 100-year event.

At Station (50+72): A 36" PVC pipe culvert exists for this crossing with the invert elevations of 922.04 on the upstream side and 920.04 on the downstream side. Existing structure was modeled using HEC-RAS. The results show this crossing will not overtop during a 25-year design period.

At Station (86+53): A 24" Stone box culvert exists over the entire crossing. A tributary of Vinica Brook crosses Monson Road at this station. The small woodland channel flows under Monson Road into a small depression near the intersection of Reed Hill Road. A precast concrete box culvert of span 8 ft

and rise 4.5 ft is proposed for this crossing. 2-feet of natural material will be filled at the bottom. Results indicate the crossing will adequately handle up to a 100-yr storm event.

6.0 TEMPORARY WATER HANDLING

Temporary water handling will be provided using temporary bypass pipes and sandbag systems as shown on the plans. (see design plans for sizes and invert elevations) will be installed. Sandbags in form of cofferdams will. The size of temporary pipes and flow through sandbags was based on HEC-RAS modeling information. A steady flow analysis was performed with approximate inverts and 2-year return period. The 2-year return period is a common design standard for temporary water handling structures and is considered a reasonable balance between the risk of failure and the cost of construction.

7.0 WATER QUALITY MEASURES

The existing roadway has significant sediment deposits and ponded areas. Pavement unraveling led to erosion at the edge of the pavement. Curbing the proposed roadway will significantly reduce the erosion potential at the edge of the pavement and from adjacent properties. Sediment from the roadway runoff will be trapped in the 4-foot sumps of the proposed catch basins. Natural turf will be established within the graded areas adjacent to the roadway. Street sweeping will be conducted on a regular basis. Due to limitations in the amount of public right-of-way, there will be no proposed water quality BMP's in an effort to reduce impacts on private property.

8.0 CONCLUSION

The proposed storm drainage systems are designed in accordance with the guidelines set in Chapter 8 (Drainage and Erosion Control) of the Mass Highway manual. The Hydraflow results show that the proposed systems are designed to convey a 10-year storm. The culverts are designed to convey a 25-year storm. The piped systems will assist in capturing roadway runoff to alleviate any potential flooding. The proposed drainage systems adequately address water quality to the maximum extent practicable.

APPENDIX A

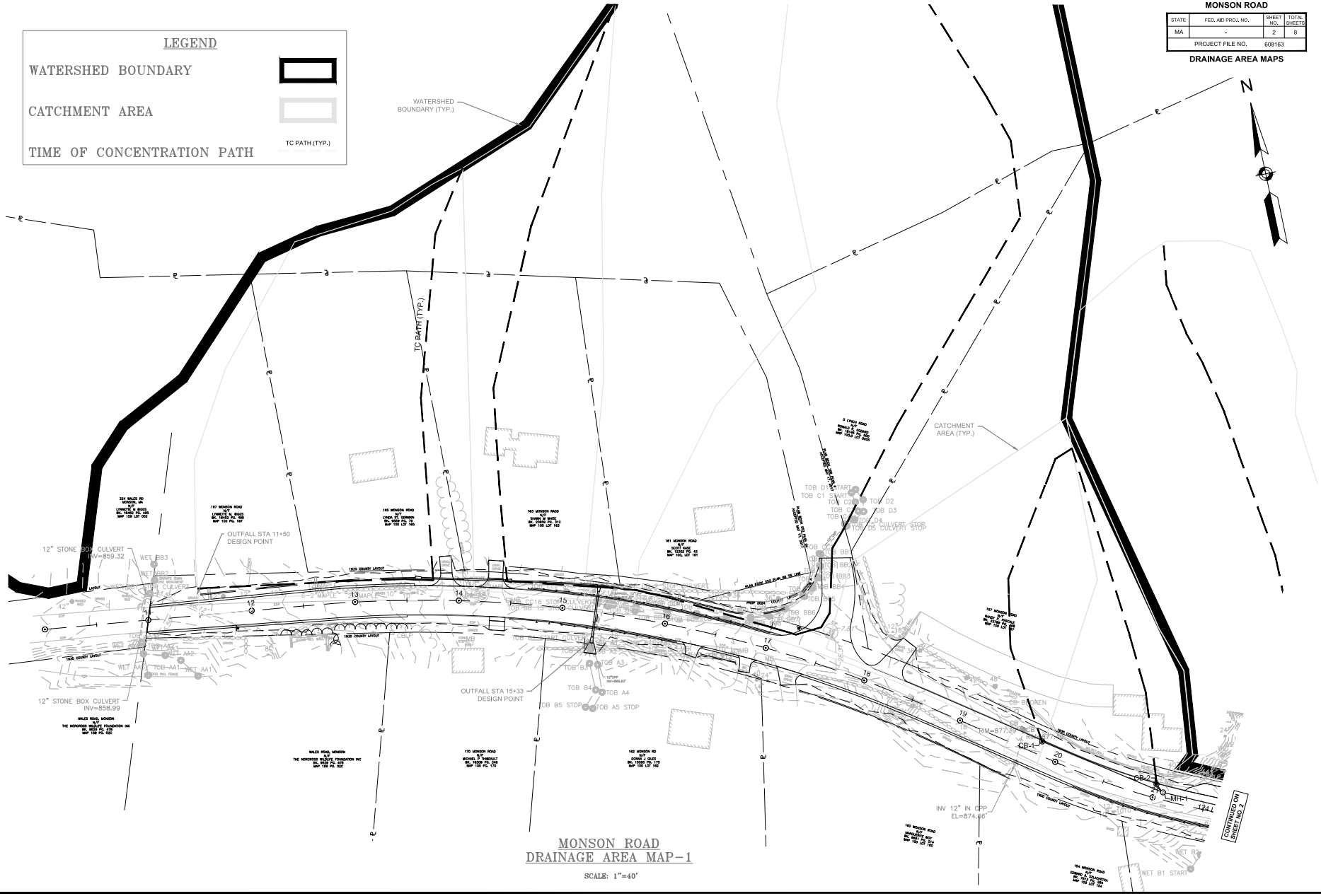
Watershed Maps

MONSON ROAD -DRAINAGE MAPS.DWG Plotted on 5-Apr-2024 11:55 AM
N
KEY PLAN
MONSON ROAD
DRAINAGE AREA MAPS

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	8
PROJECT FILE NO.	608163		

DRAINAGE AREA MAPS



MONSON ROAD
DRAINAGE AREA MAP-1

SCALE: 1"=40'

MONSON ROAD -DRAINAGE MAPS.DWG Plotted on 8-Apr-2024 11:49 AM

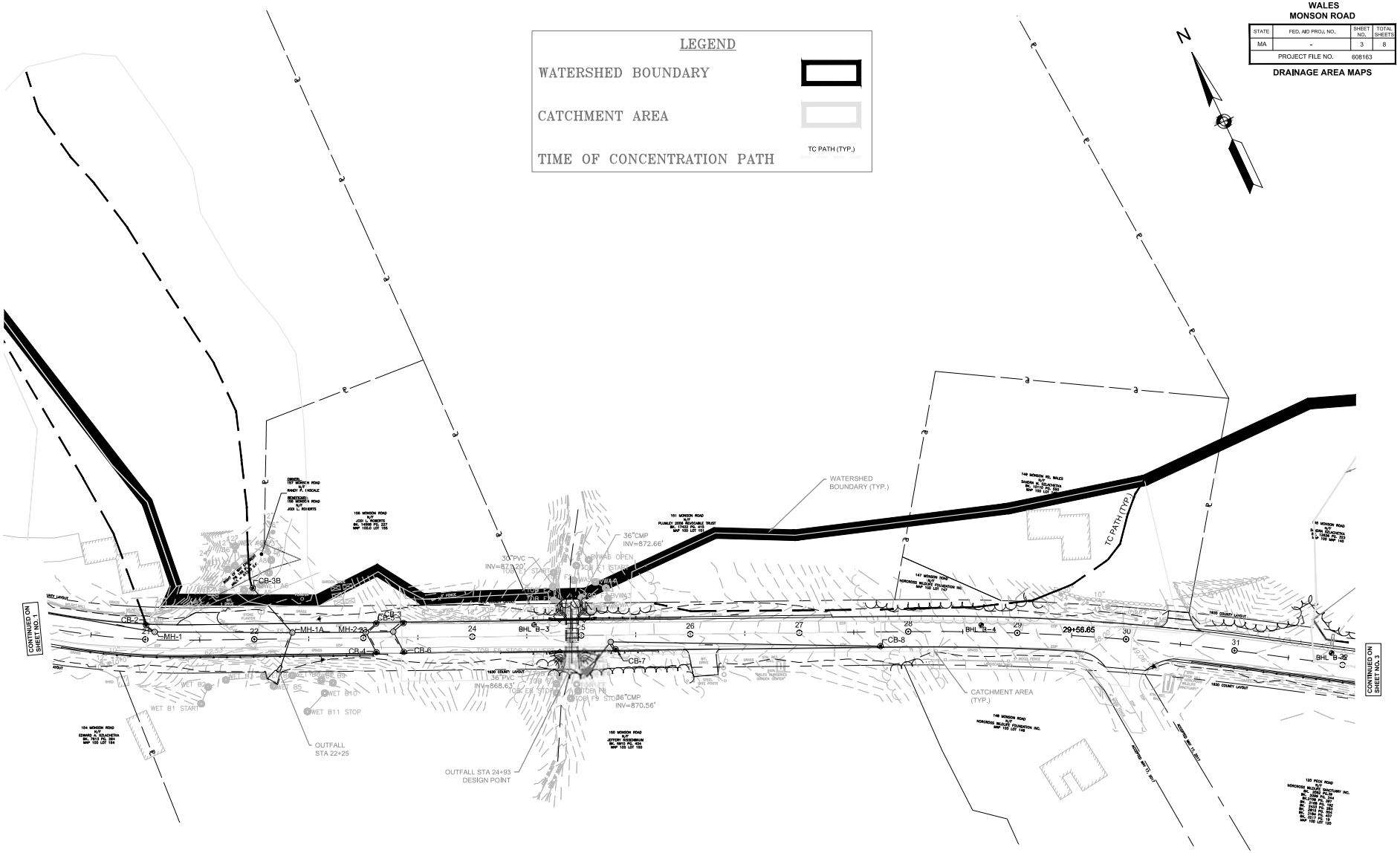
Proposal No. 608163 - 128112

A00030 - 290

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	8
PROJECT FILE NO.	608163		

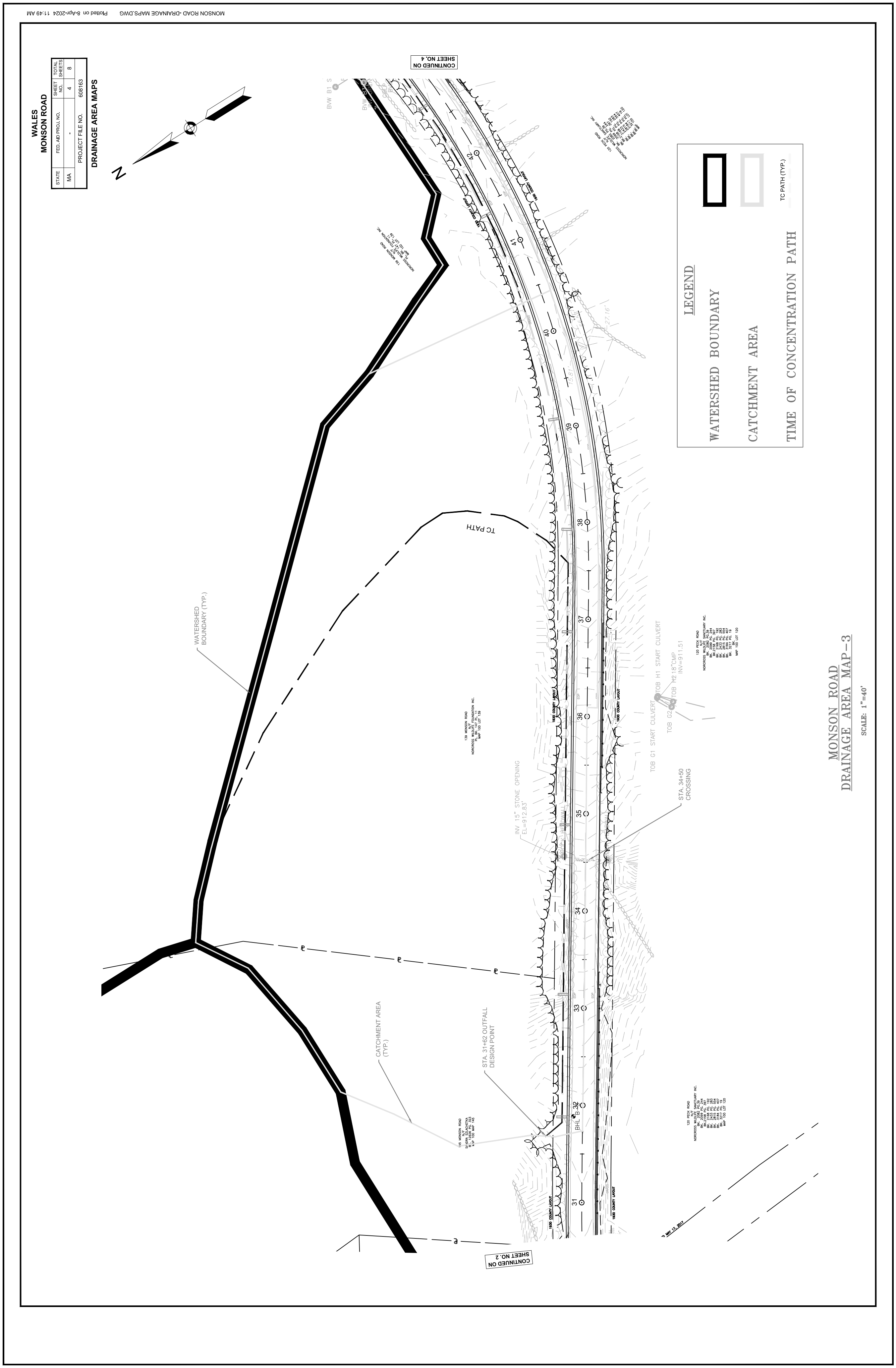
DRAINAGE AREA MAPS



MONSON ROAD
DRAINAGE AREA MAP-2

SCALE: 1"=40'

MONSON ROAD -DRAINAGE MAPS.DWG Plotted on 8-Apr-2024 11:49 AM
Proposal No. 608163 - 128112
A000830 - 251

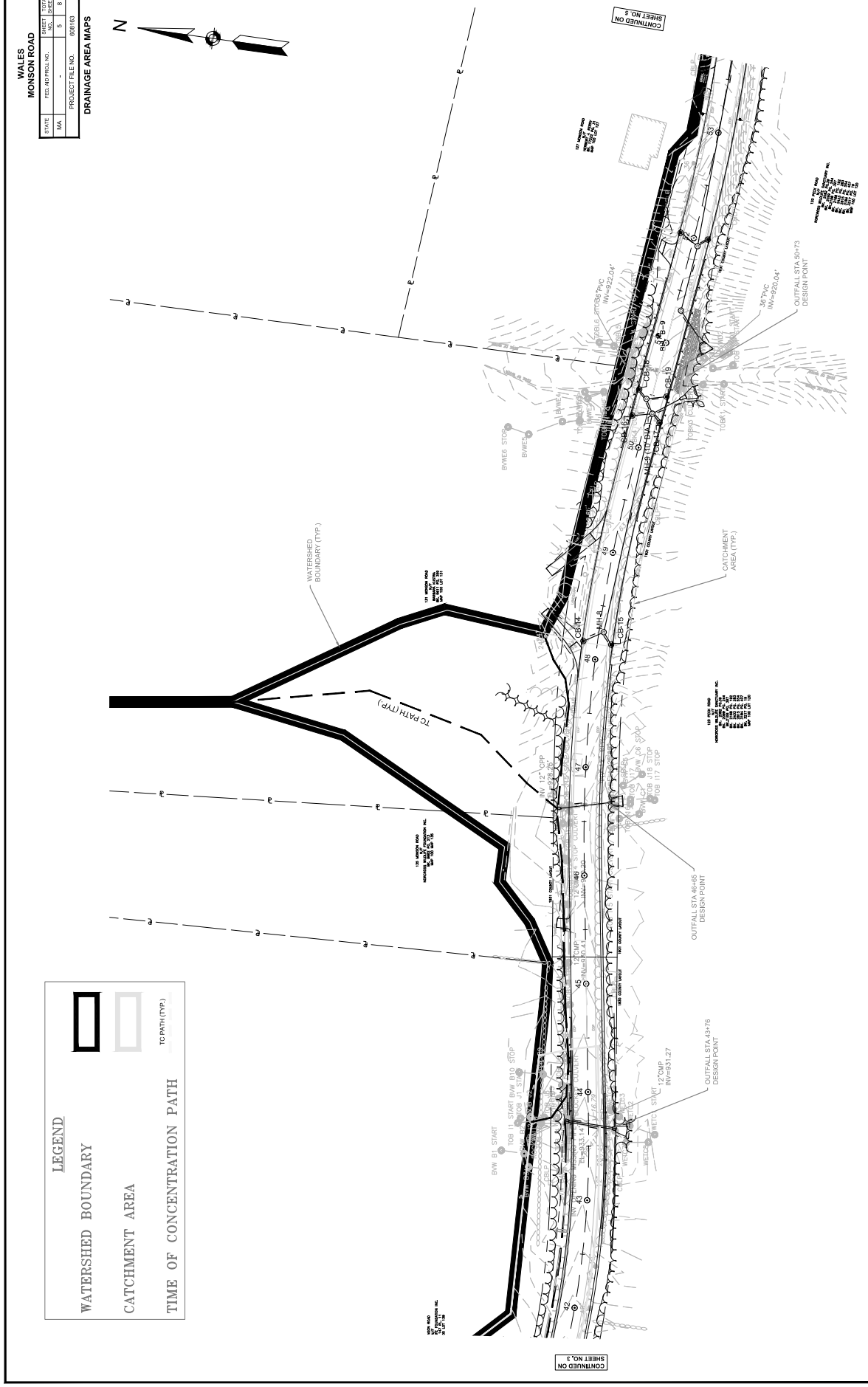

WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
SHEET NO.
4
TOTAL SHEETS
8
PROJECT FILE NO.
608163
DRAINAGE AREA MAPS
N
MONSON ROAD -DRAINAGE MAPS.DWG
Plotted on 8-Apr-2024 11:49 AM
CONTINUED ON SHEET NO. 4
CONTINUED ON SHEET NO. 2
LEGEND
WATERSHED BOUNDARY
CATCHMENT AREA
TIME OF CONCENTRATION PATH
TC PATH (TYP.)
TC PATH
WATERSHED BOUNDARY (TYP.)
CATCHMENT AREA (TYP.)
STA. 31+62 OUTFALL DESIGN POINT
STA. 34+50 CROSSING
INV 15" STONE OPENING EL=912.83'
TOB G1 START CULVERT
TOB H1 START CULVERT
TOB G2
TOB H2 18"CMP INV=911.51
BHL
1930 COUNTY LAYOUT
139 MONSON ROAD
N/F
NORCROSS WILDLIFE FOUNDATION INC.
PL. BK. 147 PL. 11
MAP 100 LOT 139
120 PECK ROAD
N/F
NORCROSS WILDLIFE SANCTUARY INC.
BK. 2082 PG.39
BK. 2099 PG. 244
BK.2158 PG. 397
BK. 2168 PG. 192
BK. 2433 PG. 283
BK. 2815 PG. 554
BK. 3184 PG. 407
BK. 3217 PG. 19
MAP 100 LOT 120
145 MONSON ROAD
N/F
SANDRA SZLACHETKA
MAP 100 MAP 145
31
32
33
34
35
36
37
38
39
40
41
42
MONSON ROAD
DRAINAGE AREA MAP-3
SCALE: 1"=40'

MONSON ROAD -DRAINAGE MAPS.DWG Plotted on 8-Apr-2024 11:50 AM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	8
	PROJECT FILE NO.	608163	

DRAINAGE AREA MAPS



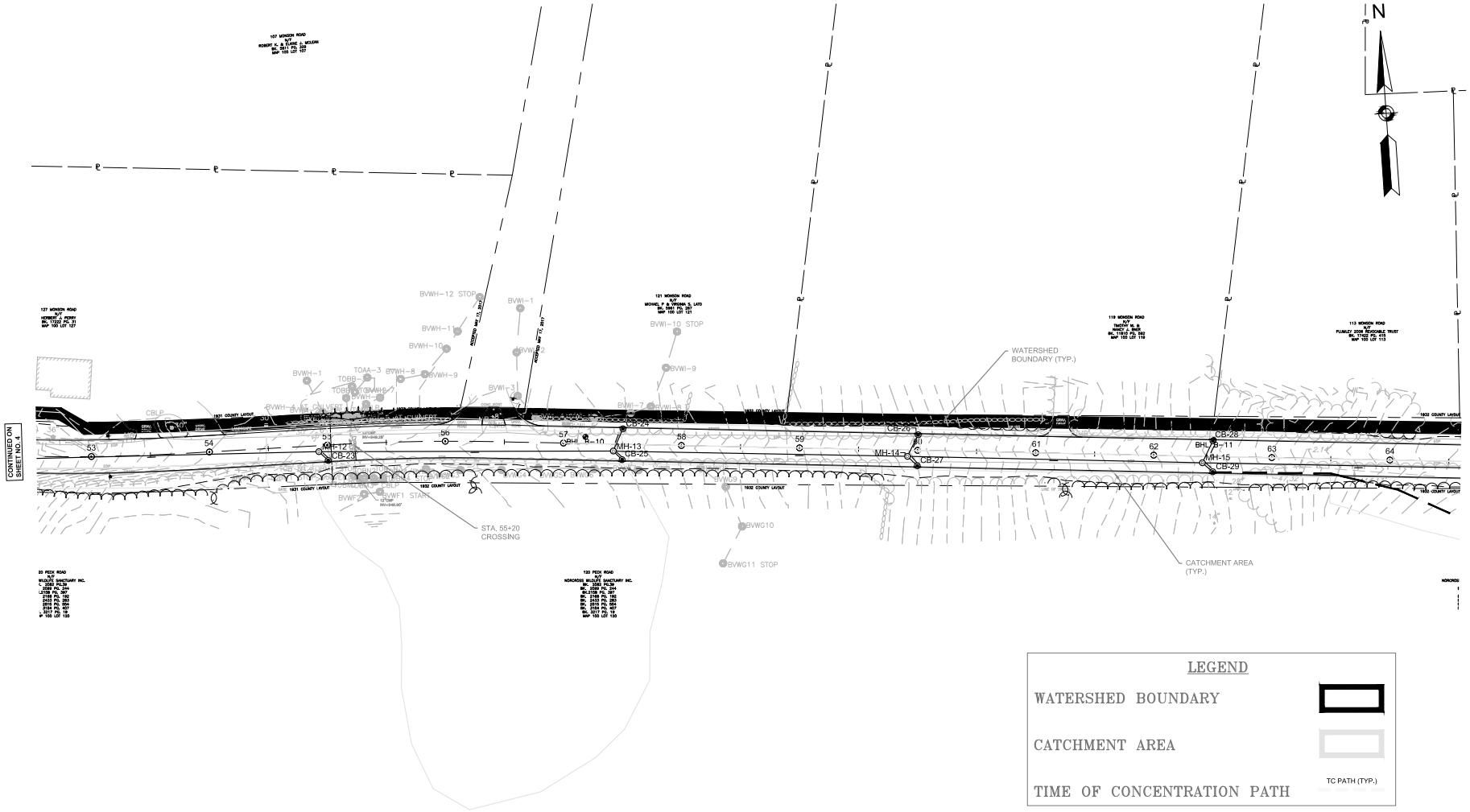
MONSON ROAD
DRAINAGE AREA MAP-4

SCALE: 1"=40'

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	8
PROJECT FILE NO.	608163		

DRAINAGE AREA MAPS



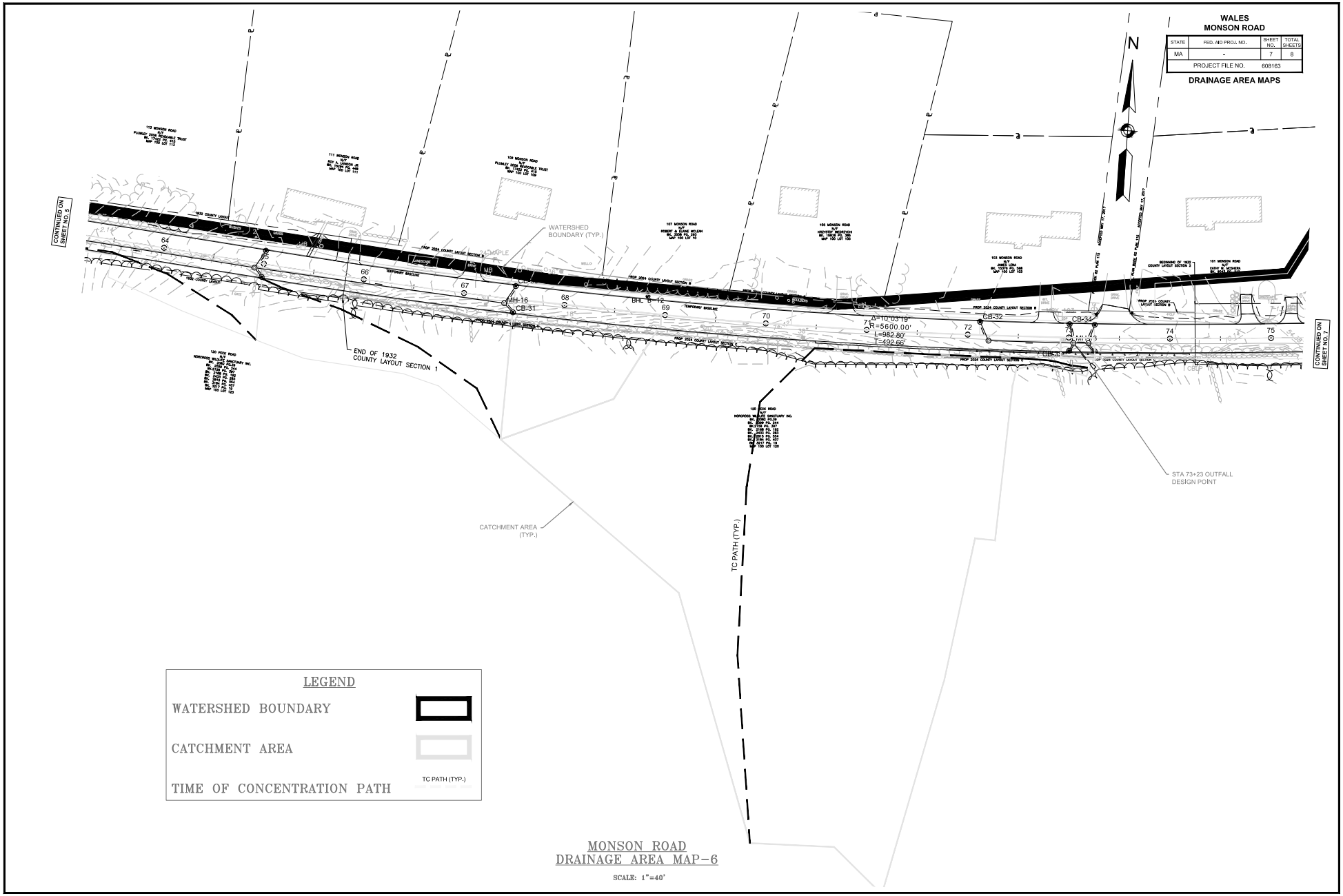
LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA	
TIME OF CONCENTRATION PATH	TC PATH (TYP.)

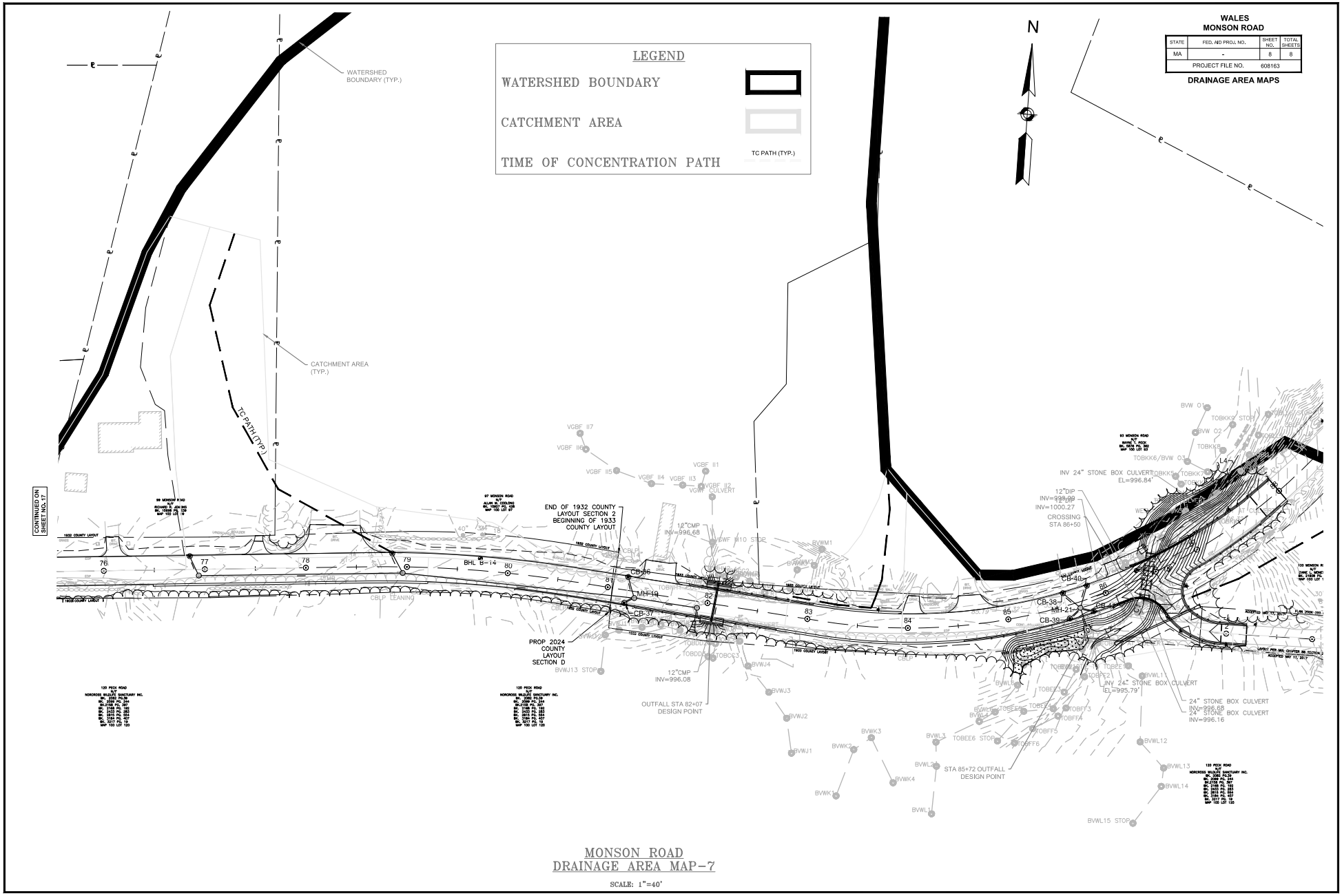
MONSON ROAD
DRAINAGE AREA MAP-5

SCALE: 1"=40'

MONSON ROAD -DRAINAGE MAPS.DWG Plotted on 8-Apr-2024 11:50 AM
Proposal No. 608163 - 128112
A00030 - 254



MONSON ROAD -DRAINAGE MAPS.DWG Plotted on 8-Apr-2024 11:50 AM
A00838 - 255
Proposal No. 608163 - 128112



MONSON ROAD -DRAINAGE MAPS.DWG Plotted on 8-Apr-2024 11:51 AM

Proposal No. 608163 - 128112

AA0030 - 296

APPENDIX B

Rational Method Data

Monson Road Reconstruction
Wales, MA

Date: 4/8/2024
By: NSD
Checked By: RSV

Weston & Sampson

TABLE 1

PROPOSED DRAINAGE AREA SUMMARY SHEET
HYDRAFLOW ANALYSIS

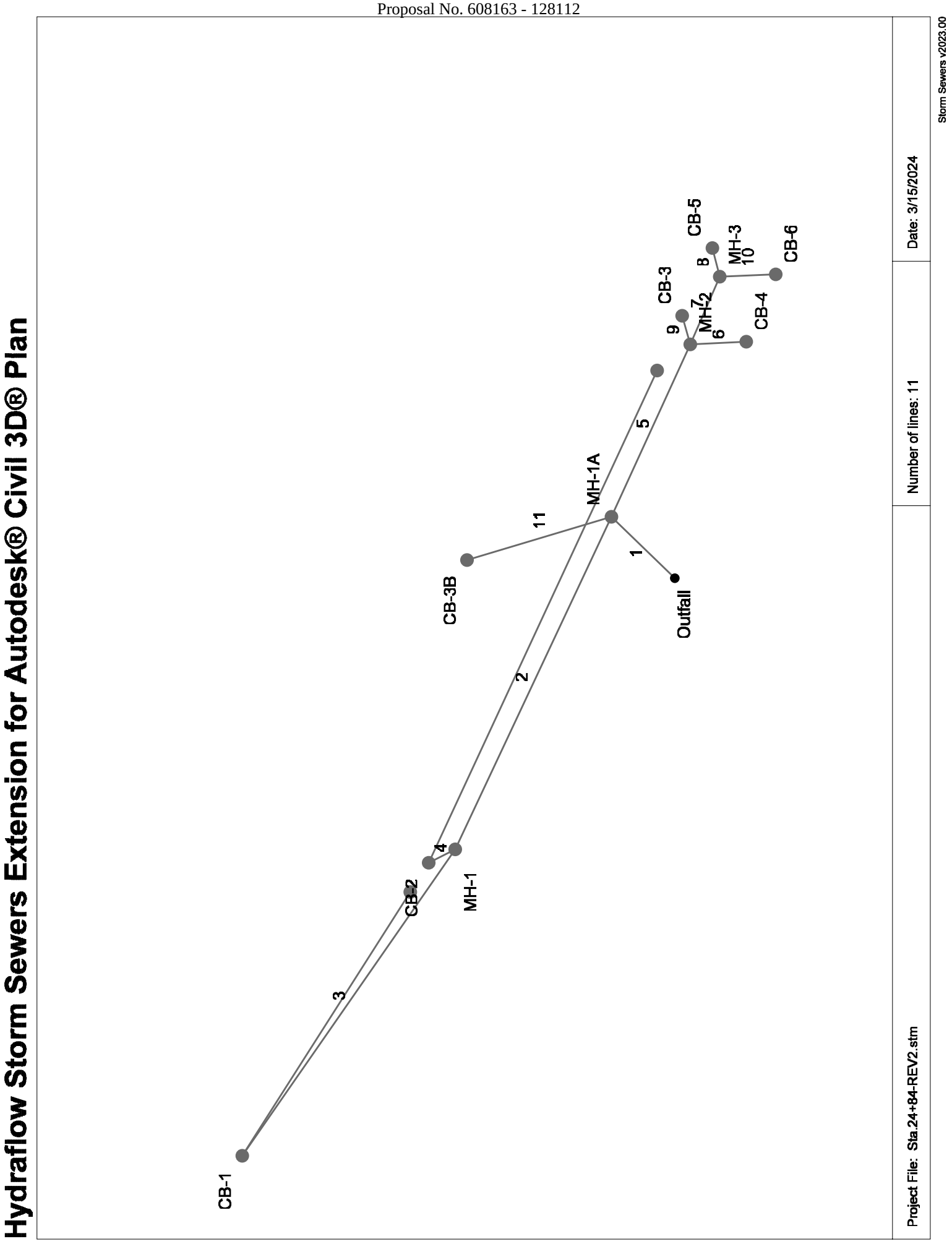
Area		Area (s.f)	Area (ac.)	Impervious Area (s.f)	Grass Area (s.f)	Woods Area (s.f)	C-Value	Tc (min.)
Proposed Drainage System								
	STA 24+84							
CB1		48,140	**1.105**	2,722	7,922	37,496	0.26	11
CB2		24,150	**0.554**	5,996	16,154	2,000	0.44	5
CB3		9,479	**0.218**	5,061	4,418		0.62	5
CB3B		92,066	**2.114**	2,150	5,730	84,186	0.22	15
CB4		372	**0.009**	372			0.90	5
CB5		5,665	**0.130**	2,370	3,295		0.55	5
CB6		5,703	**0.131**	2,720	948	2,035	0.55	5
	STA 25+00							
CB7		4,854	**0.111**	4,050	804		0.80	5
CB8		7,359	**0.169**	6,261	1,098		0.81	5
	STA 50+61							
CB14		2,813	**0.065**	769	2,044		0.46	5
CB15		3,181	**0.073**	2,086		1,095	0.66	5
CB16		3,387	**0.078**	762	417	2,208	0.37	5
CB17		4,558	**0.105**	2,885	158	1,515	0.65	5
CB18		7,714	**0.177**	3,404	1,284	3,026	0.53	5
CB19		4,866	**0.112**	2,185	758	1,923	0.53	5
	STA 51+24							
CB20		9,120	**0.209**	6,483	1,406	1,231	0.71	5
CB21		6,026	**0.138**	2,414	1,437	2,175	0.50	5
CB22		2,673	**0.061**	1,854	819		0.72	5
CB23		6,334	**0.145**	5,584		750	0.82	5
CB24		5,414	**0.124**	4,364		1,050	0.76	5
CB25		4,912	**0.113**	4,350		562	0.82	5
CB26		4,444	**0.102**	3,664	780		0.79	5
CB27		3,941	**0.090**	3,578	363		0.84	5
CB28		5,465	**0.125**	3,756	1,709		0.71	5
CB29		10,177	**0.234**	3,549		6,628	0.44	5
CB28B		4,735	**0.109**	3,765	970		0.78	5
CB29B		23,495	**0.539**	3,627		19,868	0.31	7.3
CB30		4,950	**0.114**	3,994	956		0.78	5
CB31		14,123	**0.324**	2,122	12,001		0.39	5
	STA 73+30							
CB32		3,093	**0.071**	2,762	331		0.84	5
CB34		1,830	**0.042**	1,649	181		0.84	5
CB35		700	**0.016**	470	230		0.70	5
CB34B		11,104	**0.255**	4,501	6,603		0.54	5
CB35B		4,454	**0.102**	3,140	1,314		0.72	5
	STA 81+97							
CB36		6,857	**0.157**	1,065	5,792		0.39	5.0
CB36B		36,290	**0.833**	6,103	30,187		0.40	10.0
CB36C		31,245	**0.717**	5,437	25,808		0.40	10.0
CB37		5,183	**0.119**	4,845		338	0.85	5
	STA 85+72							
CB38		11,348	**0.261**	6,499	4,849		0.64	5
CB39		1,038	**0.024**	758		280	0.71	5
CB40		5,335	**0.122**	3,556	1,187	592	0.69	5
CB41		359	**0.008**	273	86		0.76	5

NOTES:
1) Refer to DA-1 - 3 for drainage areas.
2) C-Values were used based on Exhibit 8-8 of the MassDOT Project Development and Design Guide. Values given below.
3) Time of Concentrations (Tc) derived from Hydraflow (TR-55 Method). Refer to Tc computations included.
4) Minimum Tc used for paved areas = 5 min. and grassy areas = 10 min.

Land Cover		C
Impervious		0.9
Grass		0.3
Unimproved (Woods)		0.2

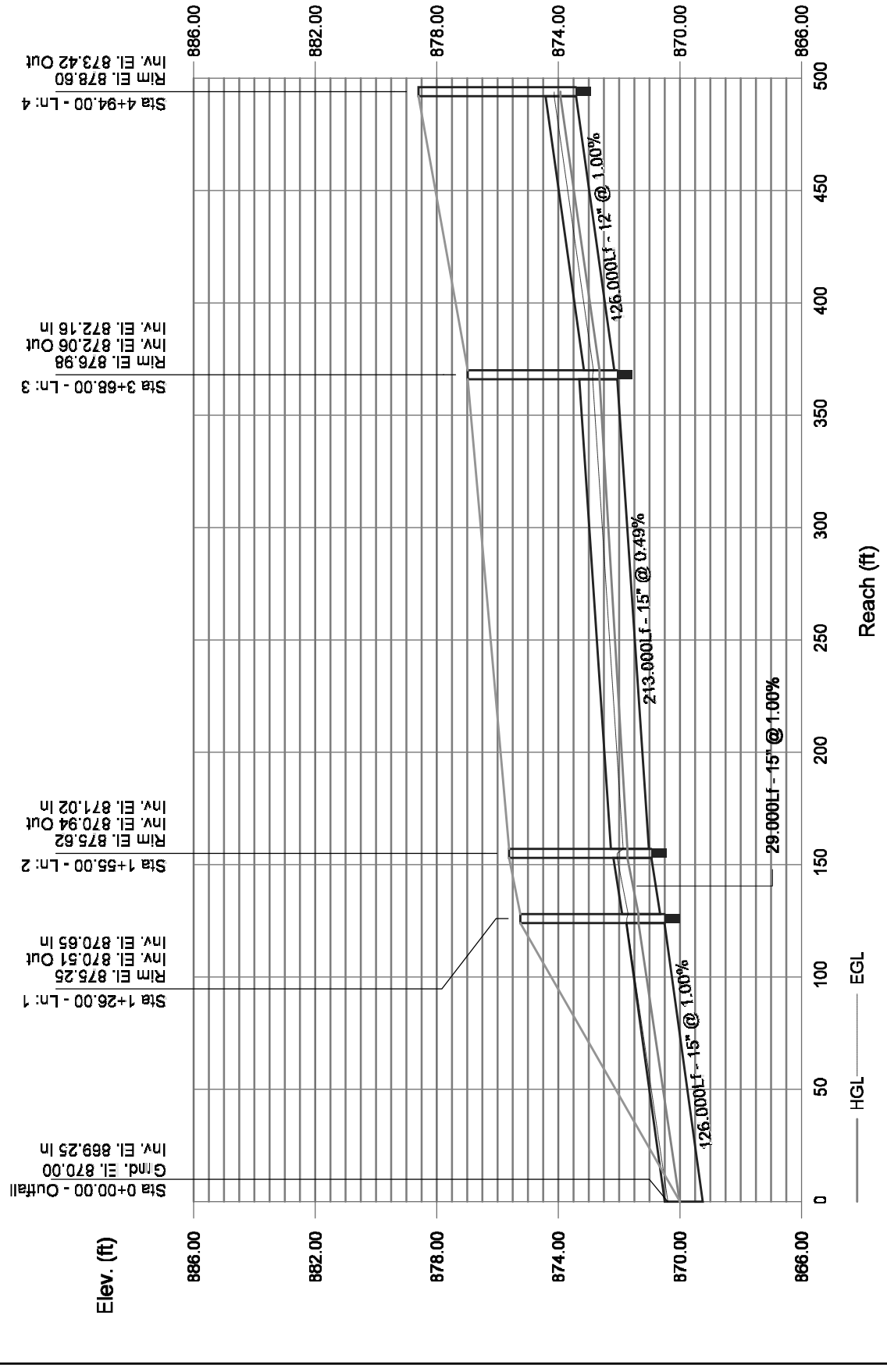
APPENDIX C

Hydraflow Reports


Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan
CB-1
CB-2
MH-1
CB-3B
MH-1A
Outfall
CB-3
MH-2
CB-5
MH-3
CB-4
CB-6
1
2
3
4
5
6
7
8
9
10
11
Project File: Sta.24+84-REV2.stm
Number of lines: 11
Date: 3/15/2024
Storm Sewers v2023.00

Storm Sewer Profile

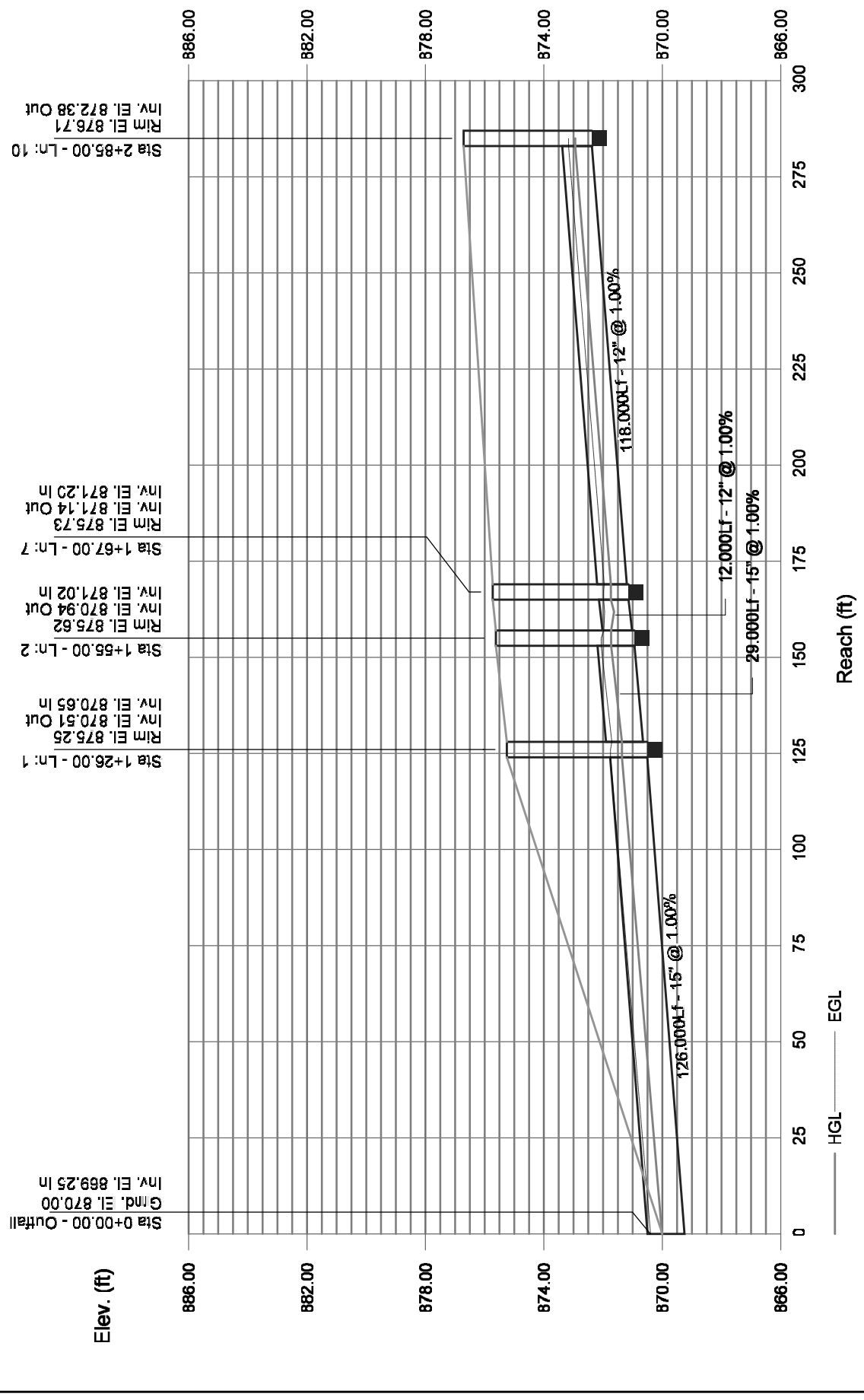
Proj. file: Sta.24+84.stm



Storm Sewers

Storm Sewer Profile

Proj. file: Sta.24+84.stm



Storm Sewers

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-1A	Manhole	875.51	Cir	4.00	4.00	15	Cir	869.82	12 12 12	Cir Cir Cir	870.00 870.00 870.00
2	MH-1	Manhole	876.90	Cir	4.00	4.00	12	Cir	872.06	12 12	Cir Cir	872.16 872.16
3	CB-1	Combination	878.65	Cir	4.00	4.00	12	Cir	873.42			
4	CB-2	Combination	876.63	Cir	4.00	4.00	12	Cir	872.26			
5	MH-2	Manhole	875.15	Cir	4.00	4.00	12	Cir	870.68	12 12 12	Cir Cir Cir	871.02 870.75 871.02
6	CB-4	Combination	874.99	Cir	4.00	4.00	12	Cir	871.22			
7	MH-3	Manhole	875.16	Cir	4.00	4.00	12	Cir	870.88	12 12	Cir Cir	871.00 871.00
8	CB-5	Combination	875.45	Cir	4.00	4.00	12	Cir	871.12			
9	CB-3	Combination	874.99	Cir	4.00	4.00	12	Cir	871.14			
10	CB-6	Combination	875.54	Cir	4.00	4.00	12	Cir	871.21			
11	CB-3B	Combination	874.88	Cir	4.00	4.00	12	Cir	870.55			

Project File: Sta.24+84-REV2.stm | Number of Structures: 11 | Run Date: 3/15/2024

A00830 - 303

Proposal No. 608163 - 128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	30.000	0.00	4.26	0.00	0.00	1.22	0.0	15.9	3.7	4.51	5.78	5.11	15	1.07	869.50	869.82	870.33	870.68	870.75	875.51	MH1A-OUTLET
2	1	124.000	0.00	1.66	0.00	0.00	0.50	0.0	11.6	4.3	2.14	3.98	3.96	12	1.66	870.00	872.06	870.68	872.69	875.51	876.90	MH1-MH1A
3	2	126.000	1.11	1.11	0.30	0.33	0.33	11.1	11.1	4.4	1.47	3.56	3.56	12	1.00	872.16	873.42	872.69	873.93	876.90	878.65	CB1-MH1
4	2	10.000	0.55	0.55	0.30	0.17	0.17	5.0	5.0	5.9	0.97	3.56	2.75	12	1.00	872.16	872.26	872.69	872.67	876.90	876.63	CB2-MH1
5	1	64.000	0.00	0.49	0.00	0.00	0.25	0.0	5.4	5.8	1.46	3.67	3.09	12	1.06	870.00	870.68	870.68	871.19	875.51	875.15	MH2-MH1A
6	5	19.000	0.01	0.01	0.50	0.01	0.01	5.0	5.0	5.9	0.03	3.65	0.78	12	1.05	871.02	871.22	871.19	871.29	875.15	874.99	CB4-MH2
7	5	25.000	0.00	0.26	0.00	0.00	0.18	0.0	5.2	5.9	1.07	2.57	3.12	12	0.52	870.75	870.88	871.20	871.33	875.15	875.16	MH3-MH2
8	7	10.000	0.13	0.13	0.70	0.09	0.09	5.0	5.0	5.9	0.54	3.90	2.08	12	1.20	871.00	871.12	871.47	871.42	875.16	875.45	CB5-MH3
9	5	10.000	0.22	0.22	0.30	0.07	0.07	5.0	5.0	5.9	0.39	3.38	2.65	12	1.20	871.02	871.14	871.25	871.40	875.15	874.99	CB3-MH2
10	7	19.000	0.13	0.13	0.70	0.09	0.09	5.0	5.0	5.9	0.54	3.74	2.08	12	1.11	871.00	871.21	871.47	871.51	875.16	875.54	CB6-MH3
11	1	51.000	2.11	2.11	0.22	0.46	0.46	15.7	15.7	3.7	1.74	3.70	3.44	12	1.08	870.00	870.55	870.68	871.11	875.51	874.88	CB3B-MH1A

Project File: Sta.24+84-REV2.stm | Number of lines: 11 | Run Date: 3/15/2024

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

A00830 - 304

Proposal No. 608163 - 128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-1A	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-1	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	CB-1	1.47	0.00	1.07	0.40	Comb	2.0	2.00	0.00	2.00	2.00	0.014	4.00	0.045	0.020	0.013	0.20	4.86	0.29	2.69	2.0	4
4	CB-2	0.97	0.40	1.13	0.24	Comb	2.0	2.00	0.00	2.00	2.00	0.014	4.00	0.057	0.057	0.013	0.21	3.69	0.28	1.92	2.0	9
5	MH-2	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
6	CB-4	0.03	0.00	0.03	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.12	0.76	0.05	0.76	2.0	Off
7	MH-3	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
8	CB-5	0.54	0.00	0.54	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.03	3.12	0.19	3.12	2.0	Off
9	CB-3	0.39	0.12	0.51	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.02	3.00	0.19	3.00	2.0	Off
10	CB-6	0.54	0.00	0.54	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.03	3.12	0.19	3.12	2.0	Off
11	CB-3B	1.74	0.00	1.74	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.17	8.35	0.33	8.35	2.0	Off

Project File: Sta.24+84-REV2.stm | Number of lines: 11 | Run Date: 3/15/2024

NOTES: Inlet N-Values = 0.016; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

A00830 - 305

Proposal No. 608163 - 128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	30.000	0.00	4.26	0.00	0.00	1.22	0.0	16.0	4.6	5.55	5.78	5.36	15	1.07	869.50	869.82	870.48	870.80	870.75	875.51	MH1A-OUTLET
2	1	124.000	0.00	1.66	0.00	0.00	0.50	0.0	11.6	5.3	2.64	3.98	3.94	12	1.66	870.00	872.06	871.25	872.76	875.51	876.90	MH1-MH1A
3	2	126.000	1.11	1.11	0.30	0.33	0.33	11.1	11.1	5.4	1.80	3.56	3.79	12	1.00	872.16	873.42	872.76	873.99	876.90	878.65	CB1-MH1
4	2	10.000	0.55	0.55	0.30	0.17	0.17	5.0	5.0	7.2	1.19	3.56	2.91	12	1.00	872.16	872.26	872.76	872.72	876.90	876.63	CB2-MH1
5	1	64.000	0.00	0.49	0.00	0.00	0.25	0.0	5.5	7.0	1.78	3.67	2.64	12	1.06	870.00	870.68	871.25	871.38	875.51	875.15	MH2-MH1A
6	5	19.000	0.01	0.01	0.50	0.01	0.01	5.0	5.0	7.2	0.04	3.65	0.69	12	1.05	871.02	871.22	871.51	871.30	875.15	874.99	CB4-MH2
7	5	25.000	0.00	0.26	0.00	0.00	0.18	0.0	5.2	7.1	1.30	2.57	2.21	12	0.52	870.75	870.88	871.51	871.53	875.15	875.16	MH3-MH2
8	7	10.000	0.13	0.13	0.70	0.09	0.09	5.0	5.0	7.2	0.66	3.90	2.06	12	1.20	871.00	871.12	871.62	871.46	875.16	875.45	CB5-MH3
9	5	10.000	0.22	0.22	0.30	0.07	0.07	5.0	5.0	7.2	0.48	3.38	1.91	12	1.20	871.02	871.14	871.51	871.43	875.15	874.99	CB3-MH2
10	7	19.000	0.13	0.13	0.70	0.09	0.09	5.0	5.0	7.2	0.66	3.74	2.06	12	1.11	871.00	871.21	871.62	871.55	875.16	875.54	CB6-MH3
11	1	51.000	2.11	2.11	0.22	0.46	0.46	15.7	15.7	4.6	2.14	3.70	2.86	12	1.08	870.00	870.55	871.25	871.40	875.51	874.88	CB3B-MH1A

Project File: Sta.24+84-RFV2.stm | Number of lines: 11 | Run Date: 4/8/2024

NOTES:Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

A00830 - 306

Proposal No. 608163 - 128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-1A	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-1	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	CB-1	1.80	0.00	1.25	0.55	Comb	2.0	2.00	0.00	2.00	2.00	0.014	4.00	0.045	0.020	0.013	0.21	5.63	0.30	3.04	2.0	4
4	CB-2	1.19	0.55	1.36	0.38	Comb	2.0	2.00	0.00	2.00	2.00	0.014	4.00	0.057	0.057	0.013	0.23	4.03	0.30	2.27	2.0	9
5	MH-2	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
6	CB-4	0.04	0.00	0.04	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.11	0.85	0.05	0.85	2.0	Off
7	MH-3	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
8	CB-5	0.66	0.00	0.66	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.05	3.57	0.22	3.57	2.0	Off
9	CB-3	0.48	0.38	0.85	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.09	4.38	0.25	4.38	2.0	Off
10	CB-6	0.66	0.00	0.66	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.05	3.57	0.22	3.57	2.0	Off
11	CB-3B	2.14	0.00	2.14	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.20	9.92	0.37	9.92	2.0	Off

Project File: Sta.24+84-RFV2.stm | Number of lines: 11 | Run Date: 4/8/2024

NOTES: Inlet N-Values = 0.016; Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

A00830 - 307

Proposal No. 608163 - 128112

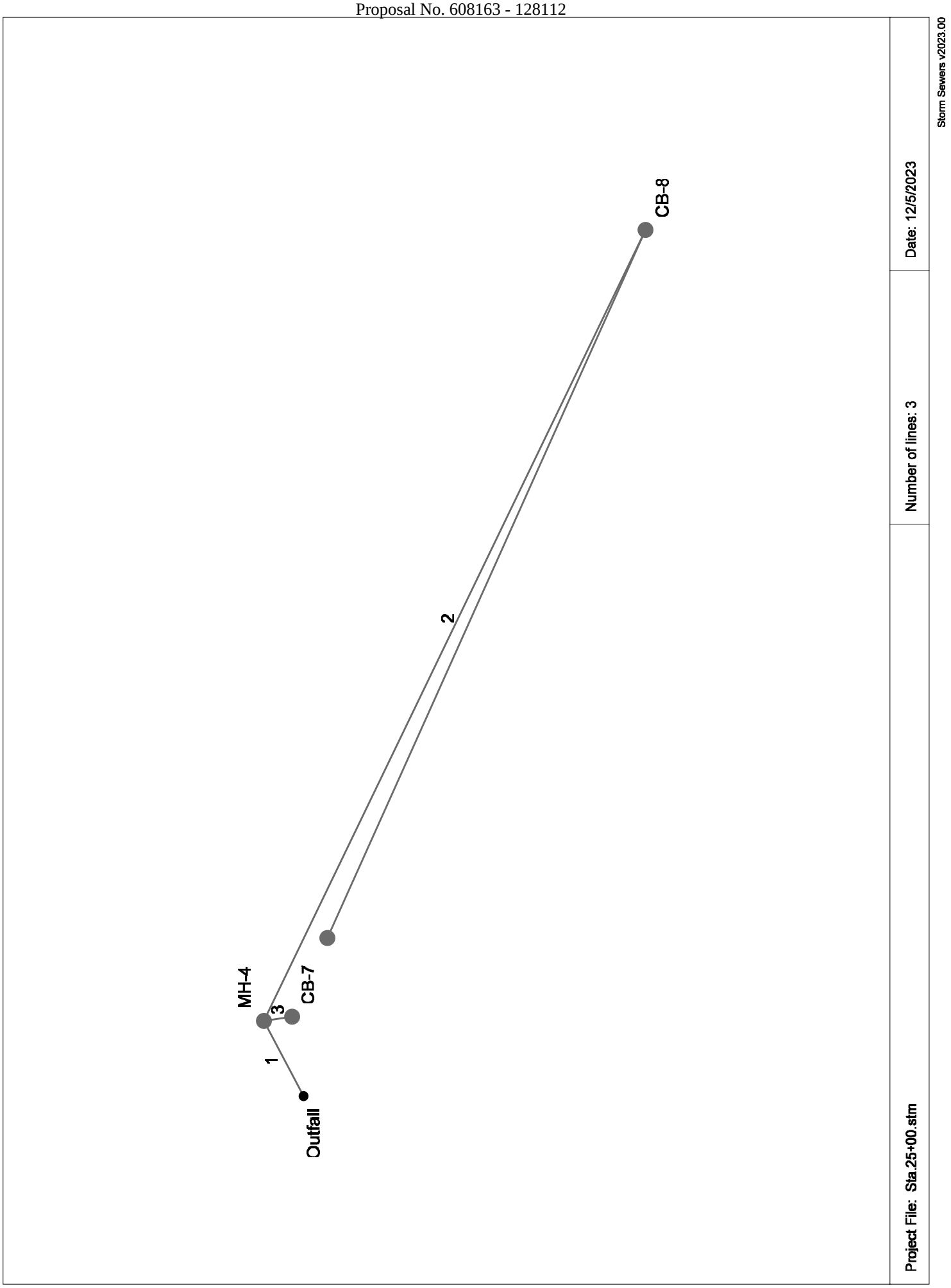
Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	Travel Time (min)
1	MH1A-OUTLET	User																		0.00
2	MH1-MH1A	User																		0.00
3	CB1-MH1	TR55	0.800	30.00	3.10	5.00	10.05	270.00	7.70	UnPaved	4.48	1.01								11.05
4	CB2-MH1	TR55	0.240	33.00	3.10	5.80	3.90	300.00	8.00	UnPaved	4.56	1.10								5.00
5	MH2-MH1A	User																		0.00
6	CB4-MH2	User																		5.00
7	MH3-MH2	User																		0.00
8	CB5-MH3	User																		5.00
9	CB3-MH2	User																		5.00
10	CB6-MH3	User																		5.00
11	CB3B-MH1A	TR55	0.400	50.00	3.10	1.76	13.19	480.00	4.00	UnPaved	3.23	2.48								15.67

Project File: Sta.24+84-REV2.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 11 | Date: 3/15/2024

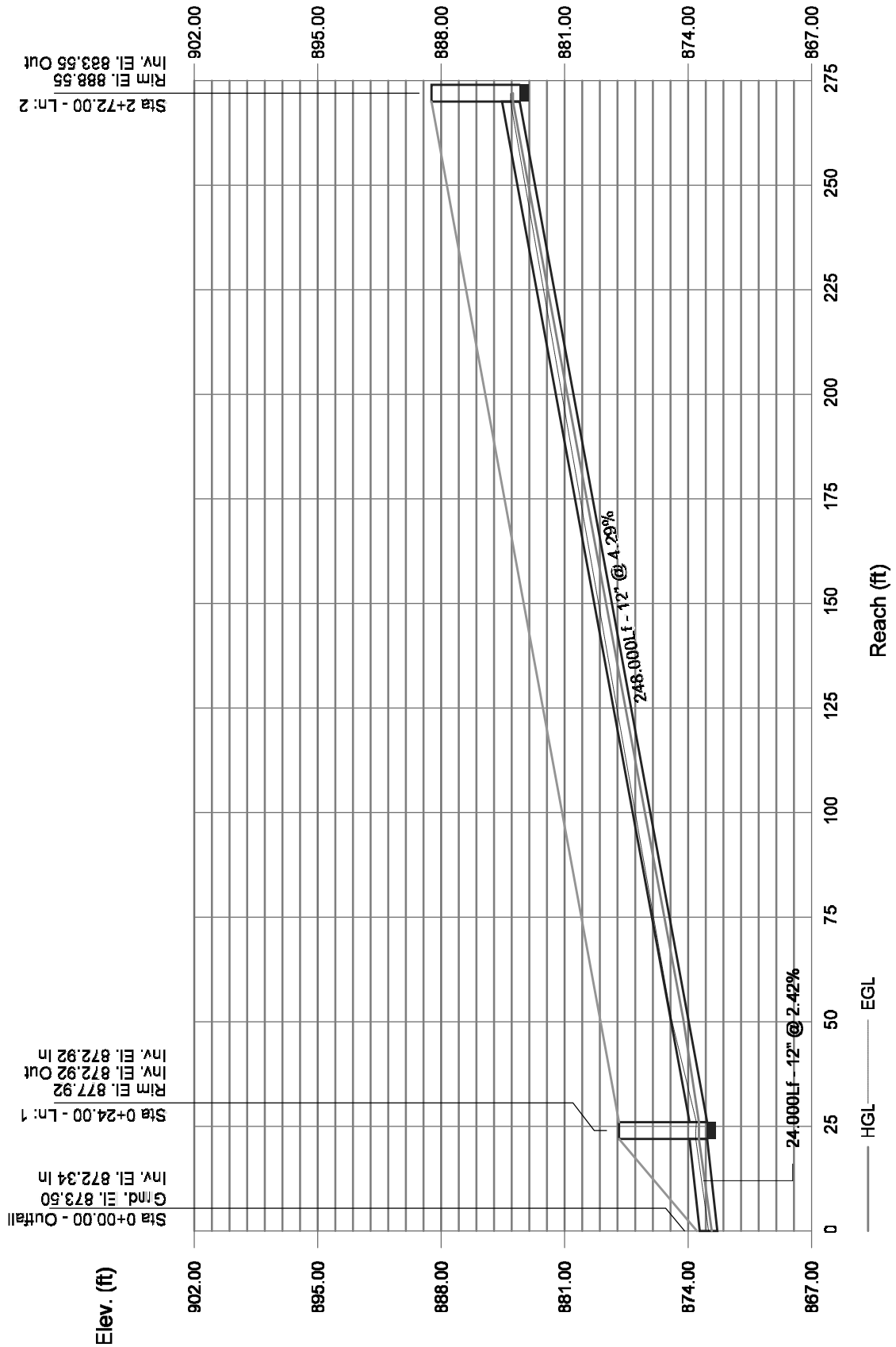
A00830 - 308

Proposal No. 608163 - 128112


Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan
CB-8
2
MH-4
3
CB-7
1
Outfall
Project File: Sta.25+00.stm
Number of lines: 3
Date: 12/5/2023
Storm Sewers v2023.00

Proj. file: Sta.25+00.stm

Storm Sewer Profile



Storm Sewers

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-4	Manhole	877.92	Cir	4.00	4.00	12	Cir	872.92	12 12	Cir Cir	872.92 872.92
2	CB-8	Combination	888.55	Cir	4.00	4.00	12	Cir	883.55			
3	CB-7	Combination	877.89	Cir	4.00	4.00	12	Cir	873.06			

Project File: Sta.25+00.stm | Number of Structures: 3 | Run Date: 12/5/2023

A00830 - 311

Proposal No. 608163 - 128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	24.000	0.00	0.28	0.00	0.00	0.23	0.0	6.6	5.4	1.22	5.54	4.53	12	2.42	872.34	872.92	872.66	873.39	873.50	877.92	MH4-OUTLET
2	1	248.000	0.17	0.17	0.81	0.14	0.14	5.0	5.0	5.9	0.81	7.37	2.64	12	4.29	872.92	883.55	873.39	883.93	877.92	888.55	CB8-MH4
3	1	8.000	0.11	0.11	0.80	0.09	0.09	5.0	5.0	5.9	0.52	4.71	2.04	12	1.75	872.92	873.06	873.39	873.36	877.92	877.89	CB7-MH4

Project File: Sta.25+00.stm | Number of lines: 3 | Run Date: 12/5/2023

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

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Proposal No. 608163 - 128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-4	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	CB-8	0.81	0.00	0.59	0.23	Comb	2.0	2.00	0.00	2.00	2.00	0.060	4.00	0.020	0.020	0.013	0.09	4.42	0.22	2.74	2.0	3
3	CB-7	0.52	0.23	0.51	0.23	Comb	2.0	2.00	0.00	2.00	2.00	0.025	4.00	0.020	0.020	0.013	0.10	5.04	0.23	3.27	2.0	Off

Project File: Sta.25+00.stm | Number of lines: 3 | Run Date: 12/5/2023

NOTES: Inlet N-Values = 0.015; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

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Proposal No. 608163 - 128112

Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	MH4-OUTLET	User																		0.00
2	CB8-MH4	User																		5.00
3	CB7-MH4	User																		5.00

Project File: Sta.25+00.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 3 | Date: 12/5/2023

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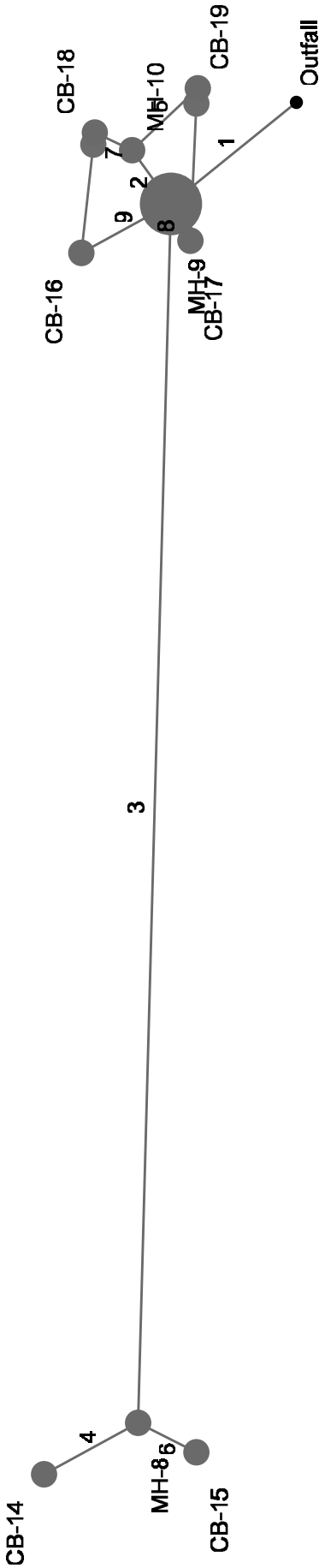
Proposal No. 608163 - 128112

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan

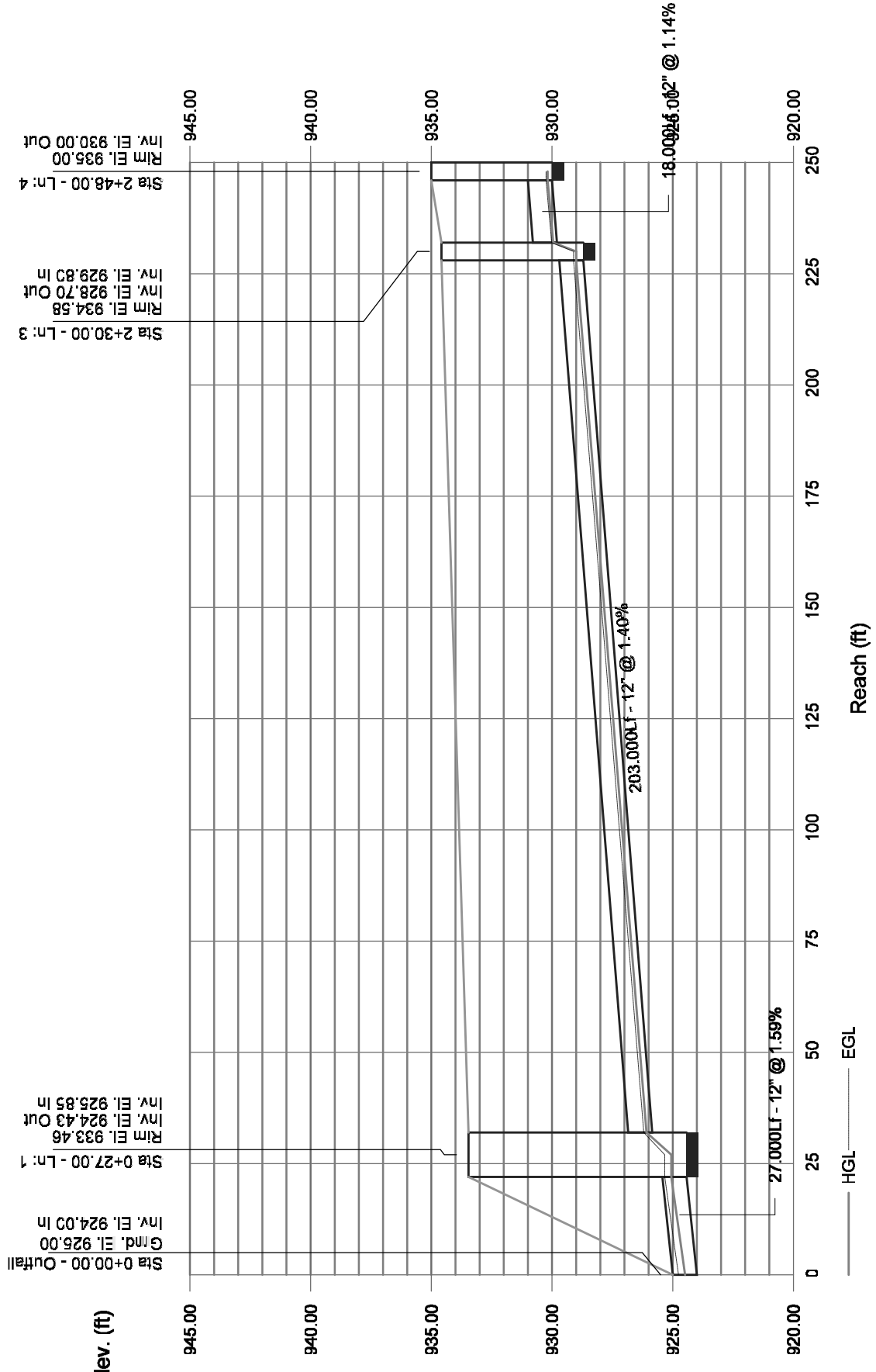


Project File: Sta.50+70.stm | Number of lines: 9 | Date: 3/15/2024

Storm Sewers v2023.00

Storm Sewer Profile

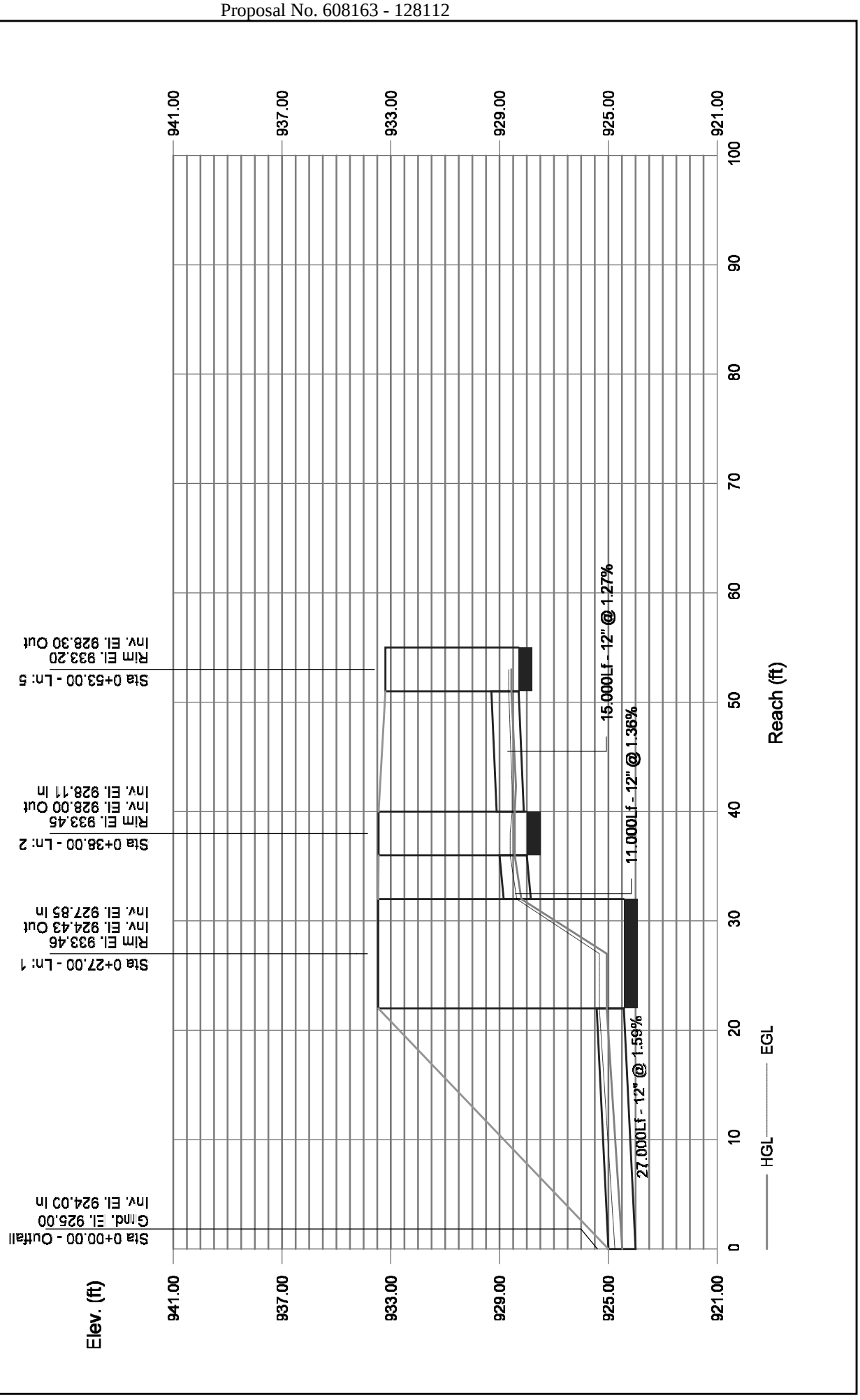
Proj. file: Sta.50+70.stm



Storm Sewers

Storm Sewer Profile

Proj. file: Sta.50+70.stm



Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-9	Manhole	933.46	Cir	10.00	10.00	12	Cir	924.43	12 12 12 12	Cir Cir Cir Cir	927.85 925.85 928.26 928.44
2	MH-10	Manhole	933.45	Cir	4.00	4.00	12	Cir	928.00	12 12	Cir Cir	928.11 928.20
3	MH-8	Manhole	934.58	Cir	4.00	4.00	12	Cir	928.70	12 12	Cir Cir	929.80 928.84
4	CB-14	Combination	935.00	Cir	4.00	4.00	12	Cir	930.00			
5	CB-19	Combination	933.20	Cir	4.00	4.00	12	Cir	928.30			
6	CB-15	Combination	934.02	Cir	4.00	4.00	12	Cir	928.97			
7	CB-18	Combination	933.32	Cir	4.00	4.00	12	Cir	928.31			
8	CB-17	Combination	933.36	Cir	4.00	4.00	12	Cir	928.37			
9	CB-16	Combination	933.61	Cir	4.00	4.00	12	Cir	928.63			

Project File: Sta.50+70.stm | Number of Structures: 9 | Run Date: 3/15/2024

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Proposal No. 608163 - 128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	27.000	0.00	0.60	0.00	0.00	0.32	0.0	6.3	5.5	1.77	4.49	4.62	12	1.59	924.00	924.43	924.44	925.00	925.00	933.46	MH9-OUTLET
2	1	11.000	0.00	0.29	0.00	0.00	0.15	0.0	5.1	5.9	0.90	4.16	3.66	12	1.36	927.85	928.00	928.17	928.40	933.46	933.45	MH10-MH9
3	1	203.000	0.00	0.13	0.00	0.00	0.07	0.0	5.1	5.9	0.43	4.22	2.98	12	1.40	925.85	928.70	926.07	928.97	933.46	934.58	MH8-MH9
4	3	18.000	0.06	0.06	0.46	0.03	0.03	5.0	5.0	5.9	0.16	3.80	2.16	12	1.14	929.80	930.00	929.94	930.17	934.58	935.00	CB14-MH8
5	2	15.000	0.11	0.11	0.53	0.06	0.06	5.0	5.0	5.9	0.34	4.01	2.10	12	1.27	928.11	928.30	928.40	928.54	933.45	933.20	CB19-MH10
6	3	11.000	0.07	0.07	0.66	0.05	0.05	5.0	5.0	5.9	0.27	3.87	2.52	12	1.18	928.84	928.97	929.02	929.18	934.58	934.02	CB15-MH8
7	2	7.000	0.18	0.18	0.53	0.10	0.10	5.0	5.0	5.9	0.56	4.46	3.29	12	1.57	928.20	928.31	928.44	928.62	933.45	933.32	CB18-MH10
8	1	7.000	0.10	0.10	0.65	0.07	0.07	5.0	5.0	5.9	0.38	4.46	2.95	12	1.57	928.26	928.37	928.46	928.63	933.46	933.36	CB17-MH9
9	1	17.000	0.08	0.08	0.37	0.03	0.03	5.0	5.0	5.9	0.17	3.76	2.20	12	1.12	928.44	928.63	928.59	928.80	933.46	933.61	CB16-MH9

Project File: Sta.50+70.stm | Number of lines: 9 | Run Date: 3/15/2024

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

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Proposal No. 608163 - 128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-9	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-10	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	MH-8	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
4	CB-14	0.16	0.00	0.15	0.01	Comb	2.0	2.00	0.00	2.00	2.00	0.018	4.00	0.020	0.020	0.013	0.06	3.02	0.19	1.22	2.0	Off
5	CB-19	0.34	0.09	0.44	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.00	2.73	0.17	2.73	2.0	Off
6	CB-15	0.27	0.00	0.27	0.00	Comb	2.0	2.00	0.00	2.00	2.00	0.018	4.00	0.048	0.048	0.013	0.10	2.12	0.17	0.13	2.0	Off
7	CB-18	0.56	0.02	0.58	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.04	3.30	0.20	3.30	2.0	Off
8	CB-17	0.38	0.00	0.29	0.09	Comb	2.0	2.00	0.00	2.00	2.00	0.013	4.00	0.020	0.020	0.013	0.09	4.44	0.22	2.63	2.0	5
9	CB-16	0.17	0.00	0.15	0.02	Comb	2.0	2.00	0.00	2.00	2.00	0.013	4.00	0.020	0.020	0.013	0.07	3.31	0.20	1.49	2.0	7

Project File: Sta.50+70.stm | Number of lines: 9 | Run Date: 3/15/2024

NOTES: Inlet N-Values = 0.016; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

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Proposal No. 608163 - 128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	27.000	0.00	0.60	0.00	0.00	0.32	0.0	6.2	6.7	2.17	4.49	4.92	12	1.59	924.00	924.43	924.49	925.06	925.00	933.46	MH9-OUTLET
2	1	11.000	0.00	0.29	0.00	0.00	0.15	0.0	5.1	7.2	1.10	4.16	3.88	12	1.36	927.85	928.00	928.20	928.44	933.46	933.45	MH10-MH9
3	1	203.000	0.00	0.13	0.00	0.00	0.07	0.0	5.1	7.2	0.53	4.22	3.16	12	1.40	925.85	928.70	926.09	929.00	933.46	934.58	MH8-MH9
4	3	18.000	0.06	0.06	0.46	0.03	0.03	5.0	5.0	7.2	0.20	3.80	2.29	12	1.14	929.80	930.00	929.95	930.18	934.58	935.00	CB14-MH8
5	2	15.000	0.11	0.11	0.53	0.06	0.06	5.0	5.0	7.2	0.42	4.01	2.17	12	1.27	928.11	928.30	928.44	928.57	933.45	933.20	CB19-MH10
6	3	11.000	0.07	0.07	0.66	0.05	0.05	5.0	5.0	7.2	0.33	3.87	2.67	12	1.18	928.84	928.97	929.04	929.21	934.58	934.02	CB15-MH8
7	2	7.000	0.18	0.18	0.53	0.10	0.10	5.0	5.0	7.2	0.69	4.46	3.49	12	1.57	928.20	928.31	928.47	928.66	933.45	933.32	CB18-MH10
8	1	7.000	0.10	0.10	0.65	0.07	0.07	5.0	5.0	7.2	0.47	4.46	3.12	12	1.57	928.26	928.37	928.48	928.65	933.46	933.36	CB17-MH9
9	1	17.000	0.08	0.08	0.37	0.03	0.03	5.0	5.0	7.2	0.21	3.76	2.33	12	1.12	928.44	928.63	928.60	928.82	933.46	933.61	CB16-MH9

Project File: Sta.50+70.stm | Number of lines: 9 | Run Date: 4/8/2024

NOTES:Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

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Proposal No. 608163 - 128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-9	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-10	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	MH-8	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
4	CB-14	0.20	0.00	0.17	0.02	Comb	2.0	2.00	0.00	2.00	2.00	0.018	4.00	0.020	0.020	0.013	0.07	3.25	0.20	1.48	2.0	Off
5	CB-19	0.42	0.13	0.55	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.03	3.17	0.20	3.17	2.0	Off
6	CB-15	0.33	0.00	0.33	0.00	Comb	2.0	2.00	0.00	2.00	2.00	0.018	4.00	0.048	0.048	0.013	0.11	2.28	0.19	0.43	2.0	Off
7	CB-18	0.69	0.03	0.72	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.07	3.79	0.23	3.79	2.0	Off
8	CB-17	0.47	0.00	0.34	0.13	Comb	2.0	2.00	0.00	2.00	2.00	0.013	4.00	0.020	0.020	0.013	0.10	4.78	0.23	2.95	2.0	5
9	CB-16	0.21	0.00	0.18	0.03	Comb	2.0	2.00	0.00	2.00	2.00	0.013	4.00	0.020	0.020	0.013	0.07	3.56	0.20	1.76	2.0	7

Project File: Sta.50+70.stm | Number of lines: 9 | Run Date: 4/8/2024

NOTES: Inlet N-Values = 0.016; Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

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Proposal No. 608163 - 128112

Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	MH9-OUTLET	User																		0.00
2	MH10-MH9	User																		0.00
3	MH8-MH9	User																		0.00
4	CB14-MH8	User																		5.00
5	CB19-MH10	User																		5.00
6	CB15-MH8	User																		5.00
7	CB18-MH10	User																		5.00
8	CB17-MH9	User																		5.00
9	CB16-MH9	User																		5.00

Project File: Sta.50+70.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 9 | Date: 3/15/2024

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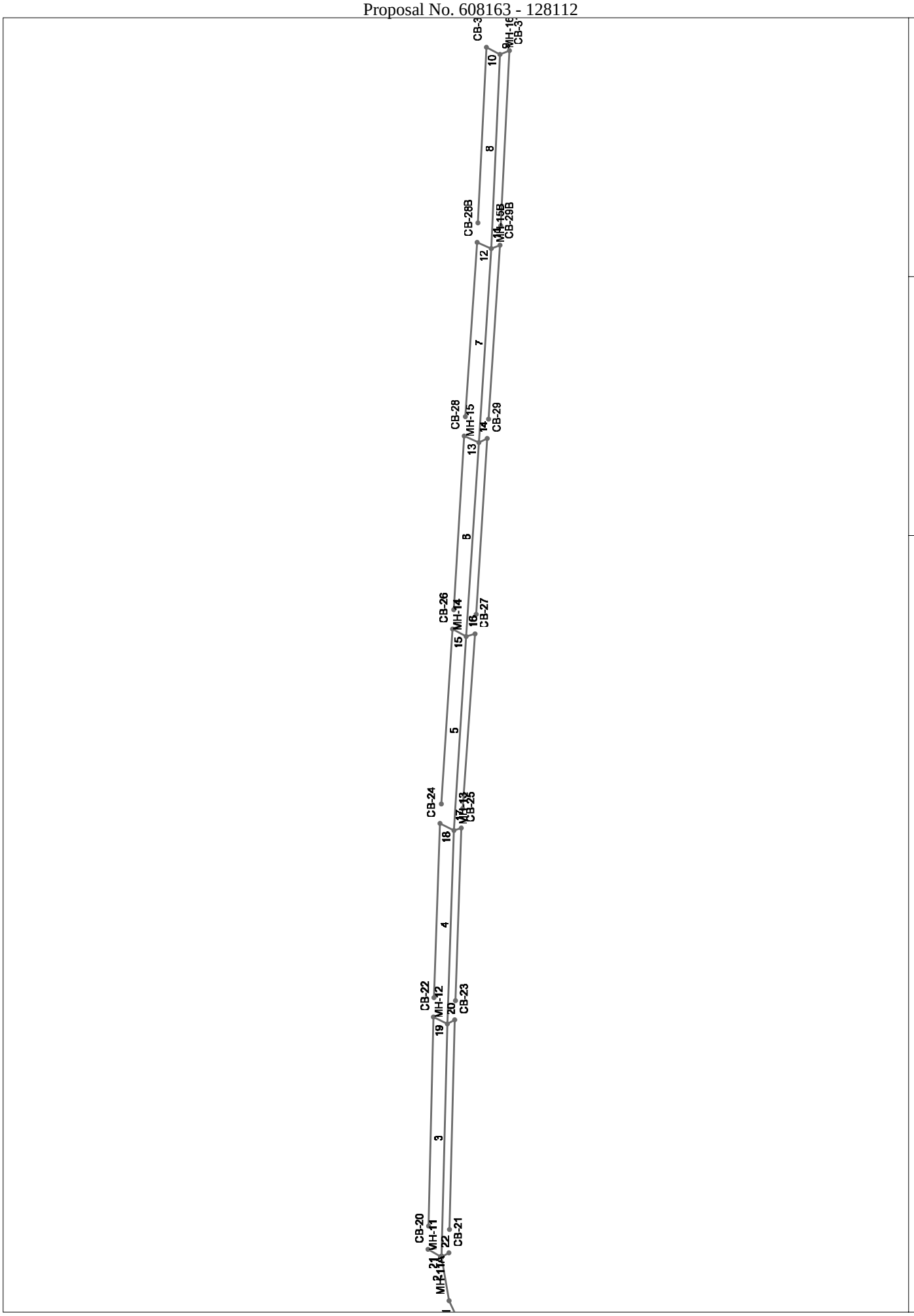
Proposal No. 608163 - 128112

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Sta.51+24.stm

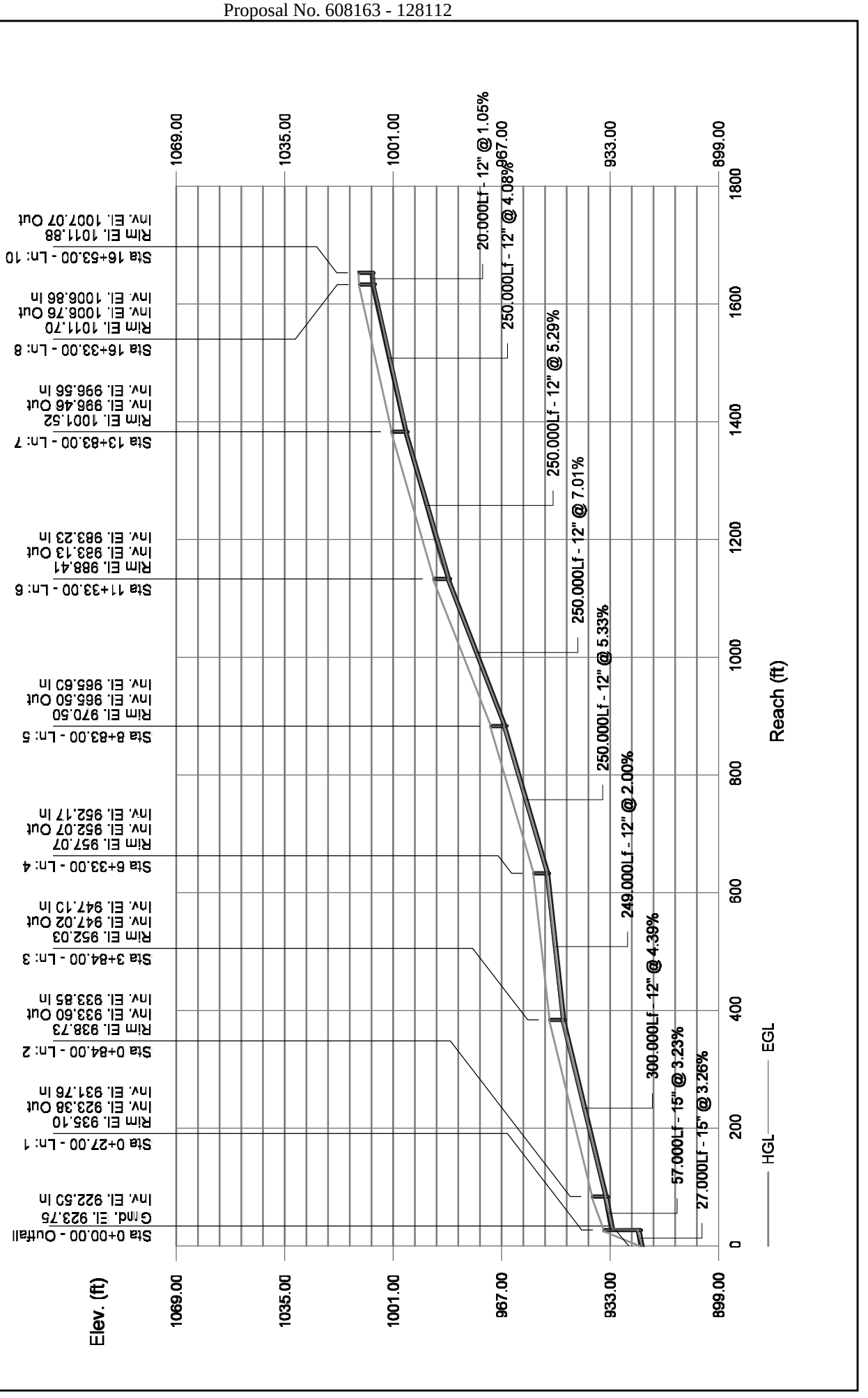
Number of lines: 22

Date: 3/15/2024

Storm Sewers v2023.00

Storm Sewer Profile

Proj. file: Sta.51+24.stm



Storm Sewers

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-11A	Manhole	935.10	Cir	4.00	4.00	15	Cir	923.38	15	Cir	931.76
2	MH-11	Manhole	938.73	Rect	4.00	4.00	15	Cir	933.60	12	Cir	933.85
										12	Cir	933.64
										12	Cir	934.36
3	MH-12	Manhole	952.03	Cir	4.00	4.00	12	Cir	947.02	12	Cir	947.10
										12	Cir	947.21
										12	Cir	947.12
4	MH-13	Manhole	957.07	Cir	4.00	4.00	12	Cir	952.07	12	Cir	952.17
										12	Cir	952.17
										12	Cir	952.17
5	MH-14	Manhole	970.50	Cir	4.00	4.00	12	Cir	965.50	12	Cir	965.60
										12	Cir	965.75
										12	Cir	965.82
6	MH-15	Manhole	988.41	Cir	4.00	4.00	12	Cir	983.13	12	Cir	983.23
										12	Cir	983.34
										12	Cir	983.45
7	MH-15B	Manhole	1001.52	Cir	4.00	4.00	12	Cir	996.46	12	Cir	996.56
										12	Cir	996.67
										12	Cir	996.56
8	MH-16	Manhole	1011.70	Cir	4.00	4.00	12	Cir	1006.76	12	Cir	1007.06
										12	Cir	1006.86
9	CB-31	Combination	1011.79	Cir	4.00	2.00	12	Cir	1007.19			
10	CB-30	Combination	1011.88	Cir	4.00	4.00	12	Cir	1007.07			
11	CB-29B	Combination	1001.78	Cir	4.00	4.00	12	Cir	996.78			
12	CB-28B	Combination	1001.70	Cir	4.00	4.00	12	Cir	996.76			
13	CB-28	Combination	988.60	Cir	4.00	4.00	12	Cir	983.54			
14	CB-29	Combination	988.57	Cir	4.00	4.00	12	Cir	983.57			
15	CB-26	Combination	970.98	Cir	4.00	4.00	12	Cir	965.95			
16	CB-27	Combination	970.94	Cir	4.00	4.00	12	Cir	965.94			

Project File: Sta.51+24.stm | Number of Structures: 22 | Run Date: 3/15/2024

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Proposal No. 608163 - 128112

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
17	CB-25	Combination	957.22	Cir	4.00	4.00	12	Cir	952.27			
18	CB-24	Combination	957.26	Cir	4.00	4.00	12	Cir	952.37			
19	CB-22	Combination	952.45	Cir	4.00	4.00	12	Cir	947.41			
20	CB-23	Combination	951.93	Cir	4.00	4.00	12	Cir	947.23			
21	CB-20	Combination	938.84	Cir	4.00	4.00	12	Cir	933.84			
22	CB-21	Combination	939.47	Cir	4.00	4.00	12	Cir	934.47			

Project File: Sta.51+24.stm | Number of Structures: 22 | Run Date: 3/15/2024

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Proposal No. 608163 - 128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	27.000	0.00	2.38	0.00	0.00	1.35	0.0	16.4	3.6	4.91	11.66	7.15	15	3.26	922.50	923.38	923.07	924.28	923.75	935.10	MH11A-OUTLET
2	1	57.000	0.00	2.38	0.00	0.00	1.35	0.0	16.3	3.7	4.94	11.60	7.14	15	3.23	931.76	933.60	932.33	934.50	935.10	938.73	MH11-MH11A
3	2	300.000	0.00	2.03	0.00	0.00	1.13	0.0	15.6	3.7	4.23	7.46	6.84	12	4.39	933.85	947.02	934.50	947.89	938.73	952.03	MH12-MH11
4	3	249.000	0.00	1.82	0.00	0.00	0.96	0.0	14.8	3.8	3.70	5.03	5.48	12	2.00	947.10	952.07	947.89	952.89	952.03	957.07	MH13-MH12
5	4	250.000	0.00	1.63	0.00	0.00	0.81	0.0	14.0	3.9	3.21	8.22	5.14	12	5.33	952.17	965.50	952.89	966.27	957.07	970.50	MH14-MH13
6	5	250.000	0.00	1.44	0.00	0.00	0.66	0.0	13.1	4.1	2.68	9.43	4.69	12	7.01	965.60	983.13	966.27	983.83	970.50	988.41	MH15-MH14
7	6	250.000	0.00	1.08	0.00	0.00	0.46	0.0	12.1	4.2	1.96	8.19	4.00	12	5.29	983.23	996.46	983.83	997.06	988.41	1001.52	MH15B-MH15
8	7	250.000	0.00	0.43	0.00	0.00	0.21	0.0	5.1	5.9	1.23	7.19	3.29	12	4.08	996.56	1006.76	997.06	1007.23	1001.52	1011.70	MH16-MH15B
9	8	13.000	0.32	0.32	0.39	0.12	0.12	5.0	5.0	5.9	0.74	3.56	3.25	12	1.00	1007.06	1007.19	1007.37	1007.55	1011.70	1011.79	CB31-MH16
10	8	20.000	0.11	0.11	0.78	0.09	0.09	5.0	5.0	5.9	0.51	3.65	2.27	12	1.05	1006.86	1007.07	1007.23	1007.37	1011.70	1011.88	CB30-MH16
11	7	12.000	0.54	0.54	0.31	0.17	0.17	12.0	12.0	4.2	0.71	3.41	2.71	12	0.92	996.67	996.78	997.06	997.13	1001.52	1001.78	CB29B-MH15B
12	7	20.000	0.11	0.11	0.78	0.09	0.09	5.0	5.0	5.9	0.51	3.56	1.96	12	1.00	996.56	996.76	997.06	997.06	1001.52	1001.70	CB28B-MH15B
13	6	21.000	0.13	0.13	0.71	0.09	0.09	5.0	5.0	5.9	0.55	3.48	2.05	12	0.95	983.34	983.54	983.83	983.85	988.41	988.60	CB28-MH15
14	6	12.000	0.23	0.23	0.44	0.10	0.10	5.0	5.0	5.9	0.60	3.56	2.46	12	1.00	983.45	983.57	983.83	983.89	988.41	988.57	CB29-MH15
15	5	20.000	0.10	0.10	0.79	0.08	0.08	5.0	5.0	5.9	0.47	3.56	1.85	12	1.00	965.75	965.95	966.27	966.23	970.50	970.98	CB26-MH14
16	5	12.000	0.09	0.09	0.84	0.08	0.08	5.0	5.0	5.9	0.45	3.56	1.92	12	1.00	965.82	965.94	966.27	966.22	970.50	970.94	CB27-MH14
17	4	10.000	0.09	0.09	0.82	0.07	0.07	5.0	5.0	5.9	0.44	3.56	1.62	12	1.00	952.17	952.27	952.89	952.54	957.07	957.22	CB25-MH13
18	4	20.000	0.10	0.10	0.76	0.08	0.08	5.0	5.0	5.9	0.45	3.56	1.64	12	1.00	952.17	952.37	952.89	952.65	957.07	957.26	CB24-MH13
19	3	20.000	0.06	0.06	0.72	0.04	0.04	5.0	5.0	5.9	0.26	3.56	1.31	12	1.00	947.21	947.41	947.89	947.62	952.03	952.45	CB22-MH12
20	3	11.000	0.15	0.15	0.82	0.12	0.12	5.0	5.0	5.9	0.73	3.56	2.01	12	1.00	947.12	947.23	947.89	947.59	952.03	951.93	CB23-MH12
21	2	20.000	0.21	0.21	0.71	0.15	0.15	5.0	5.0	5.9	0.88	3.56	2.15	12	1.00	933.64	933.84	934.50	934.23	938.73	938.84	CB20-MH11
22	2	11.000	0.14	0.14	0.50	0.07	0.07	5.0	5.0	5.9	0.41	3.56	2.75	12	1.00	934.36	934.47	934.59	934.74	938.73	939.47	CB21-MH11

Project File: Sta.51+24.stm | Number of lines: 22 | Run Date: 3/15/2024

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

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Proposal No. 608163 - 128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-11A	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-11	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	1
3	MH-12	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
4	MH-13	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
5	MH-14	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
6	MH-15	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
7	MH-15B	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
8	MH-16	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
9	CB-31	0.74	0.00	0.53	0.21	Comb	2.0	2.00	0.00	2.00	2.00	0.041	4.00	0.020	0.020	0.013	0.09	4.57	0.22	2.86	2.0	11
10	CB-30	0.51	0.00	0.39	0.11	Comb	2.0	2.00	0.00	2.00	2.00	0.041	4.00	0.020	0.020	0.013	0.08	3.97	0.21	2.28	2.0	12
11	CB-29B	0.71	0.21	0.63	0.29	Comb	2.0	2.00	0.00	2.00	2.00	0.041	4.00	0.020	0.020	0.013	0.10	4.97	0.23	3.24	2.0	14
12	CB-28B	0.51	0.11	0.46	0.16	Comb	2.0	2.00	0.00	2.00	2.00	0.041	4.00	0.020	0.020	0.013	0.09	4.29	0.22	2.59	2.0	13
13	CB-28	0.55	0.16	0.53	0.18	Comb	2.0	2.00	0.00	2.00	2.00	0.066	4.00	0.020	0.020	0.013	0.08	4.12	0.22	2.45	2.0	15
14	CB-29	0.60	0.29	0.64	0.26	Comb	2.0	2.00	0.00	2.00	2.00	0.066	4.00	0.020	0.020	0.013	0.09	4.49	0.22	2.82	2.0	16
15	CB-26	0.47	0.18	0.50	0.15	Comb	2.0	2.00	0.00	2.00	2.00	0.071	4.00	0.020	0.020	0.013	0.08	3.92	0.21	2.25	2.0	18
16	CB-27	0.45	0.26	0.53	0.17	Comb	2.0	2.00	0.00	2.00	2.00	0.071	4.00	0.020	0.020	0.013	0.08	4.05	0.21	2.38	2.0	17
17	CB-25	0.44	0.17	0.45	0.16	Comb	2.0	2.00	0.00	2.00	2.00	0.038	4.00	0.020	0.020	0.013	0.09	4.31	0.22	2.61	2.0	20
18	CB-24	0.45	0.15	0.44	0.15	Comb	2.0	2.00	0.00	2.00	2.00	0.038	4.00	0.020	0.020	0.013	0.09	4.28	0.22	2.58	2.0	19
19	CB-22	0.26	0.15	0.31	0.10	Comb	2.0	2.00	0.00	2.00	2.00	0.014	4.00	0.020	0.020	0.013	0.09	4.49	0.22	2.68	2.0	21
20	CB-23	0.73	0.16	0.60	0.28	Comb	2.0	2.00	0.00	2.00	2.00	0.014	4.00	0.024	0.024	0.013	0.13	5.34	0.25	3.49	2.0	22
21	CB-20	0.88	0.10	0.78	0.21	Comb	2.0	2.00	0.00	2.00	2.00	0.066	4.00	0.028	0.028	0.013	0.11	3.77	0.23	2.10	2.0	Off
22	CB-21	0.41	0.28	0.52	0.17	Comb	2.0	2.00	0.00	2.00	2.00	0.066	4.00	0.020	0.020	0.013	0.08	4.09	0.22	2.43	2.0	Off

Project File: Sta.51+24.stm | Number of lines: 22 | Run Date: 3/15/2024

NOTES: Inlet N-Values = 0.016; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

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Proposal No. 608163 - 128112

Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	MH11A-OUTLET	User																		0.00
2	MH11-MH11A	User																		0.00
3	MH12-MH11	User																		0.00
4	MH13-MH12	User																		0.00
5	MH14-MH13	User																		0.00
6	MH15-MH14	User																		0.00
7	MH15B-MH15	User																		0.00
8	MH16-MH15B	User																		0.00
9	CB31-MH16	User																		5.00
10	CB30-MH16	User																		5.00
11	CB29B-MH15B	TR55	0.800	30.00	3.10	4.00	10.99	170.00 100.00	13.00 4.00	UnPaved UnPaved	5.82 3.23	0.49 0.52								12.00
12	CB28B-MH15B	User																		5.00
13	CB28-MH15	User																		5.00
14	CB29-MH15	User																		5.00
15	CB26-MH14	User																		5.00
16	CB27-MH14	User																		5.00
17	CB25-MH13	User																		5.00
18	CB24-MH13	User																		5.00
19	CB22-MH12	User																		5.00
20	CB23-MH12	User																		5.00
21	CB20-MH11	User																		5.00
22	CB21-MH11	User																		5.00

Project File: Sta.51+24.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 22 | Date: 3/15/2024

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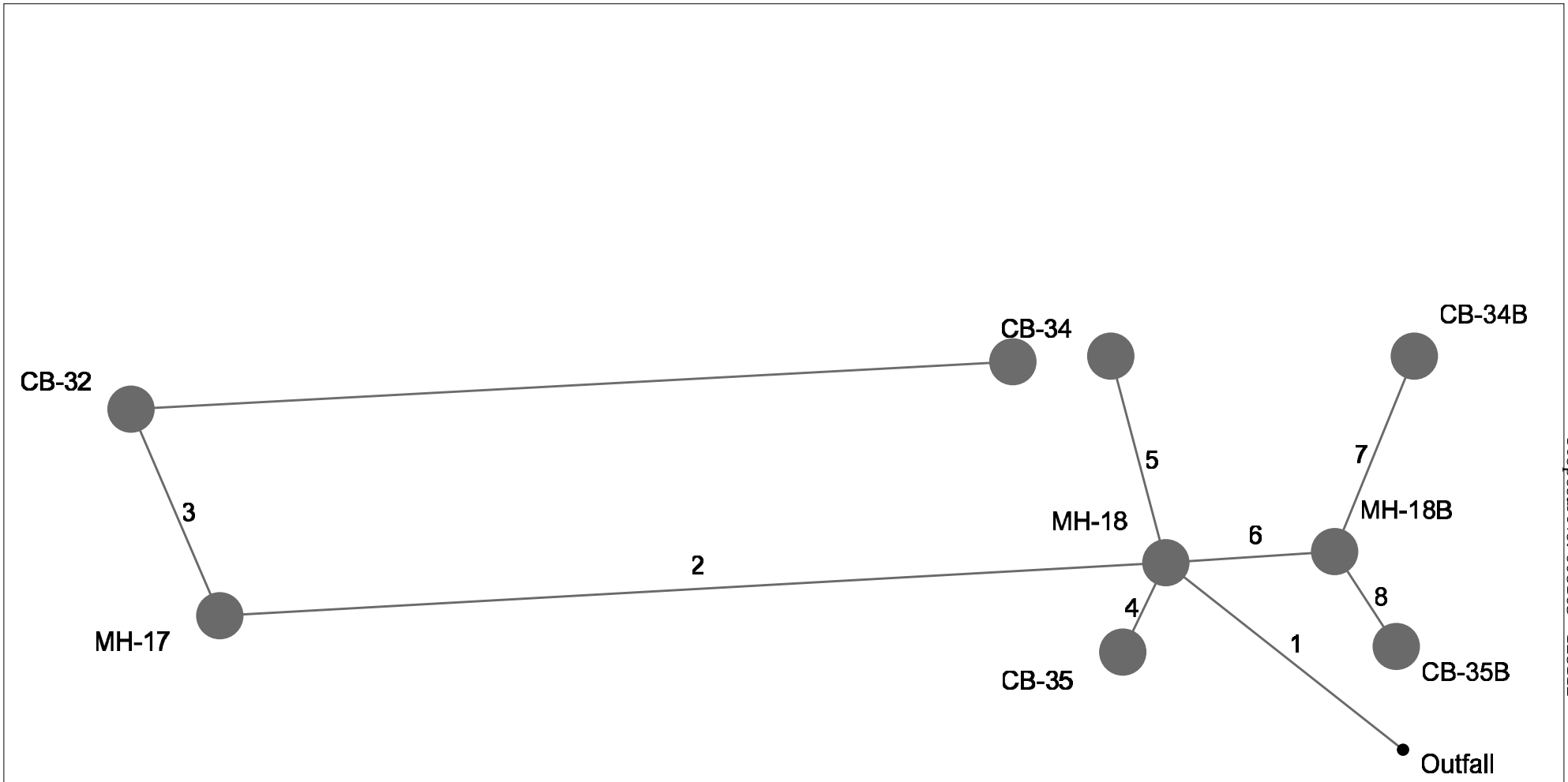
Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Sta.73+25.stm	Number of lines: 8	Date: 3/15/2024

Storm Sewers v2023.00

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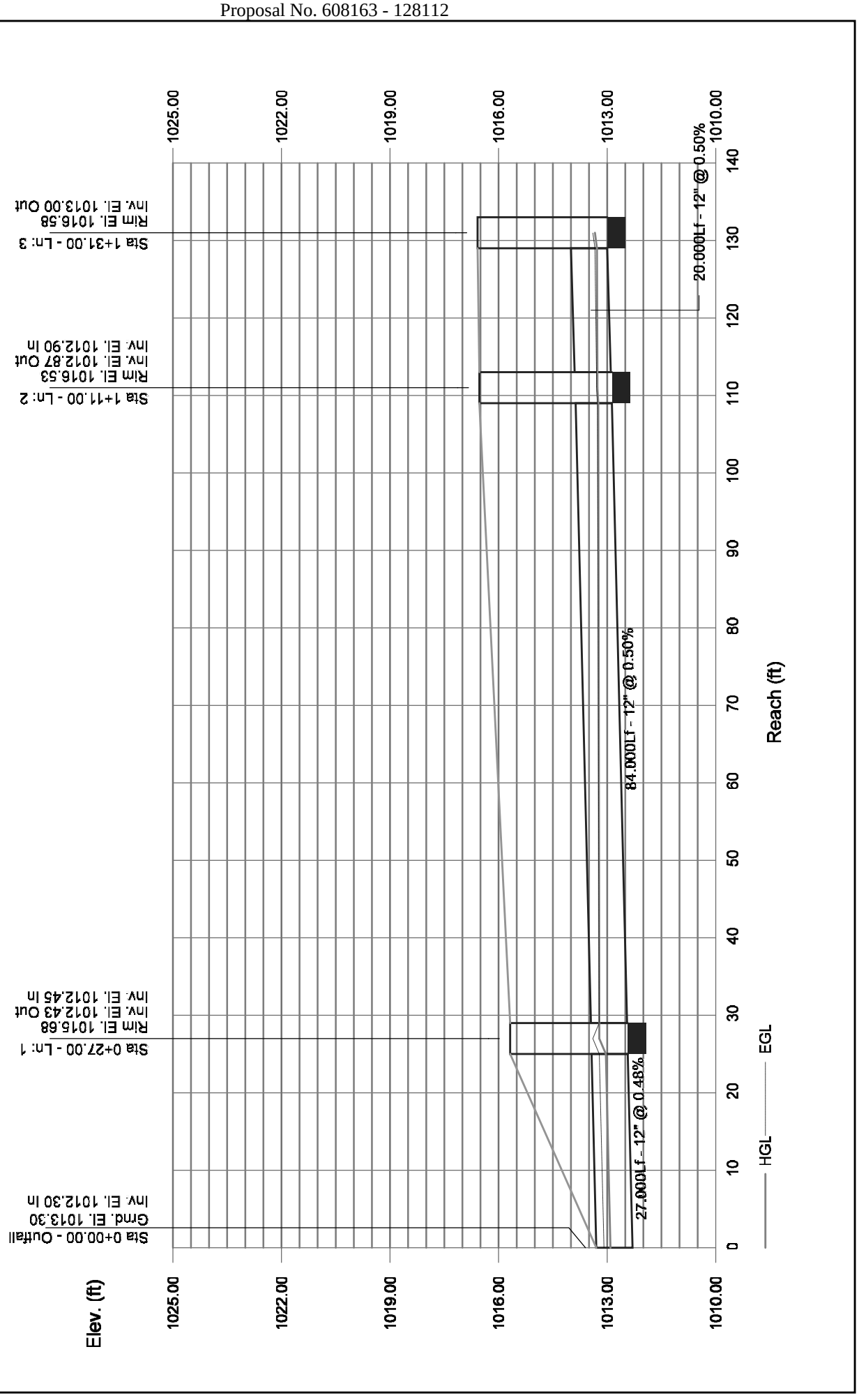
Storm Sewer Profile

Proj. file: Sta.73+25.stm



Storm Sewers

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-18	Manhole	1015.68	Cir	4.00	4.00	12	Cir	1012.43	12 12 12 12	Cir Cir Cir Cir	1012.45 1012.45 1012.44 1012.45
2	MH-17	Manhole	1016.53	Cir	4.00	4.00	12	Cir	1012.87	12	Cir	1012.90
3	CB-32	Combination	1016.58	Cir	4.00	2.00	12	Cir	1013.00			
4	CB-35	Combination	1015.93	Cir	4.00	4.00	12	Cir	1012.49			
5	CB-34	Combination	1015.52	Cir	4.00	2.00	12	Cir	1012.53			
6	MH-18B	Manhole	1015.73	Cir	4.00	4.00	12	Cir	1012.52	12 12	Cir Cir	1012.53 1012.55
7	CB-34B	Combination	1015.61	Cir	4.00	4.00	12	Cir	1012.63			
8	CB-35B	Combination	1016.00	Cir	4.00	4.00	12	Cir	1012.60			

Project File: Sta.73+25.stm | Number of Structures: 8 | Run Date: 3/15/2024

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Proposal No. 608163 - 128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	27.000	0.00	0.49	0.00	0.00	0.32	0.0	6.7	5.4	1.69	2.47	3.39	12	0.48	1012.30	1012.43	1012.91	1013.04	1013.30	1015.68	MH18-OUTLET
2	1	84.000	0.00	0.07	0.00	0.00	0.06	0.0	5.2	5.8	0.34	2.52	0.90	12	0.50	1012.45	1012.87	1013.22	1013.25	1015.68	1016.53	MH17-MH18
3	2	20.000	0.07	0.07	0.84	0.06	0.06	5.0	5.0	5.9	0.35	2.52	1.61	12	0.50	1012.90	1013.00	1013.27	1013.28	1016.53	1016.58	CB32-MH17
4	1	9.000	0.02	0.02	0.70	0.01	0.01	5.0	5.0	5.9	0.07	2.37	0.11	12	0.44	1012.45	1012.49	1013.22	1013.22	1015.68	1015.93	CB35-MH18
5	1	19.000	0.04	0.04	0.84	0.03	0.03	5.0	5.0	5.9	0.20	2.45	0.32	12	0.47	1012.44	1012.53	1013.22	1013.22	1015.68	1015.52	CB34-MH18
6	1	15.000	0.00	0.36	0.00	0.00	0.21	0.0	5.2	5.8	1.24	2.43	2.00	12	0.47	1012.45	1012.52	1013.22	1013.23	1015.68	1015.73	MH18B-MH18
7	6	19.000	0.26	0.26	0.54	0.14	0.14	5.0	5.0	5.9	0.83	2.58	1.39	12	0.53	1012.53	1012.63	1013.29	1013.30	1015.73	1015.61	CB34B-MH18B
8	6	10.000	0.10	0.10	0.72	0.07	0.07	5.0	5.0	5.9	0.43	2.52	0.71	12	0.50	1012.55	1012.60	1013.29	1013.29	1015.73	1016.00	CB35B-MH18B

Project File: Sta.73+25.stm | Number of lines: 8 | Run Date: 3/15/2024

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

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Proposal No. 608163 - 128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-18	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-17	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	CB-32	0.35	0.00	0.28	0.07	Comb	2.0	2.00	0.00	2.00	2.00	0.024	4.00	0.020	0.020	0.013	0.08	3.81	0.21	2.07	2.0	5
4	CB-35	0.07	0.00	0.07	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.09	1.18	0.07	1.18	2.0	Off
5	CB-34	0.20	0.07	0.27	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.04	2.00	0.12	2.00	2.0	Off
6	MH-18B	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	4.00	0.020	0.020	0.013	0.00	0.00	0.00	0.00	0.0	1
7	CB-34B	0.83	0.00	0.83	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.09	4.26	0.25	4.26	2.0	Off
8	CB-35B	0.43	0.00	0.43	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.00	2.67	0.16	2.67	2.0	Off

Project File: Sta.73+25.stm | Number of lines: 8 | Run Date: 3/15/2024

NOTES: Inlet N-Values = 0.016; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

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Proposal No. 608163 - 128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	27.000	0.00	0.49	0.00	0.00	0.32	0.0	6.9	6.5	2.06	2.47	3.76	12	0.48	1012.30	1012.43	1012.91	1013.14	1013.30	1015.68	MH18-OUTLET
2	1	84.000	0.00	0.07	0.00	0.00	0.06	0.0	5.2	7.1	0.42	2.52	0.85	12	0.50	1012.45	1012.87	1013.33	1013.35	1015.68	1016.53	MH17-MH18
3	2	20.000	0.07	0.07	0.84	0.06	0.06	5.0	5.0	7.2	0.42	2.52	1.40	12	0.50	1012.90	1013.00	1013.36	1013.37	1016.53	1016.58	CB32-MH17
4	1	9.000	0.02	0.02	0.70	0.01	0.01	5.0	5.0	7.2	0.08	2.37	0.11	12	0.44	1012.45	1012.49	1013.33	1013.33	1015.68	1015.93	CB35-MH18
5	1	19.000	0.04	0.04	0.84	0.03	0.03	5.0	5.0	7.2	0.24	2.45	0.34	12	0.47	1012.44	1012.53	1013.33	1013.33	1015.68	1015.52	CB34-MH18
6	1	15.000	0.00	0.36	0.00	0.00	0.21	0.0	5.2	7.1	1.51	2.43	2.13	12	0.47	1012.45	1012.52	1013.33	1013.35	1015.68	1015.73	MH18B-MH18
7	6	19.000	0.26	0.26	0.54	0.14	0.14	5.0	5.0	7.2	1.01	2.58	1.45	12	0.53	1012.53	1012.63	1013.41	1013.42	1015.73	1015.61	CB34B-MH18B
8	6	10.000	0.10	0.10	0.72	0.07	0.07	5.0	5.0	7.2	0.52	2.52	0.74	12	0.50	1012.55	1012.60	1013.41	1013.42	1015.73	1016.00	CB35B-MH18B

Project File: Sta.73+25.stm | Number of lines: 8 | Run Date: 3/15/2024

NOTES:Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

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Proposal No. 608163 - 128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-18	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-17	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	CB-32	0.42	0.00	0.33	0.10	Comb	2.0	2.00	0.00	2.00	2.00	0.024	4.00	0.020	0.020	0.013	0.08	4.11	0.21	2.38	2.0	5
4	CB-35	0.08	0.00	0.08	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.09	1.31	0.08	1.31	2.0	Off
5	CB-34	0.24	0.10	0.34	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.02	2.30	0.14	2.30	2.0	Off
6	MH-18B	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	4.00	0.020	0.020	0.013	0.00	0.00	0.00	0.00	0.0	1
7	CB-34B	1.01	0.00	1.01	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.10	5.17	0.27	5.17	2.0	Off
8	CB-35B	0.52	0.00	0.52	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.02	3.05	0.19	3.05	2.0	Off

Project File: Sta.73+25.stm | Number of lines: 8 | Run Date: 3/15/2024

NOTES: Inlet N-Values = 0.016; Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

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Proposal No. 608163 - 128112

Storm Sewer Inlet Time Tabulation

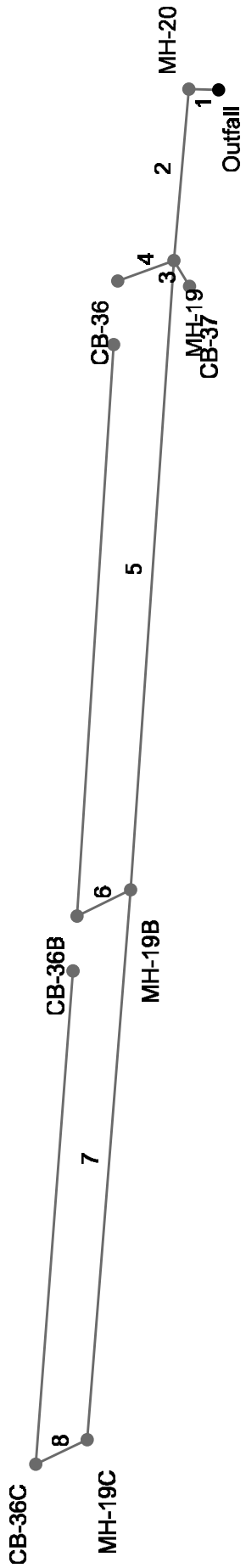
Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	MH18-OUTLET	User																		0.00
2	MH17-MH18	User																		0.00
3	CB32-MH17	User																		5.00
4	CB35-MH18	User																		5.00
5	CB34-MH18	User																		5.00
6	MH18B-MH18	User																		0.00
7	CB34B-MH18B	User																		5.00
8	CB35B-MH18B	User																		5.00

Project File: Sta.73+25.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 8 | Date: 3/15/2024

A00830 - 338

Proposal No. 608163 - 128112

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan

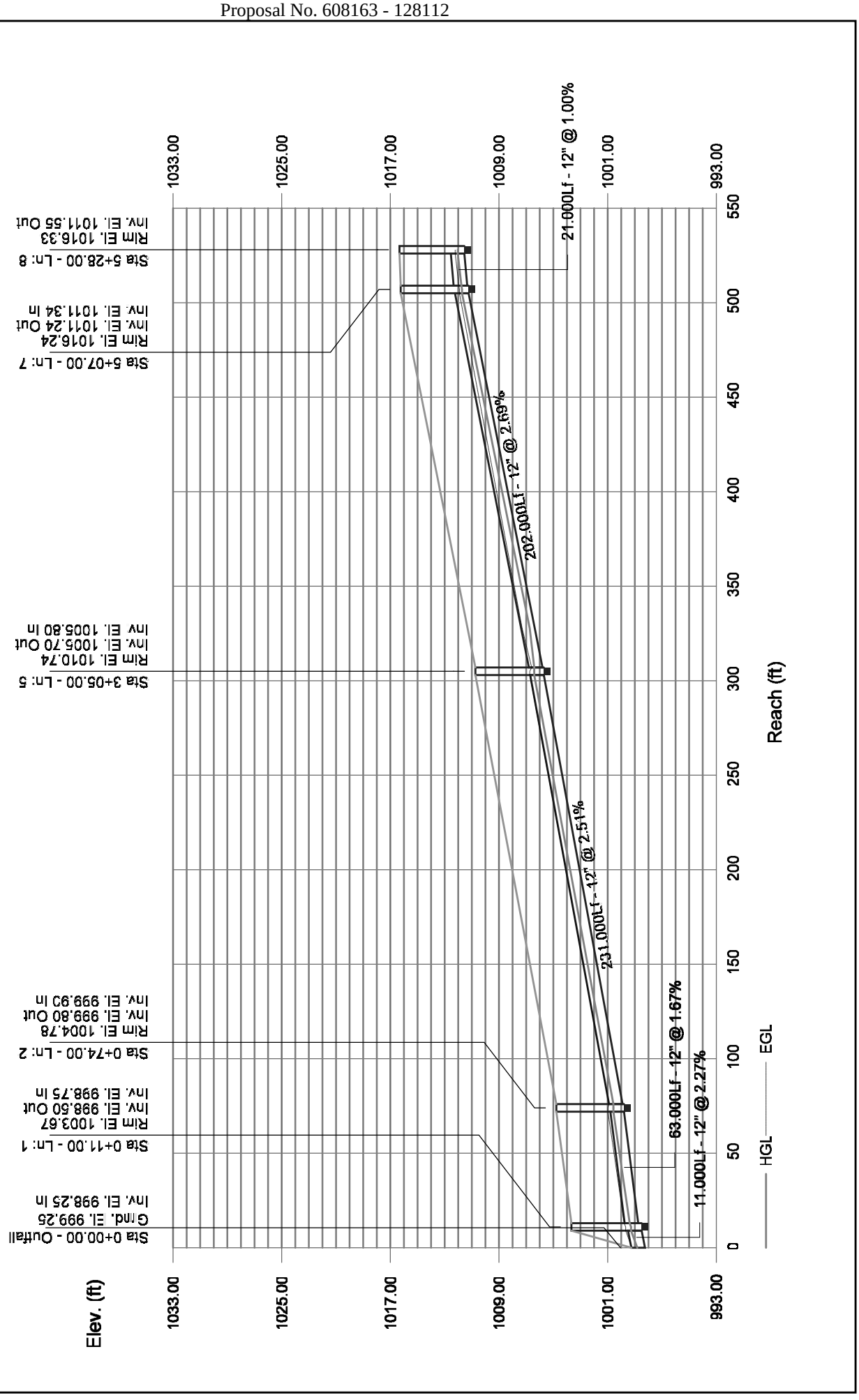


Project File: Sta.81+97.stm | Number of lines: 8 | Date: 3/15/2024

Storm Sewers v2023.00

Proj. file: Sta.81+97.stm

Storm Sewer Profile



Storm Sewers

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-20	Manhole	1003.67	Cir	4.00	4.00	12	Cir	998.50	12	Cir	998.75
2	MH-19	Manhole	1004.78	Cir	4.00	4.00	12	Cir	999.80	12 12 12	Cir Cir Cir	999.90 1000.00 999.90
3	CB-37	Combination	1004.87	Cir	4.00	2.00	12	Cir	1000.01			
4	CB-36	Combination	1005.13	Cir	4.00	2.00	12	Cir	1000.22			
5	MH-19B	Manhole	1010.74	Cir	4.00	4.00	12	Cir	1005.70	12 12	Cir Cir	1006.45 1005.80
6	CB-36B	Combination	1011.71	Cir	4.00	4.00	12	Cir	1006.67			
7	MH-19C	Manhole	1016.24	Cir	4.00	4.00	12	Cir	1011.24	12	Cir	1011.34
8	CB-36C	Combination	1016.33	Cir	4.00	2.00	12	Cir	1011.55			

Project File: Sta.81+97.stm | Number of Structures: 8 | Run Date: 3/15/2024

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Proposal No. 608163 - 128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	11.000	0.00	1.83	0.00	0.00	0.78	0.0	12.2	4.2	3.31	5.37	6.12	12	2.27	998.25	998.50	998.82	999.28	999.25	1003.67	MH20-OUTLET
2	1	63.000	0.00	1.83	0.00	0.00	0.78	0.0	12.0	4.2	3.33	4.60	5.72	12	1.67	998.75	999.80	999.38	1000.58	1003.67	1004.78	MH19-MH20
3	2	11.000	0.12	0.12	0.85	0.10	0.10	5.0	5.0	5.9	0.60	3.56	1.90	12	1.00	999.90	1000.01	1000.58	1000.33	1004.78	1004.87	CB37-MH19
4	2	22.000	0.16	0.16	0.39	0.06	0.06	5.0	5.0	5.9	0.37	3.56	1.59	12	1.00	1000.00	1000.22	1000.58	1000.47	1004.78	1005.13	CB36-MH19
5	2	231.000	0.00	1.55	0.00	0.00	0.62	0.0	11.2	4.4	2.72	5.64	4.68	12	2.51	999.90	1005.70	1000.58	1006.41	1004.78	1010.74	MH19B-MH19
6	5	22.000	0.83	0.83	0.40	0.33	0.33	10.0	10.0	4.6	1.53	3.56	4.01	12	1.00	1006.45	1006.67	1006.91	1007.19	1010.74	1011.71	CB36B-MH19B
7	5	202.000	0.00	0.72	0.00	0.00	0.29	0.0	10.1	4.6	1.32	5.84	3.07	12	2.69	1005.80	1011.24	1006.41	1011.73	1010.74	1016.24	MH19C-MH19B
8	7	21.000	0.72	0.72	0.40	0.29	0.29	10.0	10.0	4.6	1.33	3.56	3.85	12	1.00	1011.34	1011.55	1011.76	1012.04	1016.24	1016.33	CB36C-MH19C

Project File: Sta.81+97.stm | Number of lines: 8 | Run Date: 3/15/2024

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

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Proposal No. 608163 - 128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-20	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-19	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	CB-37	0.60	0.00	0.55	0.06	Comb	2.0	2.00	0.00	2.00	2.00	0.025	4.00	0.042	0.020	0.013	0.12	2.92	0.22	1.20	2.0	Off
4	CB-36	0.37	0.92	0.90	0.39	Comb	2.0	2.00	0.00	2.00	2.00	0.025	4.00	0.031	0.020	0.013	0.15	5.07	0.26	3.00	2.0	Off
5	MH-19B	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	4.00	0.020	0.020	0.013	0.00	0.00	0.00	0.00	0.0	2
6	CB-36B	1.53	0.52	1.13	0.92	Comb	2.0	2.00	0.00	2.00	2.00	0.027	4.00	0.020	0.020	0.013	0.15	7.27	0.27	5.39	2.0	4
7	MH-19C	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	4.00	0.020	0.020	0.013	0.00	0.00	0.00	0.00	0.0	5
8	CB-36C	1.33	0.00	0.81	0.52	Comb	2.0	2.00	0.00	2.00	2.00	0.027	4.00	0.020	0.020	0.013	0.12	6.18	0.25	4.34	2.0	6

Project File: Sta.81+97.stm | Number of lines: 8 | Run Date: 3/15/2024

NOTES: Inlet N-Values = 0.016; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

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Proposal No. 608163 - 128112

Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	MH20-OUTLET	User																		0.00
2	MH19-MH20	User																		0.00
3	CB37-MH19	User																		5.00
4	CB36-MH19	User																		5.00
5	MH19B-MH19	User																		0.00
6	CB36B-MH19B	User																		10.00
7	MH19C-MH19B	User																		0.00
8	CB36C-MH19C	User																		10.00

Project File: Sta.81+97.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 8 | Date: 3/15/2024

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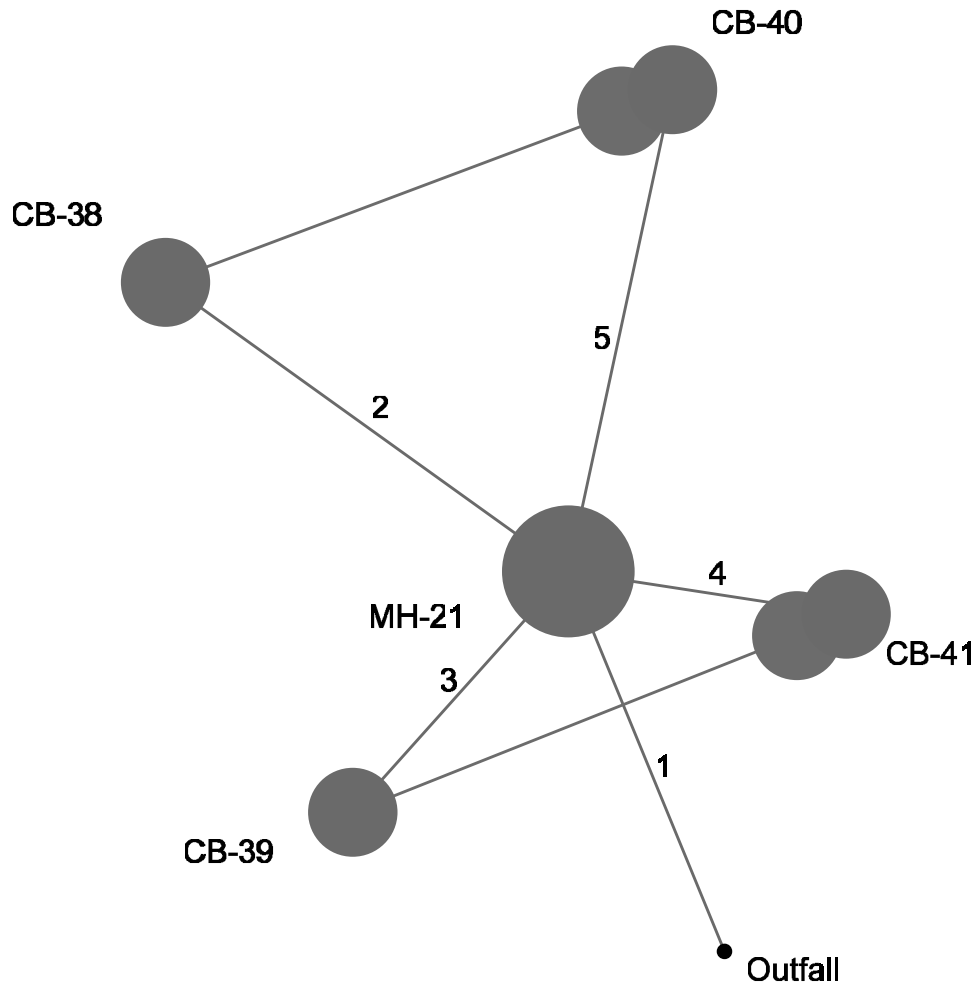
Proposal No. 608163 - 128112

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Sta.85+72.stm	Number of lines: 5	Date: 4/8/2024

Storm Sewers v2023.00

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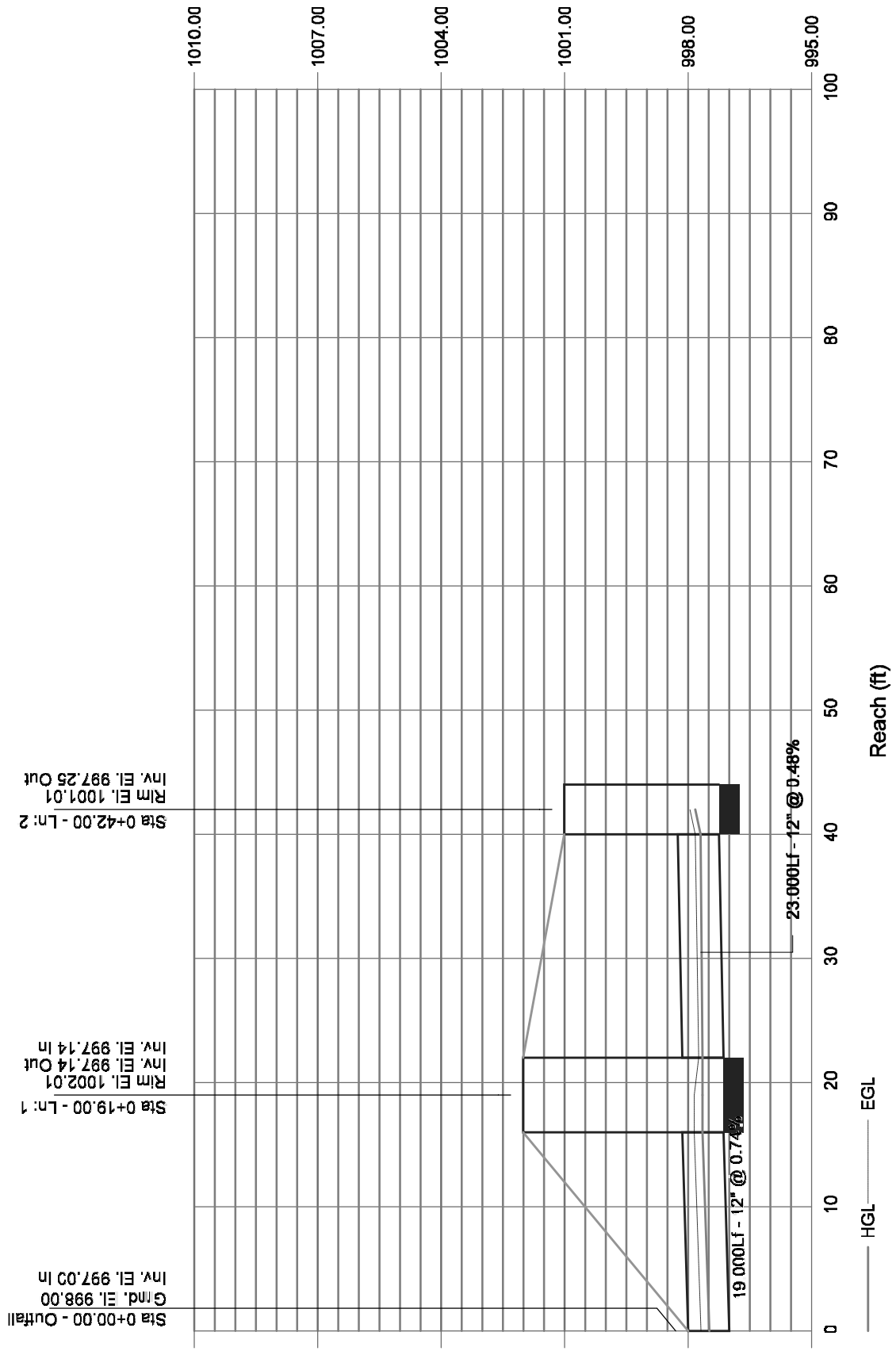
Proposal No. 608163 - 128112

Storm Sewer Profile

Proj. file: Sta.85+72.stm



Storm Sewers

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-21	Manhole	1002.01	Cir	6.00	6.00	12	Cir	997.14	12 12 12 12	Cir Cir Cir Cir	997.14 997.14 997.14 997.14
2	CB-38	Combination	1001.01	Cir	4.00	4.00	12	Cir	997.25			
3	CB-39	Combination	1002.33	Cir	4.00	4.00	12	Cir	997.21			
4	CB-41	Combination	1002.17	Cir	4.00	4.00	12	Cir	997.21			
5	CB-40	Combination	1000.85	Cir	4.00	4.00	12	Cir	997.25			

Project File: Sta.85+72.stm | Number of Structures: 5 | Run Date: 4/8/2024

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Proposal No. 608163 - 128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	19.000	0.00	0.41	0.00	0.00	0.27	0.0	6.7	5.4	1.45	3.06	3.72	12	0.74	997.00	997.14	997.49	997.65	998.00	1002.01	MH21-OUTLET
2	1	23.000	0.26	0.26	0.64	0.17	0.17	5.0	5.0	5.9	0.98	2.46	2.66	12	0.48	997.14	997.25	997.65	997.70	1002.01	1001.01	CB38-MH21
3	1	15.000	0.02	0.02	0.71	0.01	0.01	5.0	5.0	5.9	0.08	2.43	0.23	12	0.47	997.14	997.21	997.65	997.65	1002.01	1002.33	CB39-MH21
4	1	13.000	0.01	0.01	0.76	0.01	0.01	5.0	5.0	5.9	0.04	2.61	0.12	12	0.54	997.14	997.21	997.65	997.65	1002.01	1002.17	CB41-MH21
5	1	23.000	0.12	0.12	0.69	0.08	0.08	5.0	5.0	5.9	0.49	2.46	1.42	12	0.48	997.14	997.25	997.65	997.66	1002.01	1000.85	CB40-MH21

Project File: Sta.85+72.stm | Number of lines: 5 | Run Date: 4/8/2024

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

A00830 - 348

Proposal No. 608163 - 128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-21	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	CB-38	0.98	0.00	0.87	0.11	Comb	2.0	2.00	0.00	2.00	2.00	0.012	4.00	0.060	0.060	0.013	0.19	3.22	0.25	1.43	2.0	5
3	CB-39	0.08	0.00	0.08	0.00	Comb	2.0	2.00	0.00	2.00	2.00	0.012	4.00	0.020	0.020	0.013	0.05	2.55	0.18	0.70	2.0	4
4	CB-41	0.04	0.00	0.05	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.11	0.99	0.06	0.99	2.0	Off
5	CB-40	0.49	0.11	0.60	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.060	0.060	0.013	0.04	2.04	0.21	2.04	2.0	Off

Project File: Sta.85+72.stm | Number of lines: 5 | Run Date: 4/8/2024

NOTES: Inlet N-Values = 0.016; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

A00830 - 349

Proposal No. 608163 - 128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	19.000	0.00	0.41	0.00	0.00	0.27	0.0	6.7	6.6	1.78	3.06	3.96	12	0.74	997.00	997.14	997.55	997.71	998.00	1002.01	MH21-OUTLET
2	1	23.000	0.26	0.26	0.64	0.17	0.17	5.0	5.0	7.2	1.20	2.46	2.80	12	0.48	997.14	997.25	997.71	997.76	1002.01	1001.01	CB38-MH21
3	1	15.000	0.02	0.02	0.71	0.01	0.01	5.0	5.0	7.2	0.10	2.43	0.24	12	0.47	997.14	997.21	997.71	997.71	1002.01	1002.33	CB39-MH21
4	1	13.000	0.01	0.01	0.76	0.01	0.01	5.0	5.0	7.2	0.05	2.61	0.13	12	0.54	997.14	997.21	997.71	997.71	1002.01	1002.17	CB41-MH21
5	1	23.000	0.12	0.12	0.69	0.08	0.08	5.0	5.0	7.2	0.60	2.46	1.48	12	0.48	997.14	997.25	997.71	997.72	1002.01	1000.85	CB40-MH21

Project File: Sta.85+72.stm | Number of lines: 5 | Run Date: 4/8/2024

NOTES:Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

A00830 - 350

Proposal No. 608163 - 128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-21	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	CB-38	1.20	0.00	1.02	0.17	Comb	2.0	2.00	0.00	2.00	2.00	0.012	4.00	0.060	0.060	0.013	0.21	3.47	0.27	1.69	2.0	5
3	CB-39	0.10	0.00	0.10	0.01	Comb	2.0	2.00	0.00	2.00	2.00	0.012	4.00	0.020	0.020	0.013	0.05	2.75	0.18	0.90	2.0	4
4	CB-41	0.05	0.01	0.06	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.10	1.12	0.07	1.12	2.0	Off
5	CB-40	0.60	0.17	0.77	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.060	0.060	0.013	0.08	2.41	0.25	2.41	2.0	Off

Project File: Sta.85+72.stm | Number of lines: 5 | Run Date: 4/8/2024

NOTES: Inlet N-Values = 0.016; Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

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Proposal No. 608163 - 128112

Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	MH21-OUTLET	User																		0.00
2	CB38-MH21	User																		5.00
3	CB39-MH21	User																		5.00
4	CB41-MH21	User																		5.00
5	CB40-MH21	User																		5.00

Project File: Sta.85+72.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 5 | Date: 4/8/2024

A00830 - 352

Proposal No. 608163 - 128112

APPENDIX D

HY-8 Reports

DRAINAGE REPORT

Existing

HY-8 Reports

STA 15+33 Existing
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 5.00 cfs

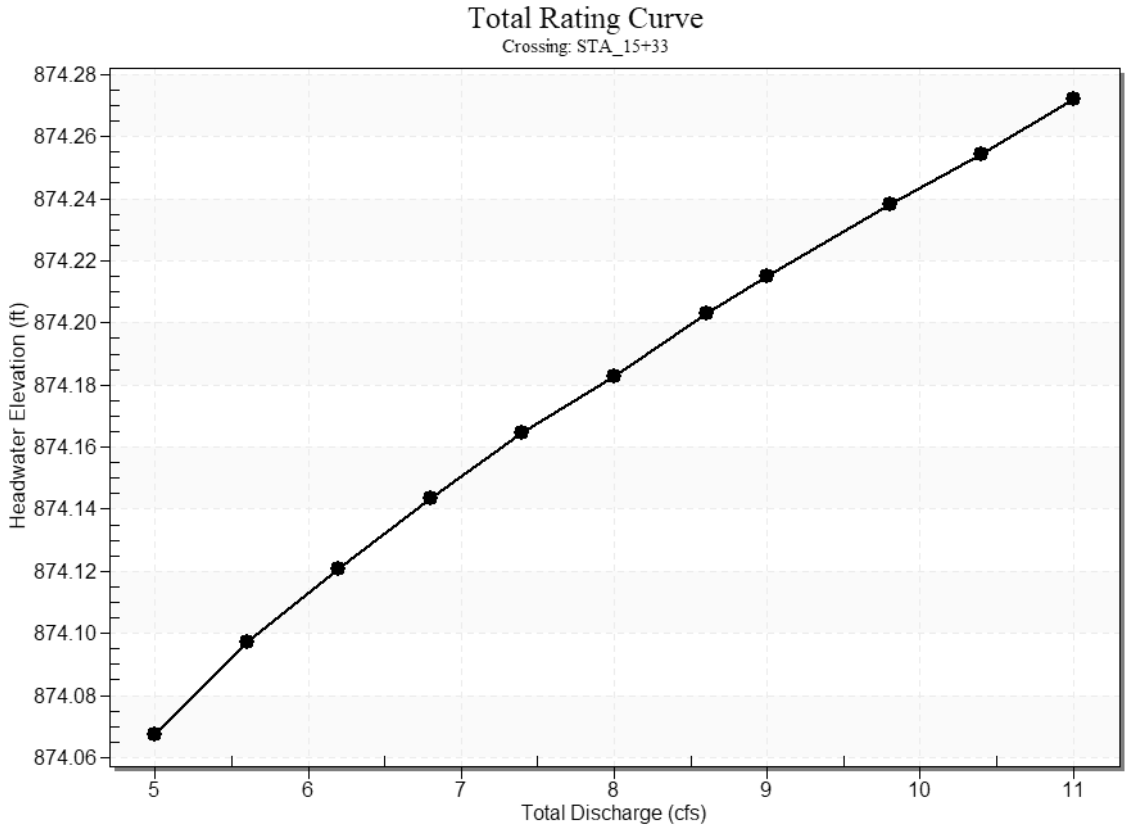
Design Flow: 9.00 cfs

Maximum Flow: 11.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: STA_15+33

Headwater Elevation (ft)	Total Discharge (cfs)	12 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
874.07	5.00	4.15	0.84	16
874.10	5.60	4.17	1.40	4
874.12	6.20	4.18	2.00	4
874.14	6.80	4.19	2.59	4
874.16	7.40	4.21	3.16	3
874.18	8.00	4.22	3.75	3
874.20	8.60	4.23	4.35	3
874.21	9.00	4.23	4.75	3
874.24	9.80	4.25	5.54	3
874.25	10.40	4.26	6.14	3
874.27	11.00	4.26	6.73	3
874.00	4.11	4.11	0.00	Overtopping

Rating Curve Plot for Crossing: STA_15+33



Culvert Data: 12

Table 2 - Culvert Summary Table: 12

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5.00 cfs	4.15 cfs	874.07	1.75	3.818	7-M2c	1.00	0.86	0.86	0.13	5.78	2.08
5.60 cfs	4.17 cfs	874.10	1.75	3.847	7-M2c	1.00	0.86	0.86	0.14	5.79	2.18
6.20 cfs	4.18 cfs	874.12	1.76	3.871	7-M2c	1.00	0.86	0.86	0.15	5.80	2.27
6.80 cfs	4.19 cfs	874.14	1.77	3.894	7-M2c	1.00	0.86	0.86	0.16	5.82	2.35

7.40 cfs	4.21 cfs	874.16	1.77	3.915	7-M2c	1.00	0.86	0.86	0.16	5.83	2.42
8.00 cfs	4.22 cfs	874.18	1.78	3.933	7-M2c	1.00	0.87	0.87	0.17	5.84	2.50
8.60 cfs	4.23 cfs	874.20	1.79	3.953	7-M2c	1.00	0.87	0.87	0.18	5.85	2.57
9.00 cfs	4.23 cfs	874.21	1.79	3.965	7-M2c	1.00	0.87	0.87	0.18	5.85	2.61
9.80 cfs	4.25 cfs	874.24	1.80	3.988	7-M2c	1.00	0.87	0.87	0.19	5.87	2.70
10.40 cfs	4.26 cfs	874.25	1.80	4.004	7-M2c	1.00	0.87	0.87	0.20	5.88	2.76
11.00 cfs	4.26 cfs	874.27	1.81	4.022	7-M2c	1.00	0.87	0.87	0.21	5.88	2.82

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

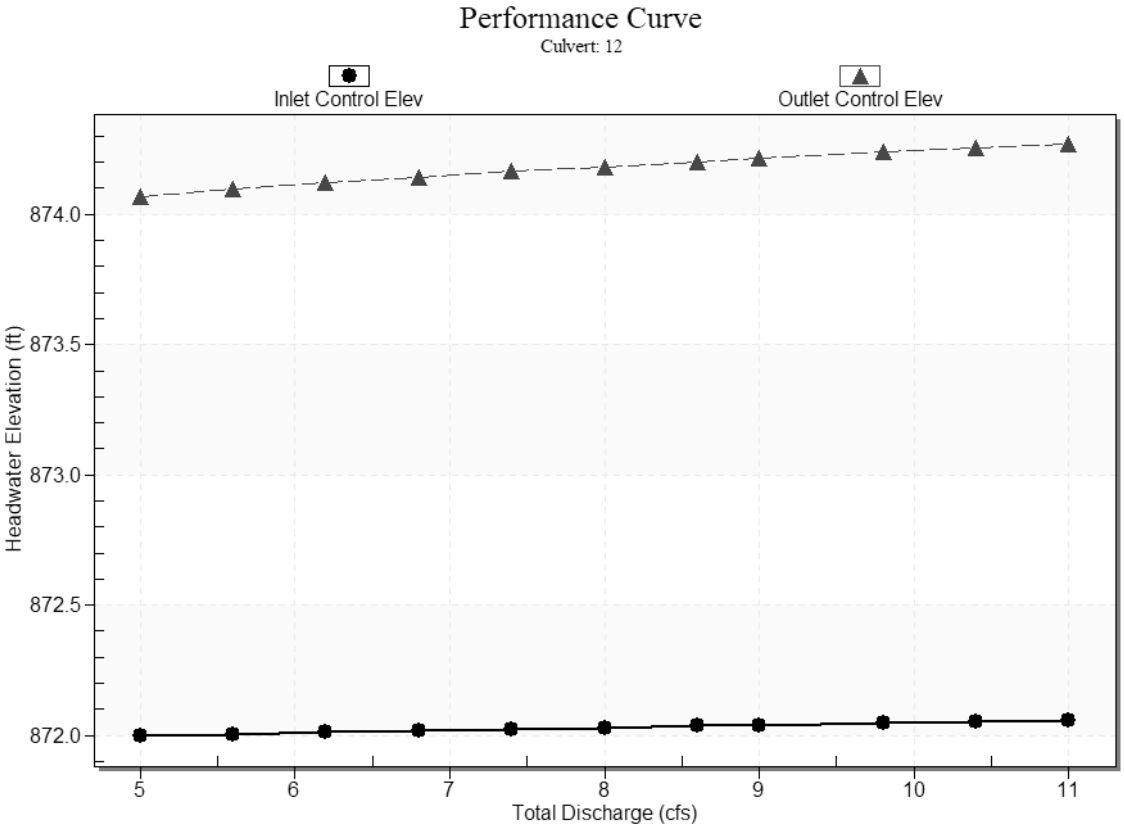
Inlet Elevation (invert): 870.25 ft,

Outlet Elevation (invert): 869.63 ft

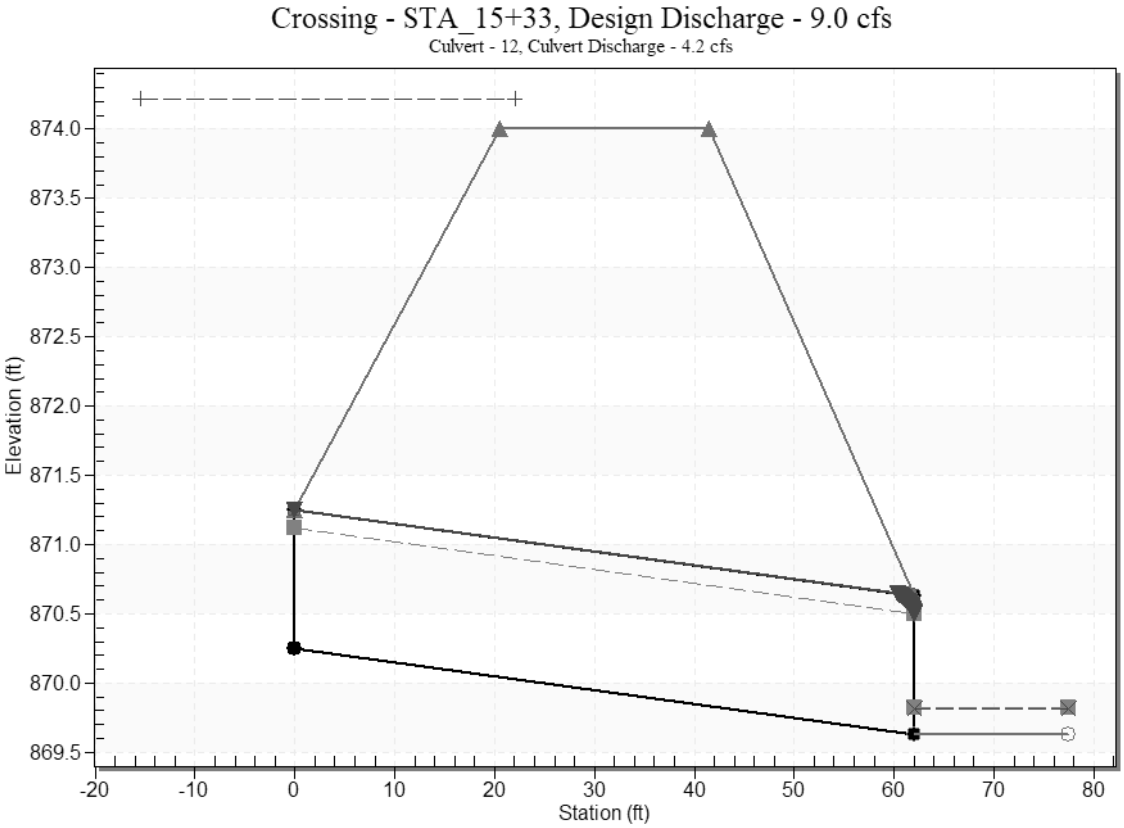
Culvert Length: 62.00 ft,

Culvert Slope: 0.0100

Culvert Performance Curve Plot: 12



Water Surface Profile Plot for Culvert: 12



Site Data - 12

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 870.25 ft

Outlet Station: 62.00 ft

Outlet Elevation: 869.63 ft

Number of Barrels: 1

Culvert Data Summary - 12

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated PE

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: STA_15+33

Table 3 - Downstream Channel Rating Curve (Crossing: STA_15+33)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	869.76	0.13	2.08	0.40	1.03
5.60	869.77	0.14	2.18	0.43	1.05
6.20	869.78	0.15	2.27	0.46	1.06
6.80	869.79	0.16	2.35	0.49	1.07
7.40	869.79	0.16	2.42	0.51	1.07
8.00	869.80	0.17	2.50	0.53	1.08
8.60	869.81	0.18	2.57	0.56	1.09
9.00	869.81	0.18	2.61	0.57	1.09
9.80	869.82	0.19	2.70	0.60	1.10
10.40	869.83	0.20	2.76	0.63	1.11
11.00	869.84	0.21	2.82	0.65	1.12

Tailwater Channel Data - STA_15+33

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 18.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0500

Channel Manning's n: 0.0400

Channel Invert Elevation: 869.63 ft

Roadway Data for Crossing: STA_15+33

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 16.00 ft

Crest Elevation: 874.00 ft

Roadway Surface: Paved

Roadway Top Width: 21.00 ft

STA 25+92 Existing
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 22.00 cfs

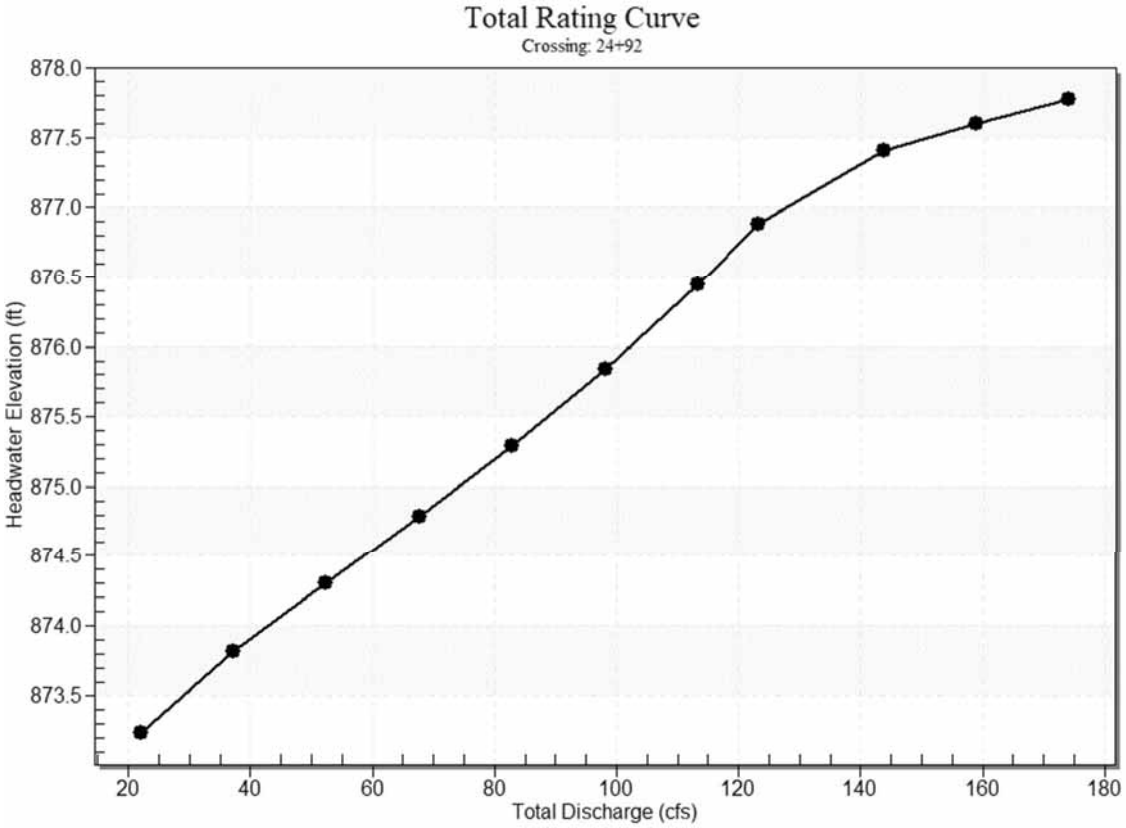
Design Flow: 123.00 cfs

Maximum Flow: 174.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: 24+92

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
873.24	22.00	19.92	2.07	0.00	6
873.81	37.20	29.45	7.75	0.00	4
874.30	52.40	37.68	14.74	0.00	2
874.79	67.60	45.15	22.45	0.00	3
875.29	82.80	51.89	30.92	0.00	3
875.84	98.00	58.27	39.73	0.00	4
876.45	113.20	64.64	48.57	0.00	4
876.89	123.00	68.78	54.18	0.00	8
877.40	143.60	73.35	60.17	10.07	6
877.60	158.80	75.00	62.29	21.48	5
877.77	174.00	76.41	64.07	33.43	4
877.10	127.41	70.70	56.72	0.00	Overtopping

Rating Curve Plot for Crossing: 24+92



Culvert Data: Culvert 1

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.00 cfs	19.92 cfs	873.24	2.04	0.0*	1-S2n	0.73	1.43	0.84	0.24	12.27	4.39
37.20 cfs	29.45 cfs	873.81	2.61	0.321	1-S2n	0.89	1.76	1.06	0.33	13.16	5.34
52.40 cfs	37.68 cfs	874.30	3.10	0.863	5-S2n	1.01	2.00	1.23	0.40	13.74	6.06
67.60 cfs	45.15 cfs	874.79	3.59	1.392	5-S2n	1.11	2.19	1.38	0.46	14.23	6.66

82.80 cfs	51.89 cfs	875.29	4.09	2.232	5-S2n	1.20	2.34	1.50	0.52	14.65	7.16
98.00 cfs	58.27 cfs	875.84	4.64	2.680	5-S2n	1.28	2.47	1.61	0.58	15.03	7.60
113.20 cfs	64.64 cfs	876.45	5.25	3.162	5-S2n	1.35	2.58	1.72	0.63	15.41	8.00
123.00 cfs	68.78 cfs	876.89	5.69	3.495	5-S2n	1.40	2.64	1.79	0.66	15.66	8.24
143.60 cfs	73.35 cfs	877.40	6.20	3.878	5-S2n	1.46	2.70	1.86	0.72	15.94	8.69
158.80 cfs	75.00 cfs	877.60	6.40	4.022	5-S2n	1.47	2.72	1.88	0.77	16.04	9.00
174.00 cfs	76.41 cfs	877.77	6.57	4.146	5-S2n	1.49	2.73	1.91	0.81	16.13	9.29

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

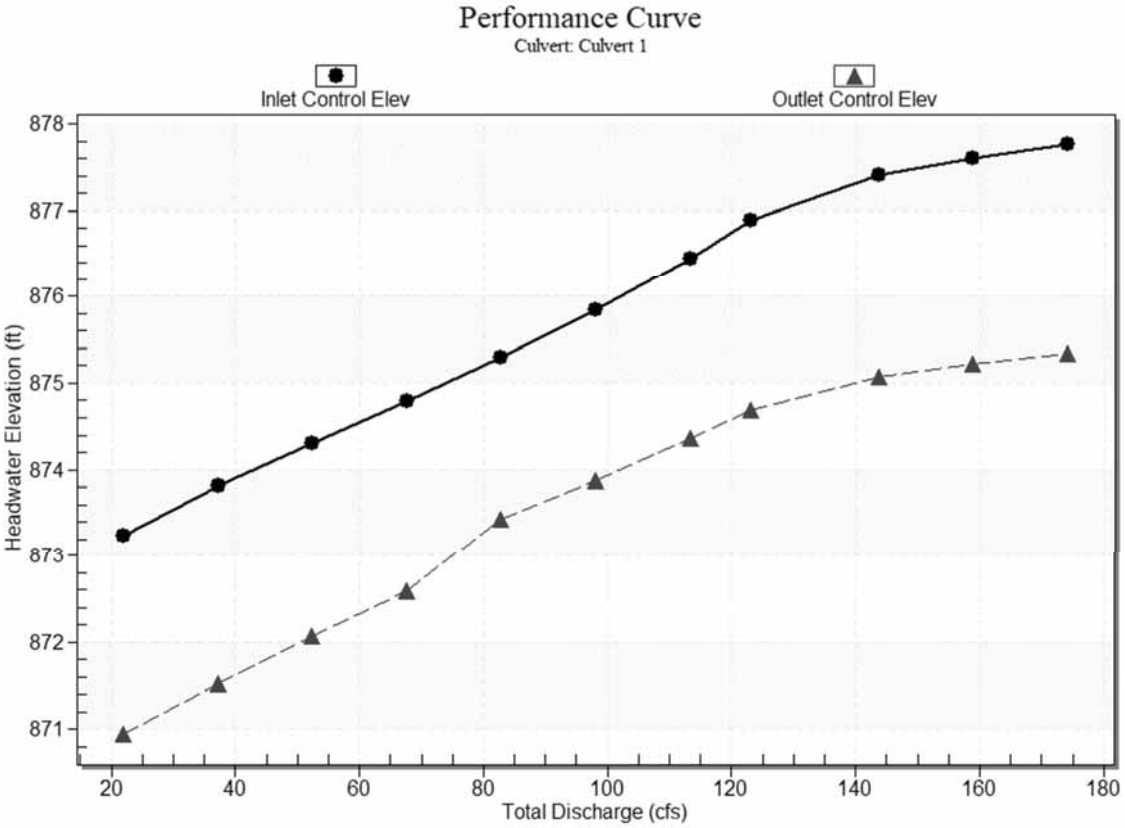
Inlet Elevation (invert): 871.20 ft,

Outlet Elevation (invert): 869.29 ft

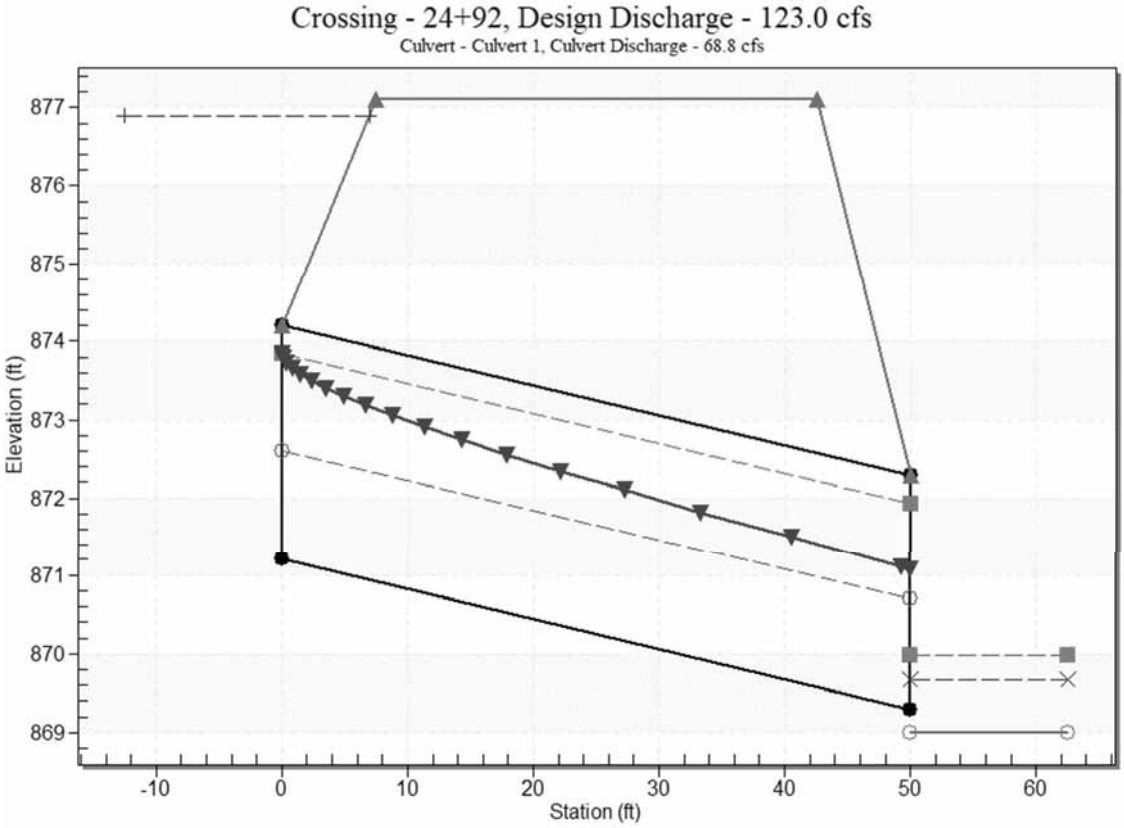
Culvert Length: 50.04 ft,

Culvert Slope: 0.0382

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 871.20 ft

Outlet Station: 50.00 ft

Outlet Elevation: 869.29 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: PVC

Embedment: 0.00 in

Barrel Manning's n: 0.0110

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Culvert Data: Culvert 2

Table 3 - Culvert Summary Table: Culvert 2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.00 cfs	2.07 cfs	873.24	0.58	0.0*	1-S2n	0.32	0.45	0.32	0.24	5.01	4.39
37.20 cfs	7.75 cfs	873.81	1.15	0.0*	1-S2n	0.62	0.88	0.62	0.33	7.39	5.34
52.40 cfs	14.74 cfs	874.30	1.64	0.0*	1-S2n	0.85	1.22	0.85	0.40	8.90	6.06
67.60 cfs	22.45 cfs	874.79	2.13	0.0*	1-S2n	1.06	1.52	1.06	0.46	10.02	6.66
82.80 cfs	30.92 cfs	875.29	2.63	0.0*	1-S2n	1.26	1.80	1.29	0.52	10.62	7.16
98.00 cfs	39.73 cfs	875.84	3.18	0.730	5-S2n	1.46	2.05	1.49	0.58	11.34	7.60
113.20 cfs	48.57 cfs	876.45	3.79	1.974	5-S2n	1.64	2.27	1.67	0.63	12.00	8.00
123.00 cfs	54.18 cfs	876.89	4.23	2.523	5-S2n	1.76	2.39	1.79	0.66	12.29	8.24
143.60 cfs	60.17 cfs	877.40	4.74	3.161	5-S2n	1.89	2.50	1.93	0.72	12.53	8.69
158.80 cfs	62.29 cfs	877.60	4.94	3.399	5-S2n	1.93	2.54	1.98	0.77	12.61	9.00
174.00 cfs	64.07 cfs	877.77	5.11	3.604	5-S2	1.97	2.57	2.01	0.81	12.70	9.29

n

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

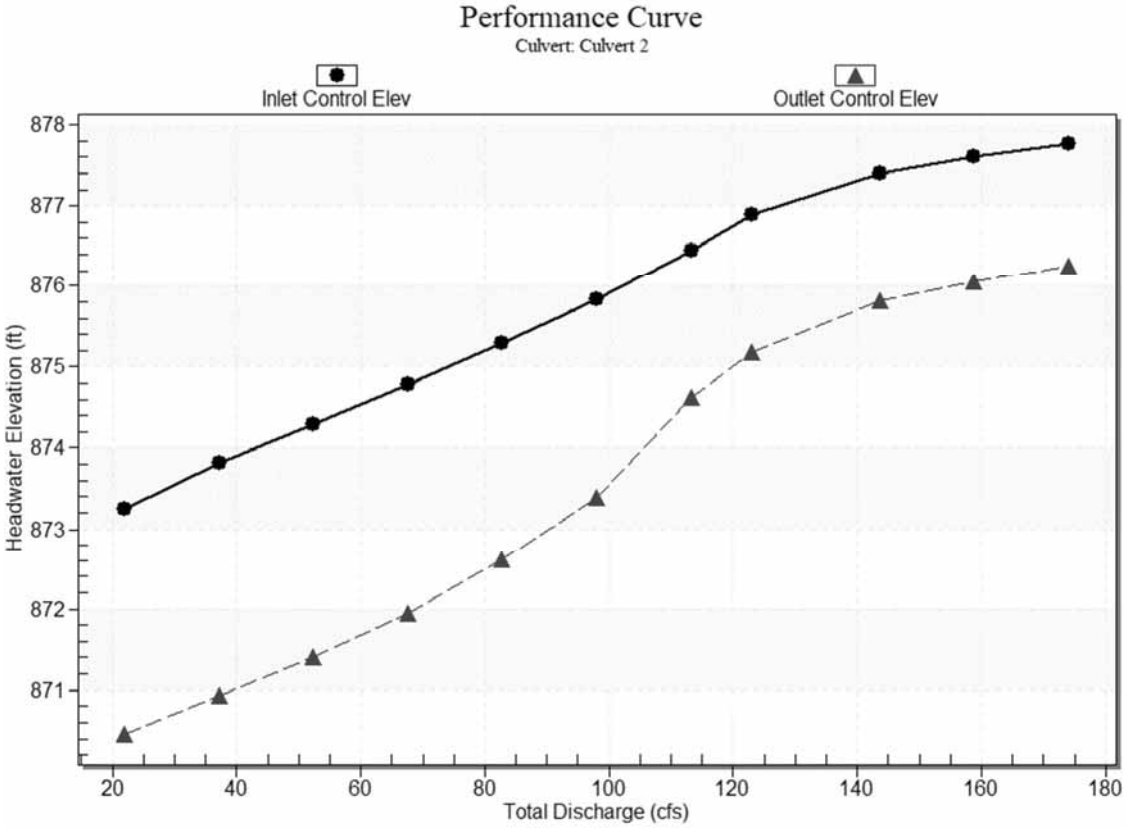
Inlet Elevation (invert): 872.66 ft,

Outlet Elevation (invert): 870.00 ft

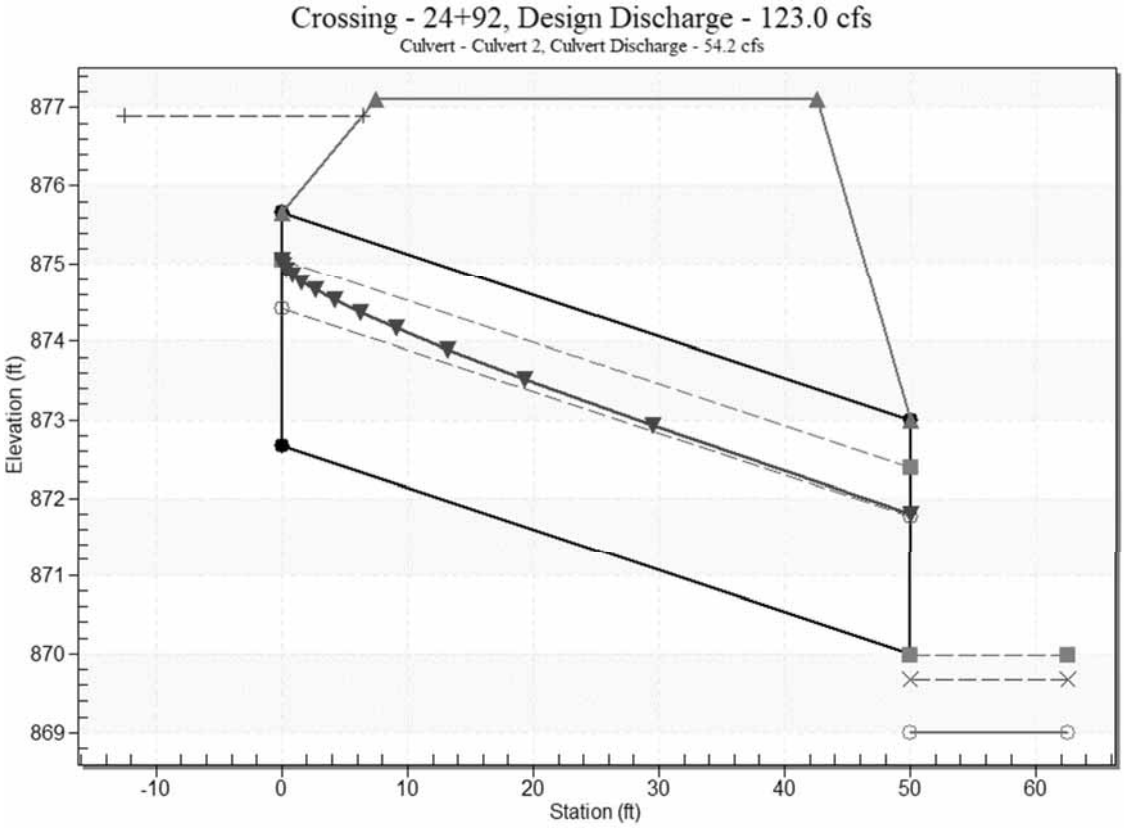
Culvert Length: 50.07 ft,

Culvert Slope: 0.0532

Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 872.66 ft

Outlet Station: 50.00 ft

Outlet Elevation: 870.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: 24+92

Table 4 - Downstream Channel Rating Curve (Crossing: 24+92)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
22.00	869.24	0.24	4.39	1.49	1.62
37.20	869.33	0.33	5.34	2.04	1.70
52.40	869.40	0.40	6.06	2.50	1.75
67.60	869.46	0.46	6.66	2.90	1.79
82.80	869.52	0.52	7.16	3.27	1.82
98.00	869.58	0.58	7.60	3.61	1.85
113.20	869.63	0.63	8.00	3.92	1.87
123.00	869.66	0.66	8.24	4.12	1.89
143.60	869.72	0.72	8.69	4.50	1.91
158.80	869.77	0.77	9.00	4.77	1.93
174.00	869.81	0.81	9.29	5.03	1.94

Tailwater Channel Data - 24+92

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 20.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.1000

Channel Manning's n: 0.0400

Channel Invert Elevation: 869.00 ft

Roadway Data for Crossing: 24+92

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 20.00 ft

Crest Elevation: 877.10 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

STA 43+76 Existing
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 9.00 cfs

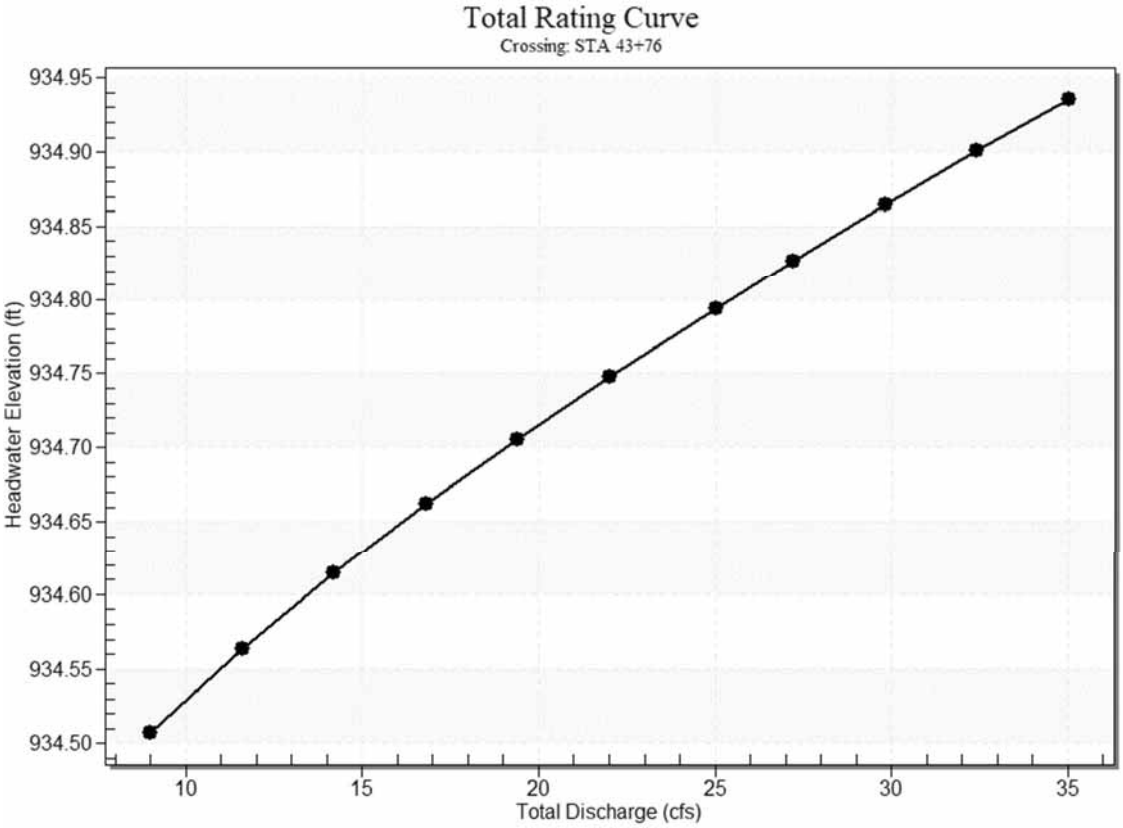
Design Flow: 25.00 cfs

Maximum Flow: 35.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: STA 43+76

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
934.51	9.00	3.33	5.63	8
934.56	11.60	3.46	8.09	4
934.61	14.20	3.58	10.60	4
934.66	16.80	3.68	13.11	4
934.71	19.40	3.77	15.58	3
934.75	22.00	3.86	18.11	3
934.79	25.00	3.95	21.02	3
934.83	27.20	4.02	23.17	3
934.86	29.80	4.09	25.70	3
934.90	32.40	4.16	28.24	3
934.94	35.00	4.22	30.72	2
934.30	2.78	2.78	0.00	Overtopping

Rating Curve Plot for Crossing: STA 43+76



Culvert Data: Culvert 1

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
9.00 cfs	3.33 cfs	934.51	1.37	0.0*	5-S2n	0.50	0.78	0.50	0.27	8.41	1.44
11.60 cfs	3.46 cfs	934.56	1.42	0.0*	5-S2n	0.51	0.79	0.52	0.31	8.45	1.58
14.20 cfs	3.58 cfs	934.61	1.47	0.040	5-S2n	0.52	0.81	0.53	0.35	8.51	1.69
16.80 cfs	3.68 cfs	934.66	1.52	0.105	5-S2n	0.53	0.82	0.54	0.38	8.56	1.79

19.40 cfs	3.77 cfs	934.71	1.57	0.164	5-S2n	0.53	0.83	0.55	0.42	8.62	1.88
22.00 cfs	3.86 cfs	934.75	1.61	0.220	5-S2n	0.54	0.83	0.55	0.45	8.66	1.96
25.00 cfs	3.95 cfs	934.79	1.65	0.282	5-S2n	0.55	0.84	0.56	0.48	8.71	2.05
27.20 cfs	4.02 cfs	934.83	1.69	0.325	5-S2n	0.56	0.85	0.57	0.50	8.74	2.11
29.80 cfs	4.09 cfs	934.86	1.72	0.375	5-S2n	0.56	0.86	0.57	0.53	8.78	2.17
32.40 cfs	4.16 cfs	934.90	1.76	0.423	5-S2n	0.57	0.86	0.58	0.56	8.81	2.23
35.00 cfs	4.22 cfs	934.94	1.80	0.468	5-S2n	0.57	0.87	0.59	0.58	8.84	2.29

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

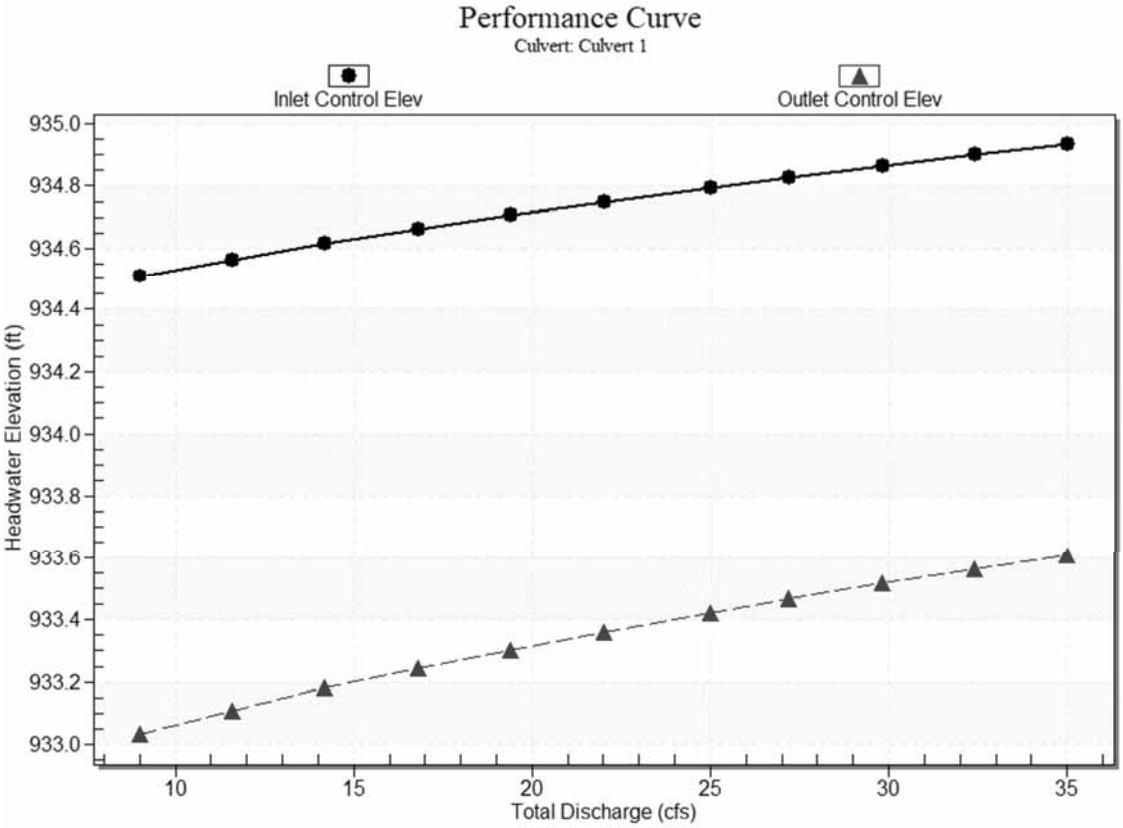
Inlet Elevation (invert): 933.14 ft,

Outlet Elevation (invert): 931.27 ft

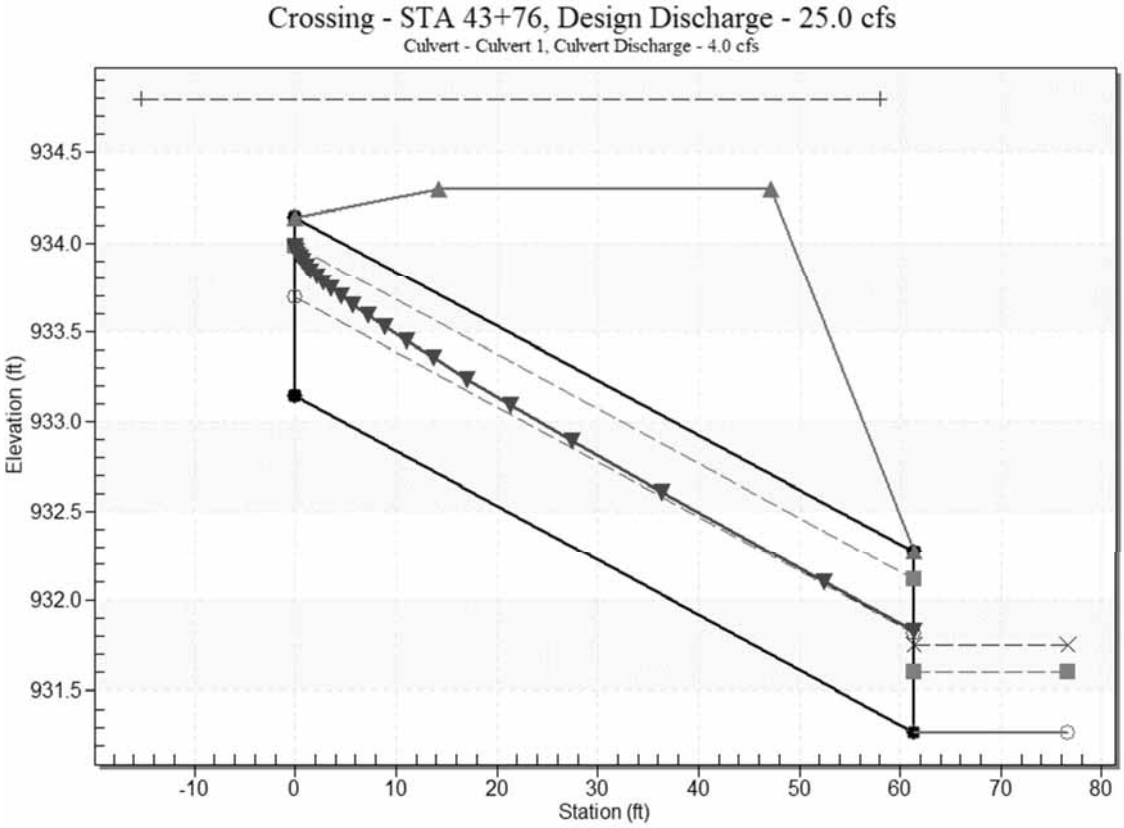
Culvert Length: 61.37 ft,

Culvert Slope: 0.0305

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 933.14 ft

Outlet Station: 61.34 ft

Outlet Elevation: 931.27 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: STA 43+76

Table 3 - Downstream Channel Rating Curve (Crossing: STA 43+76)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
9.00	931.54	0.27	1.44	0.17	0.52
11.60	931.58	0.31	1.58	0.19	0.53
14.20	931.62	0.35	1.69	0.22	0.54
16.80	931.65	0.38	1.79	0.24	0.55
19.40	931.69	0.42	1.88	0.26	0.55
22.00	931.72	0.45	1.96	0.28	0.56
25.00	931.75	0.48	2.05	0.30	0.56
27.20	931.77	0.50	2.11	0.32	0.57
29.80	931.80	0.53	2.17	0.33	0.57
32.40	931.83	0.56	2.23	0.35	0.58
35.00	931.85	0.58	2.29	0.36	0.58

Tailwater Channel Data - STA 43+76

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 21.00 ft

Side Slope (H:V): 9.00 (_:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0400

Channel Invert Elevation: 931.27 ft

Roadway Data for Crossing: STA 43+76

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 20.00 ft

Crest Elevation: 934.30 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

STA 50+72 Existing
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 40.00 cfs

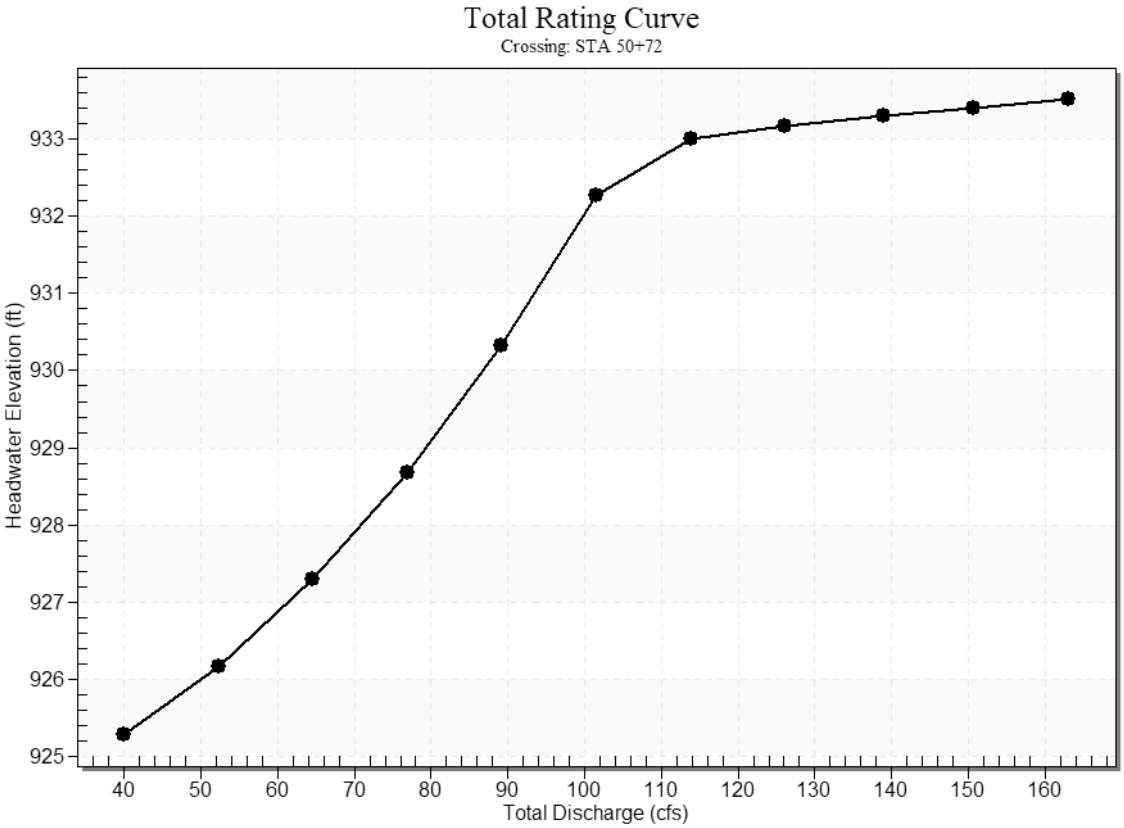
Design Flow: 139.00 cfs

Maximum Flow: 163.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: STA 50+72

Headwater Elevation (ft)	Total Discharge (cfs)	36 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
925.29	40.00	40.00	0.00	1
926.17	52.30	52.30	0.00	1
927.29	64.60	64.60	0.00	1
928.68	76.90	76.90	0.00	1
930.32	89.20	89.20	0.00	1
932.27	101.50	101.50	0.00	1
933.00	113.80	105.69	8.07	7
933.16	126.10	106.57	19.49	6
933.29	139.00	107.32	31.62	5
933.40	150.70	107.91	42.65	4
933.51	163.00	108.49	54.42	4
932.80	104.55	104.55	0.00	Overtopping

Rating Curve Plot for Crossing: STA 50+72



Culvert Data: 36

Table 2 - Culvert Summary Table: 36

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
40.00 cfs	40.00 cfs	925.29	3.25	0.908	5-S2n	0.97	2.06	1.25	0.66	14.38	4.32
52.30 cfs	52.30 cfs	926.17	4.13	2.126	5-S2n	1.12	2.35	1.47	0.77	15.13	4.68
64.60 cfs	64.60 cfs	927.29	5.25	3.003	5-S2n	1.26	2.58	1.68	0.86	15.88	4.98
76.90 cfs	76.90 cfs	928.68	6.64	4.007	5-S2n	1.39	2.74	1.87	0.94	16.64	5.24

89.20 cfs	89.20 cfs	930.32	8.28	5.141	5-S2n	1.51	2.84	2.03	1.01	17.49	5.47
101.50 cfs	101.50 cfs	932.27	10.23	6.363	5-S2n	1.63	2.80	2.18	1.08	18.46	5.68
113.80 cfs	105.69 cfs	933.00	10.96	6.926	5-S2n	1.67	3.00	2.26	1.15	18.48	5.86
126.10 cfs	106.57 cfs	933.16	11.12	7.025	5-S2n	1.68	3.00	2.27	1.21	18.56	6.03
139.00 cfs	107.32 cfs	933.29	11.25	7.109	5-S2n	1.69	3.00	2.28	1.27	18.62	6.20
150.70 cfs	107.91 cfs	933.40	11.36	7.177	5-S2n	1.70	3.00	2.29	1.32	18.68	6.34
163.00 cfs	108.49 cfs	933.51	11.47	7.244	5-S2n	1.70	3.00	2.29	1.38	18.73	6.48

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

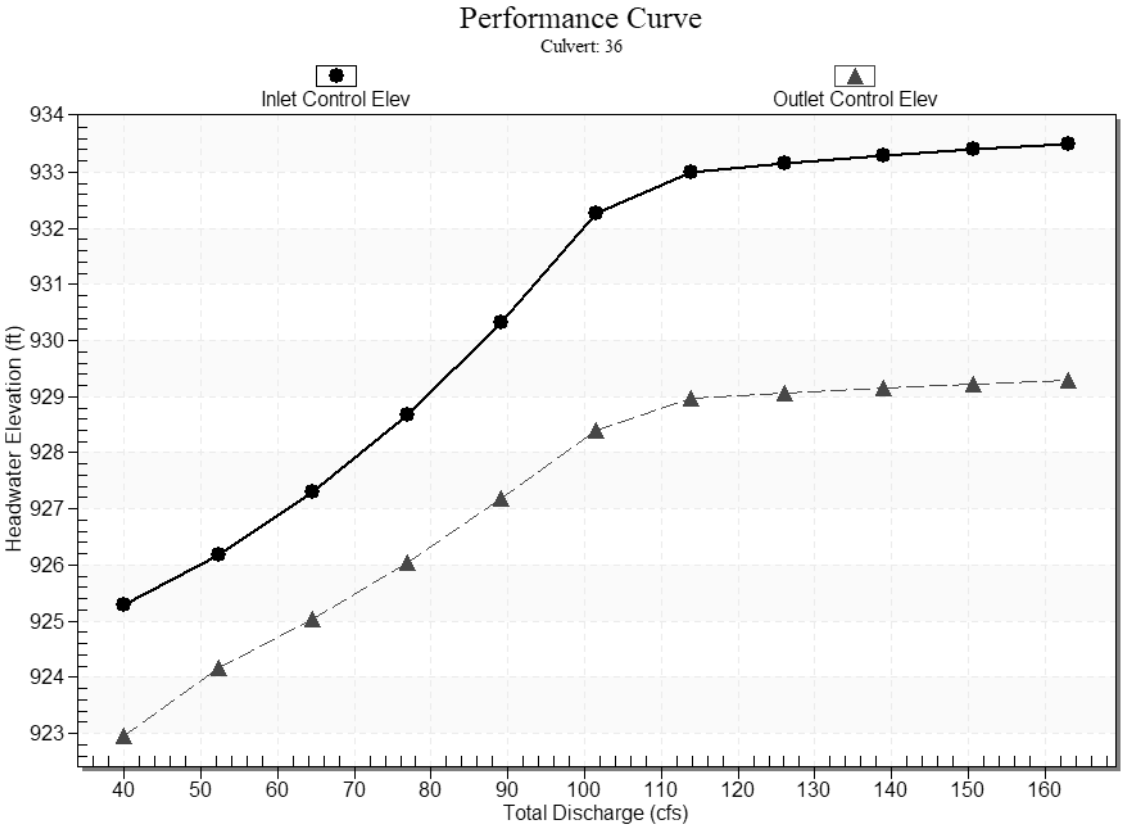
Inlet Elevation (invert): 922.04 ft,

Outlet Elevation (invert): 920.04 ft

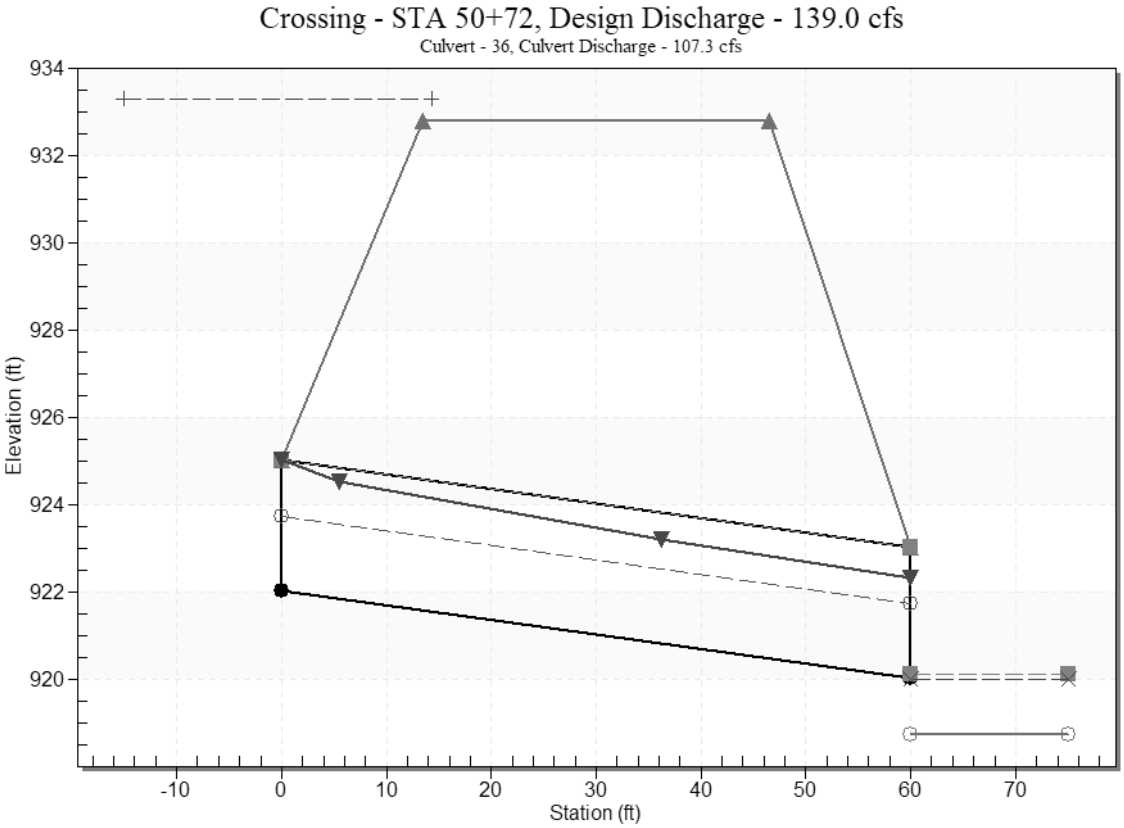
Culvert Length: 60.03 ft,

Culvert Slope: 0.0333

Culvert Performance Curve Plot: 36



Water Surface Profile Plot for Culvert: 36



Site Data - 36

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 922.04 ft

Outlet Station: 60.00 ft

Outlet Elevation: 920.04 ft

Number of Barrels: 1

Culvert Data Summary - 36

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: PVC

Embedment: 0.00 in

Barrel Manning's n: 0.0090

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: STA 50+72

Table 3 - Downstream Channel Rating Curve (Crossing: STA 50+72)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
40.00	919.41	0.66	4.32	1.36	1.06
52.30	919.52	0.77	4.68	1.58	1.08
64.60	919.61	0.86	4.98	1.76	1.10
76.90	919.69	0.94	5.24	1.93	1.11
89.20	919.76	1.01	5.47	2.09	1.12
101.50	919.83	1.08	5.68	2.23	1.13
113.80	919.90	1.15	5.86	2.37	1.14
126.10	919.96	1.21	6.03	2.49	1.15
139.00	920.02	1.27	6.20	2.62	1.16
150.70	920.07	1.32	6.34	2.73	1.17
163.00	920.13	1.38	6.48	2.84	1.17

Tailwater Channel Data - STA 50+72

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 6.00 (_:1)

Channel Slope: 0.0330

Channel Manning's n: 0.0400

Channel Invert Elevation: 918.75 ft

Roadway Data for Crossing: STA 50+72

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 30.00 ft

Crest Elevation: 932.80 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

STA 82+07 Existing
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 5.00 cfs

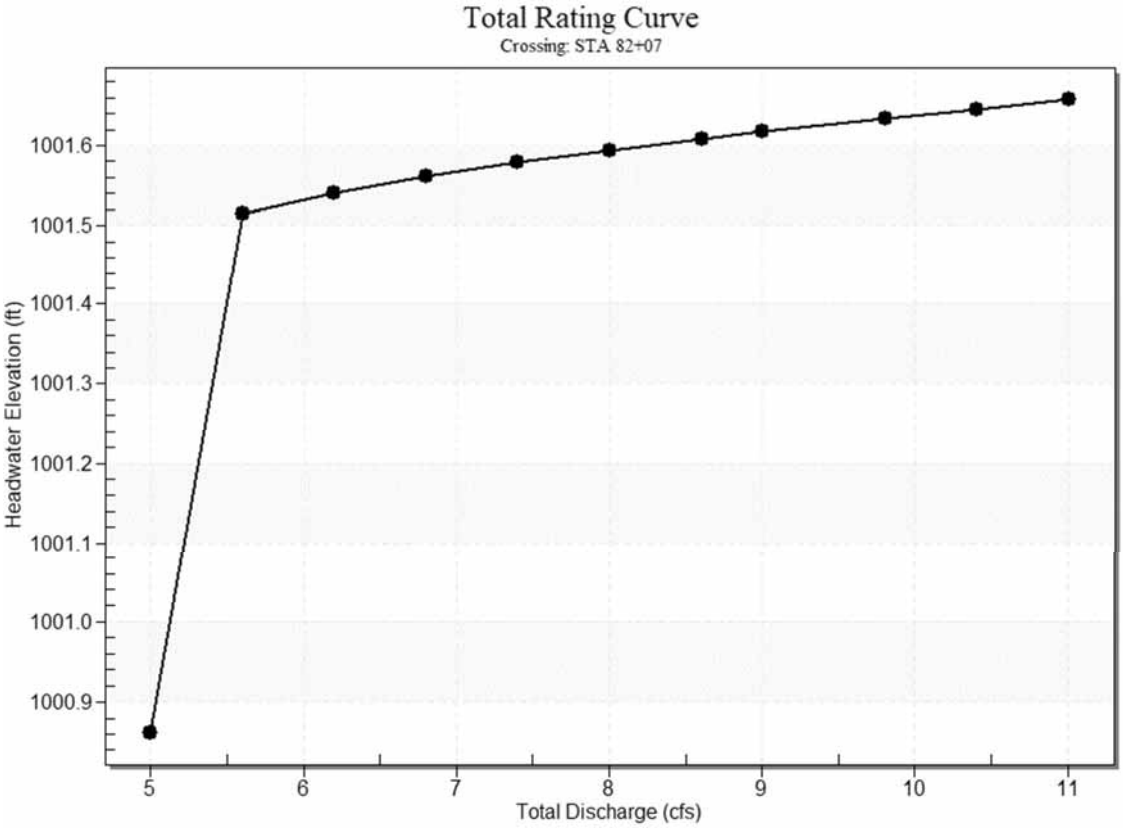
Design Flow: 9.00 cfs

Maximum Flow: 11.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: STA 82+07

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1000.86	5.00	5.00	0.00	1
1001.51	5.60	5.41	0.15	49
1001.54	6.20	5.42	0.73	5
1001.56	6.80	5.43	1.32	4
1001.58	7.40	5.44	1.93	4
1001.59	8.00	5.45	2.50	3
1001.61	8.60	5.46	3.10	3
1001.62	9.00	5.47	3.51	3
1001.63	9.80	5.48	4.30	3
1001.65	10.40	5.48	4.90	3
1001.66	11.00	5.49	5.50	3
1001.50	5.40	5.40	0.00	Overtopping

Rating Curve Plot for Crossing: STA 82+07



Culvert Data: Culvert 1

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5.00 cfs	5.00 cfs	1000.86	2.23	4.182	7-M2c	1.00	0.92	0.92	0.10	6.63	2.00
5.60 cfs	5.41 cfs	1001.51	2.49	4.834	7-M2c	1.00	0.94	0.94	0.11	7.08	2.09
6.20 cfs	5.42 cfs	1001.54	2.50	4.861	7-M2c	1.00	0.94	0.94	0.11	7.09	2.18
6.80 cfs	5.43 cfs	1001.56	2.51	4.881	7-M2c	1.00	0.94	0.94	0.12	7.11	2.26

7.40 cfs	5.44 cfs	1001.58	2.52	4.898	7-M2c	1.00	0.94	0.94	0.13	7.12	2.34
8.00 cfs	5.45 cfs	1001.59	2.52	4.913	7-M2c	1.00	0.94	0.94	0.13	7.13	2.41
8.60 cfs	5.46 cfs	1001.61	2.53	4.928	7-M2c	1.00	0.94	0.94	0.14	7.14	2.48
9.00 cfs	5.47 cfs	1001.62	2.53	4.937	7-M2c	1.00	0.94	0.94	0.14	7.15	2.52
9.80 cfs	5.48 cfs	1001.63	2.54	4.953	7-M2c	1.00	0.94	0.94	0.15	7.16	2.61
10.40 cfs	5.48 cfs	1001.65	2.54	4.965	7-M2c	1.00	0.94	0.94	0.15	7.16	2.67
11.00 cfs	5.49 cfs	1001.66	2.55	4.977	7-M2c	1.00	0.94	0.94	0.16	7.17	2.73

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

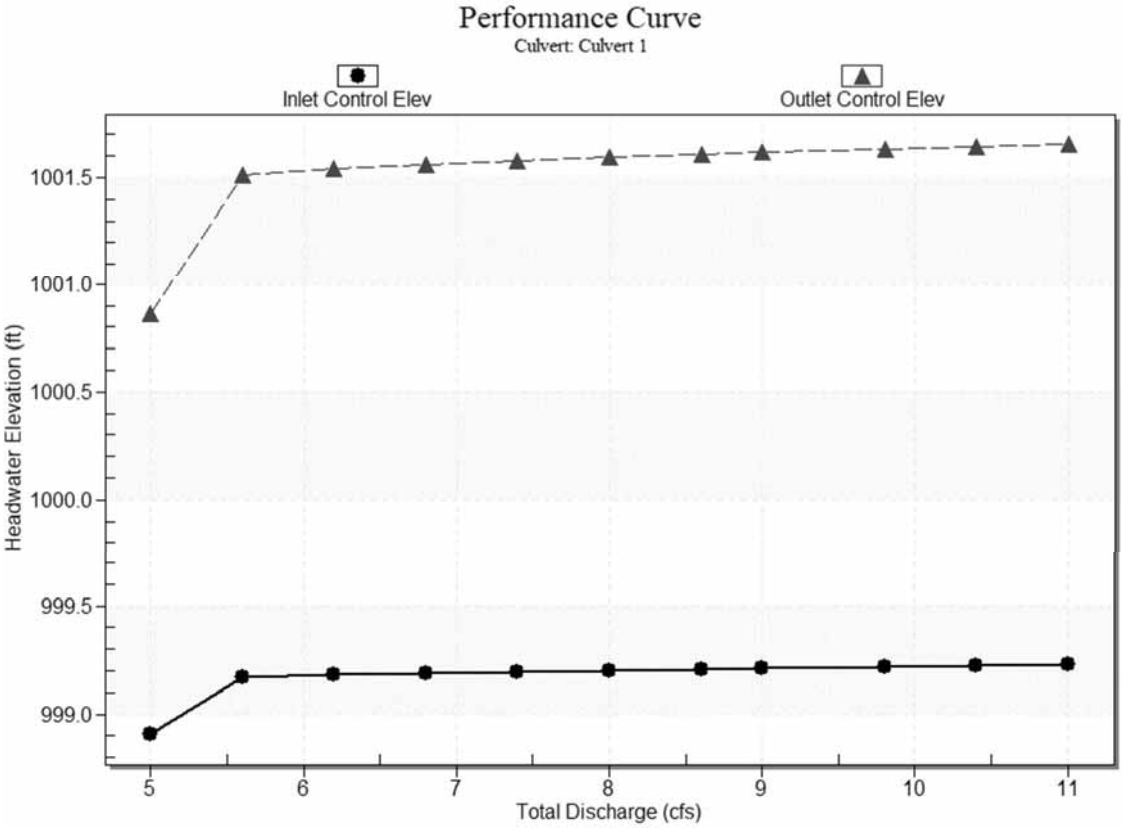
Inlet Elevation (invert): 996.68 ft,

Outlet Elevation (invert): 996.08 ft

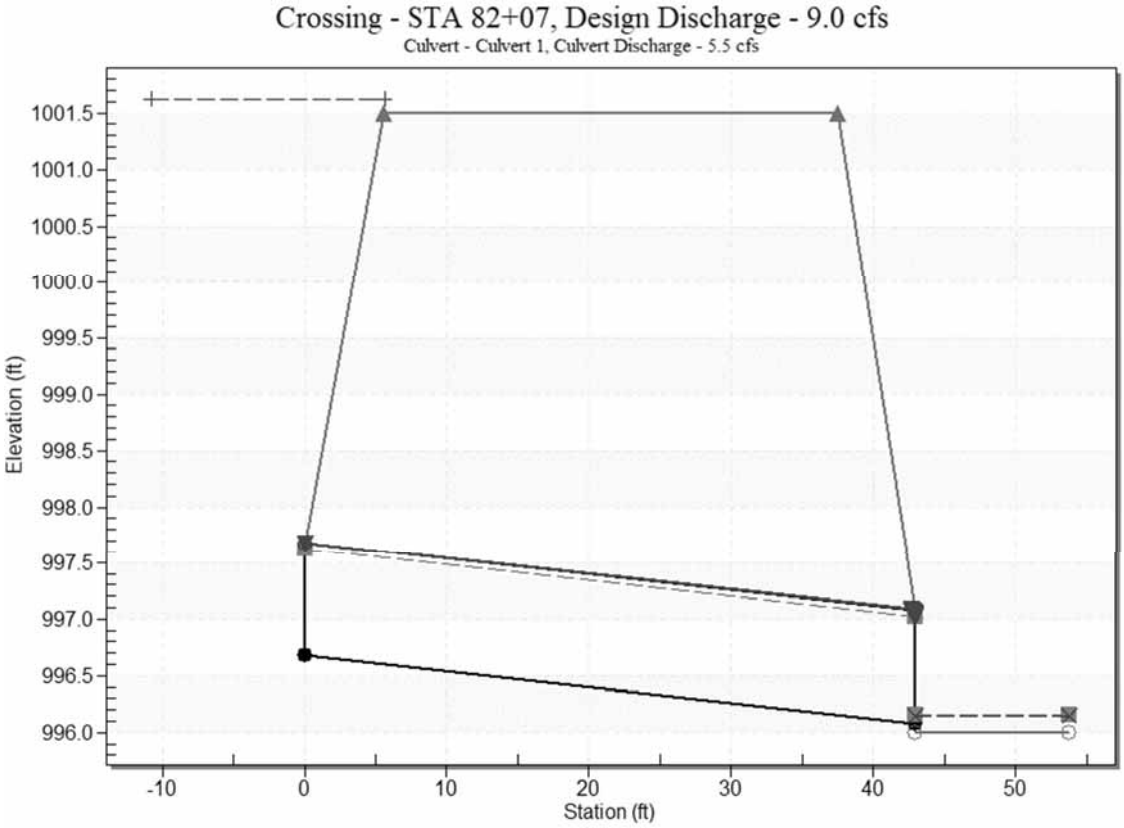
Culvert Length: 43.00 ft,

Culvert Slope: 0.0140

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 996.68 ft

Outlet Station: 43.00 ft

Outlet Elevation: 996.08 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: STA 82+07

Table 3 - Downstream Channel Rating Curve (Crossing: STA 82+07)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	996.10	0.10	2.00	0.22	1.12
5.60	996.11	0.11	2.09	0.24	1.14
6.20	996.11	0.11	2.18	0.25	1.15
6.80	996.12	0.12	2.26	0.27	1.16
7.40	996.13	0.13	2.34	0.28	1.17
8.00	996.13	0.13	2.41	0.30	1.18
8.60	996.14	0.14	2.48	0.31	1.19
9.00	996.14	0.14	2.52	0.32	1.19
9.80	996.15	0.15	2.61	0.33	1.20
10.40	996.15	0.15	2.67	0.35	1.21
11.00	996.16	0.16	2.73	0.36	1.21

Tailwater Channel Data - STA 82+07

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 25.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0360

Channel Manning's n: 0.0300

Channel Invert Elevation: 996.00 ft

Roadway Data for Crossing: STA 82+07

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 30.00 ft

Crest Elevation: 1001.50 ft

Roadway Surface: Paved

Roadway Top Width: 32.00 ft

STA 85+60 Existing
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 26.00 cfs

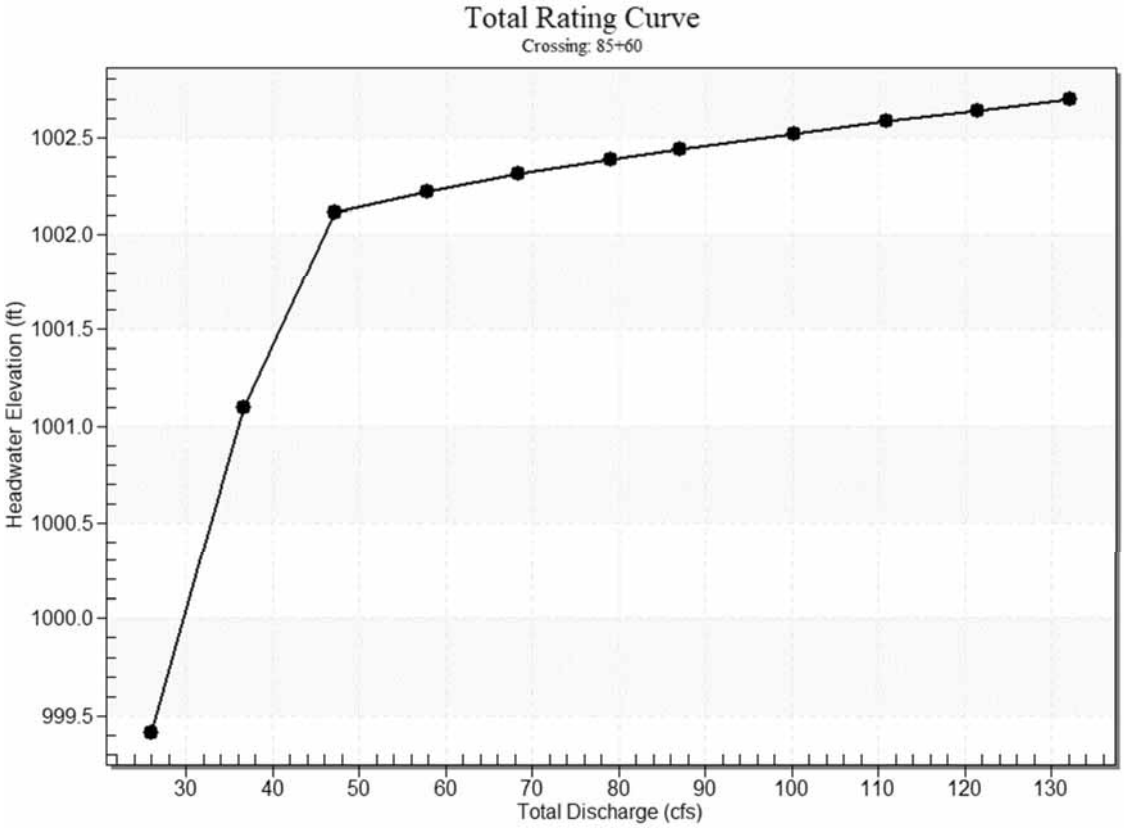
Design Flow: 87.00 cfs

Maximum Flow: 132.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: 85+60

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
999.41	26.00	26.00	0.00	1
1001.10	36.60	36.60	0.00	1
1002.11	47.20	41.63	5.48	6
1002.22	57.80	42.11	15.60	6
1002.31	68.40	42.47	25.85	5
1002.39	79.00	42.79	36.09	4
1002.44	87.00	43.00	43.95	4
1002.52	100.20	43.33	56.83	4
1002.58	110.80	43.58	67.08	3
1002.64	121.40	43.81	77.50	3
1002.70	132.00	44.03	87.91	3
1002.00	41.10	41.10	0.00	Overtopping

Rating Curve Plot for Crossing: 85+60



Culvert Data: Culvert 1

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
26.00 cfs	26.00 cfs	999.41	3.25	2.849	5-S2n	1.71	1.74	1.71	0.57	7.62	4.30
36.60 cfs	36.60 cfs	1001.10	4.94	4.305	6-FFc	2.00	2.00	2.00	0.70	9.15	4.87
47.20 cfs	41.63 cfs	1002.11	5.95	5.090	6-FFc	2.00	2.00	2.00	0.82	10.41	5.33
57.80 cfs	42.11 cfs	1002.22	6.06	5.171	6-FFc	2.00	2.00	2.00	0.92	10.53	5.73

68.40 cfs	42.47 cfs	1002.31	6.15	5.233	6-FFc	2.00	2.00	2.00	1.02	10.62	6.07
79.00 cfs	42.79 cfs	1002.39	6.23	5.286	6-FFc	2.00	2.00	2.00	1.11	10.70	6.38
87.00 cfs	43.00 cfs	1002.44	6.28	5.323	6-FFc	2.00	2.00	2.00	1.18	10.75	6.60
100.20 cfs	43.33 cfs	1002.52	6.36	5.380	6-FFc	2.00	2.00	2.00	1.28	10.83	6.92
110.80 cfs	43.58 cfs	1002.58	6.42	5.422	6-FFc	2.00	2.00	2.00	1.36	10.89	7.16
121.40 cfs	43.81 cfs	1002.64	6.48	5.463	6-FFc	2.00	2.00	2.00	1.44	10.95	7.38
132.00 cfs	44.03 cfs	1002.70	6.54	5.502	6-FFc	2.00	2.00	2.00	1.51	11.01	7.58

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

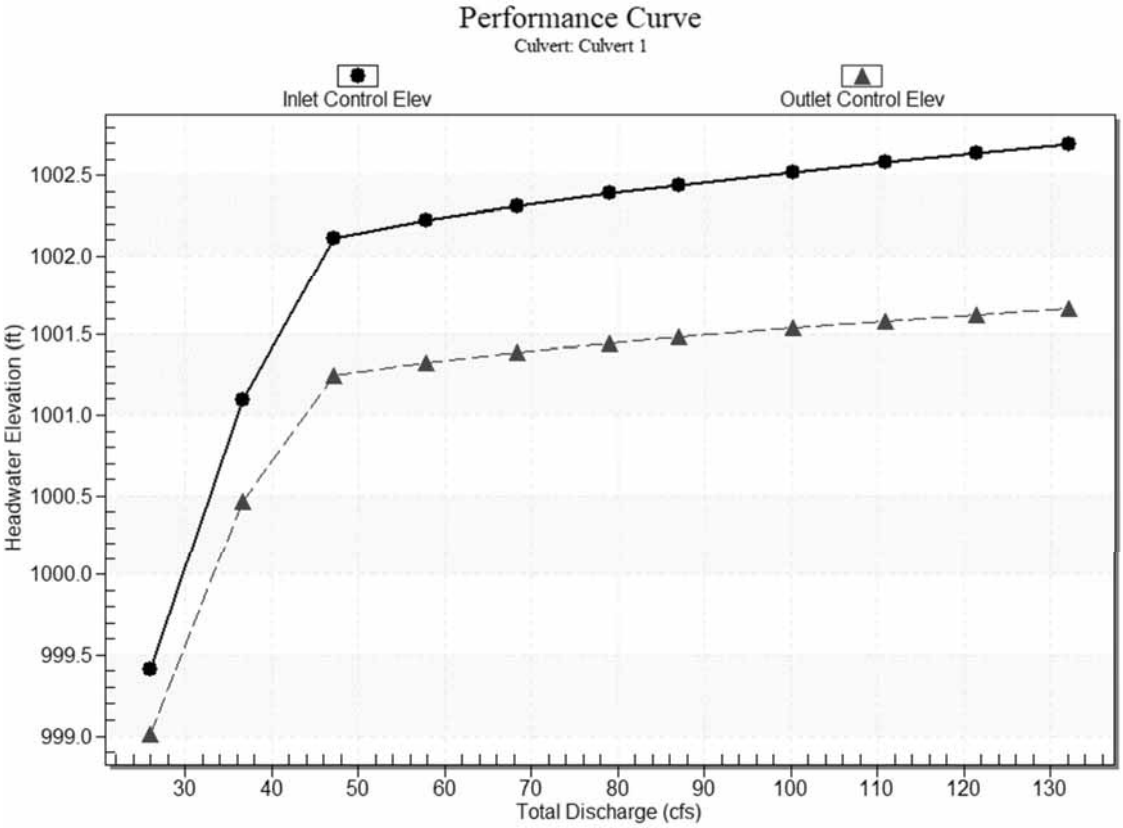
Inlet Elevation (invert): 996.16 ft,

Outlet Elevation (invert): 995.79 ft

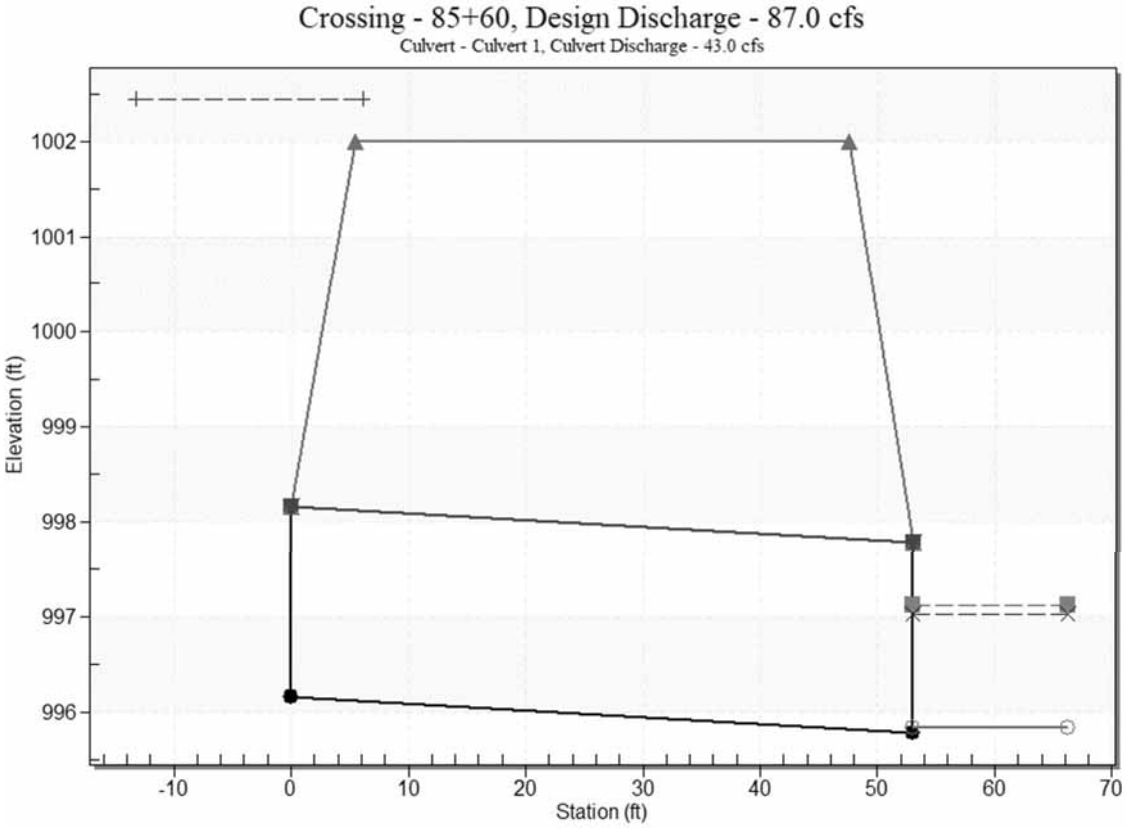
Culvert Length: 53.00 ft,

Culvert Slope: 0.0070

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 996.16 ft

Outlet Station: 53.00 ft

Outlet Elevation: 995.79 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 2.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Tailwater Data for Crossing: 85+60

Table 3 - Downstream Channel Rating Curve (Crossing: 85+60)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
26.00	996.41	0.57	4.30	1.78	1.03
36.60	996.54	0.70	4.87	2.19	1.06
47.20	996.66	0.82	5.33	2.55	1.08
57.80	996.76	0.92	5.73	2.88	1.09
68.40	996.86	1.02	6.07	3.19	1.11
79.00	996.95	1.11	6.38	3.47	1.12
87.00	997.02	1.18	6.60	3.68	1.13
100.20	997.12	1.28	6.92	4.00	1.14
110.80	997.20	1.36	7.16	4.25	1.14
121.40	997.28	1.44	7.38	4.49	1.15
132.00	997.35	1.51	7.58	4.72	1.16

Tailwater Channel Data - 85+60

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 1.00 (_:1)

Channel Slope: 0.0500

Channel Manning's n: 0.0500

Channel Invert Elevation: 995.84 ft

Roadway Data for Crossing: 85+60

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 1002.00 ft

Roadway Surface: Paved

Roadway Top Width: 42.00 ft

DRAINAGE REPORT

Proposed

HY-8 Reports

Proposed STA 1+50
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.50 cfs

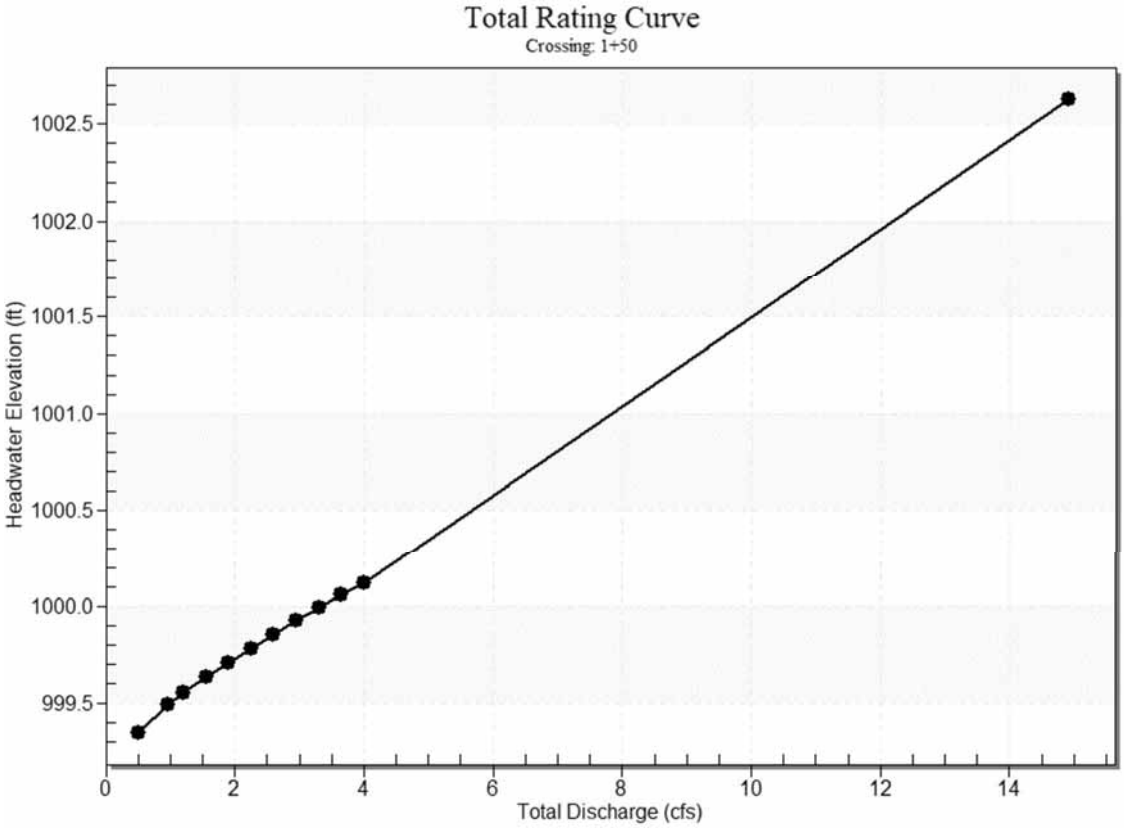
Design Flow: 0.97 cfs

Maximum Flow: 4.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: 1+50

Headwater Elevation (ft)	Total Discharge (cfs)	18 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
999.35	0.50	0.50	0.00	1
999.50	0.97	0.97	0.00	1
999.55	1.20	1.20	0.00	1
999.63	1.55	1.55	0.00	1
999.71	1.90	1.90	0.00	1
999.78	2.25	2.25	0.00	1
999.86	2.60	2.60	0.00	1
999.93	2.95	2.95	0.00	1
999.99	3.30	3.30	0.00	1
1000.06	3.65	3.65	0.00	1
1000.12	4.00	4.00	0.00	1
1002.60	14.34	14.34	0.00	Overtopping

Rating Curve Plot for Crossing: 1+50



Culvert Data: 18

Table 2 - Culvert Summary Table: 18

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.50 cfs	0.50 cfs	999.35	0.35	0.0*	1-S2n	0.18	0.26	0.18	0.10	4.08	0.79
0.97 cfs	0.97 cfs	999.50	0.50	0.0*	1-S2n	0.25	0.37	0.25	0.15	4.96	1.02
1.20 cfs	1.20 cfs	999.55	0.55	0.0*	1-S2n	0.28	0.41	0.28	0.17	5.28	1.10
1.55 cfs	1.55 cfs	999.63	0.63	0.0*	1-S2n	0.32	0.47	0.32	0.20	5.69	1.21

1.90 cfs	1.90 cfs	999.71	0.71	0.0*	1-S2 n	0.35	0.52	0.35	0.23	6.03	1.30
2.25 cfs	2.25 cfs	999.78	0.78	0.0*	1-S2 n	0.38	0.57	0.38	0.25	6.32	1.39
2.60 cfs	2.60 cfs	999.86	0.86	0.0*	1-S2 n	0.41	0.61	0.41	0.27	6.60	1.46
2.95 cfs	2.95 cfs	999.93	0.93	0.0*	1-S2 n	0.44	0.65	0.44	0.29	6.85	1.53
3.30 cfs	3.30 cfs	999.99	0.99	0.0*	1-S2 n	0.47	0.69	0.47	0.31	7.06	1.59
3.65 cfs	3.65 cfs	1000.06	1.06	0.0*	1-S2 n	0.49	0.73	0.49	0.33	7.20	1.65
4.00 cfs	4.00 cfs	1000.12	1.12	0.0*	1-S2 n	0.51	0.77	0.51	0.35	7.46	1.70

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

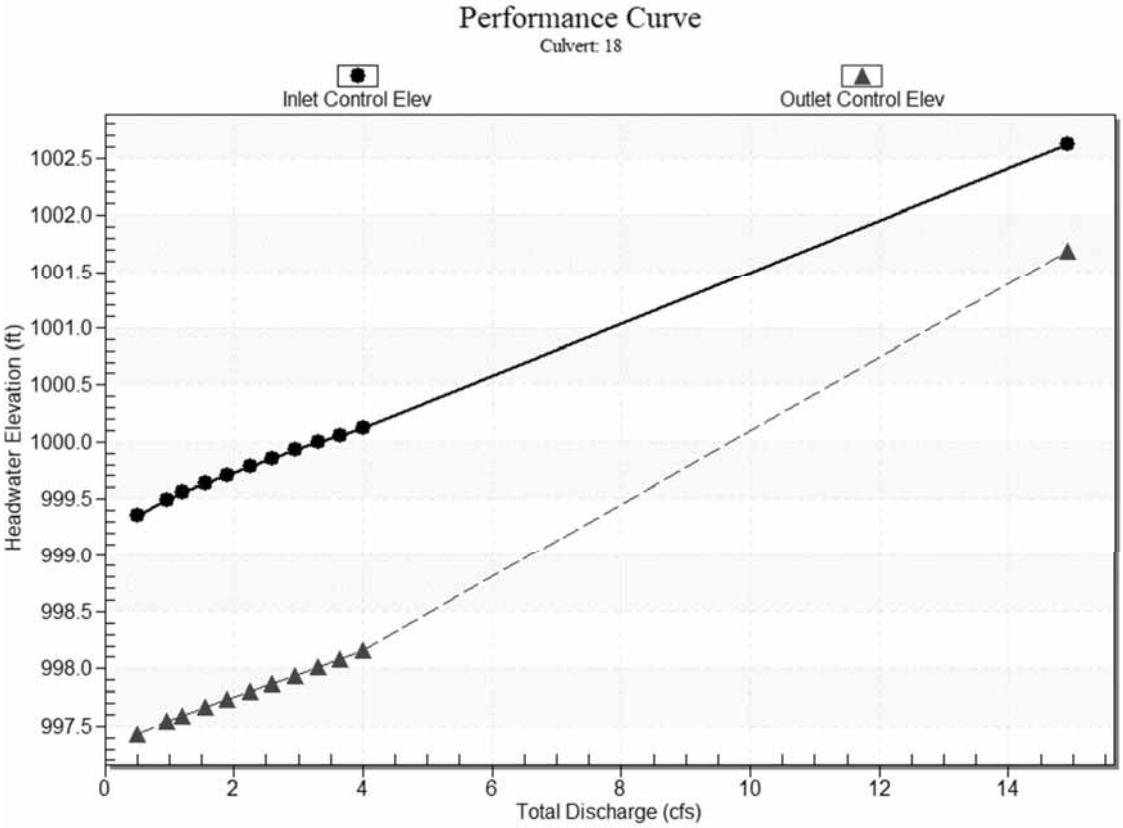
Inlet Elevation (invert): 999.00 ft,

Outlet Elevation (invert): 997.16 ft

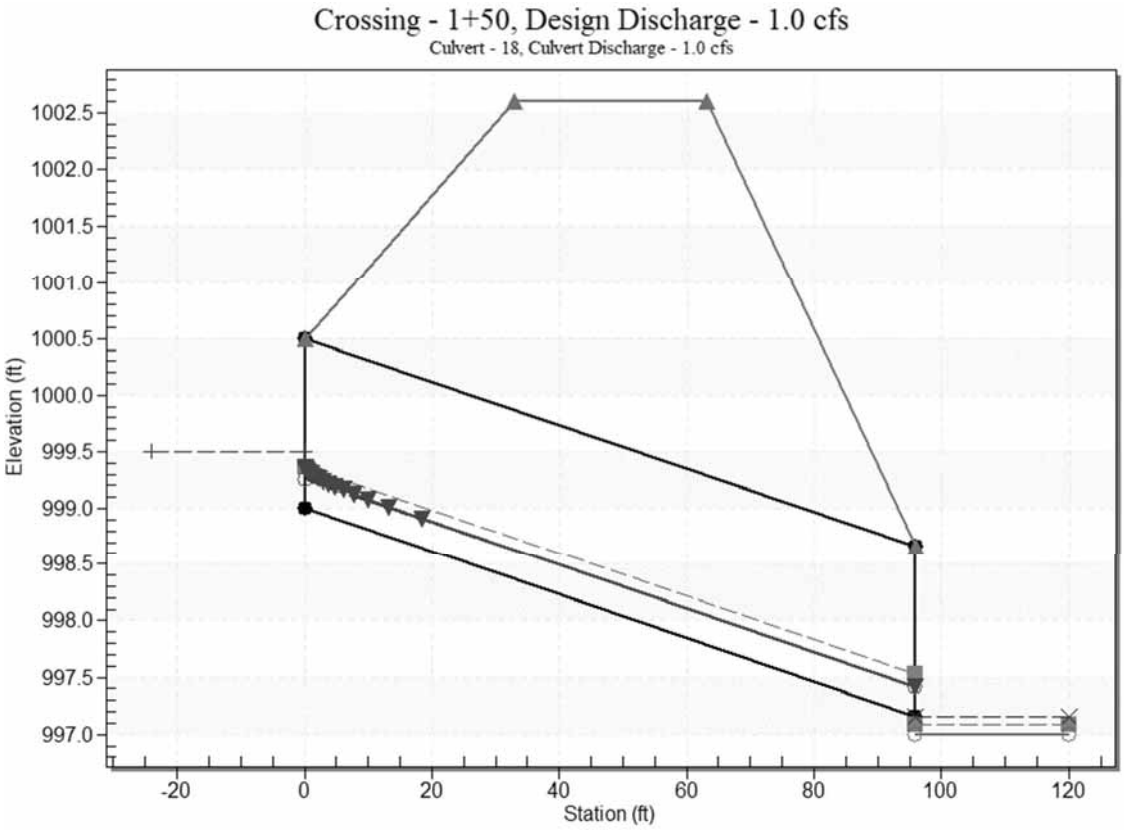
Culvert Length: 96.02 ft,

Culvert Slope: 0.0192

Culvert Performance Curve Plot: 18



Water Surface Profile Plot for Culvert: 18



Site Data - 18

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 999.00 ft

Outlet Station: 96.00 ft

Outlet Elevation: 997.16 ft

Number of Barrels: 1

Culvert Data Summary - 18

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: 1+50

Table 3 - Downstream Channel Rating Curve (Crossing: 1+50)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.50	997.10	0.10	0.79	0.06	0.44
0.97	997.15	0.15	1.02	0.09	0.47
1.20	997.17	0.17	1.10	0.11	0.48
1.55	997.20	0.20	1.21	0.12	0.49
1.90	997.23	0.23	1.30	0.14	0.50
2.25	997.25	0.25	1.39	0.16	0.51
2.60	997.27	0.27	1.46	0.17	0.51
2.95	997.29	0.29	1.53	0.18	0.52
3.30	997.31	0.31	1.59	0.20	0.52
3.65	997.33	0.33	1.65	0.21	0.53
4.00	997.35	0.35	1.70	0.22	0.53

Tailwater Channel Data - 1+50

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 6.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0400

Channel Invert Elevation: 997.00 ft

Roadway Data for Crossing: 1+50

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 40.00 ft

Crest Elevation: 1002.60 ft

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

STA 15+33
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 5.00 cfs

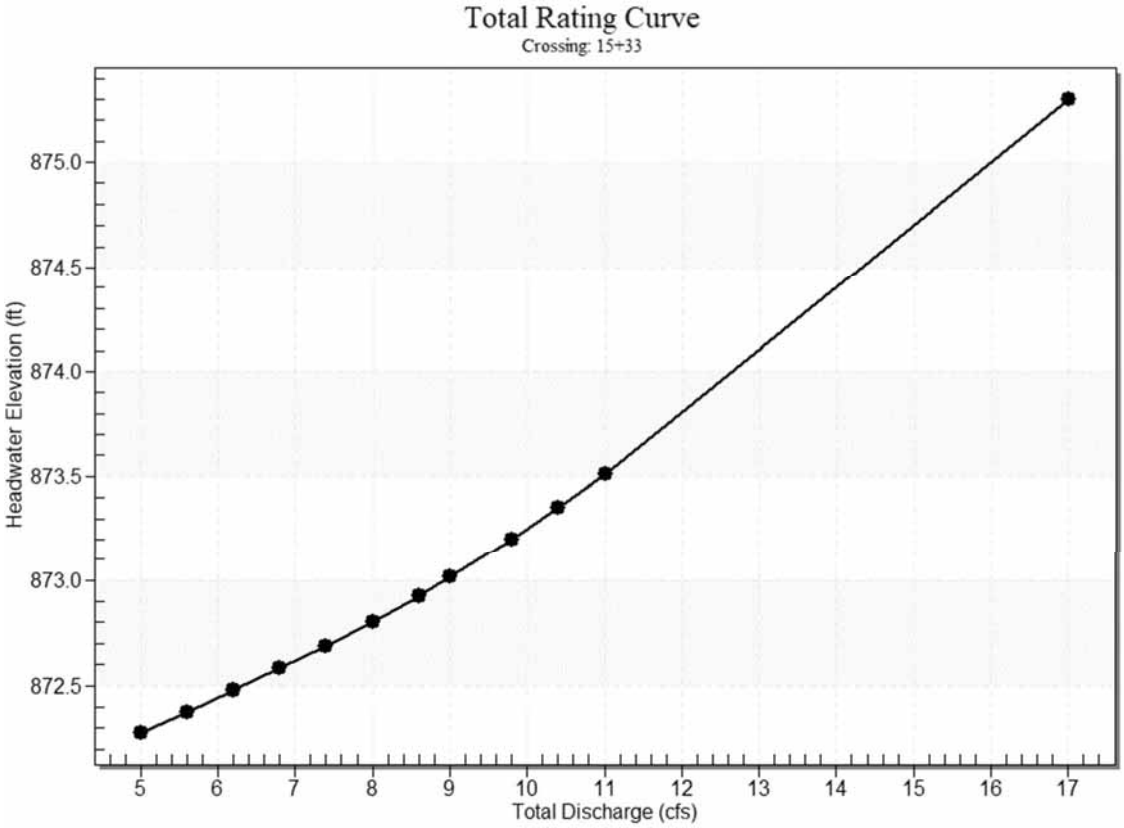
Design Flow: 9.00 cfs

Maximum Flow: 11.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: 15+33

Headwater Elevation (ft)	Total Discharge (cfs)	18 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
872.28	5.00	5.00	0.00	1
872.38	5.60	5.60	0.00	1
872.48	6.20	6.20	0.00	1
872.58	6.80	6.80	0.00	1
872.69	7.40	7.40	0.00	1
872.80	8.00	8.00	0.00	1
872.93	8.60	8.60	0.00	1
873.01	9.00	9.00	0.00	1
873.20	9.80	9.80	0.00	1
873.35	10.40	10.40	0.00	1
873.51	11.00	11.00	0.00	1
875.23	15.98	15.98	0.00	Overtopping

Rating Curve Plot for Crossing: 15+33



Culvert Data: 18

Table 2 - Culvert Summary Table: 18

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5.00 cfs	5.00 cfs	872.28	1.28	0.0*	1-S2n	0.52	0.86	0.54	0.21	8.68	2.73
5.60 cfs	5.60 cfs	872.38	1.38	0.0*	1-S2n	0.55	0.91	0.58	0.22	8.90	2.84
6.20 cfs	6.20 cfs	872.48	1.48	0.079	1-S2n	0.58	0.96	0.62	0.24	9.09	2.95
6.80 cfs	6.80 cfs	872.58	1.58	0.210	5-S2n	0.61	1.01	0.65	0.25	9.28	3.05

7.40 cfs	7.40 cfs	872.69	1.69	0.347	5-S2n	0.64	1.05	0.68	0.26	9.45	3.14
8.00 cfs	8.00 cfs	872.80	1.80	0.489	5-S2n	0.67	1.10	0.72	0.27	9.61	3.22
8.60 cfs	8.60 cfs	872.93	1.93	0.819	5-S2n	0.70	1.14	0.75	0.28	9.76	3.31
9.00 cfs	9.00 cfs	873.01	2.01	0.908	5-S2n	0.71	1.16	0.77	0.29	9.86	3.36
9.80 cfs	9.80 cfs	873.20	2.20	1.095	5-S2n	0.75	1.21	0.81	0.31	10.04	3.46
10.40 cfs	10.40 cfs	873.35	2.35	1.242	5-S2n	0.78	1.24	0.84	0.32	10.18	3.53
11.00 cfs	11.00 cfs	873.51	2.51	1.396	5-S2n	0.80	1.27	0.87	0.33	10.31	3.60

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

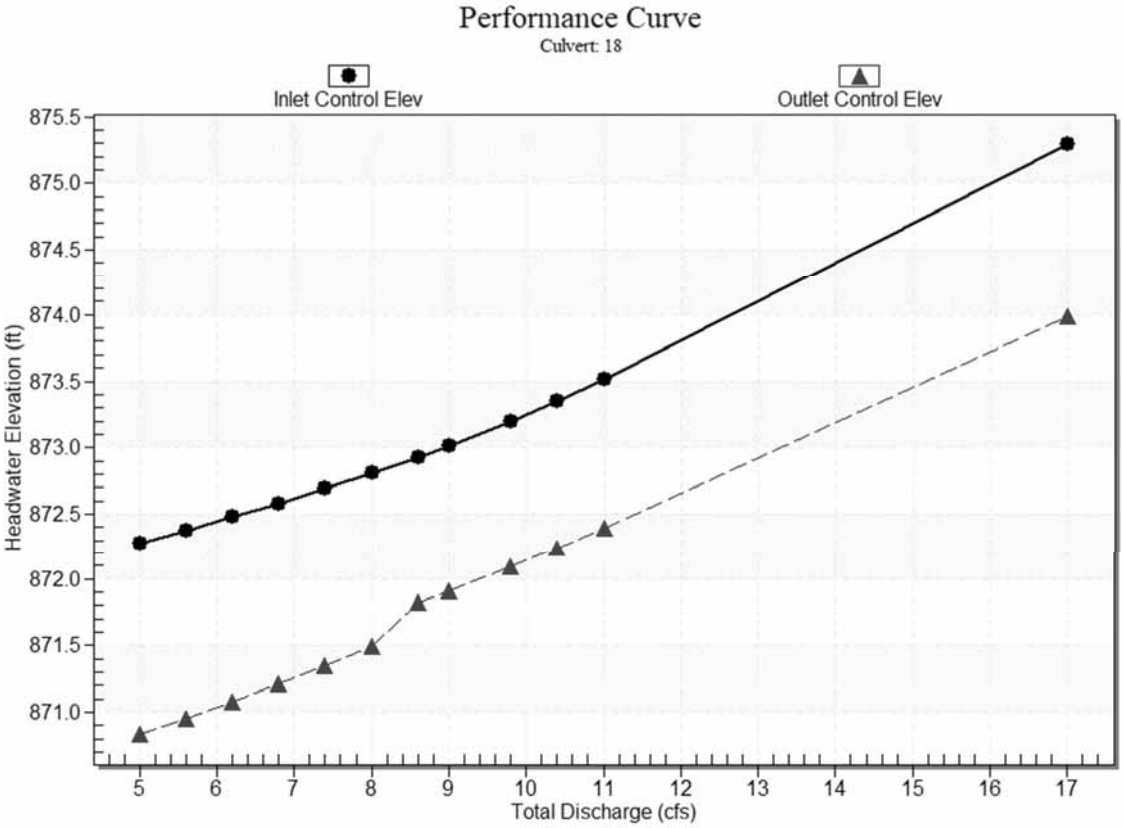
Inlet Elevation (invert): 871.00 ft,

Outlet Elevation (invert): 869.70 ft

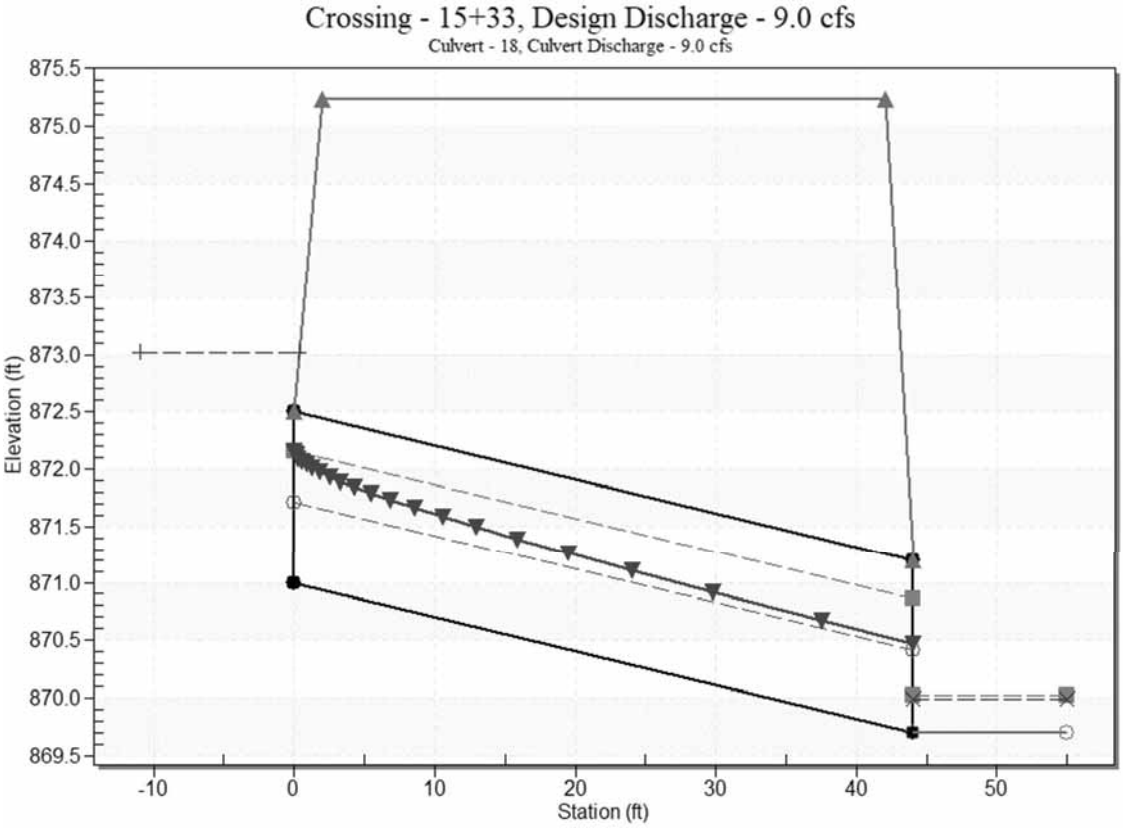
Culvert Length: 44.02 ft,

Culvert Slope: 0.0295

Culvert Performance Curve Plot: 18



Water Surface Profile Plot for Culvert: 18



Site Data - 18

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 871.00 ft

Outlet Station: 44.00 ft

Outlet Elevation: 869.70 ft

Number of Barrels: 1

Culvert Data Summary - 18

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: 15+33

Table 3 - Downstream Channel Rating Curve (Crossing: 15+33)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	869.91	0.21	2.73	0.65	1.11
5.60	869.92	0.22	2.84	0.69	1.12
6.20	869.94	0.24	2.95	0.73	1.13
6.80	869.95	0.25	3.05	0.77	1.14
7.40	869.96	0.26	3.14	0.81	1.14
8.00	869.97	0.27	3.22	0.85	1.15
8.60	869.98	0.28	3.31	0.89	1.16
9.00	869.99	0.29	3.36	0.91	1.16
9.80	870.01	0.31	3.46	0.96	1.17
10.40	870.02	0.32	3.53	0.99	1.18
11.00	870.03	0.33	3.60	1.02	1.18

Tailwater Channel Data - 15+33

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0500

Channel Manning's n: 0.0400

Channel Invert Elevation: 869.70 ft

Roadway Data for Crossing: 15+33

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 16.00 ft

Crest Elevation: 875.23 ft

Roadway Surface: Paved

Roadway Top Width: 40.00 ft

Sta. 43+76 (Split Flow w/ 46+65) HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 9.00 cfs

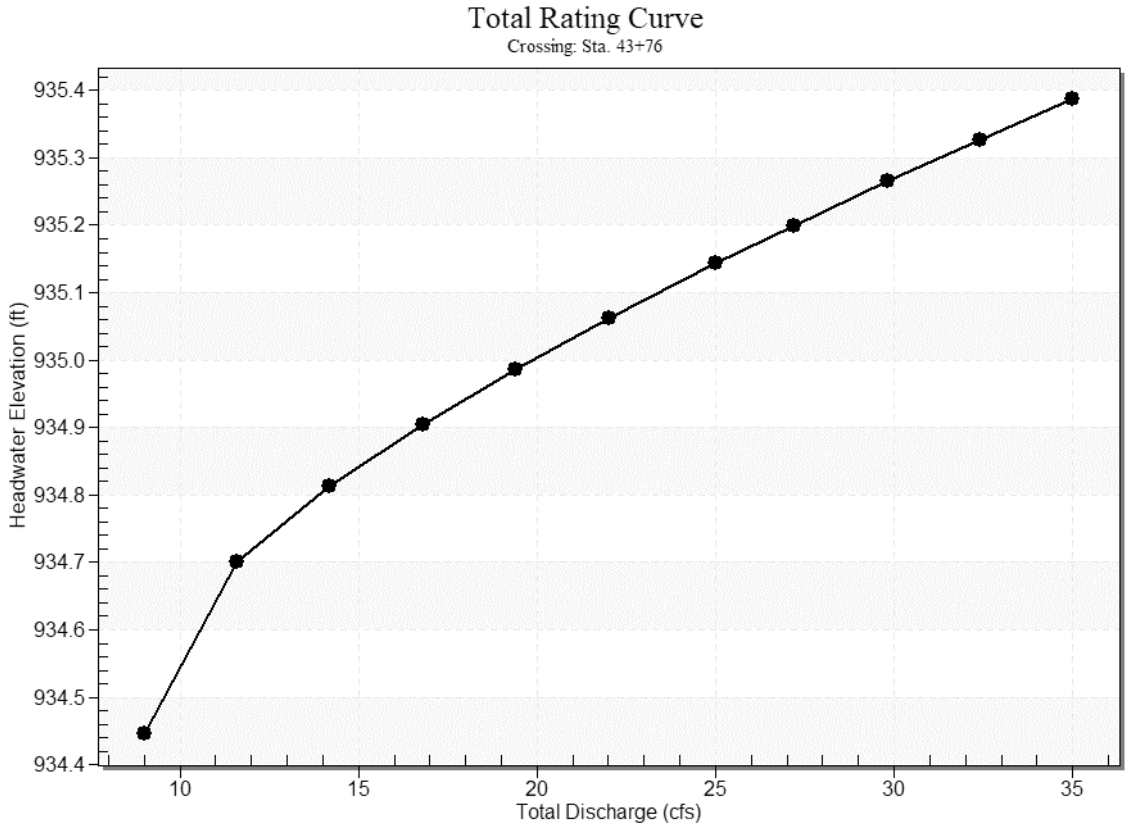
Design Flow: 25.00 cfs

Maximum Flow: 35.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: Sta. 43+76

Headwater Elevation (ft)	Total Discharge (cfs)	12 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
934.45	9.00	9.00	0.00	1
934.70	11.60	9.83	1.74	8
934.81	14.20	10.18	4.01	6
934.90	16.80	10.45	6.33	5
934.99	19.40	10.69	8.69	4
935.06	22.00	10.90	11.08	4
935.14	25.00	11.13	13.86	4
935.20	27.20	11.28	15.88	3
935.26	29.80	11.46	18.31	3
935.33	32.40	11.63	20.76	3
935.39	35.00	11.78	23.21	3
934.55	9.35	9.35	0.00	Overtopping

Rating Curve Plot for Crossing: Sta. 43+76



Culvert Data: 12

Table 2 - Culvert Summary Table: 12

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
9.00 cfs	9.00 cfs	934.45	1.95	0.819	5-S2n	0.59	0.89	0.61	0.27	9.00	1.44
11.60 cfs	9.83 cfs	934.70	2.20	1.106	5-S2n	0.62	0.91	0.65	0.31	9.17	1.58
14.20 cfs	10.18 cfs	934.81	2.31	1.230	5-S2n	0.64	0.92	0.66	0.35	9.25	1.69
16.80 cfs	10.45 cfs	934.90	2.40	1.332	5-S2n	0.65	0.93	0.67	0.38	9.31	1.79

19.40 cfs	10.69 cfs	934.99	2.49	1.422	5-S2n	0.66	0.93	0.68	0.42	9.34	1.88
22.00 cfs	10.90 cfs	935.06	2.56	1.505	5-S2n	0.67	0.94	0.69	0.45	9.38	1.96
25.00 cfs	11.13 cfs	935.14	2.64	1.596	5-S2n	0.68	0.94	0.70	0.48	9.43	2.05
27.20 cfs	11.28 cfs	935.20	2.70	1.657	5-S2n	0.69	0.94	0.71	0.50	9.45	2.11
29.80 cfs	11.46 cfs	935.26	2.76	1.728	5-S2n	0.69	0.95	0.72	0.53	9.48	2.17
32.40 cfs	11.63 cfs	935.33	2.83	1.797	5-S2n	0.70	0.95	0.73	0.56	9.51	2.23
35.00 cfs	11.78 cfs	935.39	2.89	1.862	5-S2n	0.71	0.95	0.73	0.58	9.53	2.29

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

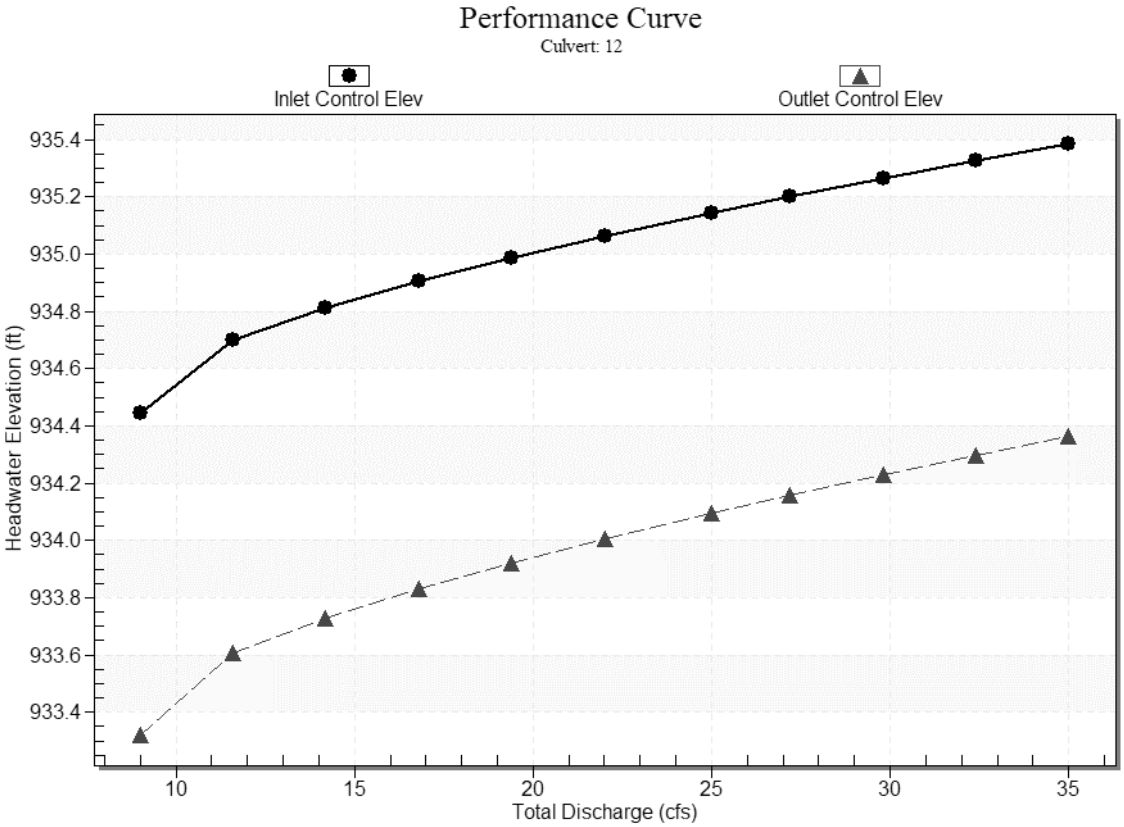
Inlet Elevation (invert): 932.50 ft,

Outlet Elevation (invert): 930.96 ft

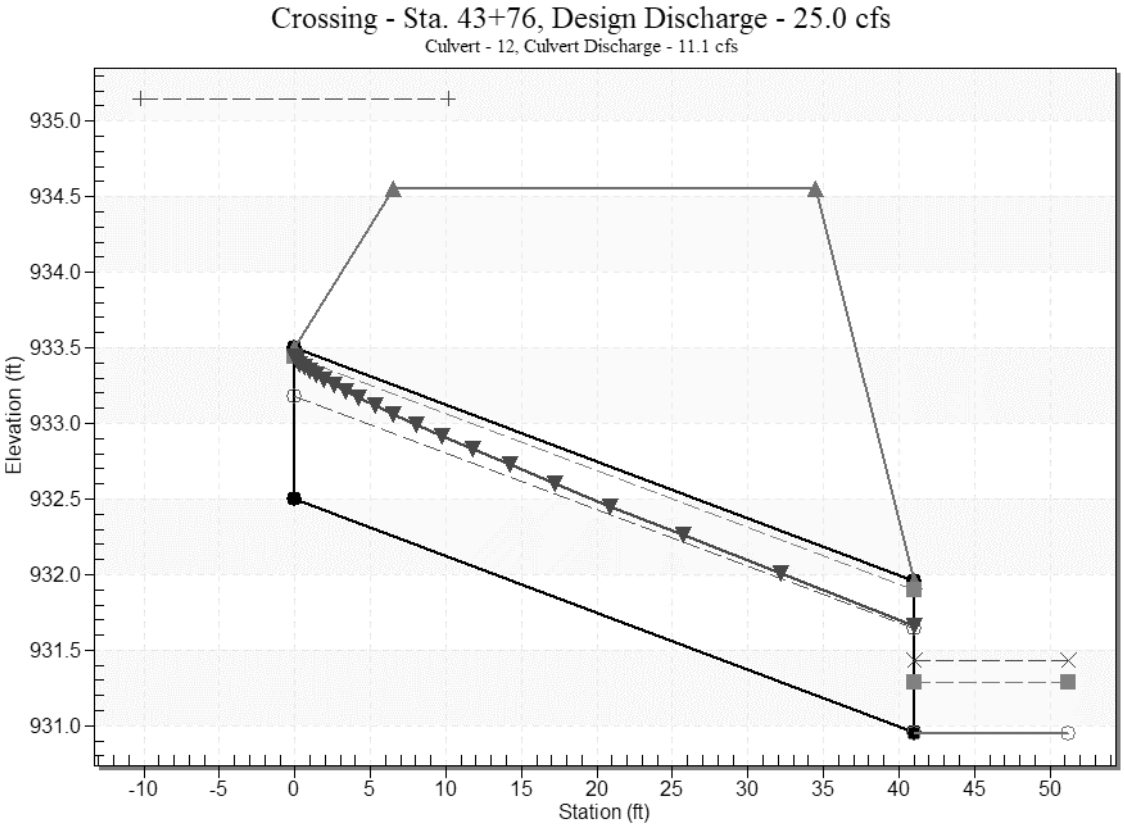
Culvert Length: 41.03 ft,

Culvert Slope: 0.0376

Culvert Performance Curve Plot: 12



Water Surface Profile Plot for Culvert: 12



Site Data - 12

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 932.50 ft

Outlet Station: 41.00 ft

Outlet Elevation: 930.96 ft

Number of Barrels: 2

Culvert Data Summary - 12

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: Sta. 43+76

Table 3 - Downstream Channel Rating Curve (Crossing: Sta. 43+76)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
9.00	931.22	0.27	1.44	0.17	0.52
11.60	931.26	0.31	1.58	0.19	0.53
14.20	931.30	0.35	1.69	0.22	0.54
16.80	931.33	0.38	1.79	0.24	0.55
19.40	931.37	0.42	1.88	0.26	0.55
22.00	931.40	0.45	1.96	0.28	0.56
25.00	931.43	0.48	2.05	0.30	0.56
27.20	931.45	0.50	2.11	0.32	0.57
29.80	931.48	0.53	2.17	0.33	0.57
32.40	931.51	0.56	2.23	0.35	0.58
35.00	931.53	0.58	2.29	0.36	0.58

Tailwater Channel Data - Sta. 43+76

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 21.00 ft

Side Slope (H:V): 9.00 (_:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0400

Channel Invert Elevation: 930.95 ft

Roadway Data for Crossing: Sta. 43+76

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 ft

Crest Elevation: 934.55 ft

Roadway Surface: Paved

Roadway Top Width: 28.00 ft

Sta 46+65 (Split Flow w/ Sta 43+76) HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 9.00 cfs

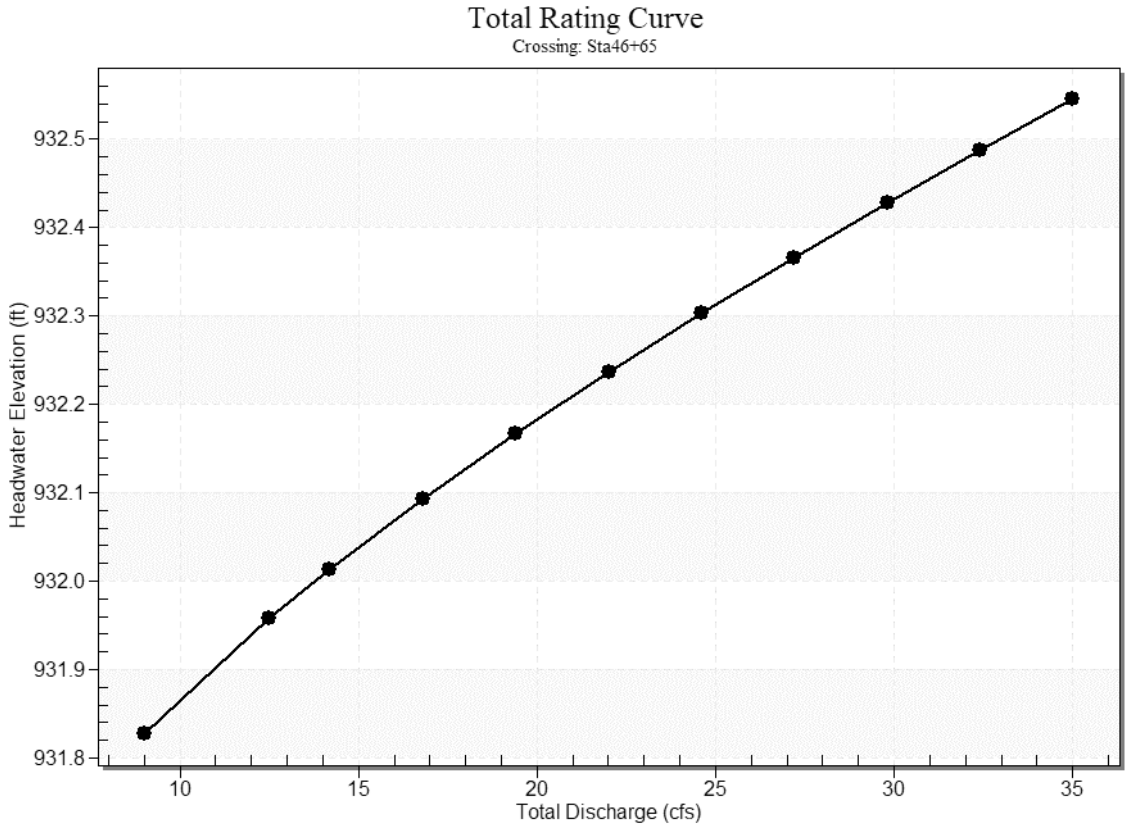
Design Flow: 12.50 cfs

Maximum Flow: 35.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: Sta46+65

Headwater Elevation (ft)	Total Discharge (cfs)	12 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
931.83	9.00	5.29	3.68	9
931.96	12.50	5.48	7.00	5
932.01	14.20	5.55	8.62	4
932.09	16.80	5.66	11.12	4
932.17	19.40	5.76	13.63	4
932.24	22.00	5.86	16.14	4
932.30	24.60	5.94	18.63	3
932.37	27.20	6.02	21.16	3
932.43	29.80	6.10	23.69	3
932.49	32.40	6.17	26.22	3
932.55	35.00	6.24	28.76	3
931.58	4.92	4.92	0.00	Overtopping

Rating Curve Plot for Crossing: Sta46+65



Culvert Data: 12

Table 2 - Culvert Summary Table: 12

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
9.00 cfs	5.29 cfs	931.83	2.43	0.0*	5-S2n	0.51	0.93	0.53	0.79	12.39	1.78
12.50 cfs	5.48 cfs	931.96	2.56	0.0*	5-S2n	0.52	0.94	0.55	0.94	12.49	1.96
14.20 cfs	5.55 cfs	932.01	2.61	0.0*	5-S2n	0.52	0.94	0.55	1.00	12.53	2.03
16.80 cfs	5.66 cfs	932.09	2.69	0.0*	5-S2n	0.53	0.95	0.56	1.09	12.59	2.12

19.40 cfs	5.76 cfs	932.17	2.77	0.083	5-S2n	0.54	0.95	0.56	1.17	12.65	2.21
22.00 cfs	5.86 cfs	932.24	2.84	0.233	5-S2n	0.54	0.95	0.57	1.24	12.70	2.28
24.60 cfs	5.94 cfs	932.30	2.90	0.374	5-S2n	0.55	0.95	0.57	1.32	12.75	2.35
27.20 cfs	6.02 cfs	932.37	2.97	0.509	5-S2n	0.55	0.95	0.58	1.38	12.79	2.42
29.80 cfs	6.10 cfs	932.43	3.03	0.638	5-S2n	0.55	0.94	0.58	1.44	12.79	2.48
32.40 cfs	6.17 cfs	932.49	3.09	0.759	5-S2n	0.56	0.92	0.59	1.50	12.85	2.53
35.00 cfs	6.24 cfs	932.55	3.15	0.875	5-S2n	0.56	0.92	0.59	1.56	12.88	2.59

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

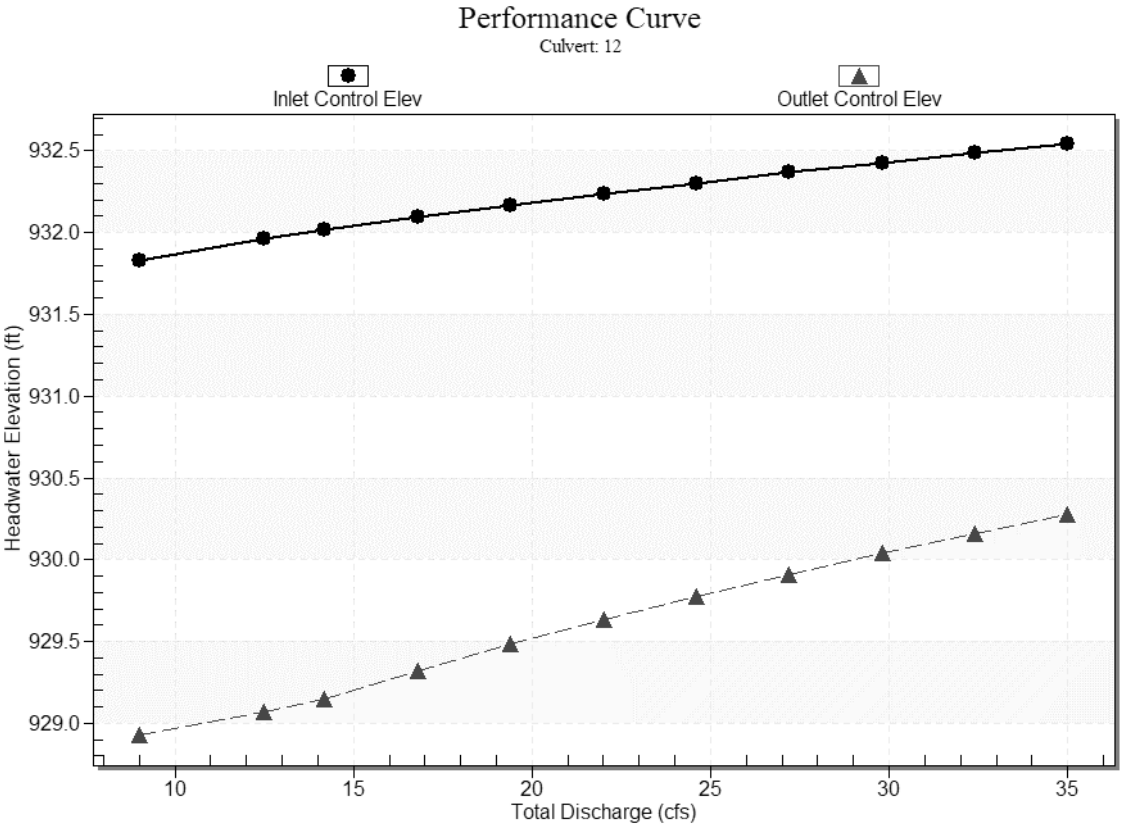
Inlet Elevation (invert): 929.40 ft,

Outlet Elevation (invert): 926.00 ft

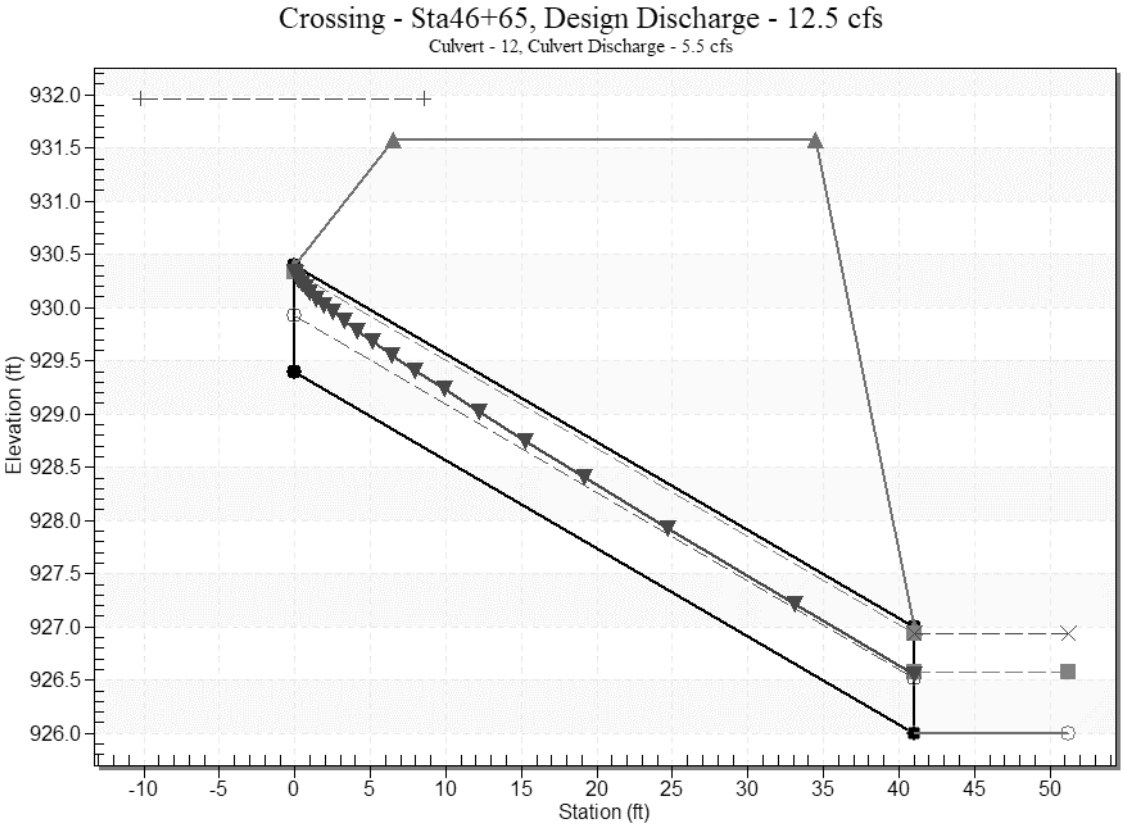
Culvert Length: 41.14 ft,

Culvert Slope: 0.0829

Culvert Performance Curve Plot: 12



Water Surface Profile Plot for Culvert: 12



Site Data - 12

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 929.40 ft

Outlet Station: 41.00 ft

Outlet Elevation: 926.00 ft

Number of Barrels: 1

Culvert Data Summary - 12

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: Sta46+65

Table 3 - Downstream Channel Rating Curve (Crossing: Sta46+65)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
9.00	926.79	0.79	1.78	0.25	0.41
12.50	926.94	0.94	1.96	0.29	0.42
14.20	927.00	1.00	2.03	0.31	0.43
16.80	927.09	1.09	2.12	0.34	0.43
19.40	927.17	1.17	2.21	0.36	0.44
22.00	927.24	1.24	2.28	0.39	0.44
24.60	927.32	1.32	2.35	0.41	0.44
27.20	927.38	1.38	2.42	0.43	0.45
29.80	927.44	1.44	2.48	0.45	0.45
32.40	927.50	1.50	2.53	0.47	0.45
35.00	927.56	1.56	2.59	0.49	0.45

Tailwater Channel Data - Sta46+65

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 4.00 ft

Side Slope (H:V): 3.00 (_:1)

Channel Slope: 0.0050

Channel Manning's n: 0.0400

Channel Invert Elevation: 926.00 ft

Roadway Data for Crossing: Sta46+65

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 ft

Crest Elevation: 931.58 ft

Roadway Surface: Paved

Roadway Top Width: 28.00 ft

Proposed STA 82+07
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 5.00 cfs

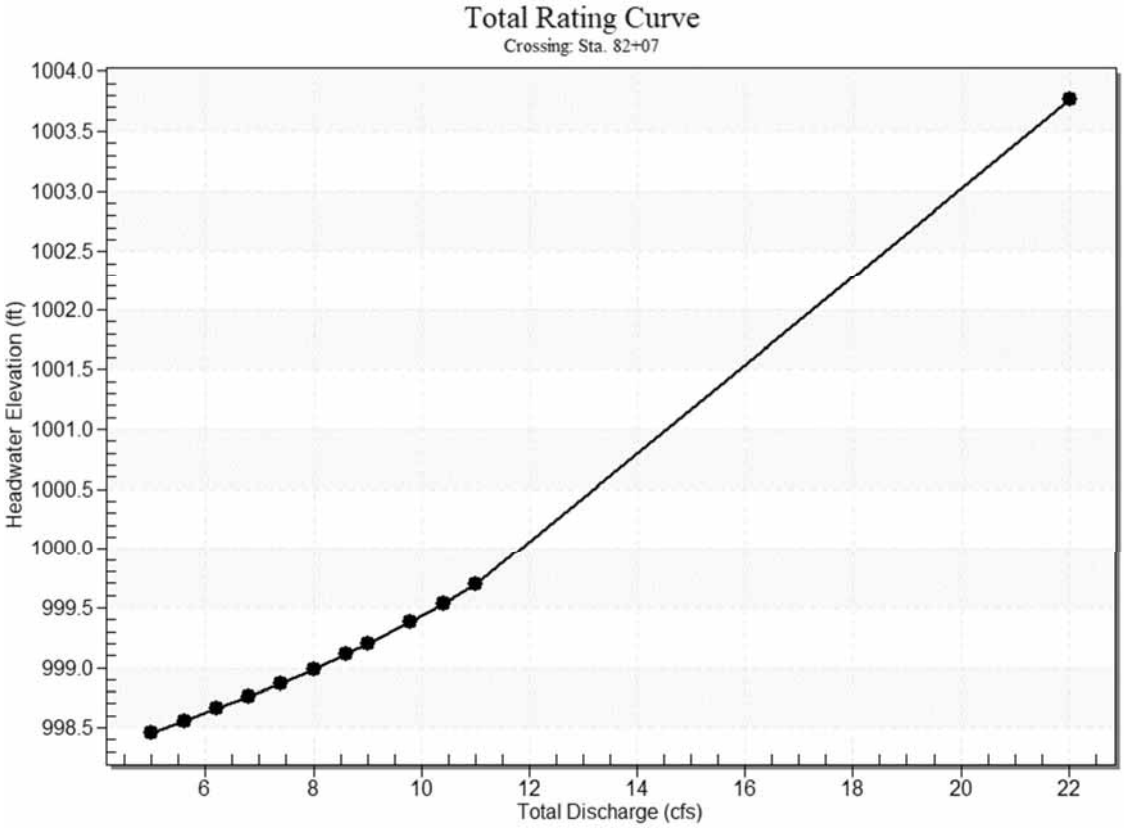
Design Flow: 9.00 cfs

Maximum Flow: 11.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: Sta. 82+07

Headwater Elevation (ft)	Total Discharge (cfs)	18 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
998.46	5.00	5.00	0.00	1
998.56	5.60	5.60	0.00	1
998.66	6.20	6.20	0.00	1
998.76	6.80	6.80	0.00	1
998.87	7.40	7.40	0.00	1
998.99	8.00	8.00	0.00	1
999.11	8.60	8.60	0.00	1
999.20	9.00	9.00	0.00	1
999.38	9.80	9.80	0.00	1
999.53	10.40	10.40	0.00	1
999.69	11.00	11.00	0.00	1
1003.70	20.61	20.61	0.00	Overtopping

Rating Curve Plot for Crossing: Sta. 82+07



Culvert Data: 18

Table 2 - Culvert Summary Table: 18

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5.00 cfs	5.00 cfs	998.46	1.29	0.549	1-S2n	0.64	0.86	0.66	0.10	6.70	2.00
5.60 cfs	5.60 cfs	998.56	1.39	0.670	1-S2n	0.68	0.91	0.70	0.11	6.89	2.09
6.20 cfs	6.20 cfs	998.66	1.49	0.796	1-S2n	0.72	0.96	0.75	0.11	7.06	2.18
6.80 cfs	6.80 cfs	998.76	1.59	0.927	5-S2n	0.76	1.01	0.79	0.12	7.22	2.26

7.40 cfs	7.40 cfs	998.87	1.70	1.063	5-S2n	0.80	1.05	0.83	0.13	7.37	2.34
8.00 cfs	8.00 cfs	998.99	1.82	1.204	5-S2n	0.84	1.10	0.87	0.13	7.51	2.41
8.60 cfs	8.60 cfs	999.11	1.94	1.534	5-S2n	0.88	1.14	0.91	0.14	7.64	2.48
9.00 cfs	9.00 cfs	999.20	2.03	1.622	5-S2n	0.91	1.16	0.94	0.14	7.72	2.52
9.80 cfs	9.80 cfs	999.38	2.21	1.807	5-S2n	0.96	1.21	0.99	0.15	7.88	2.61
10.40 cfs	10.40 cfs	999.53	2.36	1.954	5-S2n	1.00	1.24	1.03	0.15	8.00	2.67
11.00 cfs	11.00 cfs	999.69	2.52	2.107	5-S2n	1.04	1.27	1.08	0.16	8.10	2.73

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

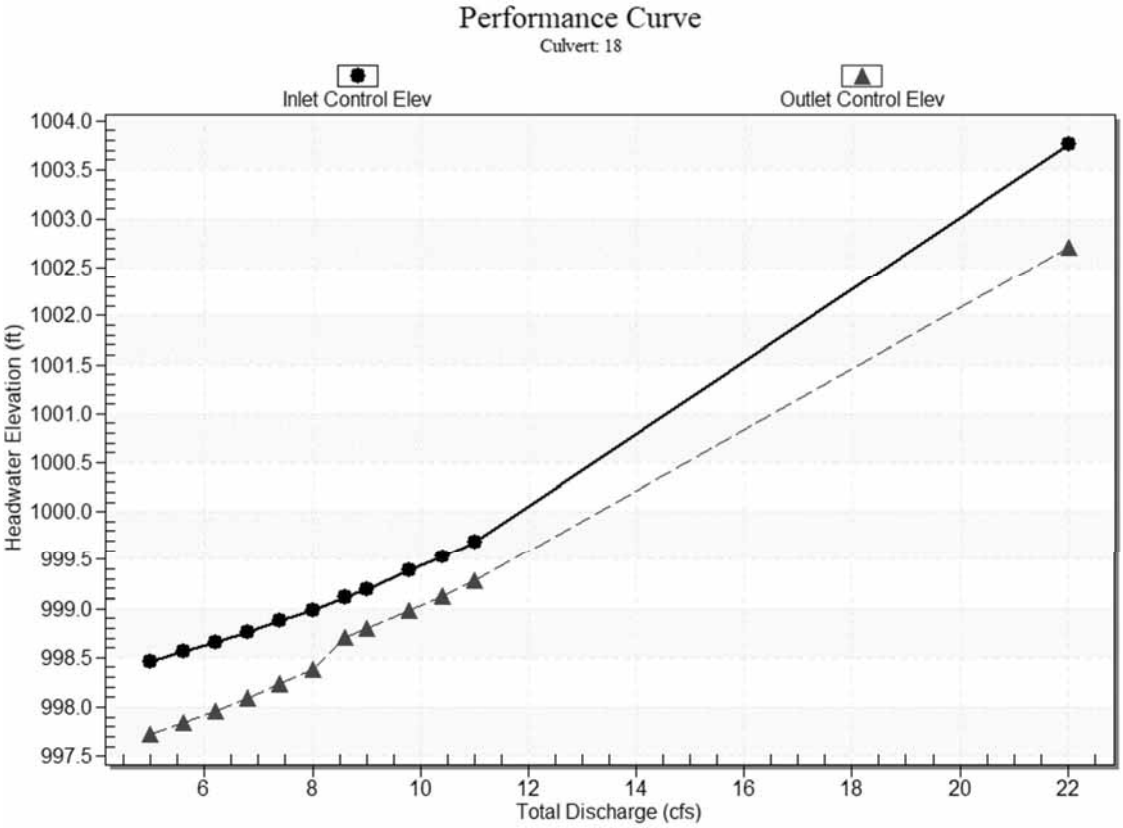
Inlet Elevation (invert): 997.17 ft,

Outlet Elevation (invert): 996.59 ft

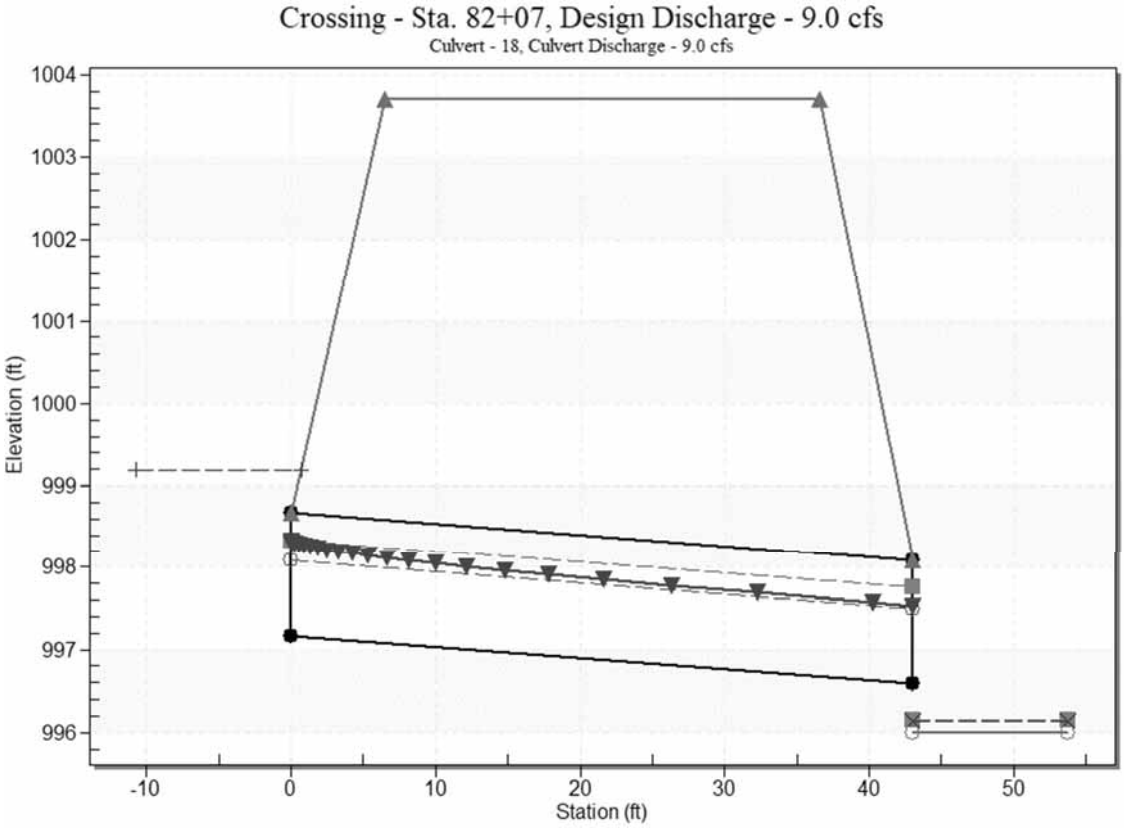
Culvert Length: 43.00 ft,

Culvert Slope: 0.0135

Culvert Performance Curve Plot: 18



Water Surface Profile Plot for Culvert: 18



Site Data - 18

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 997.17 ft

Outlet Station: 43.00 ft

Outlet Elevation: 996.59 ft

Number of Barrels: 1

Culvert Data Summary - 18

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: Sta. 82+07

Table 3 - Downstream Channel Rating Curve (Crossing: Sta. 82+07)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	996.10	0.10	2.00	0.22	1.12
5.60	996.11	0.11	2.09	0.24	1.14
6.20	996.11	0.11	2.18	0.25	1.15
6.80	996.12	0.12	2.26	0.27	1.16
7.40	996.13	0.13	2.34	0.28	1.17
8.00	996.13	0.13	2.41	0.30	1.18
8.60	996.14	0.14	2.48	0.31	1.19
9.00	996.14	0.14	2.52	0.32	1.19
9.80	996.15	0.15	2.61	0.33	1.20
10.40	996.15	0.15	2.67	0.35	1.21
11.00	996.16	0.16	2.73	0.36	1.21

Tailwater Channel Data - Sta. 82+07

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 25.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0360

Channel Manning's n: 0.0300

Channel Invert Elevation: 996.00 ft

Roadway Data for Crossing: Sta. 82+07

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 1003.70 ft

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

APPENDIX E

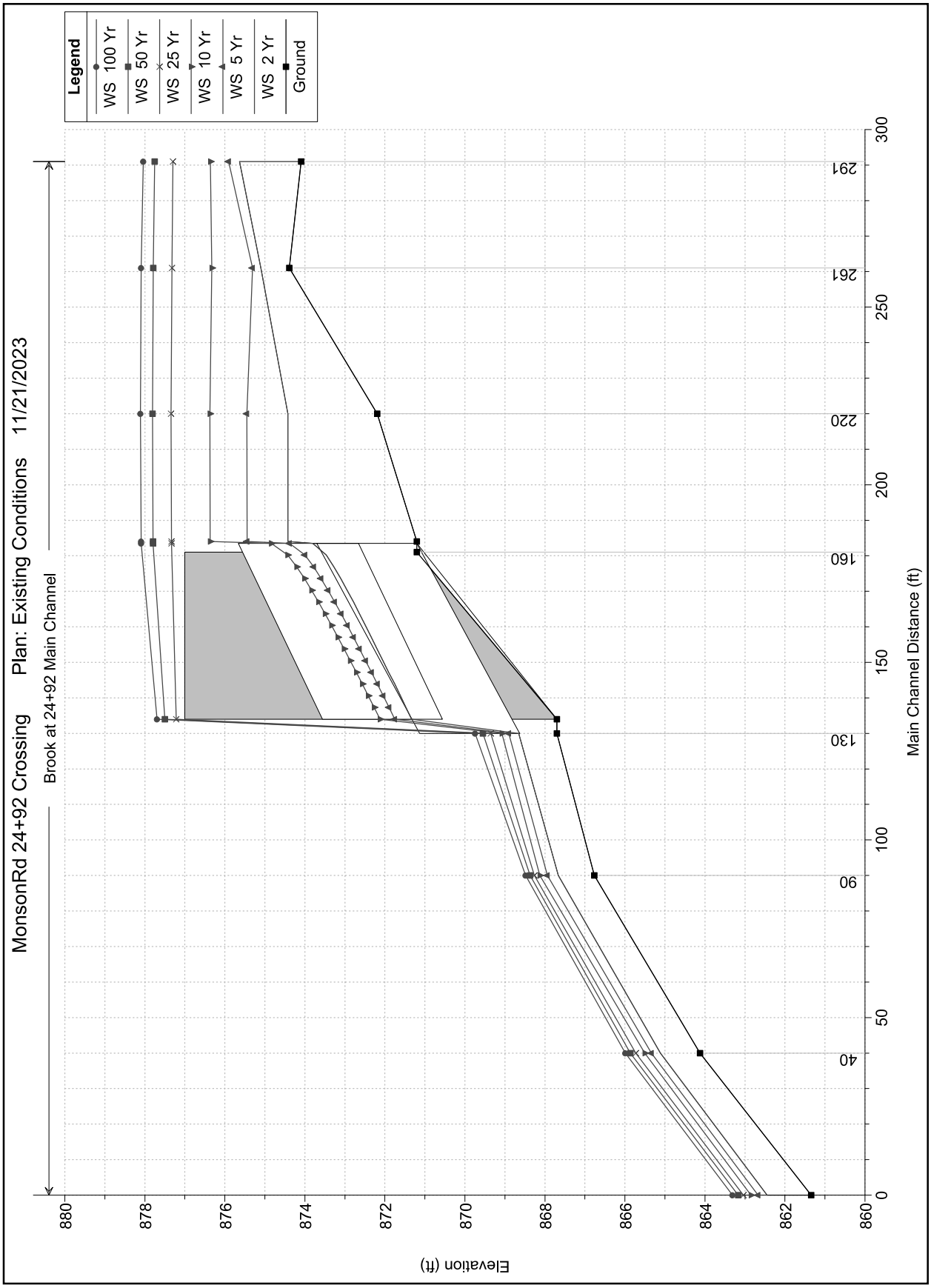
HEC-RAS

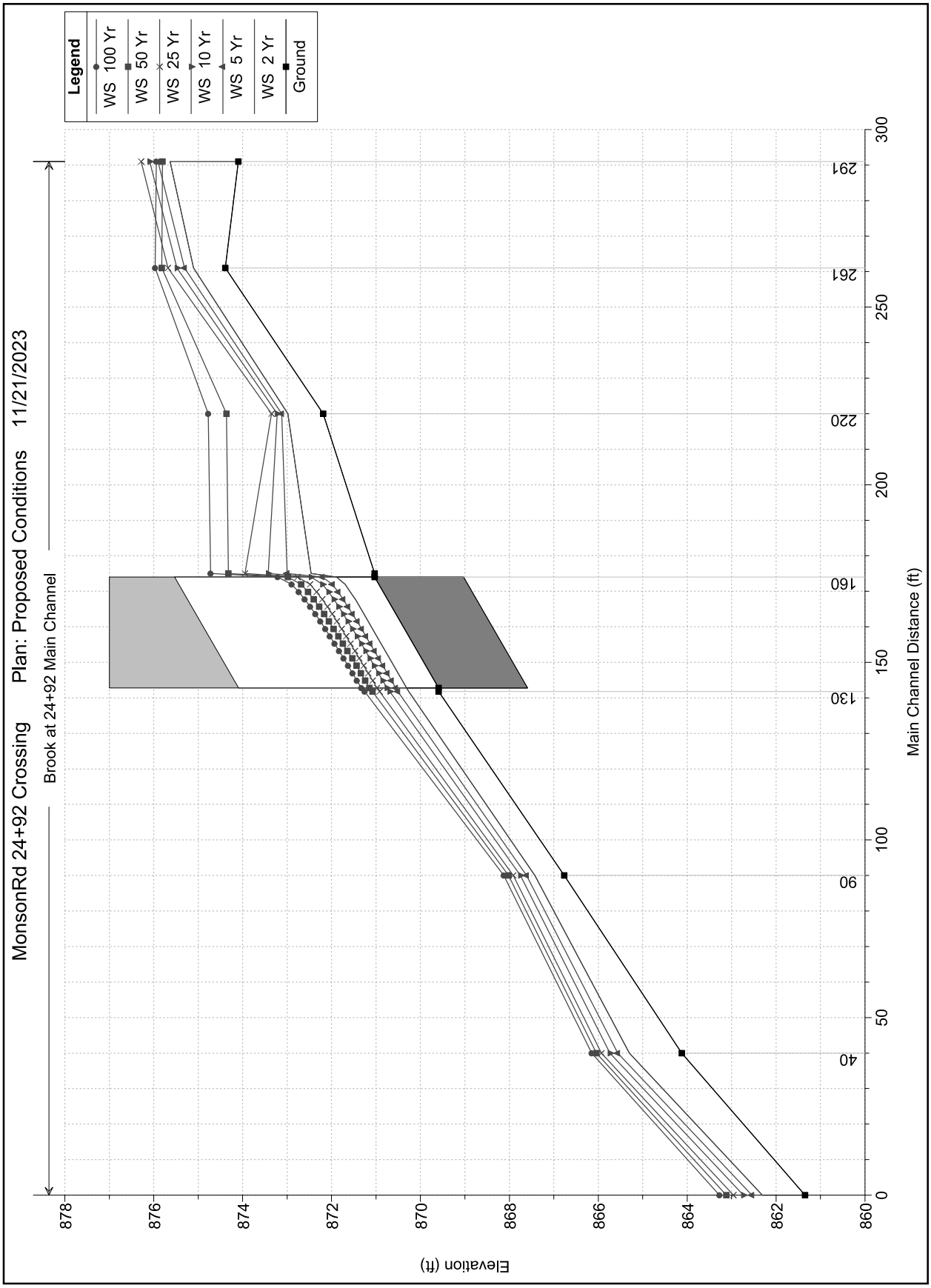
HEC-RAS Computed Results for crossing 24+92 proposed

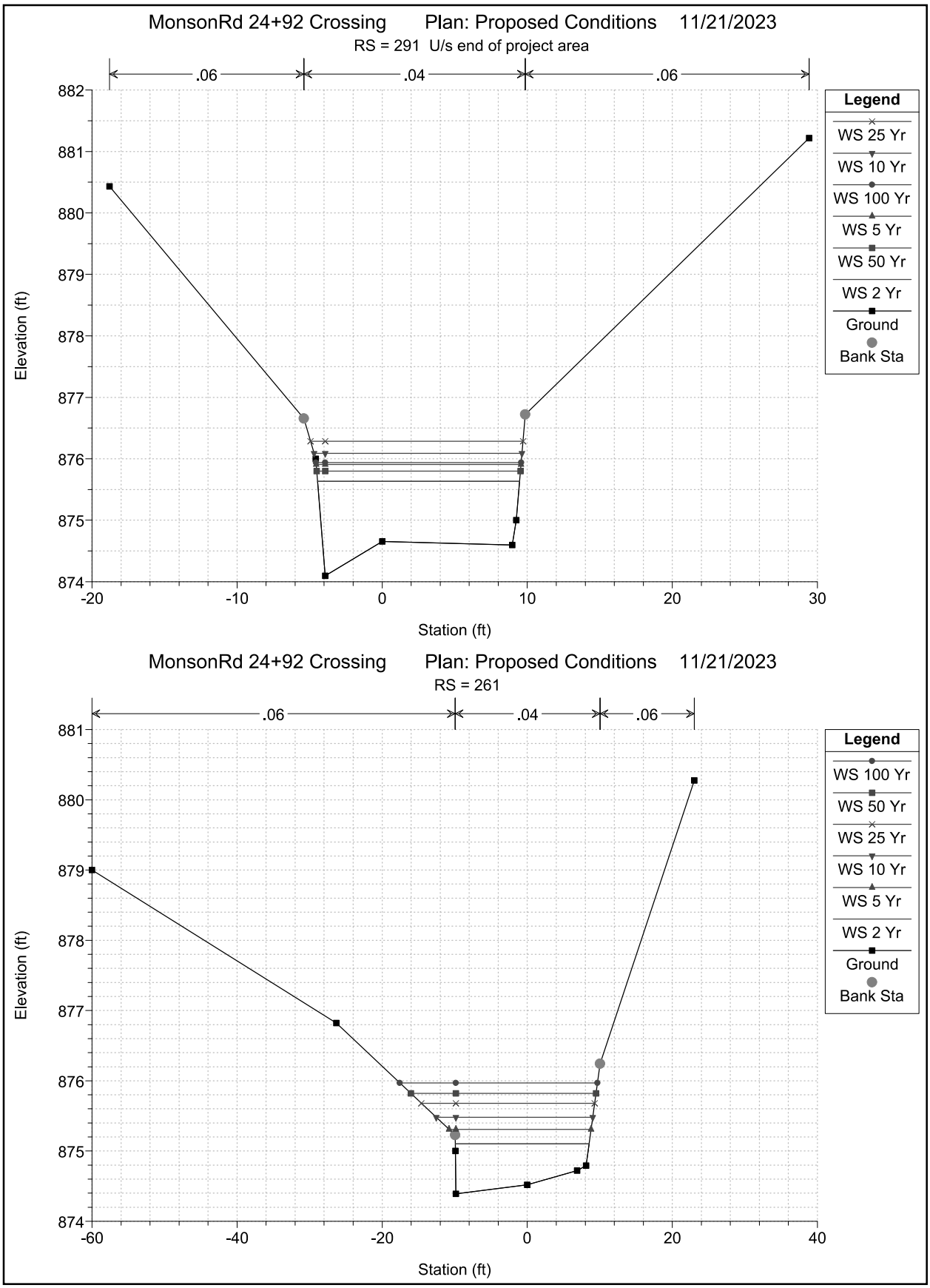
HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ.MILES)	0.903
DESIGN FLOOD DISCHARGE (C.F.S)	123
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S)	6.32
DESIGN FLOOD ELEVATION (FEET, NAVD)	873.95
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S)	174
BASE FLOOD ELEVATION (FEET, NAVD)	874.72
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY	25
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY	100
FLOOD OF RECORD	
DISCHARGE (C.F.S)	Unknown
FREQUENCY (IF KNOWN, YEARS)	Unknown
MAXIMUM ELEVATION (FEET, NAVD)	Unknown
DATE (MM/YYYY)	Unknown
HISTORY OF ICE FLOCS	Unknown

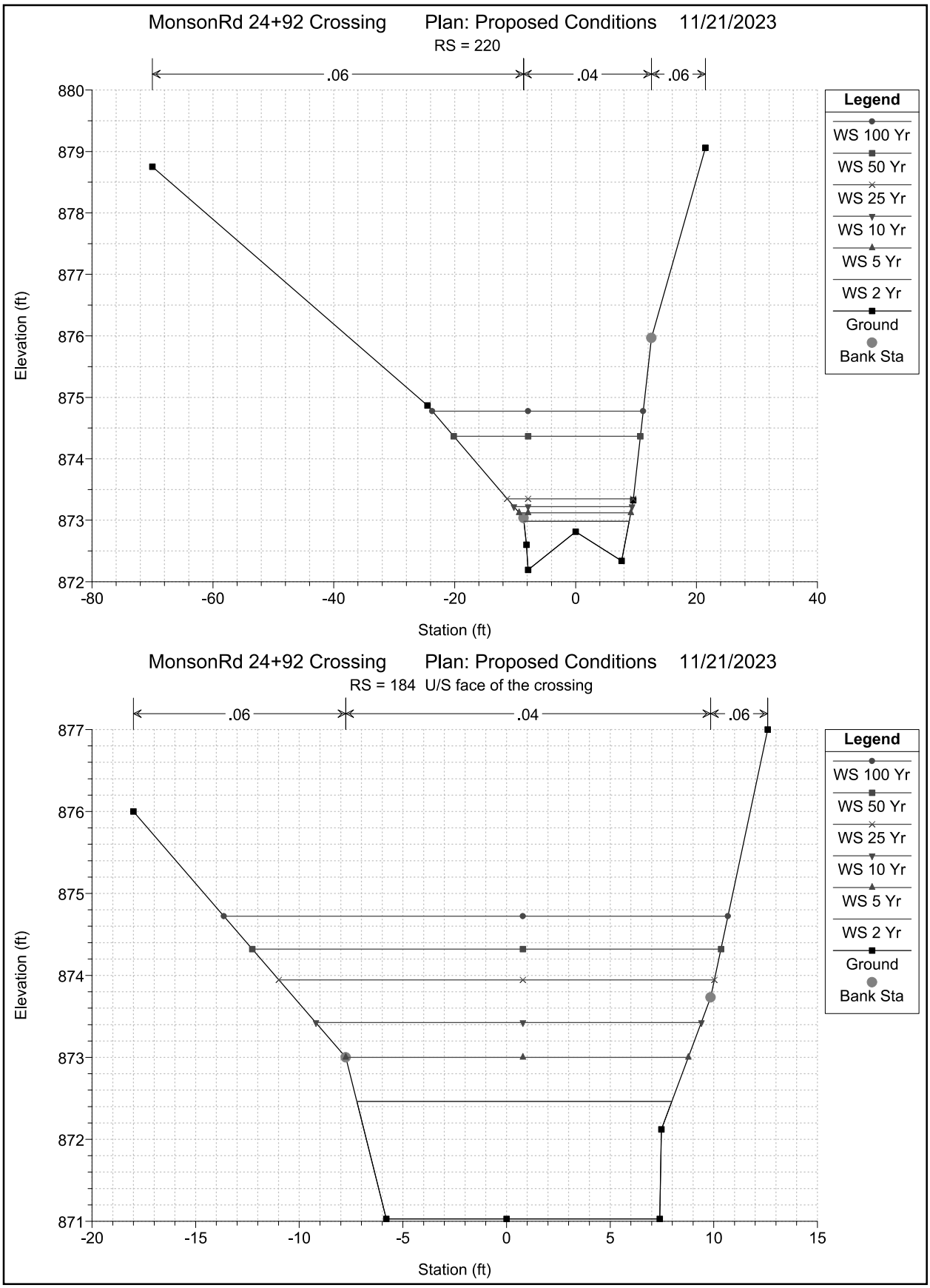
TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S)	43
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY	5.23
DESIGN FLOOD ELEVATION (FEET,NAVD)	876.1

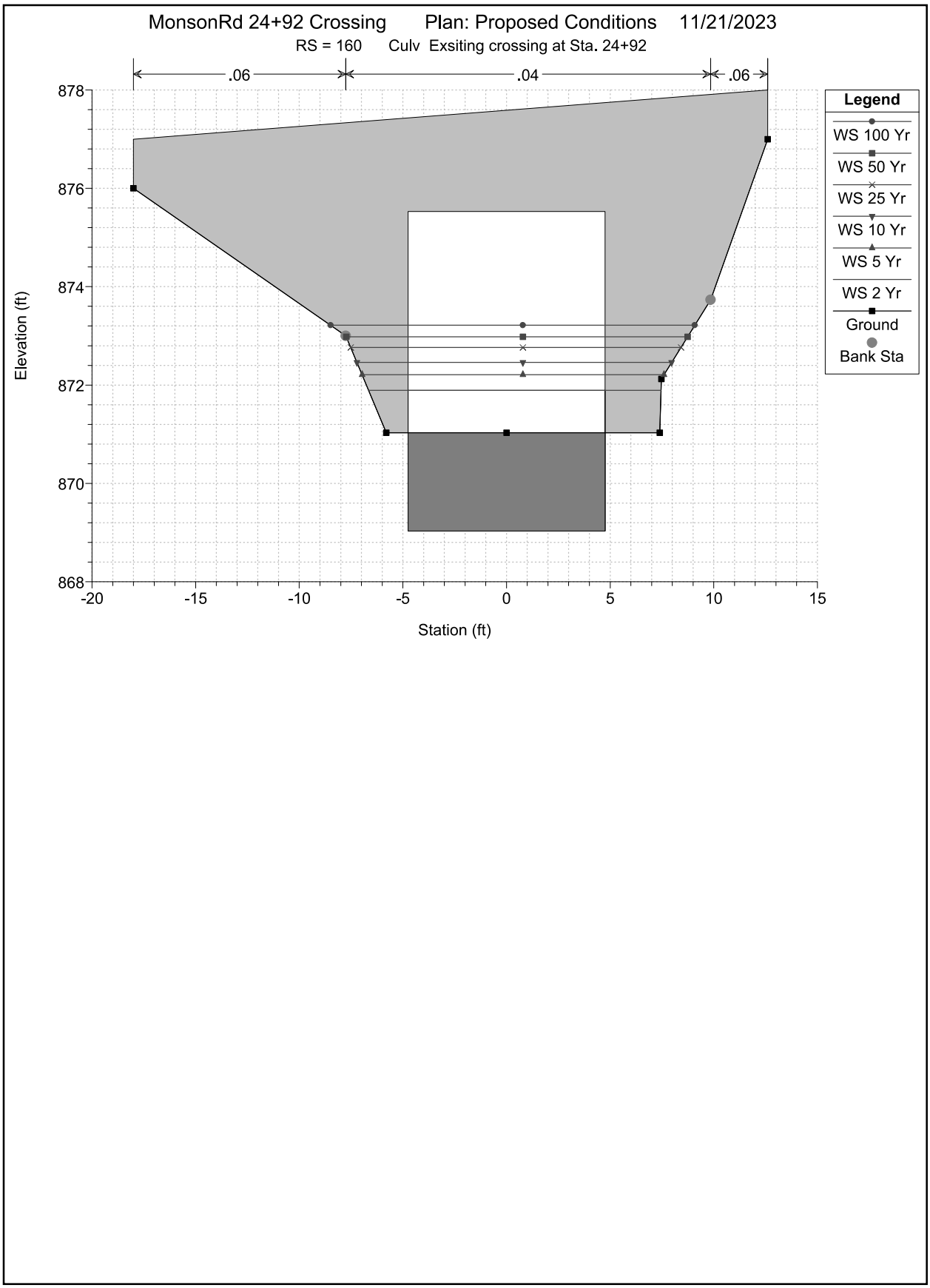
Section	Length (ft)	Span (ft)	Rise (ft)	Invert (u/s)	Invert (d/s)
R.C Box Culvert	31.21	9.5	6.5	871.03	869.59

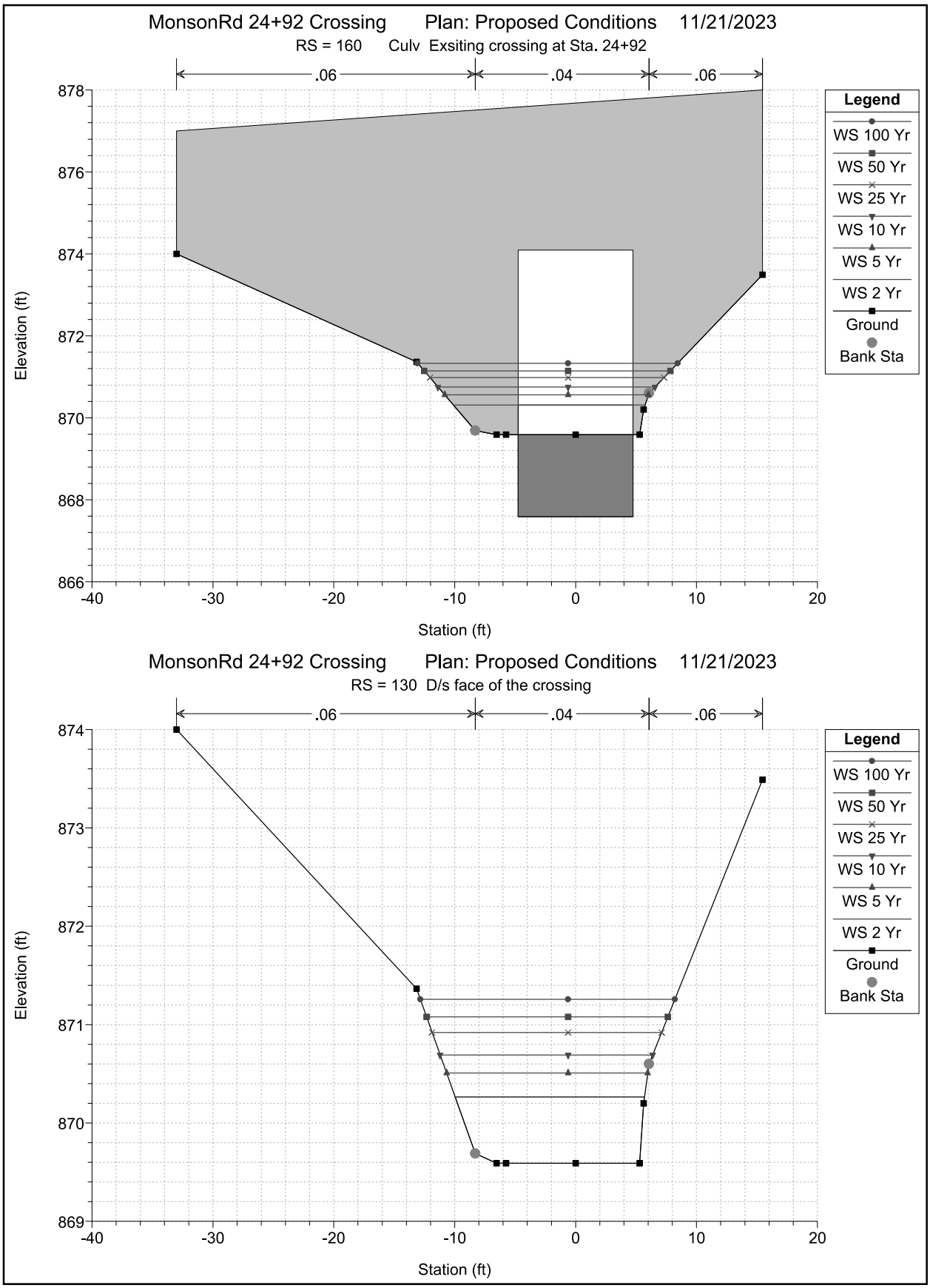

MonsonRd 24+92 Crossing
Plan: Existing Conditions 11/21/2023
Brook at 24+92 Main Channel
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Elevation (ft)
Main Channel Distance (ft)
880
878
876
874
872
870
868
866
864
862
860
0
50
100
150
200
250
300
40
90
130
160
220
261
291

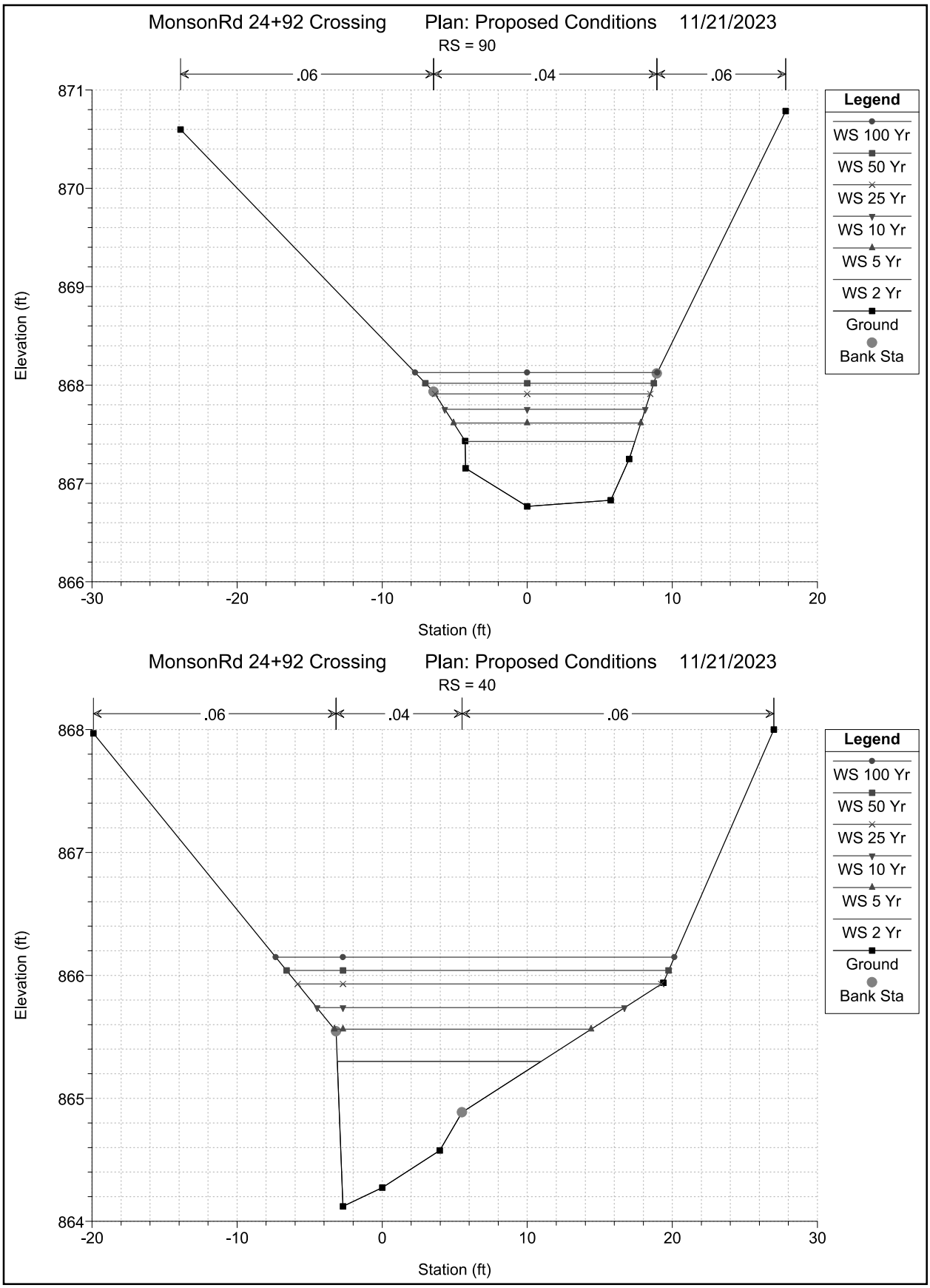

MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
Brook at 24+92 Main Channel
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Elevation (ft)
Main Channel Distance (ft)
878
876
874
872
870
868
866
864
862
860
0
40
50
90
100
130
150
160
200
220
250
261
291
300

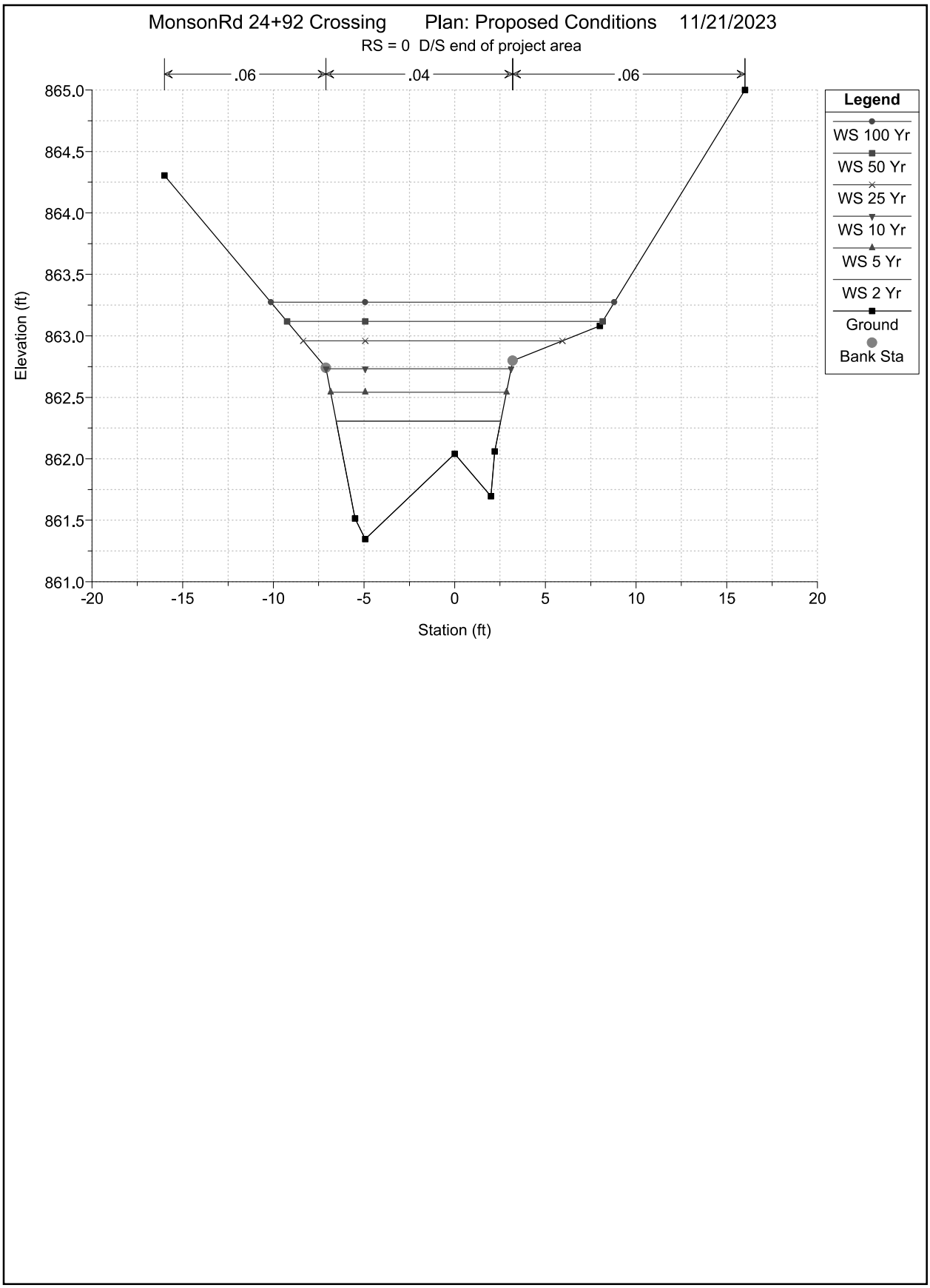

MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 291 U/s end of project area
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 25 Yr
WS 10 Yr
WS 100 Yr
WS 5 Yr
WS 50 Yr
WS 2 Yr
Ground
Bank Sta
MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 261
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta


MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 220
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 184 U/S face of the crossing
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta


MonsonRd 24+92 Crossing
Plan: Proposed Conditions
11/21/2023
RS = 160
Culv Exsiting crossing at Sta. 24+92
.06
.04
.06
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
878
876
874
872
870
868
-20
-15
-10
-5
0
5
10
15
Station (ft)


MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 160 Culv Exsiting crossing at Sta. 24+92
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 130 D/s face of the crossing
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta


MonsonRd 24+92 Crossing
Plan: Proposed Conditions
11/21/2023
RS = 90
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
MonsonRd 24+92 Crossing
Plan: Proposed Conditions
11/21/2023
RS = 40
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta


MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 0 D/S end of project area
.06
.04
.06
Elevation (ft)
Station (ft)
865.0
864.5
864.0
863.5
863.0
862.5
862.0
861.5
861.0
-20
-15
-10
-5
0
5
10
15
20
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta

HEC-RAS Plan: Exist River: Brook at 24+92 Reach: Main Channel

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	291	2 Yr	43.00	874.10	875.63	875.23	875.77	0.006791	2.93	14.70	13.93	0.50
Main Channel	291	5 Yr	69.00	874.10	875.91	875.48	876.12	0.008508	3.73	18.51	14.12	0.57
Main Channel	291	10 Yr	92.00	874.10	876.36	875.68	876.57	0.006020	3.67	25.08	14.77	0.50
Main Channel	291	25 Yr	123.00	874.10	877.30	875.92	877.45	0.002536	3.11	40.73	20.05	0.34
Main Channel	291	50 Yr	147.00	874.10	877.75	876.10	877.90	0.002041	3.11	50.68	23.65	0.32
Main Channel	291	100 Yr	174.00	874.10	878.04	876.28	878.21	0.002053	3.32	57.84	25.93	0.32
Main Channel	261	2 Yr	43.00	874.39	875.10	875.10	875.38	0.029929	4.22	10.20	18.45	1.00
Main Channel	261	5 Yr	69.00	874.39	875.31	875.31	875.68	0.027589	4.92	14.04	19.58	1.00
Main Channel	261	10 Yr	92.00	874.39	876.33		876.43	0.002553	2.56	40.10	31.59	0.35
Main Channel	261	25 Yr	123.00	874.39	877.32		877.38	0.000818	1.97	78.88	47.62	0.21
Main Channel	261	50 Yr	147.00	874.39	877.79		877.84	0.000619	1.91	103.13	56.34	0.19
Main Channel	261	100 Yr	174.00	874.39	878.09		878.14	0.000598	2.00	120.89	61.94	0.19
Main Channel	220	2 Yr	43.00	872.19	874.43	873.12	874.45	0.000483	1.15	42.65	31.46	0.15
Main Channel	220	5 Yr	69.00	872.19	875.45	873.35	875.46	0.000244	1.06	80.46	43.27	0.12
Main Channel	220	10 Yr	92.00	872.19	876.37		876.38	0.000141	0.97	126.10	55.86	0.09
Main Channel	220	25 Yr	123.00	872.19	877.35		877.36	0.000094	0.93	187.38	70.07	0.08
Main Channel	220	50 Yr	147.00	872.19	877.81		877.82	0.000090	0.97	221.42	76.84	0.08
Main Channel	220	100 Yr	174.00	872.19	878.11		878.12	0.000098	1.05	245.16	81.22	0.08
Main Channel	184	2 Yr	43.00	871.20	874.42	871.96	874.43	0.000149	0.85	53.33	23.04	0.09
Main Channel	184	5 Yr	69.00	871.20	875.44	872.21	875.46	0.000129	0.97	79.06	27.39	0.09
Main Channel	184	10 Yr	92.00	871.20	876.37	872.41	876.38	0.000104	1.01	105.91	30.07	0.08
Main Channel	184	25 Yr	123.00	871.20	877.34	872.65	877.35	0.000094	1.08	135.44	30.60	0.08
Main Channel	184	50 Yr	147.00	871.20	877.80	872.81	877.82	0.000101	1.18	149.53	30.60	0.08
Main Channel	184	100 Yr	174.00	871.20	878.09	872.99	878.12	0.000119	1.32	158.61	30.60	0.09
Main Channel	160		Culvert									
Main Channel	130	2 Yr	43.00	867.70	868.66	868.57	868.96	0.020428	4.43	9.71	11.70	0.86
Main Channel	130	5 Yr	69.00	867.70	868.90	868.85	869.37	0.023223	5.47	12.63	11.91	0.94
Main Channel	130	10 Yr	92.00	867.70	869.08	869.08	869.68	0.026087	6.26	14.71	12.20	1.00
Main Channel	130	25 Yr	123.00	867.70	869.35	869.35	870.06	0.025316	6.77	18.18	12.94	1.01
Main Channel	130	50 Yr	147.00	867.70	869.55	869.55	870.33	0.024776	7.08	20.76	13.47	1.01
Main Channel	130	100 Yr	174.00	867.70	869.75	869.75	870.60	0.024193	7.41	23.49	14.02	1.00
Main Channel	90	2 Yr	43.00	866.77	867.67	867.67	868.01	0.027657	4.71	9.13	13.26	1.00
Main Channel	90	5 Yr	69.00	866.77	867.94	867.94	868.38	0.025952	5.31	12.99	15.06	1.01
Main Channel	90	10 Yr	92.00	866.77	868.13	868.13	868.65	0.024492	5.79	16.00	16.73	1.01

HEC-RAS Plan: Exist River: Brook at 24+92 Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	90	25 Yr	123.00	866.77	868.26	868.37	868.99	0.028912	6.83	18.34	18.05	1.12
Main Channel	90	50 Yr	147.00	866.77	868.37	868.54	869.23	0.030415	7.43	20.37	19.13	1.16
Main Channel	90	100 Yr	174.00	866.77	868.48	868.71	869.48	0.032139	8.07	22.50	20.20	1.21
Main Channel	40	2 Yr	43.00	864.12	865.11	865.36	865.90	0.067632	7.16	6.26	11.48	1.51
Main Channel	40	5 Yr	69.00	864.12	865.34	865.68	866.38	0.064742	8.34	9.25	14.57	1.53
Main Channel	40	10 Yr	92.00	864.12	865.50	865.93	866.71	0.063759	9.12	11.81	16.78	1.55
Main Channel	40	25 Yr	123.00	864.12	865.73	866.15	866.99	0.054635	9.56	16.05	21.03	1.48
Main Channel	40	50 Yr	147.00	864.12	865.86	866.29	867.21	0.052564	10.01	19.05	23.72	1.47
Main Channel	40	100 Yr	174.00	864.12	865.99	866.44	867.43	0.051739	10.50	22.16	25.77	1.48
Main Channel	0	2 Yr	43.00	861.35	862.45	862.65	863.19	0.066836	6.91	6.22	9.44	1.50
Main Channel	0	5 Yr	69.00	861.35	862.67	863.00	863.71	0.068697	8.18	8.44	10.04	1.57
Main Channel	0	10 Yr	92.00	861.35	862.85	863.27	864.10	0.066222	8.97	10.31	11.83	1.59
Main Channel	0	25 Yr	123.00	861.35	863.04	863.54	864.58	0.065444	10.00	12.92	16.08	1.62
Main Channel	0	50 Yr	147.00	861.35	863.17	863.72	864.87	0.063441	10.58	15.21	17.93	1.63
Main Channel	0	100 Yr	174.00	861.35	863.31	863.90	865.14	0.061000	11.09	17.79	19.30	1.62

HEC-RAS Plan: prop River: Brook at 24+92 Reach: Main Channel

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	291	2 Yr	43.00	874.10	875.63	875.23	875.77	0.006822	2.93	14.67	13.93	0.50
Main Channel	291	5 Yr	69.00	874.10	875.91	875.48	876.12	0.008494	3.73	18.51	14.12	0.57
Main Channel	291	10 Yr	92.00	874.10	876.09	875.68	876.38	0.010123	4.36	21.10	14.33	0.63
Main Channel	291	25 Yr	123.00	874.10	876.28	875.92	876.69	0.012395	5.14	23.92	14.65	0.71
Main Channel	291	50 Yr	147.00	874.10	875.80	876.09	876.96	0.050095	8.64	17.02	14.05	1.38
Main Channel	291	100 Yr	174.00	874.10	875.94	876.28	877.25	0.050078	9.17	18.97	14.14	1.40
Main Channel	261	2 Yr	43.00	874.39	875.10	875.10	875.38	0.029929	4.22	10.20	18.45	1.00
Main Channel	261	5 Yr	69.00	874.39	875.31	875.31	875.68	0.027589	4.92	14.04	19.58	1.00
Main Channel	261	10 Yr	92.00	874.39	875.48	875.48	875.92	0.024916	5.32	17.56	21.56	0.98
Main Channel	261	25 Yr	123.00	874.39	875.68	875.68	876.19	0.022903	5.77	22.12	23.89	0.97
Main Channel	261	50 Yr	147.00	874.39	875.82	875.82	876.38	0.021751	6.05	25.62	25.53	0.96
Main Channel	261	100 Yr	174.00	874.39	875.97	875.97	876.57	0.020640	6.32	29.57	27.26	0.95
Main Channel	220	2 Yr	43.00	872.19	872.98	873.12	873.49	0.076775	5.74	7.49	17.42	1.54
Main Channel	220	5 Yr	69.00	872.19	873.12	873.35	873.87	0.078410	6.92	10.00	18.48	1.63
Main Channel	220	10 Yr	92.00	872.19	873.22	873.51	874.17	0.082184	7.83	11.86	19.52	1.71
Main Channel	220	25 Yr	123.00	872.19	873.35	873.71	874.52	0.080896	8.69	14.48	20.87	1.74
Main Channel	220	50 Yr	147.00	872.19	874.37	873.85	874.61	0.006361	4.09	40.77	30.86	0.55
Main Channel	220	100 Yr	174.00	872.19	874.77	873.99	874.97	0.004204	3.77	54.21	34.89	0.46
Main Channel	184	2 Yr	43.00	871.03	872.46	871.71	872.53	0.002652	2.14	20.06	15.19	0.33
Main Channel	184	5 Yr	69.00	871.03	873.00	871.96	873.09	0.002383	2.41	28.59	16.52	0.32
Main Channel	184	10 Yr	92.00	871.03	873.42	872.16	873.53	0.002121	2.57	36.03	18.60	0.31
Main Channel	184	25 Yr	123.00	871.03	873.95	872.40	874.06	0.001820	2.72	46.40	21.01	0.30
Main Channel	184	50 Yr	147.00	871.03	874.32	872.57	874.44	0.001618	2.81	54.60	22.61	0.29
Main Channel	184	100 Yr	174.00	871.03	874.72	872.75	874.85	0.001449	2.90	63.98	24.32	0.28
Main Channel	160		Culvert									
Main Channel	130	2 Yr	43.00	869.59	870.26	870.26	870.59	0.027595	4.58	9.68	15.66	1.00
Main Channel	130	5 Yr	69.00	869.59	870.51	870.51	870.93	0.025058	5.30	13.60	16.64	0.99
Main Channel	130	10 Yr	92.00	869.59	870.69	870.69	871.20	0.023566	5.80	16.75	17.58	0.99
Main Channel	130	25 Yr	123.00	869.59	870.92	870.92	871.52	0.021537	6.32	20.93	18.98	0.98
Main Channel	130	50 Yr	147.00	869.59	871.08	871.08	871.74	0.020548	6.66	24.03	19.96	0.98
Main Channel	130	100 Yr	174.00	869.59	871.26	871.26	871.97	0.019231	6.96	27.66	21.05	0.96
Main Channel	90	2 Yr	43.00	866.77	867.43	867.66	868.19	0.087757	7.01	6.13	11.71	1.71
Main Channel	90	5 Yr	69.00	866.77	867.61	867.94	868.65	0.088978	8.17	8.45	12.92	1.78
Main Channel	90	10 Yr	92.00	866.77	867.75	868.13	868.99	0.089077	8.92	10.32	13.83	1.82

HEC-RAS Plan: prop River: Brook at 24+92 Reach: Main Channel (Continued)

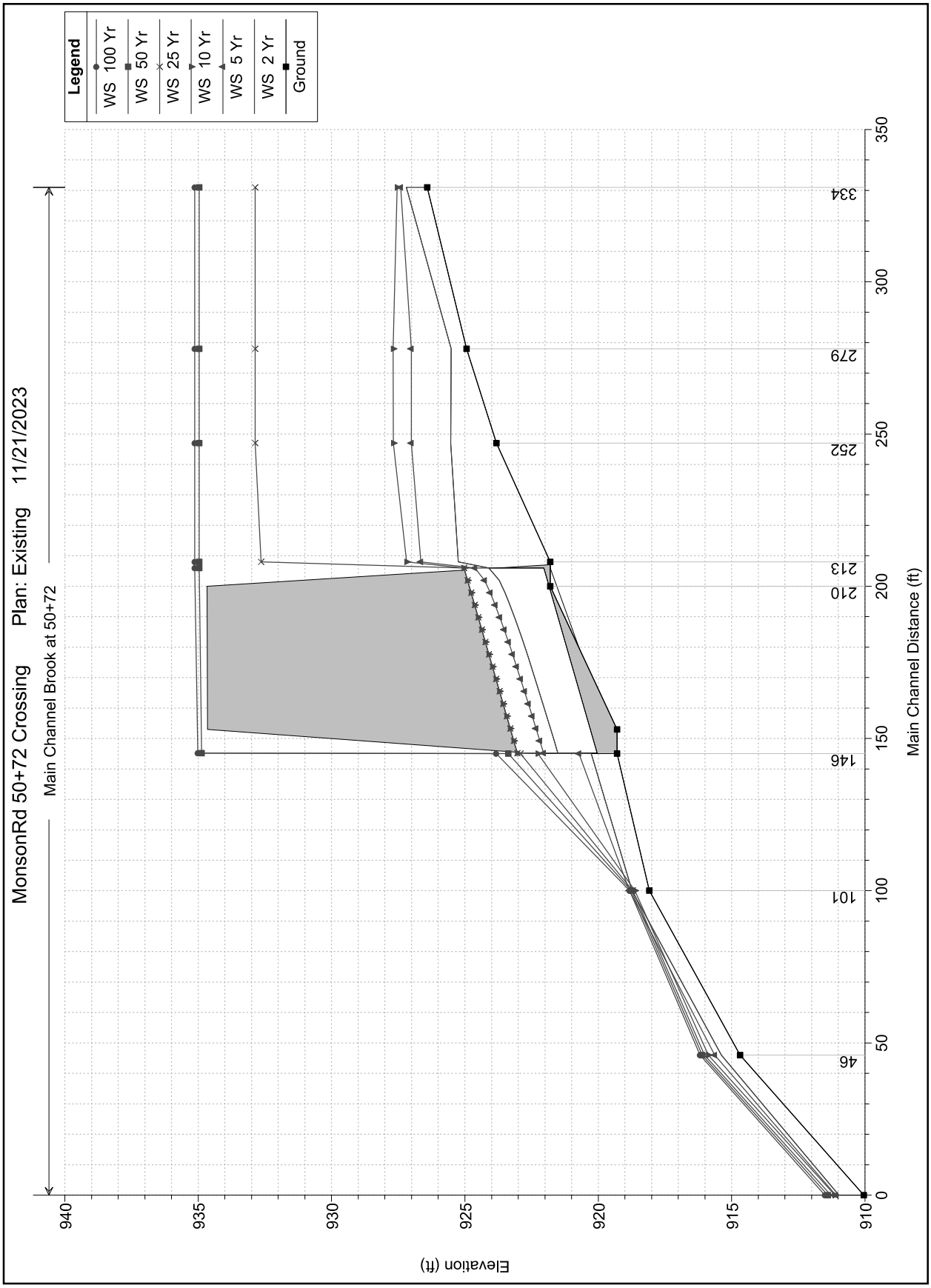
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	90	25 Yr	123.00	866.77	867.91	868.37	869.40	0.091293	9.80	12.54	14.84	1.88
Main Channel	90	50 Yr	147.00	866.77	868.02	868.54	869.69	0.089500	10.37	14.20	15.74	1.89
Main Channel	90	100 Yr	174.00	866.77	868.13	868.71	870.00	0.088274	10.98	15.96	16.70	1.91
Main Channel	40	2 Yr	43.00	864.12	865.30	865.36	865.75	0.029337	5.47	8.69	14.04	1.03
Main Channel	40	5 Yr	69.00	864.12	865.56	865.68	866.15	0.029358	6.40	12.83	17.69	1.06
Main Channel	40	10 Yr	92.00	864.12	865.74	865.93	866.43	0.029868	7.10	16.21	21.18	1.09
Main Channel	40	25 Yr	123.00	864.12	865.93	866.15	866.75	0.030526	7.86	20.67	25.06	1.13
Main Channel	40	50 Yr	147.00	864.12	866.04	866.29	866.96	0.031932	8.44	23.53	26.33	1.17
Main Channel	40	100 Yr	174.00	864.12	866.15	866.44	867.17	0.033594	9.04	26.45	27.48	1.22
Main Channel	0	2 Yr	43.00	861.35	862.31	862.65	863.49	0.135916	8.71	4.94	9.07	2.08
Main Channel	0	5 Yr	69.00	861.35	862.54	863.00	863.99	0.113529	9.67	7.14	9.69	1.99
Main Channel	0	10 Yr	92.00	861.35	862.73	863.27	864.34	0.099306	10.18	9.04	10.20	1.91
Main Channel	0	25 Yr	123.00	861.35	862.96	863.54	864.76	0.083177	10.77	11.73	14.30	1.81
Main Channel	0	50 Yr	147.00	861.35	863.12	863.72	865.00	0.073977	11.11	14.26	17.40	1.74
Main Channel	0	100 Yr	174.00	861.35	863.27	863.90	865.23	0.067208	11.44	17.09	18.94	1.69

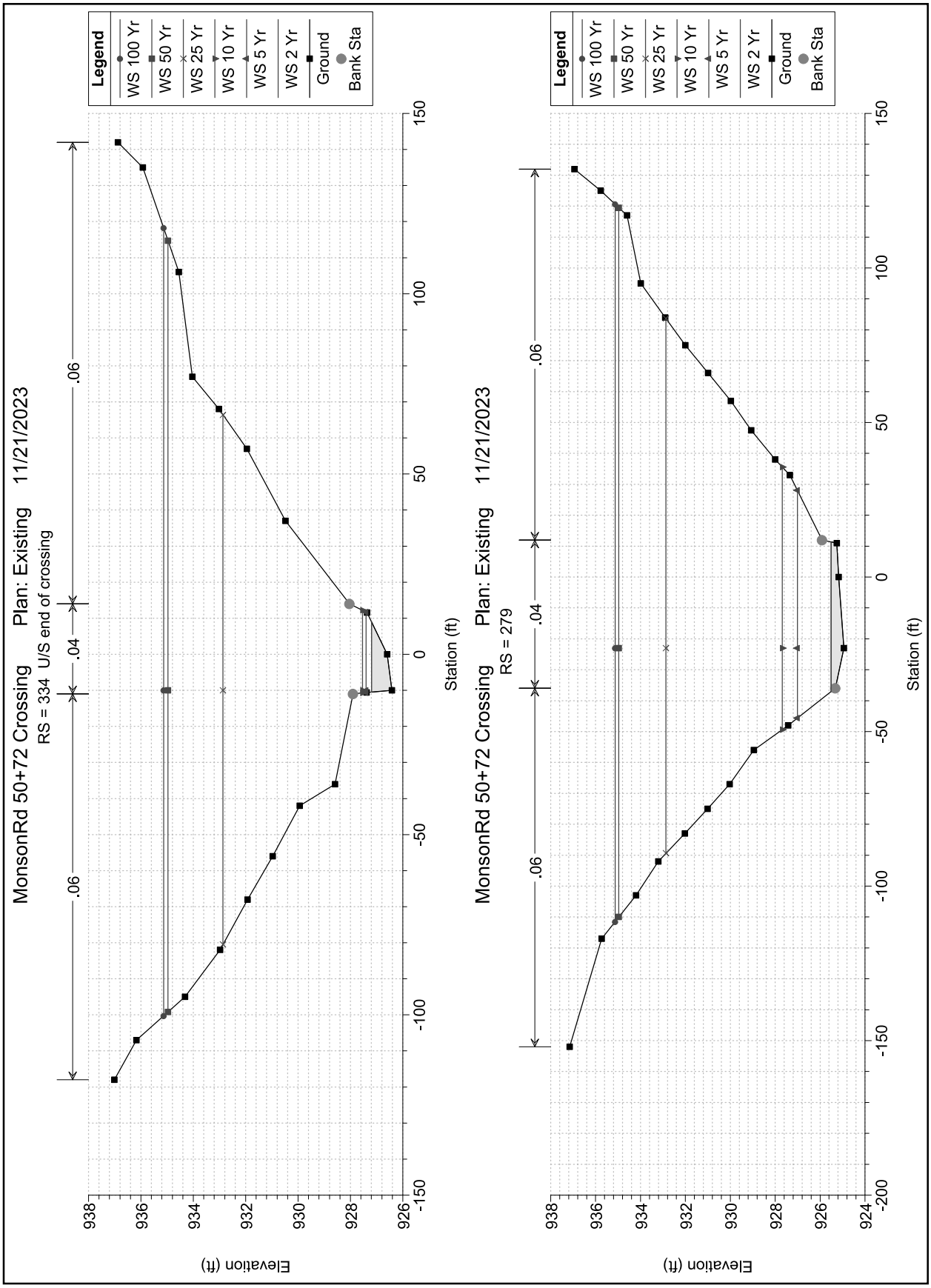
HEC-RAS Computed Results for crossing 50+72 proposed

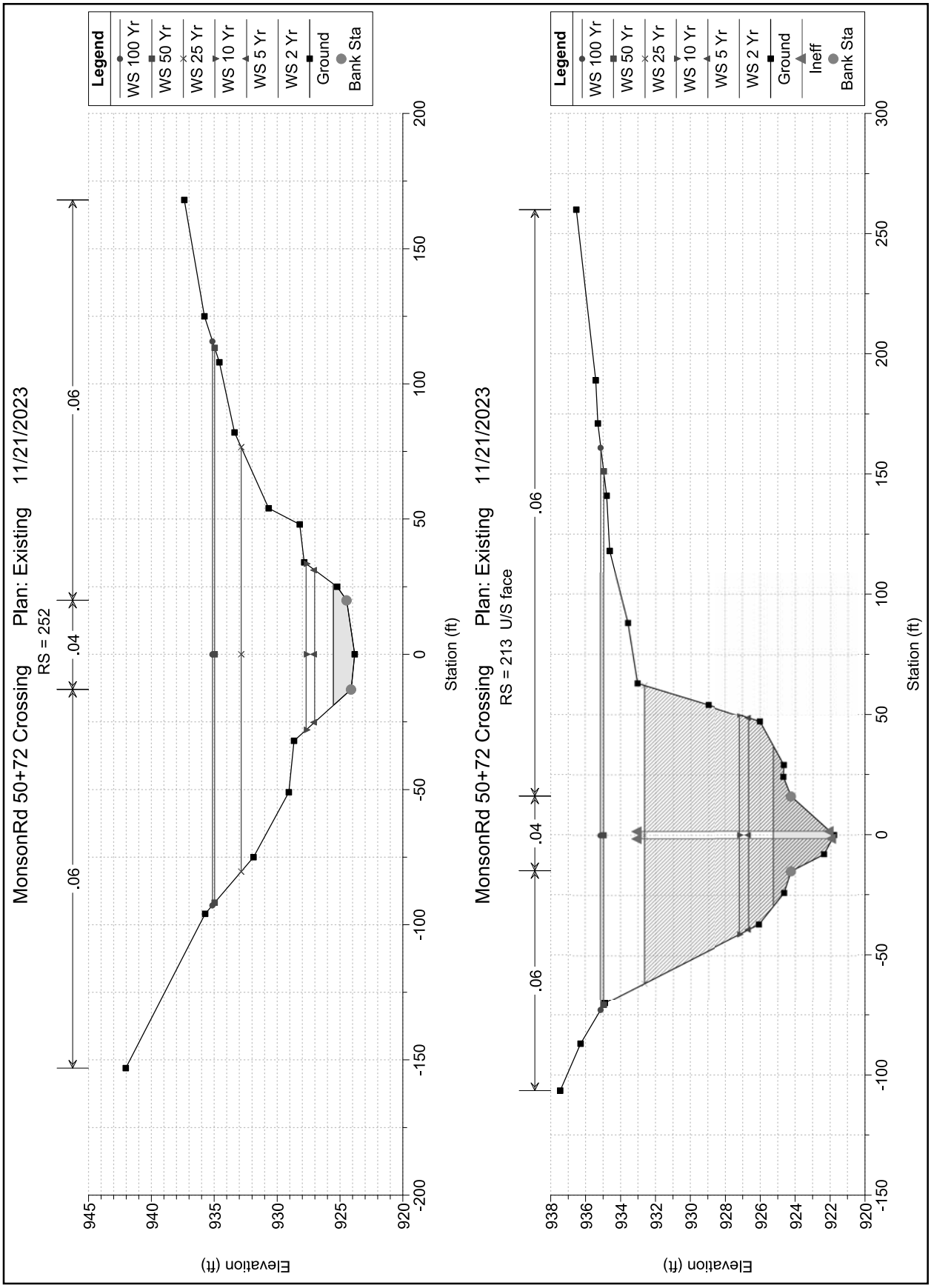
HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ.MILES)	
DESIGN FLOOD DISCHARGE (C.F.S)	116
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S)	10.75
DESIGN FLOOD ELEVATION (FEET, NAVD)	932.64
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S)	163
BASE FLOOD ELEVATION (FEET, NAVD)	933.34
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY	25
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY	100
FLOOD OF RECORD	
DISCHARGE (C.F.S)	Unknown
FREQUENCY (IF KNOWN, YEARS)	Unknown
MAXIMUM ELEVATION (FEET, NAVD)	Unknown
DATE (MM/YYYY)	Unknown
HISTORY OF ICE FLOCS	Unknown

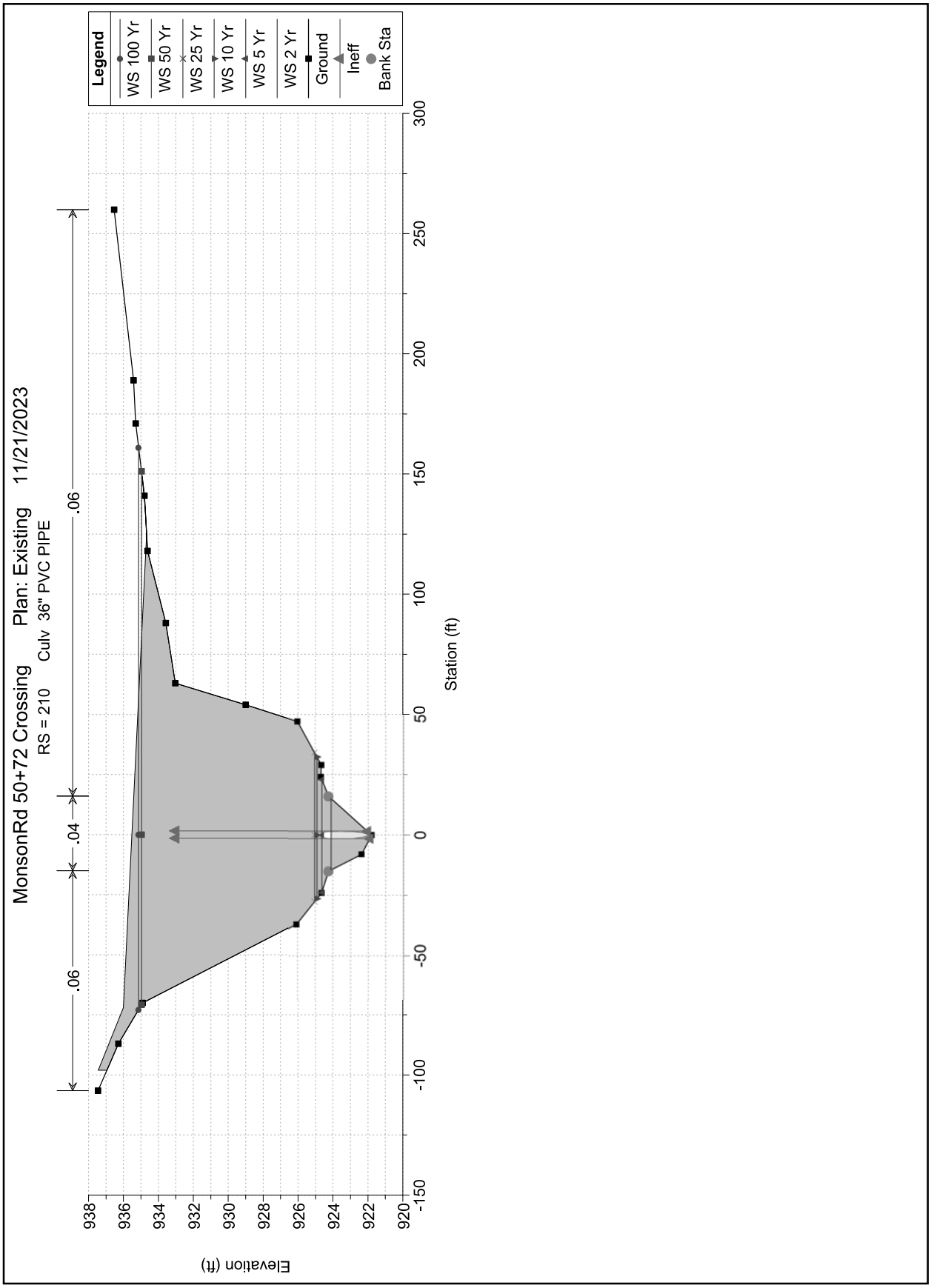
TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S)	40
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY	
DESIGN FLOOD ELEVATION (FEET,NAVD)	

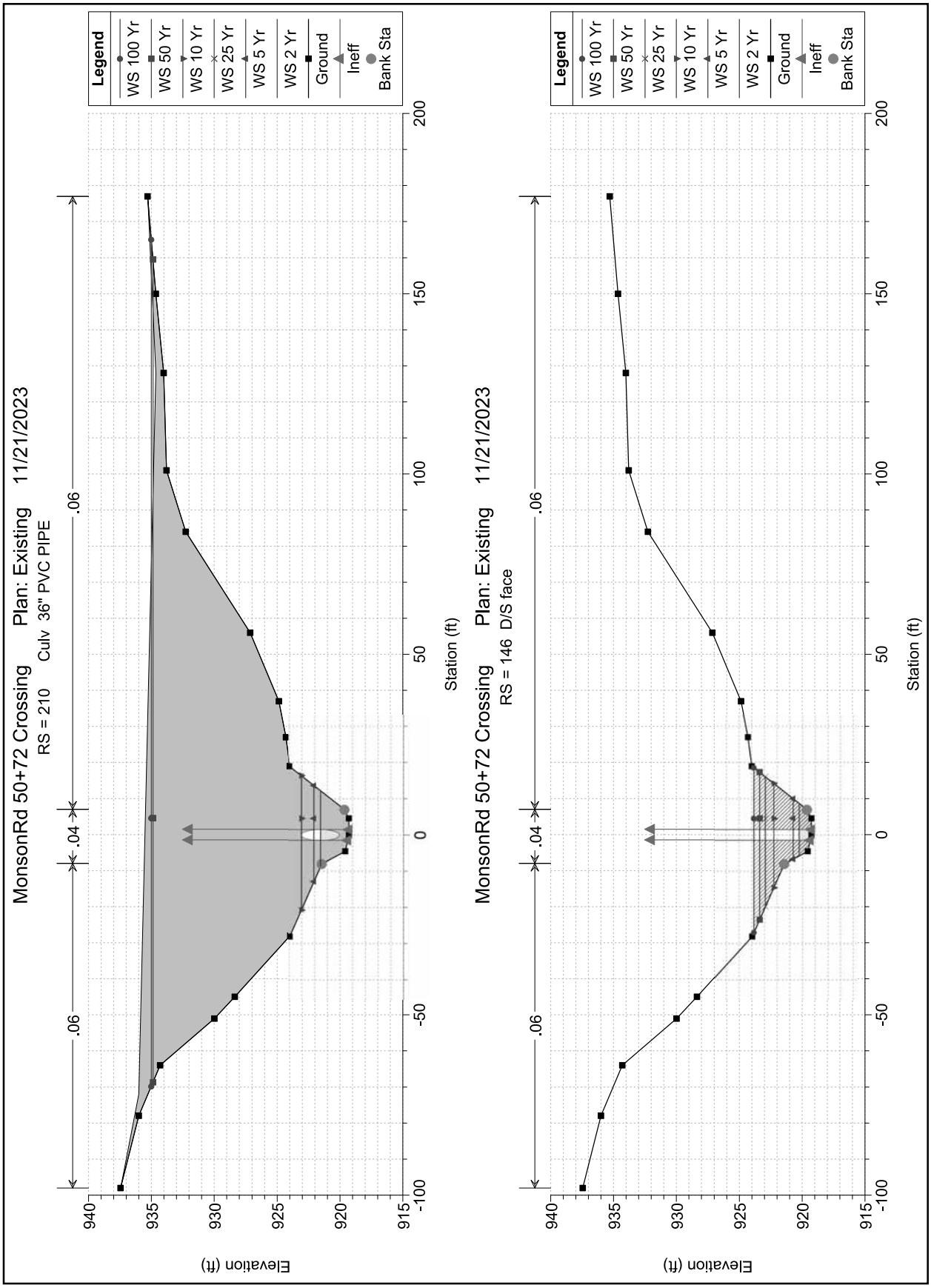
Section	Length (ft)	Span (ft)	Diameter (ft)	Invert (u/s)	Invert (d/s)
Circular Culvert	60.8	3	3	922.04	920.04

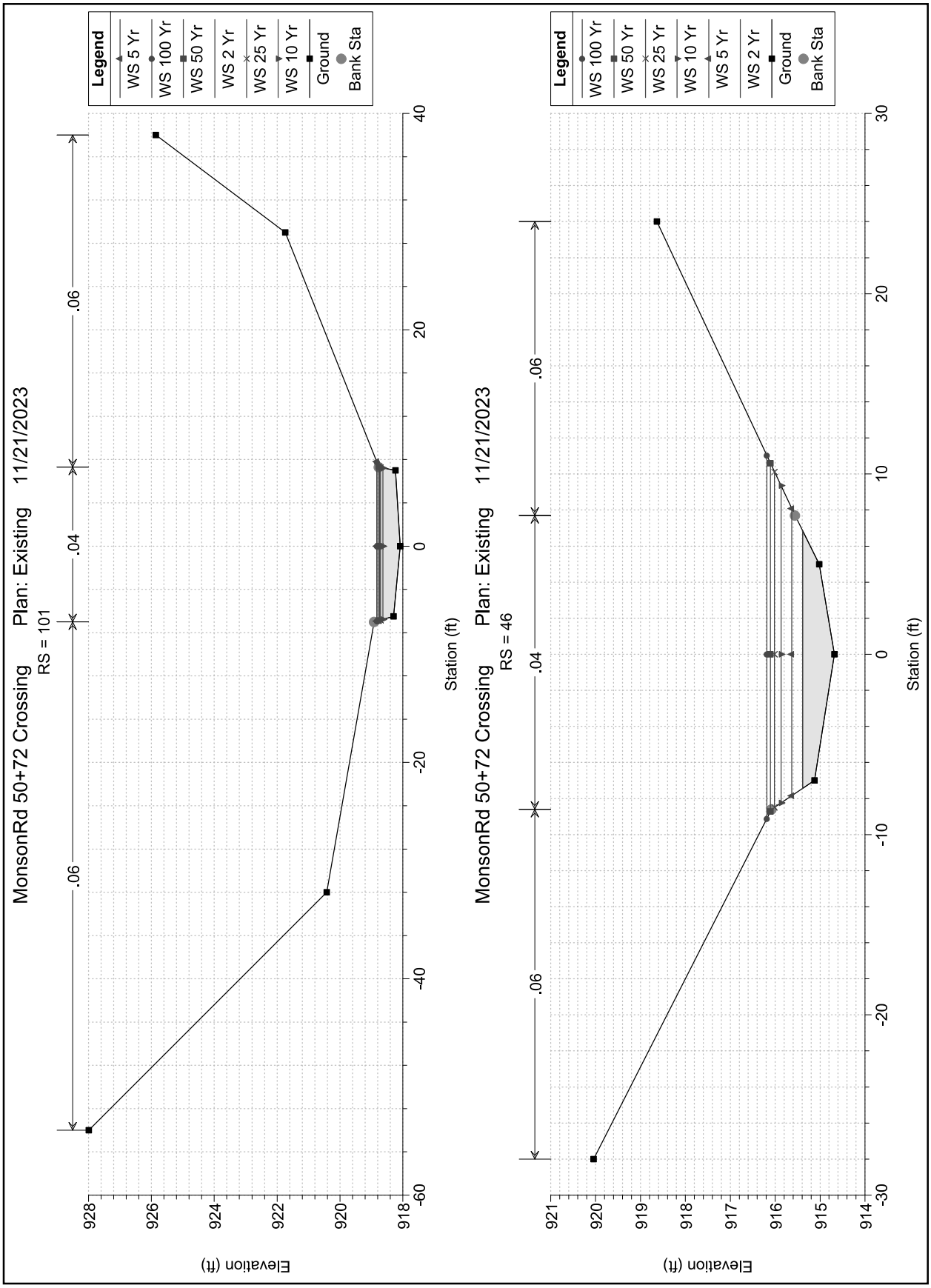

MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
Main Channel Brook at 50+72
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Elevation (ft)
Main Channel Distance (ft)
940
935
930
925
920
915
910
0
50
100
150
200
250
300
350
46
101
146
210
213
252
279
334

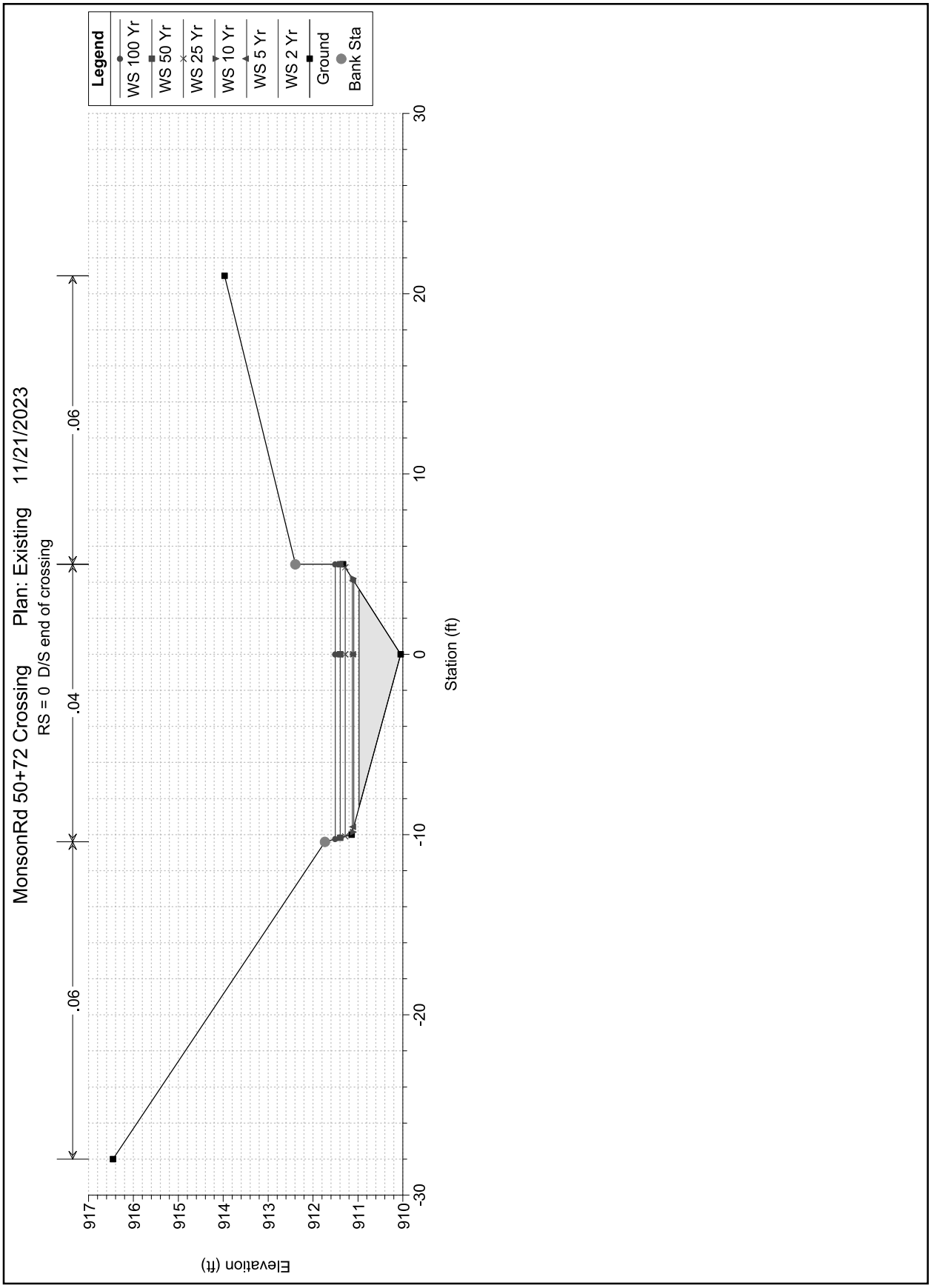

MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 334 U/S end of crossing
.06
.04
.06
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
938
936
934
932
930
928
926
150
100
50
0
-50
-100
-150
MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 279
.06
.04
.06
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
938
936
934
932
930
928
926
924
150
100
50
0
-50
-100
-150
-200


MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 252
.06
.04
.06
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
945
940
935
930
925
920
200
150
100
50
0
-50
-100
-150
-200
MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 213 U/S face
.06
.04
.06
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
938
936
934
932
930
928
926
924
922
920
300
250
200
150
100
50
0
-50
-100
-150


MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 210 Culv 36" PVC PIPE
.06
.04
.06
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
938
936
934
932
930
928
926
924
922
920
300
250
200
150
100
50
0
-50
-100
-150
Station (ft)


MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 210 Culv 36" PVC PIPE
.06
.04
.06
Legend
WS 100 Yr
WS 50 Yr
WS 10 Yr
WS 25 Yr
WS 5 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
940
935
930
925
920
915
-100
-50
0
50
100
150
200
Station (ft)
MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 146 D/S face
.06
.04
.06
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
940
935
930
925
920
915
-100
-50
0
50
100
150
200
Station (ft)


MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 101
Legend
WS 5 Yr
WS 100 Yr
WS 50 Yr
WS 2 Yr
WS 25 Yr
WS 10 Yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)
928
926
924
922
920
918
40
20
0
-20
-40
-60
MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 46
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)
921
920
919
918
917
916
915
914
30
20
10
0
-10
-20
-30


MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 0 D/S end of crossing
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
917
916
915
914
913
912
911
910
Station (ft)
30
20
10
0
-10
-20
-30

HEC-RAS Plan: Exst River: Main Channel Reach: Brook at 50+72

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Brook at 50+72	334	2 Yr	40.00	926.41	927.20	927.20	927.46	0.030832	4.07	9.83	19.51	1.01
Brook at 50+72	334	5 Yr	65.00	926.41	927.41	927.41	927.73	0.028816	4.58	14.19	22.34	1.01
Brook at 50+72	334	10 Yr	86.00	926.41	927.54	927.54	927.93	0.027344	4.98	17.25	22.94	1.01
Brook at 50+72	334	25 Yr	116.00	926.41	932.86	927.72	932.87	0.000013	0.43	463.57	146.85	0.03
Brook at 50+72	334	50 Yr	139.00	926.41	934.96	927.84	934.97	0.000005	0.31	831.05	213.91	0.02
Brook at 50+72	334	100 Yr	163.00	926.41	935.13	927.96	935.13	0.000006	0.35	867.47	218.55	0.02
Brook at 50+72	279	2 Yr	40.00	924.94	925.51	925.40	925.58	0.011315	2.13	18.87	48.50	0.60
Brook at 50+72	279	5 Yr	65.00	924.94	927.01	925.50	927.01	0.000144	0.68	107.26	73.71	0.09
Brook at 50+72	279	10 Yr	86.00	924.94	927.69	925.58	927.69	0.000081	0.63	161.79	85.03	0.07
Brook at 50+72	279	25 Yr	116.00	924.94	932.86		932.87	0.000002	0.21	823.56	173.02	0.01
Brook at 50+72	279	50 Yr	139.00	924.94	934.96		934.97	0.000001	0.18	1241.22	229.51	0.01
Brook at 50+72	279	100 Yr	163.00	924.94	935.13		935.13	0.000001	0.21	1280.14	232.20	0.01
Brook at 50+72	252	2 Yr	40.00	923.82	925.53		925.54	0.000268	0.78	55.96	44.97	0.11
Brook at 50+72	252	5 Yr	65.00	923.82	927.01		927.01	0.000060	0.59	130.59	56.23	0.06
Brook at 50+72	252	10 Yr	86.00	923.82	927.69		927.69	0.000049	0.61	170.66	61.43	0.06
Brook at 50+72	252	25 Yr	116.00	923.82	932.86		932.87	0.000002	0.25	759.54	157.00	0.01
Brook at 50+72	252	50 Yr	139.00	923.82	934.96		934.97	0.000001	0.21	1137.50	205.18	0.01
Brook at 50+72	252	100 Yr	163.00	923.82	935.13		935.13	0.000002	0.24	1172.36	208.53	0.01
Brook at 50+72	213	2 Yr	40.00	921.80	925.25	923.65	925.49	0.002277	3.96	10.10	66.47	0.38
Brook at 50+72	213	5 Yr	65.00	921.80	926.65	924.33	926.97	0.001884	4.55	14.30	87.66	0.37
Brook at 50+72	213	10 Yr	86.00	921.80	927.19	924.83	927.64	0.002312	5.41	15.91	90.93	0.41
Brook at 50+72	213	25 Yr	116.00	921.80	932.64	925.49	932.85	0.000398	3.59	32.28	123.70	0.19
Brook at 50+72	213	50 Yr	139.00	921.80	934.96	925.94	934.97	0.000001	0.21	1214.13	221.92	0.01
Brook at 50+72	213	100 Yr	163.00	921.80	935.13	926.41	935.13	0.000001	0.24	1252.53	233.86	0.01
Brook at 50+72	210		Culvert									
Brook at 50+72	146	2 Yr	40.00	919.29	920.26	921.08	923.38	0.157973	14.17	2.82	14.54	2.58
Brook at 50+72	146	5 Yr	65.00	919.29	920.73	921.77	924.42	0.109571	15.42	4.22	16.69	2.29
Brook at 50+72	146	10 Yr	86.00	919.29	922.26	922.26	923.74	0.016438	9.76	8.81	28.77	1.00
Brook at 50+72	146	25 Yr	116.00	919.29	922.92	922.92	924.72	0.015232	10.75	10.79	35.79	1.00
Brook at 50+72	146	50 Yr	139.00	919.29	923.38	923.38	925.41	0.014659	11.43	12.16	40.68	1.00
Brook at 50+72	146	100 Yr	163.00	919.29	923.83	923.83	926.09	0.014206	12.07	13.51	45.47	1.00
Brook at 50+72	101	2 Yr	40.00	918.08	918.74	918.82	919.15	0.044569	5.14	7.78	14.15	1.22
Brook at 50+72	101	5 Yr	65.00	918.08	918.83	919.07	919.62	0.071050	7.15	9.10	14.75	1.58

HEC-RAS Plan: Exst River: Main Channel Reach: Brook at 50+72 (Continued)

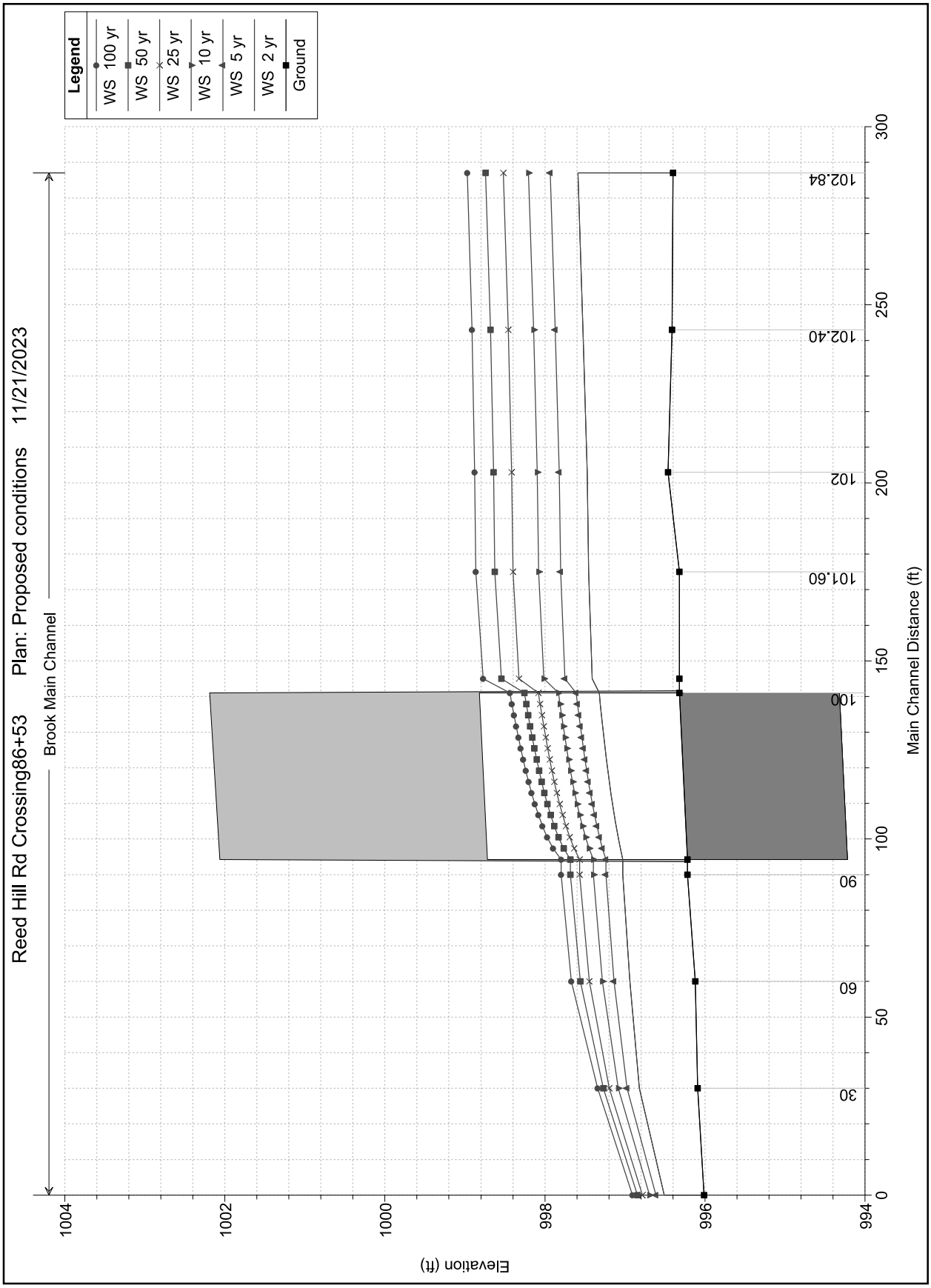
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Brook at 50+72	101	10 Yr	86.00	918.08	918.63	919.27	921.55	0.410756	13.69	6.28	14.00	3.60
Brook at 50+72	101	25 Yr	116.00	918.08	918.71	919.50	922.56	0.445820	15.74	7.37	14.11	3.84
Brook at 50+72	101	50 Yr	139.00	918.08	918.77	919.65	923.26	0.459074	17.01	8.17	14.23	3.95
Brook at 50+72	101	100 Yr	163.00	918.08	918.82	919.79	923.95	0.465437	18.16	8.99	14.69	4.03
Brook at 50+72	46	2 Yr	40.00	914.68	915.39	915.56	915.98	0.079859	6.16	6.49	14.29	1.61
Brook at 50+72	46	5 Yr	65.00	914.68	915.63	915.80	916.27	0.053473	6.40	10.16	15.93	1.40
Brook at 50+72	46	10 Yr	86.00	914.68	915.87	915.97	916.46	0.033671	6.15	14.18	17.60	1.16
Brook at 50+72	46	25 Yr	116.00	914.68	916.01	916.19	916.79	0.037296	7.09	16.77	18.60	1.25
Brook at 50+72	46	50 Yr	139.00	914.68	916.11	916.34	917.03	0.040066	7.75	18.51	19.32	1.31
Brook at 50+72	46	100 Yr	163.00	914.68	916.19	916.49	917.28	0.042985	8.43	20.12	20.15	1.37
Brook at 50+72	0	2 Yr	40.00	910.05	910.97	911.22	911.77	0.105045	7.14	5.60	12.10	1.85
Brook at 50+72	0	5 Yr	65.00	910.05	911.09	911.45	912.39	0.145922	9.12	7.13	13.65	2.22
Brook at 50+72	0	10 Yr	86.00	910.05	911.12	911.62	913.13	0.217622	11.36	7.57	14.06	2.73
Brook at 50+72	0	25 Yr	116.00	910.05	911.28	911.85	913.43	0.177670	11.74	9.88	14.92	2.54
Brook at 50+72	0	50 Yr	139.00	910.05	911.39	912.01	913.64	0.156288	12.03	11.56	15.17	2.43
Brook at 50+72	0	100 Yr	163.00	910.05	911.50	912.16	913.87	0.140339	12.34	13.21	15.25	2.34

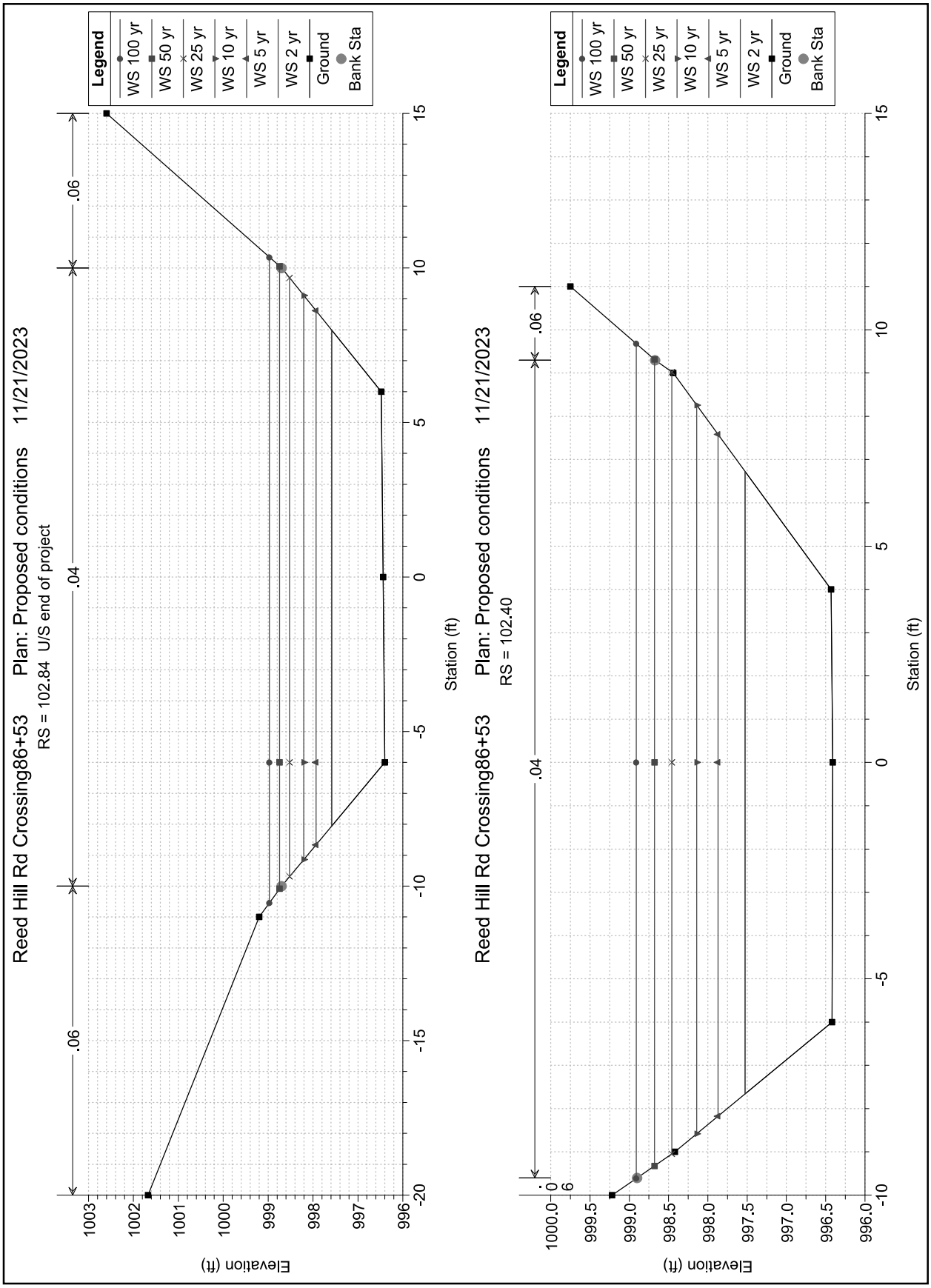
HEC-RAS Computed Results for crossing 86+53 proposed

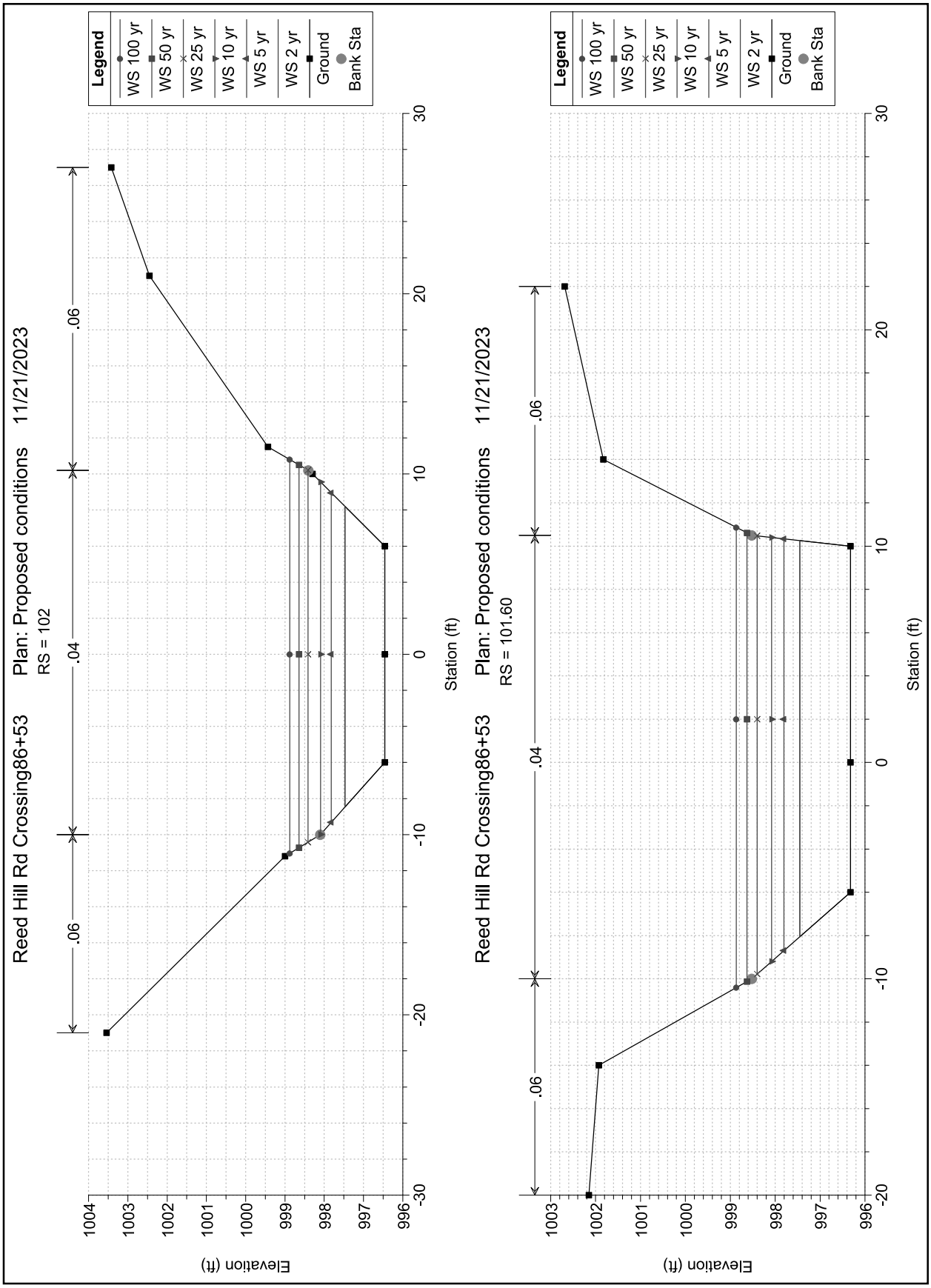
HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ.MILES)	0.33
DESIGN FLOOD DISCHARGE (C.F.S)	52
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S)	3.22
DESIGN FLOOD ELEVATION (FEET, NAVD)	998.32
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S)	73
BASE FLOOD ELEVATION (FEET, NAVD)	998.77
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY	25
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY	100
FLOOD OF RECORD	
DISCHARGE (C.F.S)	Unknown
FREQUENCY (IF KNOWN, YEARS)	Unknown
MAXIMUM ELEVATION (FEET, NAVD)	Unknown
DATE (MM/YYYY)	Unknown
HISTORY OF ICE FLOCS	Unknown

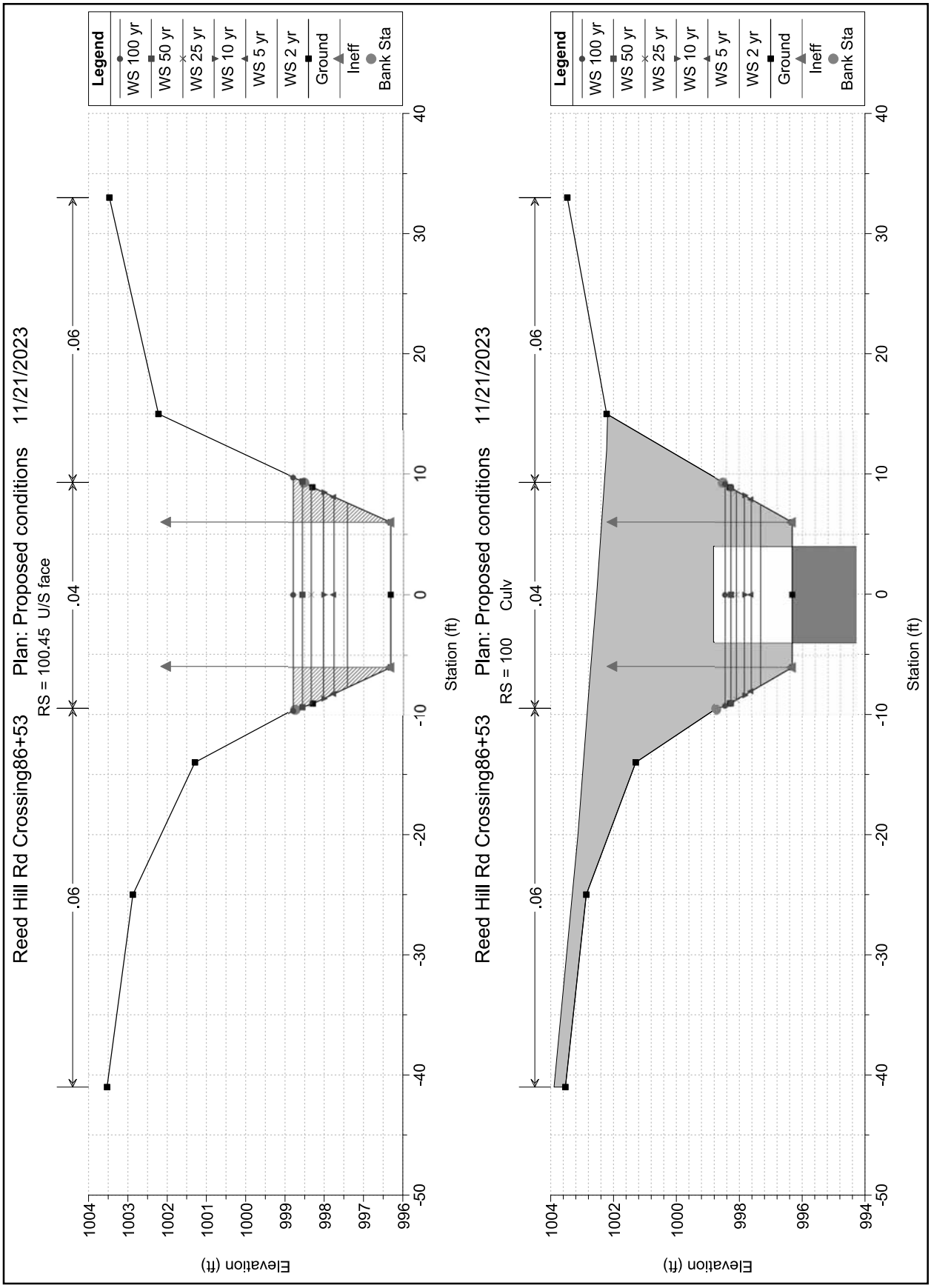
TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S)	18
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY	8.91
DESIGN FLOOD ELEVATION (FEET,NAVD)	1001.42

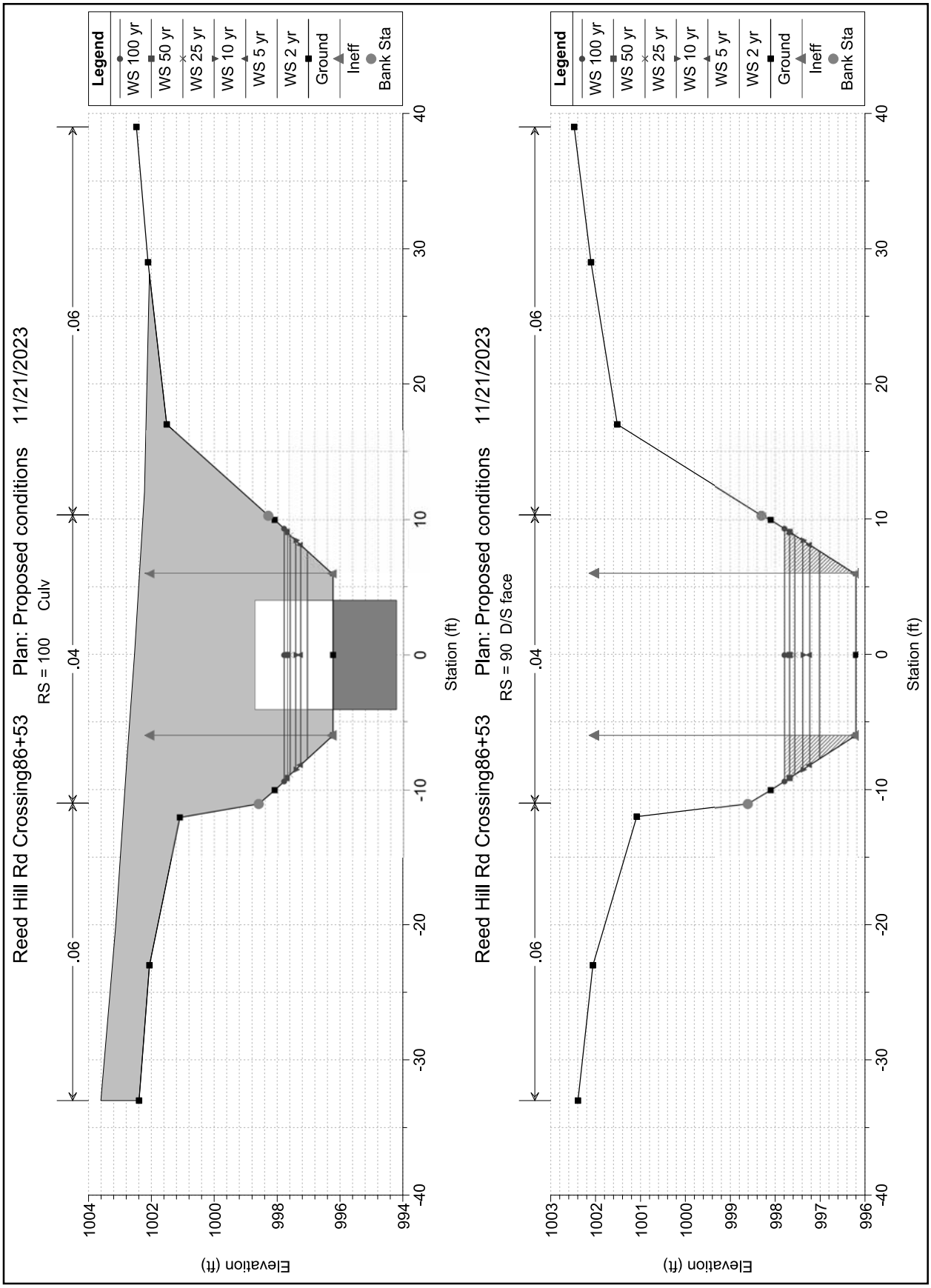
Section	Length (ft)	Span (ft)	Rise (ft)	Invert (u/s)	Invert (d/s)
R.C Box Culvert	50	8	4.5	994.32	994.22

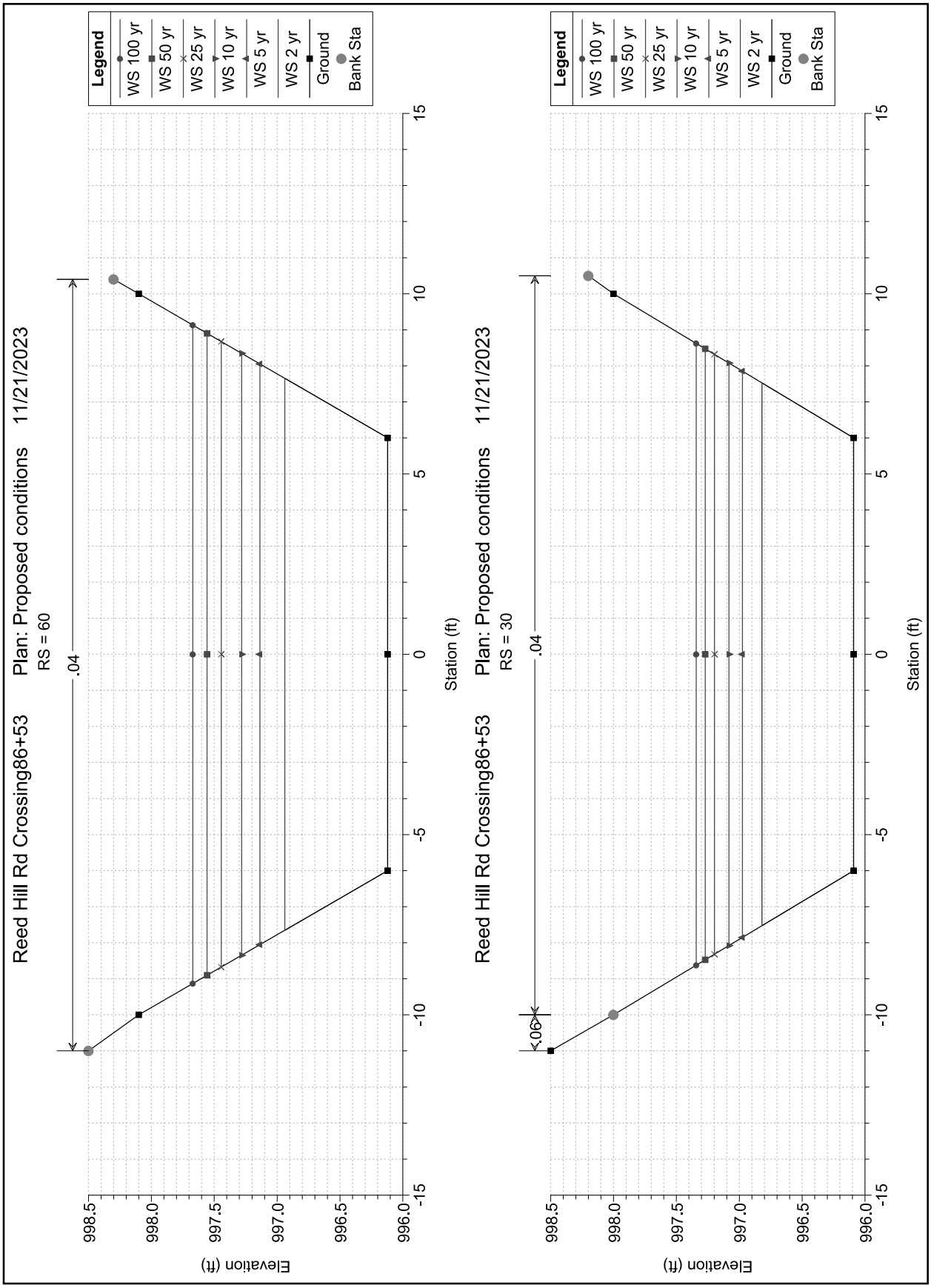

Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
Brook Main Channel
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Elevation (ft)
Main Channel Distance (ft)
994
996
998
1000
1002
1004
0
30
50
60
90
100
150
200
250
300
101.60
102
102.40
102.84

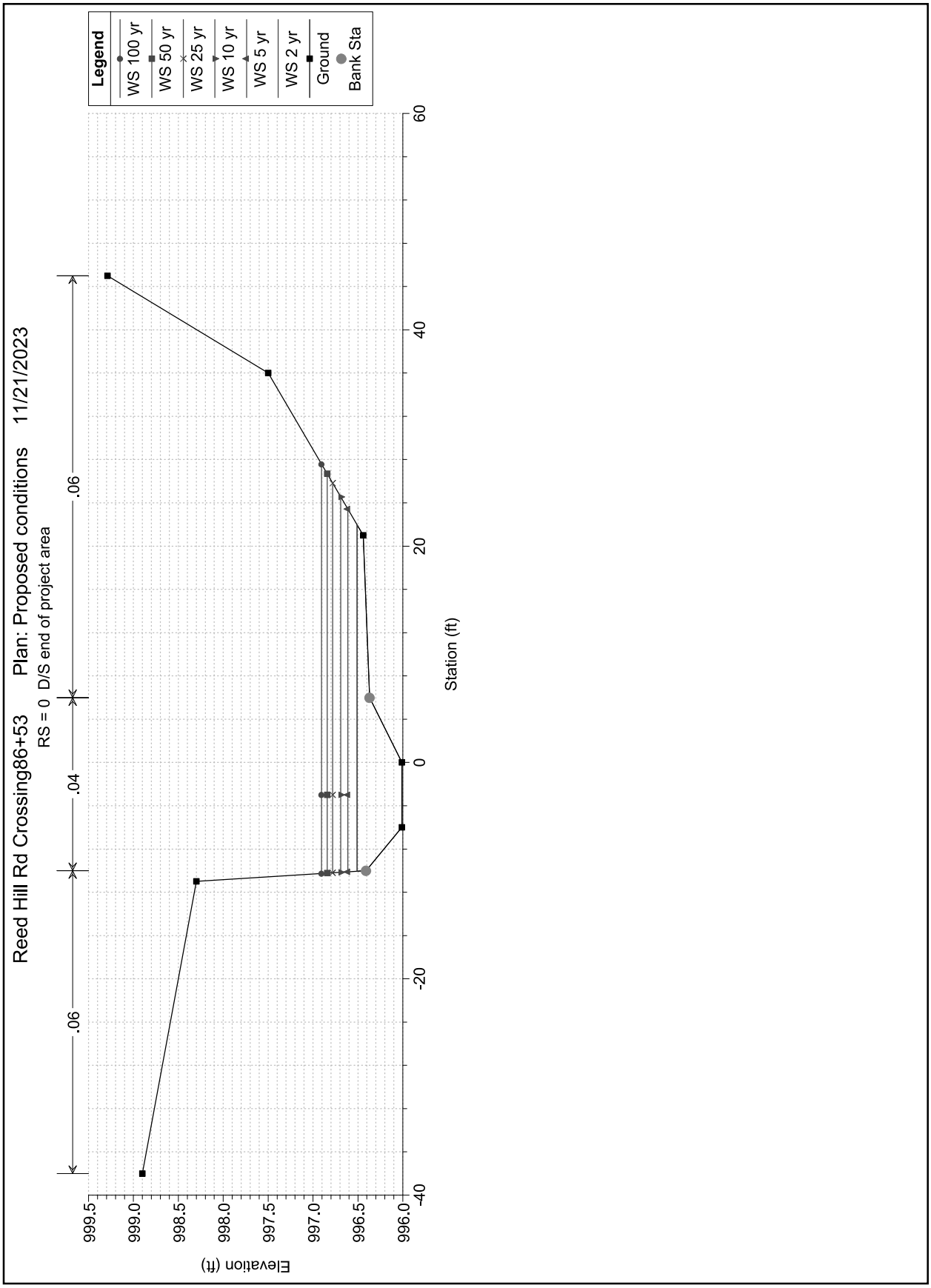

Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 102.84 U/S end of project
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)
1003
1002
1001
1000
999
998
997
996
15
10
5
0
-5
-10
-15
-20
Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 102.40
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)
1000.0
999.5
999.0
998.5
998.0
997.5
997.0
996.5
996.0
15
10
5
0
-5
-10


Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 102
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)
Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 101.60
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)


Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 100.45 U/S face
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Ineff
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)
Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 100 Culv
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Ineff
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)


Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 100
Culv
.06
.04
.06
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1004
1002
1000
998
996
994
40
30
20
10
0
-10
-20
-30
-40
Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 90
D/S face
.06
.04
.06
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1003
1002
1001
1000
999
998
997
996
40
30
20
10
0
-10
-20
-30
-40


Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 60
.04
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
998.5
998.0
997.5
997.0
996.5
996.0
15
10
5
0
-5
-10
-15
Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 30
.04
.06
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 0 D/S end of project area
.06
.04
.06
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
Elevation (ft)
999.5
999.0
998.5
998.0
997.5
997.0
996.5
996.0
-40
-20
0
20
40
60
Station (ft)

HEC-RAS Plan: prop River: Brook Reach: Main Channel

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	102.84	2 yr	18.00	996.40	997.59	996.84	997.61	0.000952	1.12	16.08	16.06	0.20
Main Channel	102.84	5 yr	29.00	996.40	997.93	996.99	997.96	0.000986	1.33	21.88	17.29	0.21
Main Channel	102.84	10 yr	39.00	996.40	998.21	997.10	998.24	0.000992	1.46	26.72	18.25	0.21
Main Channel	102.84	25 yr	52.00	996.40	998.52	997.24	998.56	0.000986	1.59	32.64	19.37	0.22
Main Channel	102.84	50 yr	62.00	996.40	998.74	997.33	998.79	0.000966	1.67	37.02	20.14	0.22
Main Channel	102.84	100 yr	73.00	996.40	998.97	997.43	999.02	0.000908	1.75	41.71	20.89	0.21
Main Channel	102.40	2 yr	18.00	996.41	997.53		997.55	0.001475	1.33	13.50	14.38	0.24
Main Channel	102.40	5 yr	29.00	996.41	997.87		997.91	0.001473	1.55	18.70	15.76	0.25
Main Channel	102.40	10 yr	39.00	996.41	998.14		998.19	0.001444	1.69	23.12	16.84	0.25
Main Channel	102.40	25 yr	52.00	996.41	998.46		998.51	0.001393	1.82	28.63	18.07	0.25
Main Channel	102.40	50 yr	62.00	996.41	998.68		998.74	0.001332	1.90	32.71	18.64	0.25
Main Channel	102.40	100 yr	73.00	996.41	998.91		998.97	0.001248	1.97	37.10	19.29	0.25
Main Channel	102	2 yr	18.00	996.46	997.47		997.49	0.001395	1.24	14.48	16.66	0.24
Main Channel	102	5 yr	29.00	996.46	997.82		997.85	0.001276	1.41	20.59	18.28	0.23
Main Channel	102	10 yr	39.00	996.46	998.10		998.13	0.001197	1.51	25.80	19.54	0.23
Main Channel	102	25 yr	52.00	996.46	998.42		998.46	0.001068	1.62	32.24	20.64	0.23
Main Channel	102	50 yr	62.00	996.46	998.64		998.69	0.000972	1.69	36.99	21.23	0.22
Main Channel	102	100 yr	73.00	996.46	998.88		998.93	0.000897	1.75	42.05	21.84	0.22
Main Channel	101.60	2 yr	18.00	996.32	997.45		997.47	0.000625	0.93	19.44	18.32	0.16
Main Channel	101.60	5 yr	29.00	996.32	997.80		997.82	0.000662	1.12	25.98	19.03	0.17
Main Channel	101.60	10 yr	39.00	996.32	998.08		998.10	0.000680	1.25	31.30	19.60	0.17
Main Channel	101.60	25 yr	52.00	996.32	998.40		998.43	0.000690	1.38	37.71	20.25	0.18
Main Channel	101.60	50 yr	62.00	996.32	998.63		998.66	0.000680	1.46	42.37	20.74	0.18
Main Channel	101.60	100 yr	73.00	996.32	998.86		998.90	0.000657	1.55	47.33	21.27	0.18
Main Channel	100.45	2 yr	18.00	996.32	997.41	996.73	997.44	0.001225	1.38	13.08	15.27	0.23
Main Channel	100.45	5 yr	29.00	996.32	997.75	996.88	997.79	0.001288	1.69	17.15	16.29	0.25
Main Channel	100.45	10 yr	39.00	996.32	998.01	997.01	998.07	0.001319	1.92	20.34	17.09	0.26
Main Channel	100.45	25 yr	52.00	996.32	998.32	997.16	998.40	0.001340	2.16	24.06	18.02	0.27
Main Channel	100.45	50 yr	62.00	996.32	998.54	997.26	998.63	0.001347	2.32	26.69	18.67	0.27
Main Channel	100.45	100 yr	73.00	996.32	998.77	997.37	998.87	0.001349	2.48	29.43	19.31	0.28
Main Channel	100		Culvert									
Main Channel	90	2 yr	18.00	996.22	997.03	996.63	997.08	0.003347	1.86	9.67	15.43	0.37
Main Channel	90	5 yr	29.00	996.22	997.24	996.79	997.33	0.003986	2.37	12.22	16.33	0.41
Main Channel	90	10 yr	39.00	996.22	997.39	996.91	997.51	0.004479	2.77	14.09	17.00	0.45

Proposal No. 608163 - 128112

HEC-RAS Plan: prop River: Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	90	25 yr	52.00	996.22	997.57	997.06	997.73	0.005057	3.22	16.15	17.73	0.49
Main Channel	90	50 yr	62.00	996.22	997.68	997.17	997.88	0.005461	3.54	17.54	18.22	0.52
Main Channel	90	100 yr	73.00	996.22	997.80	997.28	998.03	0.005871	3.86	18.93	18.71	0.54
Main Channel	60	2 yr	18.00	996.12	996.94		996.98	0.002948	1.61	11.18	15.31	0.33
Main Channel	60	5 yr	29.00	996.12	997.14		997.20	0.003645	2.03	14.28	16.11	0.38
Main Channel	60	10 yr	39.00	996.12	997.28		997.37	0.004144	2.34	16.67	16.70	0.41
Main Channel	60	25 yr	52.00	996.12	997.45		997.56	0.004663	2.67	19.45	17.35	0.45
Main Channel	60	50 yr	62.00	996.12	997.56		997.69	0.004990	2.90	21.41	17.81	0.47
Main Channel	60	100 yr	73.00	996.12	997.67		997.82	0.005291	3.11	23.46	18.26	0.48
Main Channel	30	2 yr	18.00	996.09	996.82		996.87	0.004345	1.82	9.88	15.06	0.40
Main Channel	30	5 yr	29.00	996.09	996.97		997.06	0.005849	2.37	12.25	15.70	0.47
Main Channel	30	10 yr	39.00	996.09	997.08	996.75	997.20	0.007099	2.79	13.98	16.16	0.53
Main Channel	30	25 yr	52.00	996.09	997.20	996.88	997.36	0.008642	3.28	15.86	16.64	0.59
Main Channel	30	50 yr	62.00	996.09	997.27	996.98	997.48	0.009811	3.63	17.10	16.95	0.64
Main Channel	30	100 yr	73.00	996.09	997.34	997.07	997.59	0.011118	3.99	18.30	17.24	0.68
Main Channel	0	2 yr	18.00	996.01	996.51	996.49	996.62	0.020035	2.76	7.67	32.01	0.79
Main Channel	0	5 yr	29.00	996.01	996.61	996.59	996.76	0.020008	3.24	11.09	33.54	0.82
Main Channel	0	10 yr	39.00	996.01	996.69	996.66	996.86	0.020010	3.58	13.78	34.70	0.84
Main Channel	0	25 yr	52.00	996.01	996.78	996.75	996.98	0.020022	3.95	16.93	36.01	0.86
Main Channel	0	50 yr	62.00	996.01	996.84	996.81	997.07	0.020016	4.20	19.19	36.92	0.88
Main Channel	0	100 yr	73.00	996.01	996.91	996.87	997.15	0.020015	4.44	21.54	37.84	0.89

APPENDIX F

Drainage Swales

PROJECT:
MONSON ROAD RECONSTRUCTION
WALES, MA
JOB NO: 2170841

STA 11+50 Lt to STA 13+50 Lt

SWALE LINING DESIGN

	B	Base width	1	ft	
		Side Slopes	2	ft/ft	
Equation 7.12	Maximum Shear Stress				
	$\tau = \Upsilon dS$				
	Υ	Unit Weight of Water	62.4	lb/ft^3	
	d	max. dept of flow	0.41	ft	(10 year)
		From Express Calcs			
	S	avg. bed slope	0.031	ft/ft	
	τ		0.79	lb/ft^2	

Turf Establishment (Permissible Unit Shear Strees 1.0 lb/ft^2)

Weston & Sampson

PROJECT:
MONSON ROAD RECONSTRUCTION
WALES, MA
JOB NO: 2170841

STA14+50 to 17+00 LT

SWALE LINING DESIGN

B	Base width	1	ft	
	Side Slopes	2	ft/ft	

Equation 7.12 Maximum Shear Stress

$\tau = \Upsilon d S$

Υ	Unit Weight of Water	62.4	lb/ft^3	
d	max. dept of flow From Express Calcs	0.63	ft	(10 year)
S	avg. bed slope	0.035	ft/ft	

τ	1.38	lb/ft^2

Rock Riprap (6" diameter) (Permissible Unit Shear Stress 2.00 lb/ft^2)

D50 bottom	5	in

$D50_{sides} = K_1/K_2 * (D50)_{bottom}$

K1 Ratio of shear streese on sides and bottom
Side slope of 2:1
B/d 1.59

K1	0.87

K2 Ratio of tractive force on the sides and bootm using Fig. 7-10
Angle of repose is 42°

K2	0.77

$D50_{sides}$	5.65	in

Weston & Sampson

PROJECT:
MONSON ROAD RECONSTRUCTION
WALES, MA
JOB NO: 2170841

STA31+65 Lt to STA40+40

SWALE LINING DESIGN

B	Base width	1	ft	
	Side Slopes	2	ft/ft	

Equation 7.12 Maximum Shear Stress

$\tau = \Upsilon d S$

Υ	Unit Weight of Water	62.4	lb/ft^3	
d	max. dept of flow From Express Calcs	0.57	ft	(10 year)
S	avg. bed slope	0.047	ft/ft	

τ	1.67	lb/ft^2

Rock Riprap (6" diameter) (Permissible Unit Shear Stress 2.00 lb/ft^2)

D50 bottom	5	in

$D50_{sides} = K_1/K_2 * (D50)_{bottom}$

K1 Ratio of shear streese on sides and bottom
Side slope of 2:1
B/d 1.75

K1	0.87

K2 Ratio of tractive force on the sides and bootm using Fig. 7-10
Angle of repose is 42°

K2	0.77

$D50_{sides}$	5.65	in

Weston & Sampson

PROJECT:
MONSON ROAD RECONSTRUCTION
WALES, MA
JOB NO: 2170841

STA40+40 Lt to STA 46+50 lt

SWALE LINING DESIGN

	B	Base width	1	ft	
		Side Slopes	2	ft/ft	
Equation 7.12	Maximum Shear Stress				
	$\tau = \Upsilon dS$				
	Υ	Unit Weight of Water	62.4	lb/ft^3	
	d	max. dept of flow	0.35	ft	(10 year)
		From Express Calcs			
	S	avg. bed slope	0.016	ft/ft	
	τ		0.35	lb/ft^2	

Turf Establishment (Permissible Unit Shear Strees 1.0 lb/ft^2)

PROJECT:
MONSON ROAD RECONSTRUCTION
WALES, MA
JOB NO: 2170841

STA 70+50 TO 72+75

SWALE LINING DESIGN

	B	Base width	1	ft	
		Side Slopes	2	ft/ft	
Equation 7.12	Maximum Shear Stress				
	$\tau = \Upsilon dS$				
	Υ	Unit Weight of Water	62.4	lb/ft^3	
	d	max. dept of flow	0.46	ft	(10 year)
		From Express Calcs			
	S	avg. bed slope	0.03	ft/ft	
	τ		0.86	lb/ft^2	

Turf Establishment (Permissible Unit Shear Strees 1.0 lb/ft^2)

Proposing modified rockfill to comply with MassDOT PDDG standards for a swale with 3% slope

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, May 12 2020

Sta. 11+50 to 13+50

Trapezoidal

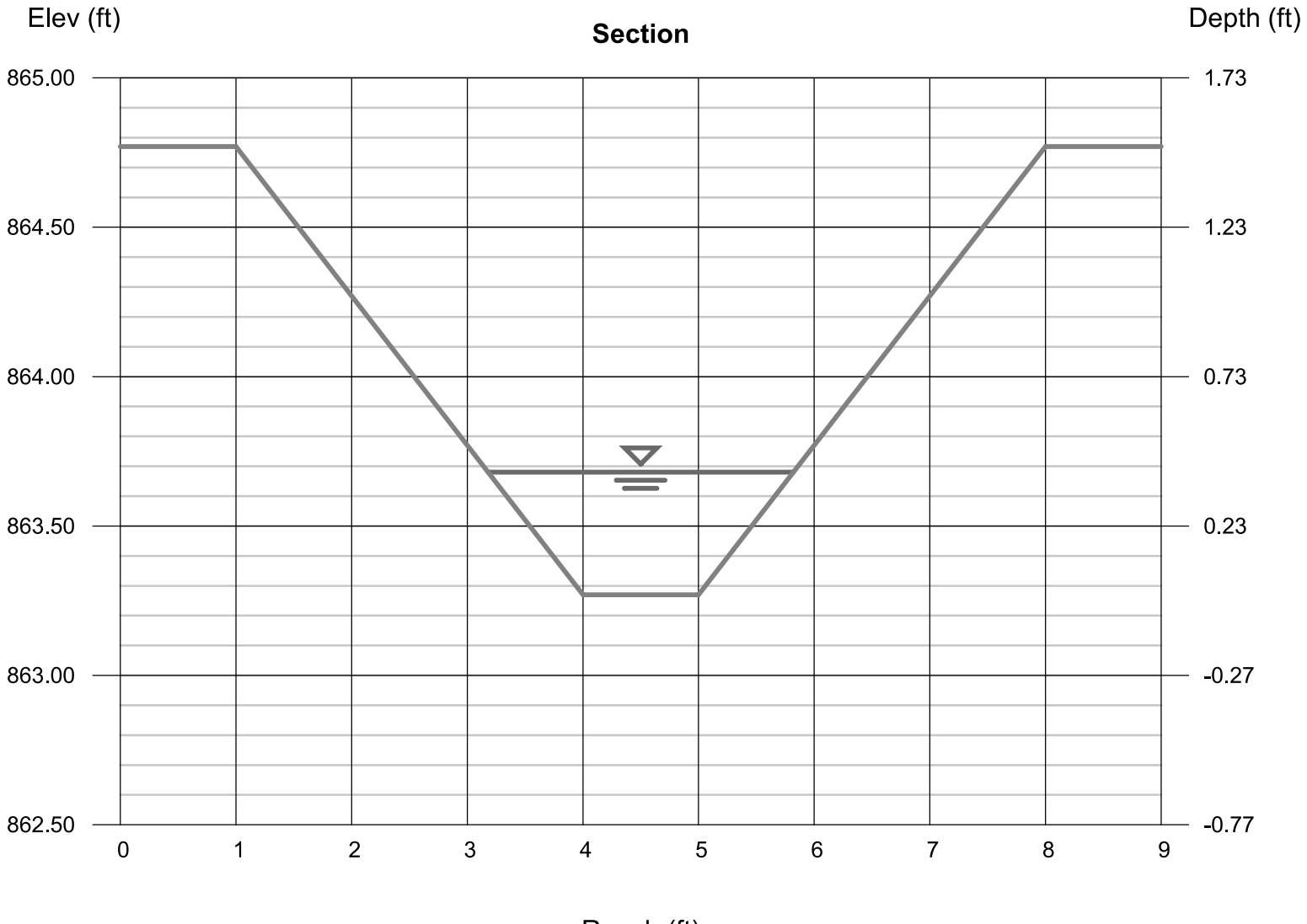
Bottom Width (ft)	= 1.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 863.27
Slope (%)	= 3.10
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.38

Highlighted

Depth (ft)	= 0.41
Q (cfs)	= 2.380
Area (sqft)	= 0.75
Velocity (ft/s)	= 3.19
Wetted Perim (ft)	= 2.83
Crit Depth, Yc (ft)	= 0.43
Top Width (ft)	= 2.64
EGL (ft)	= 0.57



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, May 12 2020

Sta. 14+50 to 17+00

Trapezoidal

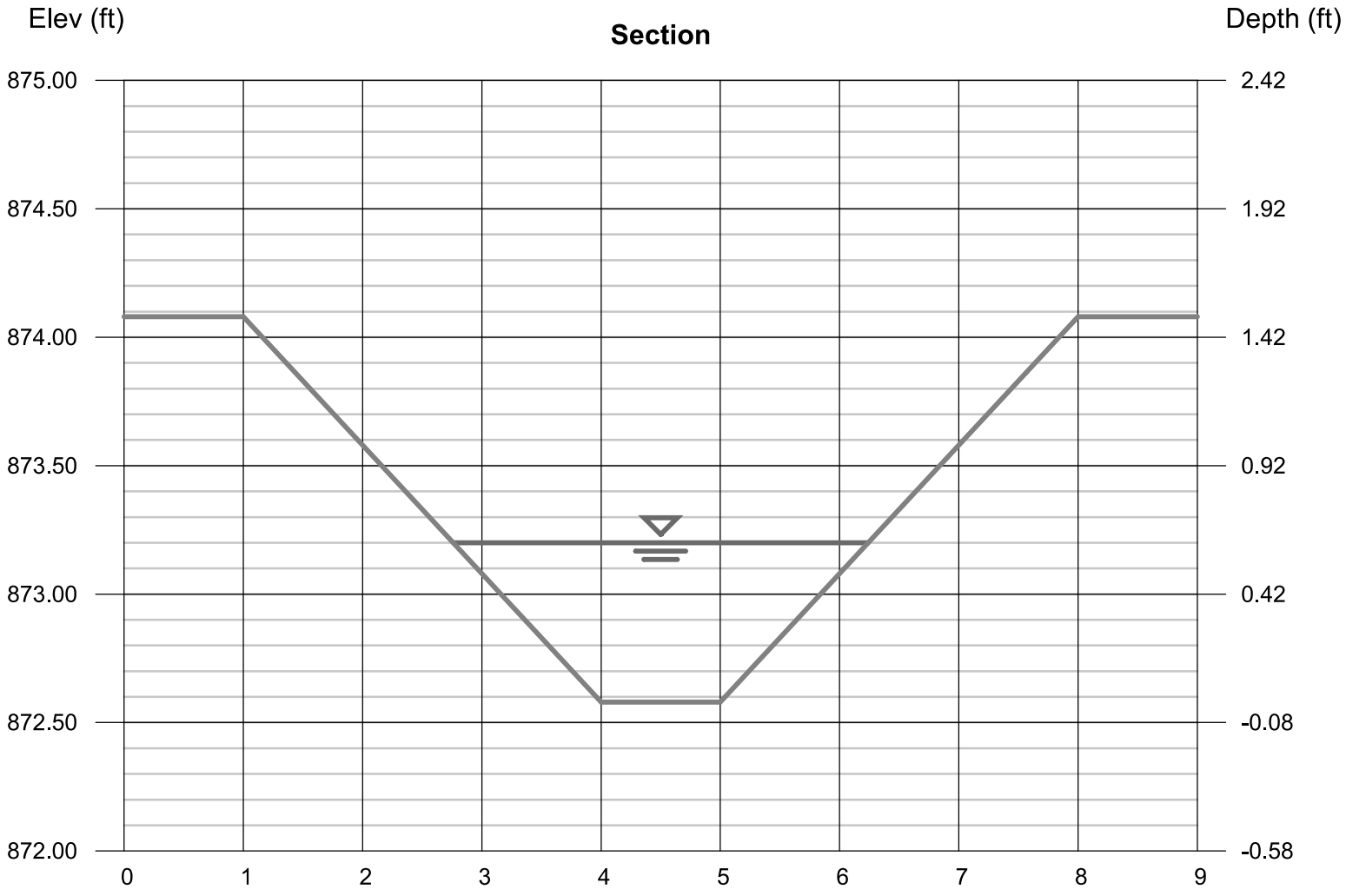
Bottom Width (ft)	= 1.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 872.58
Slope (%)	= 3.90
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.14

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 6.140
Area (sqft)	= 1.39
Velocity (ft/s)	= 4.42
Wetted Perim (ft)	= 3.77
Crit Depth, Yc (ft)	= 0.69
Top Width (ft)	= 3.48
EGL (ft)	= 0.92



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Dec 14 2021

Sta. 31+65

Trapezoidal

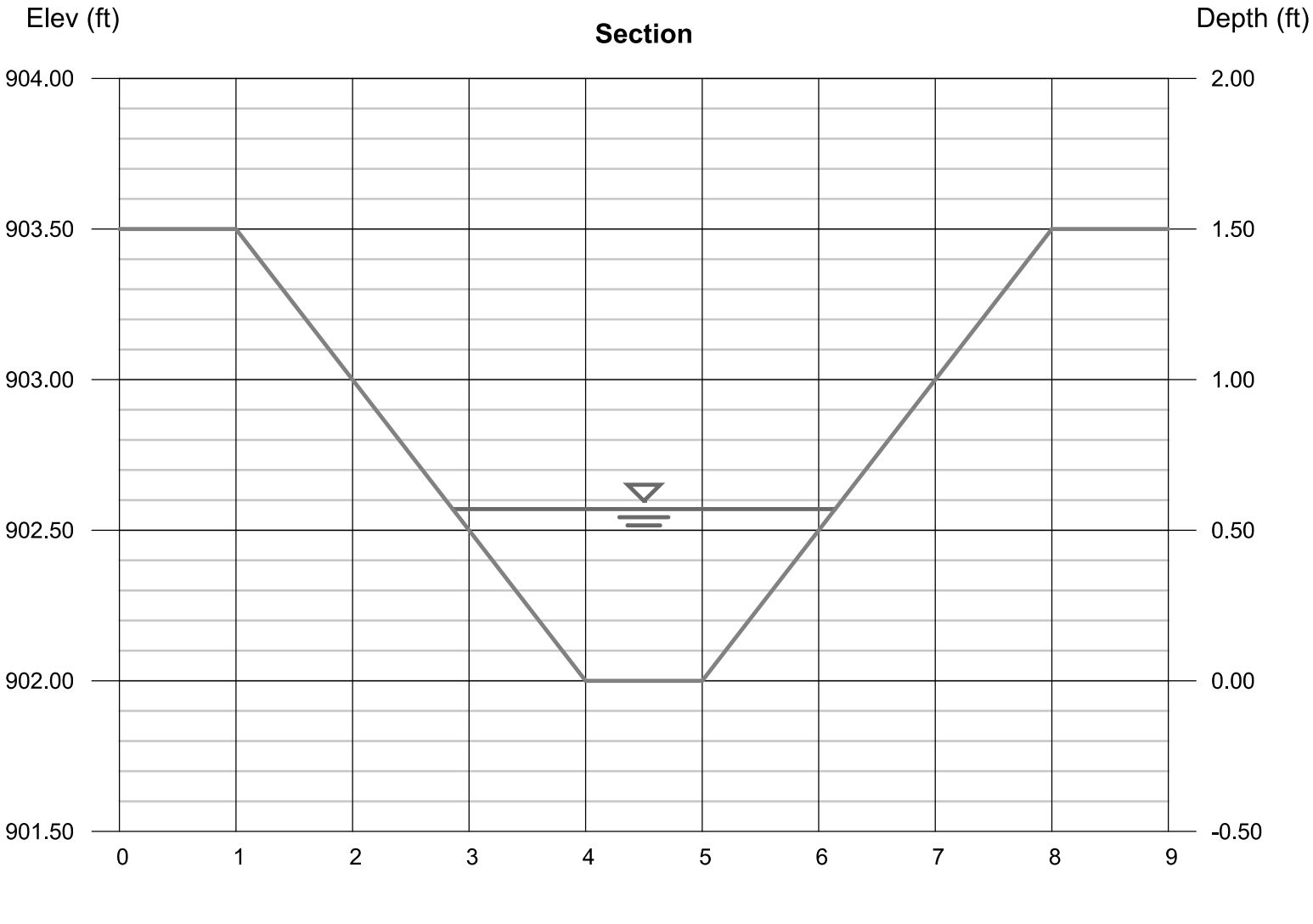
Bottom Width (ft)	= 1.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 902.00
Slope (%)	= 4.70
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.66

Highlighted

Depth (ft)	= 0.57
Q (cfs)	= 5.660
Area (sqft)	= 1.22
Velocity (ft/s)	= 4.64
Wetted Perim (ft)	= 3.55
Crit Depth, Yc (ft)	= 0.67
Top Width (ft)	= 3.28
EGL (ft)	= 0.90



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Dec 14 2021

Sta. 43+70

Trapezoidal

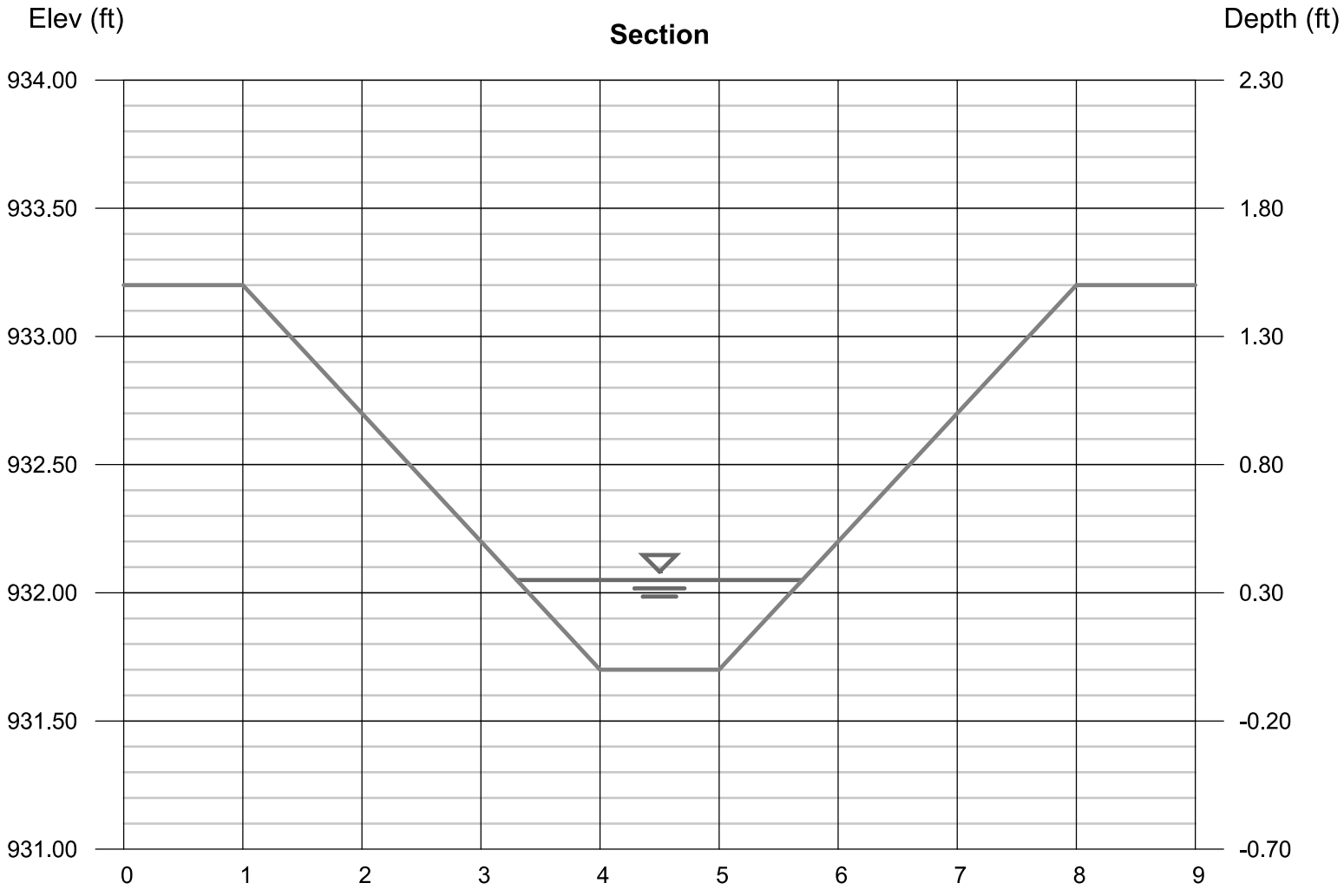
Bottom Width (ft)	= 1.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 931.70
Slope (%)	= 1.60
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.23

Highlighted

Depth (ft)	= 0.35
Q (cfs)	= 1.230
Area (sqft)	= 0.59
Velocity (ft/s)	= 2.07
Wetted Perim (ft)	= 2.57
Crit Depth, Yc (ft)	= 0.30
Top Width (ft)	= 2.40
EGL (ft)	= 0.42



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Nov 30 2023

Sta. 46+65

Triangular

Side Slopes (z:1)	= 6.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 930.00
Slope (%)	= 0.66
N-Value	= 0.033

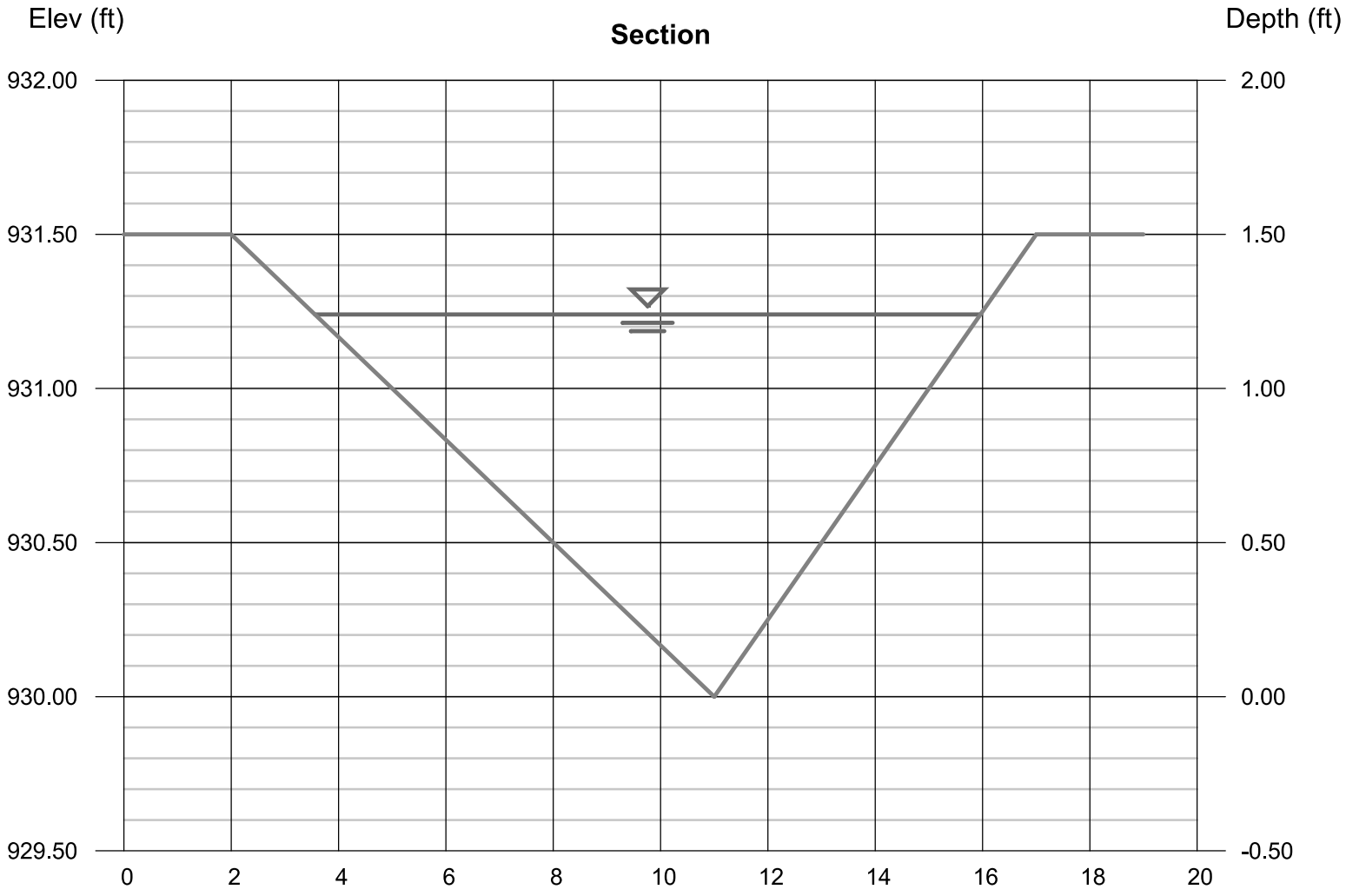
Calculations

Compute by:	Known Q
Known Q (cfs)	= 20.00

Highlighted

Depth (ft)	= 1.24
Q (cfs)	= 20.00
Area (sqft)	= 7.69
Velocity (ft/s)	= 2.60
Wetted Perim (ft)	= 12.66
Crit Depth, Yc (ft)	= 1.00
Top Width (ft)	= 12.40
EGL (ft)	= 1.35

Assuming diverted flow from Sta. 43+76 crossing - normal flow without diversion is 1.60 cfs



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Dec 14 2021

STA 72+75

Trapezoidal

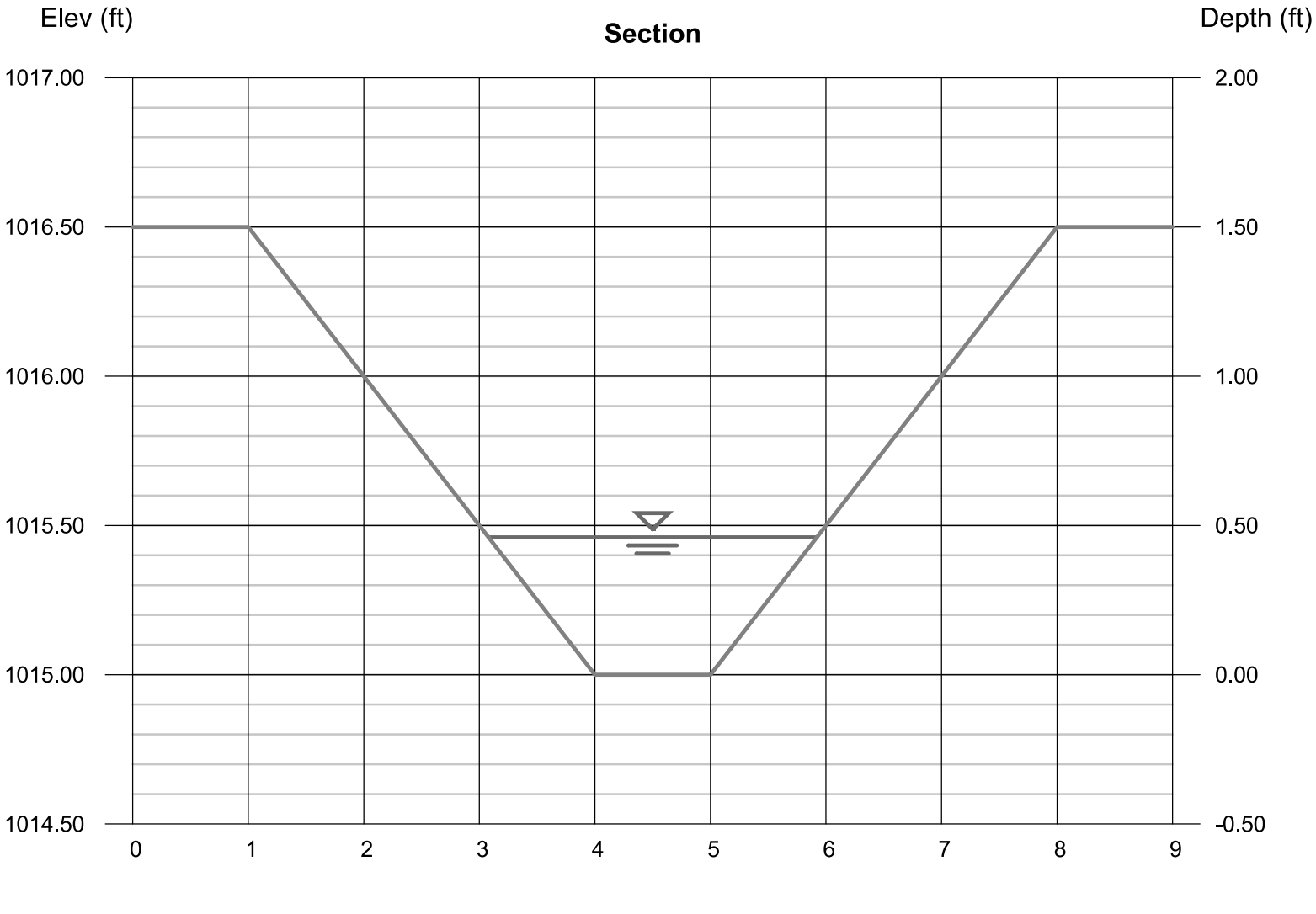
Bottom Width (ft)	= 1.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 1015.00
Slope (%)	= 3.00
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.94

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 2.940
Area (sqft)	= 0.88
Velocity (ft/s)	= 3.33
Wetted Perim (ft)	= 3.06
Crit Depth, Yc (ft)	= 0.48
Top Width (ft)	= 2.84
EGL (ft)	= 0.63



Monson Road Reconstruction
Wales, MA

Weston&Sampson ENGINEERS, INC.

Date: 4/8/2024
By: NSD
Checked By: RSV

TABLE 1

PROPOSED DRAINAGE AREA SUMMARY SHEET
HYDRAFLOW ANALYSIS

i = 7.21 for 5 min
i = 4.00 for 15 min. Tc
10-yr Storm

Area		Area (s.f)	Area (ac.)	Impervious Area (s.f)	Grass Area (s.f)	Woods Area (s.f)	C-Value	Tc (min.)	Q=CiA
Proposed Drainage System									
	STA 11+50								
Swale		146,424	**3.361**	5,227	141,197		0.32	15	4.32
	STA 15+30								
Swale		263,398	**6.047**	14,906	88,478	160,014	0.27	15	6.61
	STA 31+65								
Swale		261,651	**6.007**	16,212	18,800	226,639	0.25	15	6.02
	STA 43+70								
Swale		33,770	**0.775**	9,772	6,265	17,733	0.42	15	1.31
	STA 46+65								
Swale		48,946	**1.124**	2,570	13,201	33,175	0.26	8	1.76
	STA 72+75								
Swale		161,325	**3.704**	5,642	6,630	149,053	0.23	15	3.39

NOTES:
1) Refer to DA-1 - 3 for drainage areas.
2) C-Values were used based on Exhibit 8-8 of the MassDOT Project Development and Design Guide. Values given below.
3) Time of Concentrations (Tc) derived from Hydraflow (TR-55 Method). Refer to Tc computations included.
4) Minimum Tc used for paved areas = 5 min. and grassy areas = 10 min.

Land Cover		C
Impervious		0.9
Grass		0.3
Unimproved (Woods)		0.2

APPENDIX G

Outlet Protection

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 15+33					
Wo	pipe diameter or span	(ft)	1.5			Input
Q	pipe(design) discharge	(cfs)	9	25-yr storm		Output
TW	tailwater depth	(ft)	0.29	(HY-8)		
D	pipe rise	(ft)	1.5			
	Velocity	(ft/s)	9.86			

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.74	ft	8.92	in

Calculated Riprap Apron Dimensions

L=	4D	6.00	FT
Depth=	$3.3D_{50}$	2.45	FT
W1= 3Wo	(min.)	4.5	FT
W2=3Wo + 2/3L		11.17	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	1.5	FT
W1	4	FT
W2	12	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 22+25					
Wo	pipe diameter or span	(ft)	1.25			Input
Q	pipe(design) discharge	(cfs)	5.55	25-yr storm		Output
TW	tailwater depth	(ft)	0.1	(HY-8)		
D	pipe rise	(ft)	1.25			

Velocity	(ft/s)	5.36

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	1.44	ft	17.31	in

Calculated Riprap Apron Dimensions

L=	4D	5.00	FT
Depth=	$3.3D_{50}$	4.76	FT
W1= 3Wo	(min.)	3.75	FT
W2=3Wo + 2/3L		7.08	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	1.5	FT
W1	5	FT
W2	10	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 25+00					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	1.22	10-yr storm		Output
TW	tailwater depth	(ft)	0.1	(HY-8)		
D	pipe rise	(ft)	1			
	Velocity	(ft/s)	4.53			

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.26	ft	3.09	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT
Depth=	$3.3D_{50}$	0.85	FT
W1= 3Wo	(min.)	3	FT
W2=3Wo + 2/3L		5.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	7.5	FT
Depth	1.5	FT
W1	4	FT
W2	6	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 43+76	Twin 12" diameter pipes				
Wo	pipe diameter or span	(ft)	2			Input
Q	pipe(design) discharge	(cfs)	12.5	25-yr storm		Output
TW	tailwater depth	(ft)	0.32	(HY-8)		
D	pipe rise	(ft)	2			

Velocity	(ft/s)	6.27

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.71	ft	8.54	in

Calculated Riprap Apron Dimensions

L=	4D	8.00	FT
Depth=	$3.3D_{50}$	2.35	FT
W1= 3Wo	(min.)	6	FT
W2=3Wo + 2/3L		12.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	1.5	FT
W1	5	FT
W2	16	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 46+65					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	12.5	25-yr storm		Output
TW	tailwater depth	(ft)	0.94	(HY-8)		
D	pipe rise	(ft)	1			
	Velocity	(ft/s)	6.75			

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.61	ft	7.32	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT
Depth=	$3.3D_{50}$	2.01	FT
W1= 3Wo	(min.)	3	FT
W2=3Wo + 2/3L		9.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	1.5	FT
W1	3	FT
W2	10	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 50+55					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	2.05	25-yr storm		Output
TW	tailwater depth	(ft)	0.1	(HY-8)		
D	pipe rise	(ft)	1			
	Velocity	(ft/s)	3.5			

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.51	ft	6.18	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT
Depth=	$3.3D_{50}$	1.70	FT
W1= 3Wo	(min.)	3	FT
W2=3Wo + 2/3L		5.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	1.5	FT
W1	5	FT
W2	12	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 51+20					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	3.75	10-yr storm		Output
TW	tailwater depth	(ft)	0.1	(HY-8)		
D	pipe rise	(ft)	1			
	Velocity	(ft/s)	5.83			

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	1.15	ft	13.82	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT
Depth=	$3.3D_{50}$	3.80	FT
W1= 3Wo	(min.)	3	FT
W2=3Wo + 2/3L		5.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	1.5	FT
W1	5	FT
W2	12	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 73+25					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	1.58	10-yr storm		Output
TW	tailwater depth	(ft)	0.05			
D	pipe rise	(ft)	1			

Velocity	(ft/s)	3.38

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.73	ft	8.73	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT
Depth=	$3.3D_{50}$	2.40	FT
W1= 3Wo	(min.)	3	FT
W2=3Wo + 2/3L		9.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	9.5	FT
Depth	1.5	FT
W1	10	FT
W2	10	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 81+97					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	3.31	10-yr storm		Output
TW	tailwater depth	(ft)	0.1			
D	pipe rise	(ft)	1			

Velocity	(ft/s)	6.12

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.98	ft	11.70	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT
Depth=	$3.3D_{50}$	3.22	FT
W1= 3Wo	(min.)	3	FT
W2=3Wo + 2/3L		5.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	5	FT
Depth	1.5	FT
W1	4	FT
W2	6	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 82+07					
Wo	pipe diameter or span	(ft)	1.5			Input
Q	pipe(design) discharge	(cfs)	9	25-yr storm		Output
TW	tailwater depth	(ft)	0.14	(HY-8)		
D	pipe rise	(ft)	1.5			
	Velocity	(ft/s)	7.72			

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	1.54	ft	18.48	in

Calculated Riprap Apron Dimensions

L=	4D	6.00	FT	Use	10	FT
Depth=	$3.3D_{50}$	5.08	FT			
W1= 3Wo	(min.)	4.5	FT			
W2=3Wo + 2/3L		11.17	FT			

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	2	FT
W1	5	FT
W2	14	FT

Project	Monson Road	Date:	4/8/2024
Project Number:	ENG23-0621	By:	NSD
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels
Chapter 10 Riprap Basins and Aprons

Location	Sta 85+72					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	1.78	25-yr storm		Output
TW	tailwater depth	(ft)	0.05			
D	pipe rise	(ft)	1			

Velocity	(ft/s)	3.96

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.85	ft	10.24	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT	Use	10	FT
Depth=	$3.3D_{50}$	2.81	FT			
W1= 3Wo	(min.)	3	FT			
W2=3Wo + 2/3L		9.67	FT			

Proposed **Modified Rockfill Scour Hole**

Ls	8	FT
Depth	2	FT
W1	4.5	FT
W2	7	FT

Dimensions based on site conditions
and proposed headwall configuration

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 1+50					
Wo	pipe diameter or span	(ft)	1.5			Input
Q	pipe(design) discharge	(cfs)	1	25-yr storm		Output
TW	tailwater depth	(ft)	0.15	(HY-8)		
D	pipe rise	(ft)	1.5			
	Velocity	(ft/s)	4.96			

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.08	ft	0.92	in

Calculated Riprap Apron Dimensions

L=	4D	6.00	FT	Use	10	FT
Depth=	$3.3D_{50}$	0.25	FT			
W1= 3Wo	(min.)	4.5	FT			
W2=3Wo + 2/3L		11.17	FT			

Proposed

Existing Wetlands to Remain. Velocity is under 5 ft/s.

ATTACHMENT D

Operation and Maintenance Plan

LONG-TERM POLLUTION PREVENTION PLAN/
OPERATION AND MAINTENANCE PLAN
Town of Wales

I. Purpose and Scope

The purpose of this plan is to provide the maintenance staff of the Town of Wales guidelines and procedures for the operation and maintenance of the drainage systems for the Monson Road Transportation Improvement Project. Checklists will be utilized during the inspection and cleaning process and kept on file in the maintenance office.

The proposed site plan includes the following stormwater structures:

- Catch Basins
- Drainage Manholes
- Drainage Swales
- Discharge Points

II. Ownership

The Town of Wales Highway Department operates and maintains Town-wide roadways and drainage systems.

III. Responsible Party

The following individual is the primary contact for the implementation of this plan.

Name: Christopher Ryan, Highway Superintendent

Phone #: (413) 245-7494

IV. Schedule for Inspection and Maintenance Activities

A. Inspection

i. Structures, swales, and outfalls will be inspected annually for excess accumulation of sediment and debris, erosion or other problems.

B. Routine and Non-Routine Maintenance

i. Structures, swales, and outfalls shall be cleaned at least once a year, at a minimum, after the snow and ice removal

season and before spring rainfall events or as required due to conditions noted during inspections.

ii. Street sweeping: The roadways shall be swept once a year after the snow and ice removal season has ended and prior to spring rains.

iii. Erosion repairs will be completed on an as-needed basis.

V. Access to System

The drainage system is located within the Town right-of-way.

VI. Funding

The Highway Department maintains a budget as required to complete all highway related services. Inspection and maintenance of the systems is part of this yearly budget process.

VII. Illicit Discharges

No illicit discharges to watercourses or drainage structures are permitted in the Town of Wales.

VIII. Operation and Maintenance Log Forms

See attached sheets.

STORMWATER MANAGEMENT SYSTEM INSPECTION CHECKLIST

DATE/TIME:_____

INSPECTOR:_____

STRUCTURE	*SATISFACTORY (YES OR NO)*	*COMMENTS*	*ACTION*	*DATE COMPLETED*
STRUCTURES				

STRUCTURE	SATISFACTORY (YES OR NO)	COMMENTS	ACTION	DATE COMPLETED

STRUCTURE	*SATISFACTORY (YES OR NO)*	*COMMENTS*	*ACTION*	*DATE COMPLETED*
OUTFALLS				

STRUCTURE	*SATISFACTORY (YES OR NO)*	*COMMENTS*	*ACTION*	*DATE COMPLETED*
OUTFALLS				

ATTACHMENT E

Erosion and Sedimentation Control Plan and Pollution Prevention Plan

Erosion and Sedimentation Control Plan and Pollution Prevention Plan

For Construction Activities At:

Monson Road Transportation Improvement Project
Wales, MA

Prepared For:

Town of Wales
3 Hegan Street
Wales, MA
(413) 245-7494– Christopher Ryan

Prepared By:

Weston & Sampson Engineers, Inc.
712 Brook Street, Suite 103
Rocky Hill, CT 06067
(860) 513-1473

Site Contractor:

To Be Determined

1. Narrative

The purpose of this plan is to provide general guidelines and operation and maintenance procedures to the contractor during construction specifically with regards to erosion and sediment control.

The proposed project includes construction activities in, or close to, the limit of work includes bordering vegetated wetlands, mean annual high water and top of bank to perennial and intermittent stream). Activities includes excavation within existing pavement limits for the installation of storm drainage systems and the reconstruction of the existing paved roadways. Soils in the project area per the NRCS Web Soil Survey include:

- 307C – Paxton fine sandy loam, 8 to 15 percent slopes –Hydrologic Soil Group C
- 316B – Scituate fine sandy loam , 3 to 8 percent slopes, very stony – Hydrologic Soil Group C/D

Imported fill material will likely be limited to new road base and pipe bedding material unless excessive unsuitable materials are encountered within the paving limit.

2. Operation and Maintenance

A. The work covered by this plan consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract.

B. The requirements set forth in this plan apply to all land disturbing activities required for this project

C. All work under this Contract shall be in accordance with the Conservation Commissions' Orders of Conditions as well as all other stated requirements.

D. The proposed erosion and sediment control measures that are to be installed are located on the construction drawings.

E. A rain gauge shall be placed at the project in a workable location and monitored during rainfall periods until all disturbed areas are stabilized. In the event, there is a rainfall greater than 1/2" in a 12 hour period, all erosion control measures shall be checked and repaired as required. If no rain gauge is used, all erosion control measures shall be checked after all rainfall events. A checklist (sample provided at the end of this plan) will be filled out by the contractor each week. The contractor shall designate a party to be responsible for the maintenance of all erosion and sediment control measures for the duration of the project. Inspections shall be completed weekly or

within 24 hours of a rain event as described above. When maintenance is required it shall be completed within 24 hours of being identified.

Designated Party: _____

F. All soil erosion and sediment control measures shall be installed, maintained, and implemented as shown on the construction drawings. It is the intent of this plan that soil erosion control measures are the first to be installed and the last to be removed. Surface waters on and adjacent to the site and abutting properties are to be protected from degradation and sedimentation. If other watercourses, streams, drainage-ways or abutting properties are jeopardized by construction, it shall be the contractor's responsibility to protect those waters and properties.

G. Make all necessary repairs to erosion control facilities as soon as possible. Silt fences and straw bale barriers, temporary sediment traps, and inlet protection which accumulate sediment and debris shall be cleaned and re-set as needed.

3. Notification

The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Engineer may order stoppage of all or part of the work until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

4. Implementation

A. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer and the Conservation Commission to develop mutual understandings relative to compliance of the environmental protection program.

B. The Contractor shall submit for approval six sets of details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of wetlands and 200 feet of watercourses.

C. Once a construction schedule has been established a person shall be named and will be responsible for implementation of sediment and erosion control measures. This responsibility includes the acquisition of materials,

installation, and maintenance of erosion and sediment structures, the communication and detailed explanation to all people involved in the site work of the requirements and objective of the erosion and sediment control measures.

D. The Engineer shall be notified of any proposed alteration to the erosion and sediment control plan, prior to altering, in order to ensure the feasibility of the addition, subtraction, or change in the plan.

5. Area of Construction Activity

Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

6. Protection of Water Resources

A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.

B. Special measures should be taken to insure against spillage of any pollutants into public waters.

7. Location of Storage Areas

A. The location of the Contractor's storage areas for equipment and/or materials shall be as negotiated with the Owner. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.

B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as the placement of baled hay or straw around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

C. There shall be no storage of equipment or materials in areas designated as wetlands.

D. The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

E. Storage areas in cross-country locations shall be restored to pre-construction conditions with the planting of native species of trees and shrubs.

8. Spill Prevention Measures

A. Vehicle Maintenance: Vehicles and equipment maintenance shall occur at the off-site staging area over a spill containment pallet or sufficiently impervious surface. Only minor maintenance shall be conducted. All equipment fluids generated from maintenance activities will be disposed of into designated drums stored on spill pallets inside a materials storage container. Fluids shall be removed from the site and dispose of in accordance with applicable regulations as soon as feasible. All vehicles and equipment including subcontractor vehicles shall be checked for leaking oil and fluids. Vehicles leaking fluid shall not be allowed onsite.

B. Spill Kits: Spill kits will be stored within the designated fueling area and concrete washout areas. Spill kits shall be readily available during all fueling operations. Spill kits must contain absorbent pads or other sorbent materials. Spill kits shall be inspected weekly to insure that adequate cleanup materials are on site at all times.

C. Spills: All spills will be cleaned up immediately upon discovery. Spent absorbent materials and rags will be hauled offsite immediately after the spill is cleaned up for disposal at an approved location. Spills large enough to discharge to surface water will be reported to the National Response Center at 1-800-424-8802.

D. Material safety data sheets: A material inventory and emergency contact information shall be maintained onsite.

9. Vehicle Fueling Operations

A. Several types of vehicles and equipment will be used on-site throughout the project, including graders, excavators, loaders, concrete equipment, rollers, trucks and trailers, backhoes, and forklifts. Equipment/vehicle fueling will be performed onsite. Fueling activities are to be situated so that drainage facilities or watercourses located in the area are not at risk from potential infiltration. Fueling shall take place on an impervious surface and shall be conducted at least 100 feet from a drainage structure, wetland or watercourse. Absorbent, spill-cleanup materials and spill kits will be available at the designated fueling areas. Fuel will be delivered to the site on an as needed basis by a fuel delivery service.

B. Maintenance and Inspection: Inspect equipment/vehicle storage areas and fueling area weekly. Vehicles and equipment will be inspected on each day of use. Leaks will be repaired immediately or the problem vehicle(s) or

equipment will be removed from the project site. Keep ample supply of spill-cleanup materials onsite and immediately clean up spills and dispose of materials properly.

10. Washing of Equipment and Vehicles

Washing of equipment and vehicles is prohibited. Vehicle and equipment washing shall occur off-site at a permitted facility.

11. Materials Storage and Staging Area

A. Construction equipment and maintenance materials will be stored at a designated staging area and materials storage areas. A watertight shipping container will be used to store hand tools, small parts, and other construction materials. All hazardous waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids will be stored in structurally sound and sealed containers under cover within the storage container, until such time they can be properly disposed of. Very large items, such as piping, valves, and structures, will be stored in the open in the materials storage area. Such materials will be elevated on wood blocks to minimize contact with runoff.

B. The storage areas will be inspected weekly. The storage areas will be kept clean, well-organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers and liners will be repaired or replaced as needed to maintain proper function.

C. It is not anticipated that pesticides, herbicides, insecticides, fertilizers and landscape materials will be stored on site. These materials will be delivered as needed during the installation of the limited landscaping features. If it is determined that these materials are required to be stored on site they shall be stored in the watertight shipping container, in a spill containment pallet, with a spill cleanup kit.

D. It is not anticipated that diesel fuel, oil, hydraulic fluids, other petroleum products, and other chemicals will be stored on site. These materials will be delivered as needed over the course of construction. If it is determined that these materials are required to be stored on site, they shall be stored in the watertight shipping container, in a spill containment pallet, with a spill cleanup kit.

E. All hazardous waste materials including oil filters, petroleum products, paint, and equipment maintenance fluids will be stored in structurally sound and sealed shipping containers, within a hazardous materials storage area in a designated staging area. Hazardous waste materials will be stored in appropriate and clearly marked containers and segregated from other non-

waste materials. Secondary containment will be provided for all waste materials in the hazardous materials storage area and will consist of commercially available spill pallets. Additionally, all hazardous waste materials will be disposed of in accordance with federal, state, and local regulations. Hazardous waste materials will not be disposed of into the on-site dumpsters. The hazardous waste materials area will be inspected weekly and after storm events. The storage area will be kept clean, well-organized and equipped with ample cleanup supplies as appropriate for the materials being stored. Material safety datasheets, material inventory, and emergency contact numbers will be maintained on site.

F. All waste materials will be collected and disposed of into a dumpster in the designated staging area. Dumpsters will have a secure tight lid, be placed away from stormwater drains and structures, and will meet all federal, state, and local regulations. Only trash and construction debris will be placed in the dumpsters. Construction materials will not be buried on site. The dumpsters will be inspected weekly and immediately after storm events. The dumpsters will be emptied weekly, or more frequently if needed, and taken to the appropriate disposal facility.

12. Sanitary Waste

Portable toilets, located in the staging area, will be provided at the site throughout all the phases. The toilets will be located away from concentrated drainage flow paths. Sanitary waste will be collected a minimum of once a week and shall be inspected weekly for evidence of leaking holding tanks.

13. Concrete Truck Washout Procedures

A. A designated temporary, above-grade concrete washout area will be constructed at an approved onsite location. The washout area shall be constructed in a location approved by the engineer. The temporary concrete washout area will be constructed using staked hay bales with a recommended minimum length and minimum width of 10 feet, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations. The washout area will be lined with plastic sheeting at least 10 mils thick and free of holes or tears.

B. Concrete pours will not be conducted during or before an anticipated storm event. Concrete mixer trucks and chutes will be washed in the designated area or concrete wastes will be properly disposed of offsite. When the temporary washout area is no longer needed for the construction project, the hardened concrete and materials used to construct the area will be removed and disposed as described below and the area will be stabilized.

C. The washout areas will be inspected weekly and each day of use to ensure that all concrete washing is being discharged into the washout area, no leaks

or tears are present and to identify when concrete wastes need to be removed. The washout areas will be cleaned out once the area is filled to 75 percent of the holding capacity. Once the area's holding capacity has been reached, the concrete wastes will be allowed to harden, the concrete will be broken up, removed, and taken to the appropriate landfill for disposal. The plastic sheeting will be replaced if tears occur during removal of concrete wastes from the washout area.

14. Recycling Practices

Wood pallets, cardboard boxes, and other recyclable construction scraps will be disposed of in a separate designated dumpster for recycling. The dumpster will have a secure watertight lid, be placed away from stormwater conveyances and drains, and meet all local and state solid waste management regulations. Only solid recyclable construction scraps from the site will be deposited in the dumpster. The recycling dumpster will be inspected weekly. The recycling dumpster will be emptied when full and taken to an approved recycling center by the contractor. If recyclable construction wastes are exceeding the dumpster's capacity, the dumpsters will be emptied more frequently.

15. Construction in Areas Designated as Wetland Resources on the Drawings

A. Insofar as possible, the Contractor shall make every effort to minimize disturbance within areas designated as wetland resources. Total construction widths shall be limited to the widths shown.

B. The Contractor shall perform his work in such a way that these areas are left in the condition existing prior to construction.

C. The elevations of areas designated as wetland resources shall not be unduly disturbed by the Contractor's operations. If such disturbance does occur, the Contractor shall take all measures necessary to return these areas to the elevations which existed prior to construction.

16. Protecting and Minimizing Exposed Areas

A. The Contractor shall limit the area of land which is exposed and erodible during construction. In areas where the period of exposure will be greater than two (2) months, temporary stabilization or other protective measures shall be provided as specified.

B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to ensure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.

17. Protection of Landscape

A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.

B. Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as required.

C. Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by his blasting or other operations, the Engineer may require the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of.

D. Cultivated hedges, shrubs, and plants which could be injured by the Contractor's operations shall be protected by suitable means or shall be dug up, balled, and temporarily replanted and maintained. After construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of a kind and quality at least equal to that existing at the start of the work.

18. Clearing and Grubbing

A. The Contractor shall clear and grub only the area required for construction operations, as approved by the Engineer. Removal of mature trees (4 inches or greater DBH) will not be allowed on temporary easements.

B. The Contractor shall not remove trees without permission of the Engineer.

19. Discharge of Dewatering Operations

A. Any water that is pumped and discharged as part of the Contractor's water handling shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.

B. Under no circumstances shall the Contractor discharge water to the areas designated as wetlands. When constructing in a wetlands area, the Contractor shall discharge water from dewatering operations directly to an approved filtration method before discharging to the nearest drainage system, stream, or waterway.

C. The pumped water shall be filtered through baled hay, a vegetative filter strip or a vegetated channel to trap sediment occurring as a result of the construction operations. The vegetated channel shall be constructed such that the discharge flow rate shall not exceed a velocity of more than 1 foot per second. Accumulated sediment shall be cleared from the channel periodically.

20. Dust Control

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Engineer decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as required.

B. Calcium Chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water.

21. Separation and Replacement of Topsoil

Topsoil shall be carefully removed from cross-country areas where excavations are to be made, and separately stored to be used again as required. The topsoil shall be stored in an area acceptable to the Engineer and adequate measures shall be employed to prevent erosion of said material.

22. Compost Filter tubes

To trap sediment and to prevent sediment from discharging downhill, compost filter tubes shall be used where shown on the drawings. The tubes should be securely staked to prevent overturning, flotation, or displacement. All deposited sediment shall be removed periodically.

23. Sediment Fence

A. Where indicated on the drawings or where required by the Engineer, the Contractor shall erect and maintain a temporary silt fence. In areas designated as wetlands, the Contractor shall line the limits of the construction easement with a silt fence. The silt fence shall be used specifically to contain sediment from runoff water and to minimize environmental damage caused by construction.

B. The silt fence shall consist of a 3-foot wide continuous length sediment control fabric, stitched to a 22-foot wide, continuous length support netting, and stapled to pre-weathered oak posts installed as shown on the drawings. The oak posts shall be 1½-inches by 1½-inches (Minimum Dimension) by 48 inches and shall be tapered. The support netting shall be industrial strength polypropylene. The bottom edge of the sediment control fabric shall be buried as shown on the drawings. The sediment control fabric shall conform to the following properties:

Property	Value	Test Method
1. Grab Strength (lbs.)	124	ASTM D-4632
2. Elongation (%)	15%	ASTM D-4632
3. Puncture Strength (lbs.)	65	ASTM D-4833
4. Burst Strength (psi)	300	ASTM D-3786
5. Trapezoid Tear (lbs.)	60	ASTM D-4533
6. Equivalent Opening Size (U.S. Sieve)	No. 30	ASTM D-4571
7. Permittivity (sec^{-1})	0.10	ASTM D-4491
8. Water Flow Rate (gal/min/sf.)	10	ASTM D-4491
9. UV Resistance (%)	70	ASTM D-4355

C. The silt fence shall be Mirafi Envirofence manufactured by Mirafi, Inc. or approved equal.

24. Inlet Protection

A. Where indicated on the drawings or where required by the Engineer, the Contractor shall install and maintain inlet protection. At a minimum inlet protection is required on all drainage structures in the project area. The inlet protection shall be SiltSack or approved equal. The inlet protection shall be cleaned or replaced as needed to insure proper operation for the duration of construction.

EROSION CONTROL MEASURES INSPECTION AND MAINTENANCE CHECKLIST

DATE/TIME:_____

INSPECTOR:_____

MEASURE	SATISFACTORY (YES OR NO)	COMMENTS	ACTION	DATE COMPLETED
Sediment Barriers				
Inlet Protection				
Discharge Points				

POLLUTION PREVENTION MEASURES INSPECTION AND MAINTENANCE CHECKLIST

DATE/TIME:_____

INSPECTOR:_____

MEASURE	SATISFACTORY (YES OR NO)	COMMENTS	ACTION	DATE COMPLETED
Trash Dumpster with Cover				
Recycling Dumpster with Cover				
Staging Area				
Bulk Material Storage Area				
Material Storage Containers				
Fueling Area				
Equipment Storage Area				
Sanitary Facilities				
Concrete Washout Area				
Spill Kits				

Weston & Sampson

Appendix K

Project Plans (provided under separate cover)

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

PLAN AND PROFILE OF

MONSON ROAD IMPROVEMENTS

IN THE TOWN OF

WALES

HAMPDEN COUNTY

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	180
PROJECT FILE NO.	608163		

TITLE SHEET & INDEX

THESE PLANS ARE SUPPLEMENTED BY THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DATED 2024, 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.

100% SUBMITTAL

404 ENVIRONMENTAL PERMIT PLAN SET

INDEX

SHEET NO.	DESCRIPTION
1	TITLE SHEET & INDEX
2	KEY PLAN
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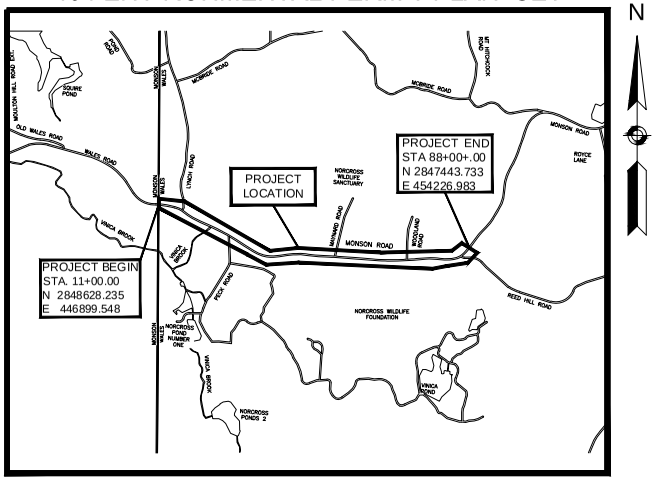
180	WETLAND REPLICATION AREA DETAIL



2000 0 2000 4000

SCALE: 1" = 2000'

LENGTH OF PROJECT = 7700.00 FEET = 1.458 MILES

June 2024

DESIGN DESIGNATION - MONSON ROAD

DESIGN SPEED	40 MPH
ADT (2017)	660
ADT (2025)	760
K	11%
D	52%
T (PEAK HOUR)	3.0%
T (AVERAGE DAY)	3.0%
DHV	85
DDHV	45
FUNCTIONAL CLASSIFICATION	RURAL MAJOR COLLECTOR

COMMONWEALTH OF MASSACHUSETTS
SCOTT R. BRUSO
STRUCTURAL
No. 46981
REGISTERED PROFESSIONAL ENGINEER

Weston & Sampson
712 Brook Street, Suite 103
Rocky Hill, CT 06067
860.513.1473
www.westonandsampson.com

DATE	DESCRIPTION	REV #

MassDOT Massachusetts Department of Transportation Highway Division

APPROVED

CHIEF ENGINEER DATE

608163_HDI(TITLE, LEGEND, KEY & TYPICAL SECTIONS)404.DWG Plotted on: 26-Jun-2024 8:26 AM

A00830 -507

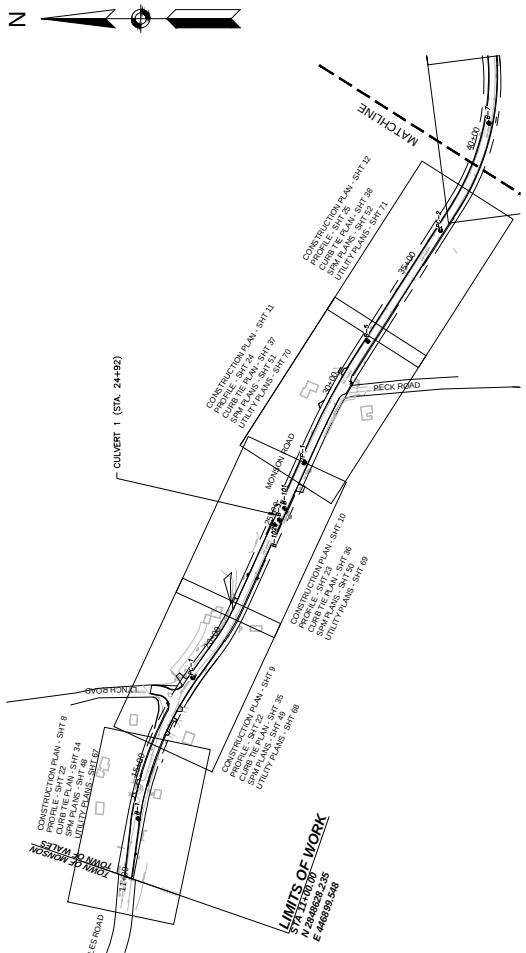
Proposal No. 608163-128112

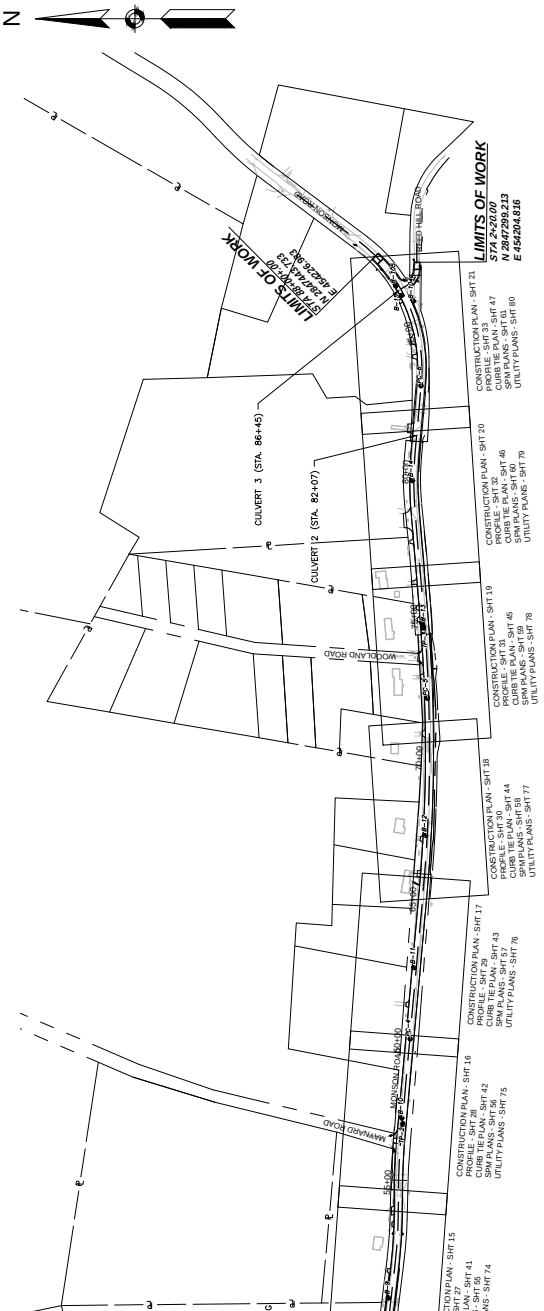
608163_HDLTITLE, LEGEND, KEY & TYPICAL SECTIONS.DWG Plotted on 25-Jun-2024 3:33 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	180
	PROJECT FILE NO. 608163		

KEY PLAN





BORING LOCATIONS (FEET)					
BORING	NORTHING	EASTING	STATION	OFFSET	SURFACE EL.	H.B.E.
B–1	2,848,584	447,074	12+80	22.4 RT	868.0	861.5
B–3	2,848,121	448,154	24+56	10.0 LT	877.0	865.2
B–5	2,847,780	448,792	31+69	10.8 LT	902.0	897.5
B–7	2,847,423	449,318	38+27	18.1 RT	941.0	937.0
B–9	2,847,397	450,584	51+05	9.6 LT	933.0	916.5
B–10	2,847,355	451,197	57+19	6.7 LT	956.0	951.5
B–11	2,847,315	451,727	62+51	14.1 LT	989.0	984.5
B–12	2,847,272	452,354	68+80	16.0 LT	1011.0	1007.0
B–13	2,847,294	453,969	74+48	19.4 LT	1018.0	1014.5
B–14	2,847,322	453,443	79+72	12.1 LT	1008.0	1004.5
B–15	2,847,355	454,092	86+37	6.1 LT	1002.0	998.1
B–101	2,848,099	448,135	24+85	4.2 RT	877.1	861.9
B–102	2,848,103	448,186	25+36	12.85 LT	877.5	64.60
B–104	2,847,316	454,089	86+39	20.6 RT	1002.4	974.4
B–105	2,847,307	454,110	85+59	11.0 RT	1001.8	987.7

NOTES:
1. BENCH MARK:
MAGNAIL U.P.L. LOCATED EAST OF NORTH STREET AT STATION 12+79.94 AND EL. 869'
MAGNAIL U.P.L. LOCATED WEST OF NORTH STREET AT STATION 21+37.43 AND EL. 877'
MAGNAIL U.P.L. LOCATED WEST OF NORTH STREET AT STATION 29+56.65 AND EL. 900'
BRASS RIVET LOCATED WEST OF NORTH STREET AT STATION 29+94.76 AND EL. 902'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 38+22.13 AND EL. 938'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 47+02.17 AND EL. 934'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 56+22.73 AND EL. 957'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 65+94.25 AND EL. 1007'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 74.95.16 AND EL. 1022'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 81+31.62 AND EL. 1006'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 74+02.17 AND EL. 934'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 87+05.97 AND EL. 1008'
BRASS RIVET LOCATED WEST OF NORTH STREET AT STATION 87+15.35 AND EL. 1001'

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
	CBCI	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
		CABLE MANHOLE
		DRAINAGE MANHOLE
		ELECTRIC MANHOLE
		GAS MANHOLE
		MISC MANHOLE
		SEWER MANHOLE
		TELEPHONE MANHOLE
		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
		SWAMP / MARSH
WG	WG	WATER GATE
PM	PM	PARKING METER
	OHU	OVERHEAD CABLE/WIRE
		CURBING
100 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
x	x	CHAIN LINK OR METAL FENCE
		WOOD FENCE
		EROSION AND SEDIMENT CONTROL BARRIER
		TREE LINE
		LIMITS OF CLEARING AND GRUBBING
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		EDGE OF PAVEMENT
		LIMIT OF MICROMILLING AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT WETLAND BUFFER
		200 FT RIVERFRONT AREA BUFFER
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT
		SIGN AND POST

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
CBCI-DB	DOUBLE GRATE CATCH BASIN W/ 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
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
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
LB	LEACH BASIN

ABBREVIATIONS (cont.)

GENERAL

LP	LIGHT POLE
LT	LEFT
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NIC	NOT IN CONTRACT
NO.	NUMBER
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
PSB	PLANTABLE 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 WATER WAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCCE	REINFORCED CONCRETE CULVERT END
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	STA
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SW	SIDEWALK
SWTU	STORMWATER TREATMENT UNIT
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
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

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
	SL	12"-WIDE STOP LINE
	SWL	6"-WIDE SOLID WHITE LINE
	DBYL	DOUBLE YELLOW LINE (2 - 6"-WIDE YELLOW LINES)

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	180
PROJECT FILE NO.	608163		

LEGEND, ABBREVIATIONS & GENERAL NOTES

GENERAL NOTES:

1. TOPOGRAPHICAL INFORMATION BASED ON AN ON THE GROUND SURVEY PERFORMED BY CHAPPELL ENGINEERING ON DECEMBER 2017 AND SUPPLEMENTED BY CHAPPELL ENGINEERING IN OCTOBER 2023. WETLAND FLAGGING WAS PERFORMED BY WESTON & SAMPSON IN NOVEMBER 2020 AND REFLAGGED IN SEPTEMBER OF 2023.
2. THE HORIZONTAL COORDINATES ARE BASED ON NAD 83, THE VERTICAL DATUM IS NAVD 88.
3. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. THE CONTRACTOR SHALL DIG TEST PITS WITH THE LOCATIONS BEING APPROVED BY THE ENGINEER PRIOR TO COMMENCEMENT OF WORK TO EXACTLY LOCATE EXISTING UTILITIES.
4. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
5. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY OWNER. ANY ALTERATIONS SHALL BE INCIDENTAL TO THE PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY SUPPORT OF ALL UTILITIES TO REMAIN IN PLACE AND SHALL DESCRIBE IN WRITING, TO THE SATISFACTION OF THE ENGINEER, HIS METHOD OF TEMPORARY SUPPORT.
6. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
7. THE TERM "PROPOSED (PROP)" INDICATES WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET (R&R)".
8. ALL EXISTING STATE, COUNTY AND TOWN LOCATION LINES AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATION ARE NOT GUARANTEED.
9. ALL EXCESS MATERIAL FROM ROADWAY RECONSTRUCTION OR THE EXCAVATION PROCESS SHALL BE REUSED ON SITE OR REMOVED FROM THE SITE AND DISPOSED OF IN A LEGAL AND PROPER MANNER.
10. THE CONTRACTOR SHALL CALL DIGSAFE AT 1-888-344-7233 AT LEAST 72 HOURS, SATURDAYS, AND HOLIDAYS EXCLUDED, PRIOR TO EXCAVATING AT ANY LOCATION. A COPY OF THE DIGSAFE PROJECT REFERENCE NUMBER(S) SHALL BE GIVEN TO THE TOWN PRIOR TO EXCAVATION.
11. JOINTS BETWEEN HOT MIX ASPHALT TRENCH PAVEMENT AND SAWCUT EXISTING PAVEMENT SHALL BE SEALED WITH BITUMEN AND BACKSANDED.
12. IF DEEMED NECESSARY DUE TO THE WORK, THE CONTRACTOR SHALL COORDINATE WITH THE TOWN OF WALES HIGHWAY DEPARTMENT, THE WALES FIRE DEPARTMENT, AND THE ENGINEER FOR APPROVAL OF SHUTTING DOWN ANY EXISTING WATER MAINS AND SHALL ALSO OBTAIN APPROVAL FOR DISRUPTING ANY EXISTING SEWER FLOWS.
13. THE CONTRACTOR SHALL BE AWARE THAT ONLY TOWN PERSONNEL ARE ALLOWED TO OPERATE WATER GATES AND HYDRANTS. ANY REQUESTS TO OPERATE THE GATES SHALL BE COORDINATED THROUGH THE ENGINEER.
14. THE CONTRACTOR SHALL COORDINATE ANY WORK FOR THE PROJECT WITH ALL ADJACENT/CONCURRENT PROJECTS AND CONTRACTORS.
15. THE CONTRACTOR SHALL INSTALL PRIOR TO COMMENCEMENT OF WORK, MAINTAIN, AND REMOVE AT THE END OF THE PROJECT INLET SEDIMENT CONTROL BAGS IN ALL CATCH BASINS, WITHIN OR ADJACENT TO THE PROJECT LIMITS. THE CONTRACTOR SHALL ALSO MAINTAIN SILT FENCE AND COMPOST FILTER TUBES AS SHOWN ON THE PLANS THROUGHOUT THE DURATION OF THE PROJECT AND REMOVE AT THE END.
16. ANY GRASS AREAS DISTURBED BY THE WORK SHALL BE RESTORED WITH LOAM AND SEED.
17. ANY LANDSCAPED AREAS DISTURBED BY THE WORK SHALL BE RESTORED TO EXISTING CONDITIONS WITH EXISTING OR NEW GROUND COVER MATERIALS AS DIRECTED BY THE ENGINEER. ANY PLANTS, SHRUBS, OR FLOWERS DISTURBED BY THE WORK SHALL BE RESET TO EXISTING CONDITIONS OR REPLACED WITH NEW PLANTS, SHRUBS, OR FLOWERS AS DIRECTED BY THE ENGINEER. ALL WORK TO RESTORE LANDSCAPE AREAS, NEW GROUND COVER MATERIALS, NEW PLANTS, NEW SHRUBS, OR NEW FLOWERS REQUIRED BY THE ENGINEER SHALL BE INCIDENTAL TO THE PROJECT.
18. CONTRACTOR TO COORDINATE WITH UTILITY POLE OWNERS IN AREAS WHERE UNDERGROUND UTILITY WORK IS WITHIN CLOSE PROXIMITY AND POSSIBLE UTILITY POLE SHORING IS REQUIRED WHILE INSTALLING PROPOSED UTILITIES.
19. RAISE AND ADJUST FRAMES AND GRATES, FRAMES AND COVERS AND GATE BOXES PRIOR TO PAVEMENT OVERLAY, IF REQUIRED.
20. CONTRACTOR IS RESPONSIBLE FOR REPLACING ANY PROPERTY PINS THAT ARE DAMAGED OR DESTROYED DURING CONSTRUCTION, TO THEIR LOCATION JUST PRIOR TO CONSTRUCTION.
21. ALL TRAFFIC SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS OTHERWISE NOTED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
22. CONTRACTOR TO ESTABLISH TEMPORARY BENCHMARKS EVERY 1000 FEET BASED ON THE PERMANENT BENCHMARKS LOCATED AT STA 29+85.04, 24.73 LEFT AND STA 87+27.18, 41.17 LEFT OR AS REQUIRED BY THE ENGINEER.
23. CONTRACTOR TO PROVIDE ADDITIONAL TRAVERSE POINTS AND TRAVERSE LINES IN THE VICINITY OF EXISTING TRAVERSE POINTS WHERE THE EXISTING TRAVERSE POINT IS LOCATED IN "SOFT GROUND" OR AS REQUIRED BY THE ENGINEER.
24. ALL EXISTING STONE WALLS PROPOSED FOR RELOCATION SHALL NOT BE REMOVED FROM THE IMMEDIATE AREA SHOWN ON THE PLANS.

608163_HDU(TITLE, LEGEND, KEY & TYPICAL SECTIONS).DWG Plotted on 25-Jun-2024 3:33 PM

Proposal No. 608163-128112

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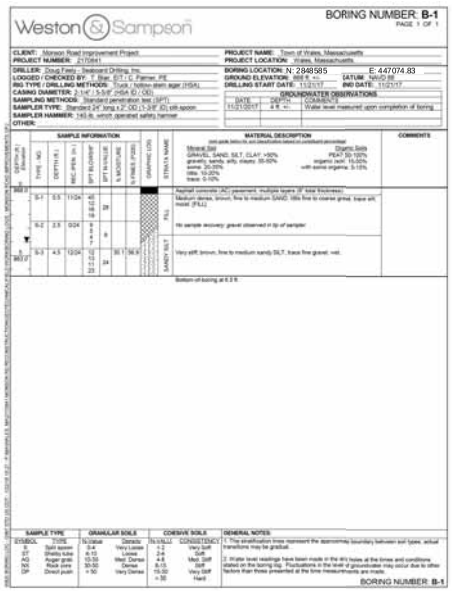
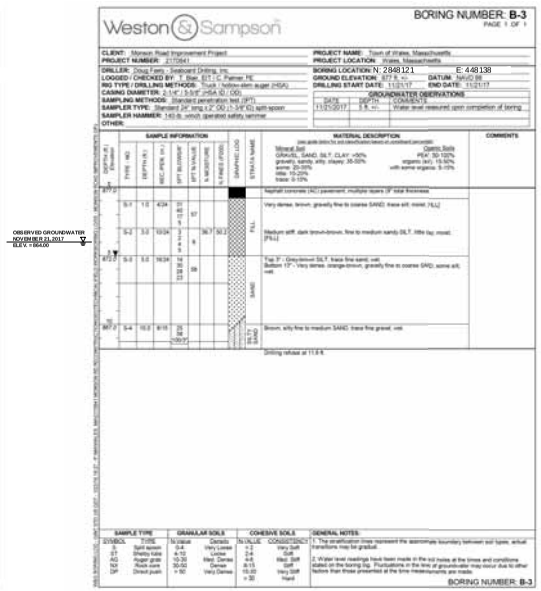
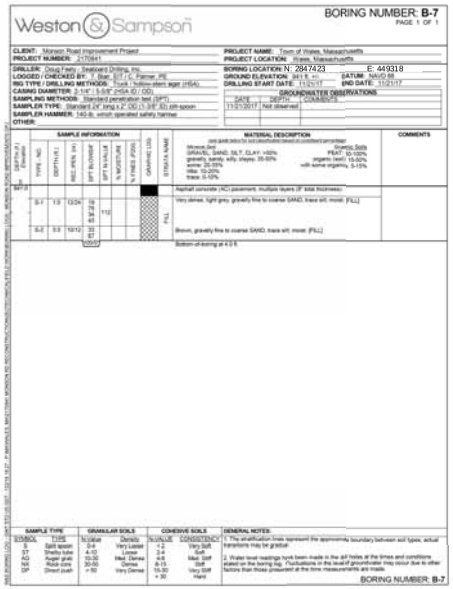
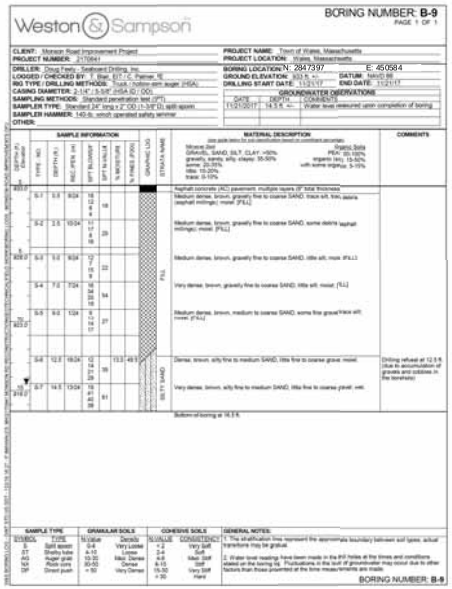




OBSERVED GROUNDWATER NOVEMBER 21, 2017 ELEV 1164.00

OBSERVED GROUNDWATER NOVEMBER 21, 2017 ELEV 1072.0





WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	180
PROJECT FILE NO.	608163		

BORING LOGS
1 OF 3

BORING NOTES:

1. LOCATION OF BORINGS SHOWN ON THE PLAN THUS: B-#
   LOCATION OF TEST PITS SHOWN ON THE PLAN THUS: TP-#
   LOCATION OF PAVEMENT CORES SHOWN ON THE PLANS THUS: PC-#
2. 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 CONSTRCUTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL TO BE ENCOUNTERED DURING CONSTRCUTION.
4. FIGURES TO THE LEFT OF THE COLUMNS INDICATE DEPTH AND ELEVATION BELOW SURFACE AT BORING POINT.
5. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30 INCHES.
6. BORING SAMPLES MADE ON: 11/21/2017, 09/13/2023, 09/14/2023
   TEST PITS MADE ON :
   PAVEMENT CORES MADE ON:
7. BORINGS WERE MADE BY:
   SEABAORD DRILLING INC.
   649 MEADOW ST, CHICOPEE, MA 01013
8. BORING SAMPLES ARE STORED AT A STORAGE FACILITY LOCATED ON ORUTE 114 (219 WINTHROP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE SOIL AND ROCK SAMPLES BY CONTACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA, BOSTON, MA.

608163_HD2(BORING LOGS).DWG Plotted on 25-Jun-2024 3:35 PM

Proposal No. 608163-128112

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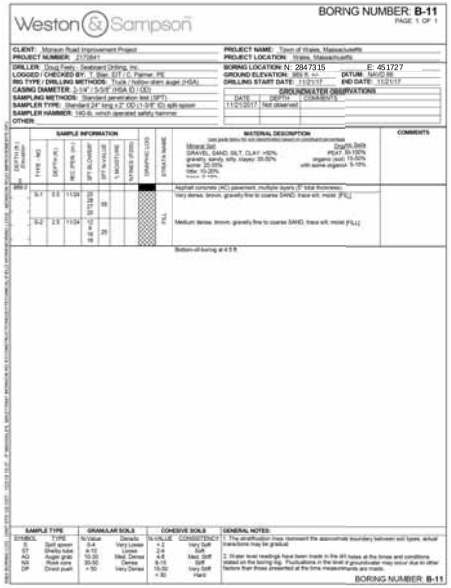
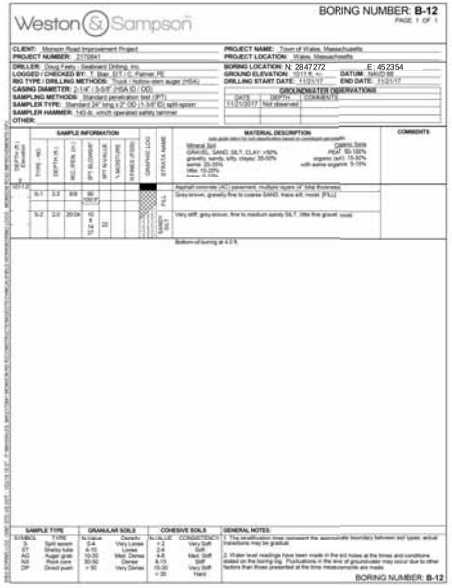




WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	180
PROJECT FILE NO.		608163	

BORING LOGS
2 OF 3

NOTES:

1. FOR BORING NOTES, SEE SHEET 4.

608163_HD2(BORING LOGS).DWG Plotted on 25-Jun-2024 3:35 PM

A00830 -511

Proposal No. 608163-128112

608163_HDZ\BORING LOGS).DWG Plotted on 25-Jun-2024 3:36 PM

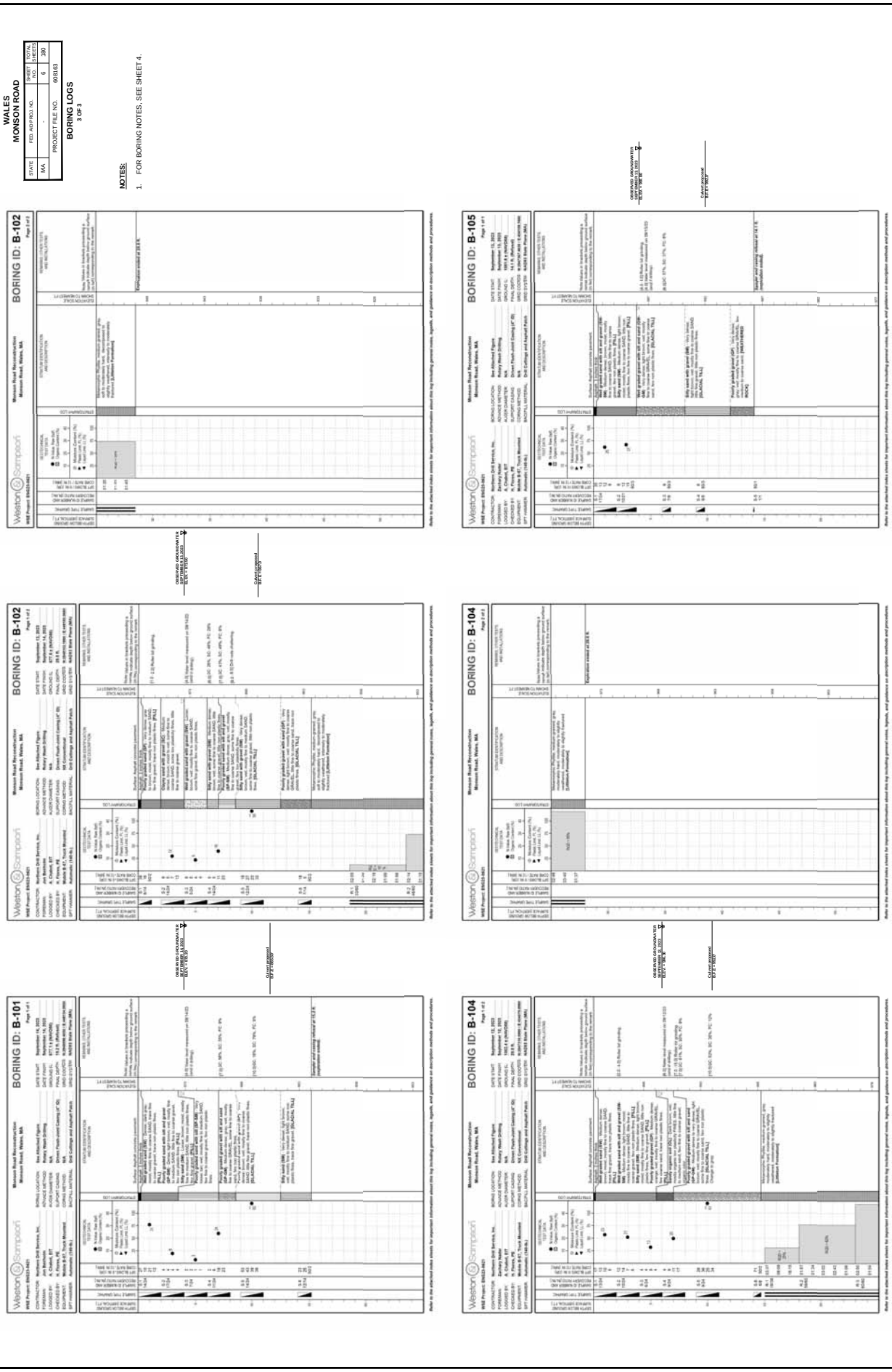
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	180
	PROJECT FILE NO. 608163		

BORING LOGS
3 OF 3

NOTES:

1. FOR BORING NOTES, SEE SHEET 4.

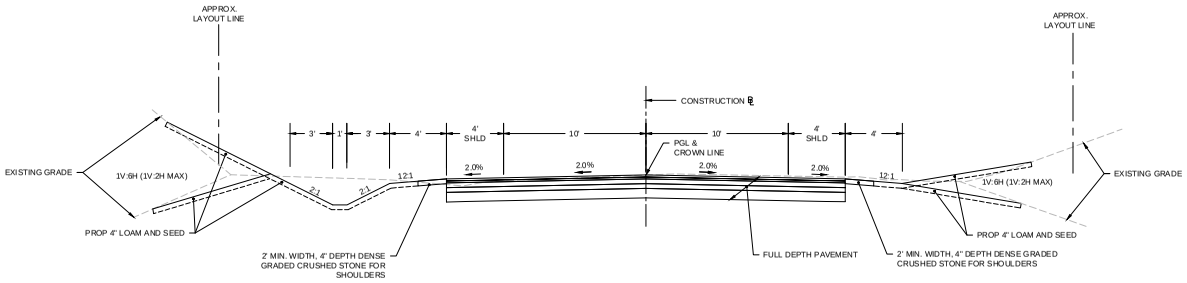


WALES
MONSON ROAD

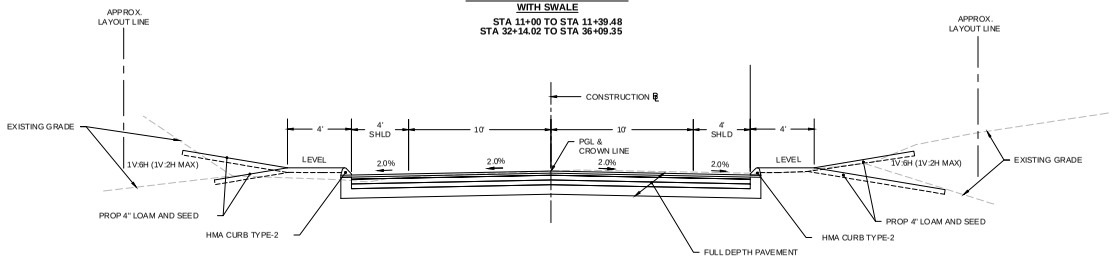
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	7	180
PROJECT FILE NO.	608163		

TYPICAL SECTIONS

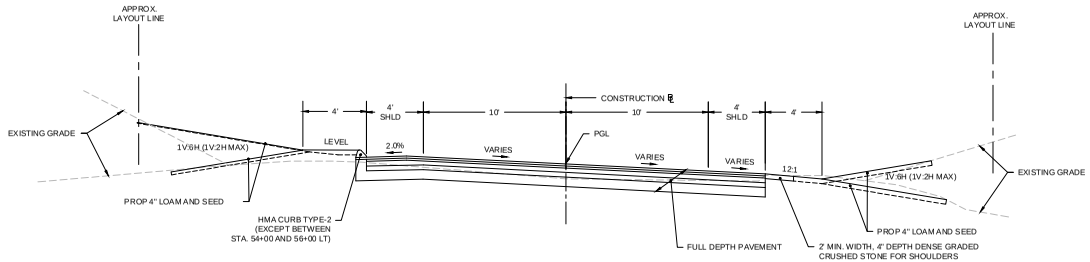
608163_HDI(TITLE, LEGEND, KEY & TYPICAL SECTIONS).DWG Plotted on 25-Jun-2024 3:33 PM



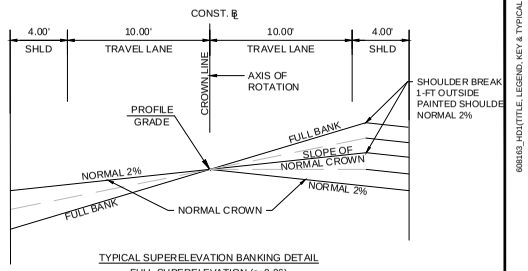
MONSON ROAD TYPICAL SECTION
WITH SWALE
STA 11+00 TO STA 11+39.48
STA 32+14.02 TO STA 36+09.35



MONSON ROAD TYPICAL SECTION
WITH CURBING
STA 22+70.43 TO STA 26+98.72
STA 57+46.79 TO STA 64+41.04
STA 75+70.50 TO STA 77+39.51



MONSON ROAD TYPICAL SECTION
FULL SUPERELEVATION AND TRANSITIONS
STA 11+39.48 TO STA 22+70.43
STA 26+98.72 TO STA 32+14.02
STA 36+09.35 TO STA 57+46.79
STA 64+41.04 TO STA 75+70.50
STA 77+39.51 TO STA 88+00



TYPICAL SUPERELEVATION BANKING DETAIL
FULL SUPERELEVATION (e=0.06)
N.T.S.

PAVEMENT NOTES

PROPOSED PAVEMENT MILLING AND OVERLAY:

1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 1.50" PAVEMENT MILLING

PROPOSED FULL DEPTH PAVEMENT:

SURFACE COURSE:	1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5).
BASE COURSE:	3.25" SUPERPAVE INTERMEDIATE COURSE 19 (SIC-19.0) PLACED IN ONE LAYER.
SUBBASE:	4" DENSE GRADED CRUSHED STONE OVER 8" GRAVEL BORROW, TYPE B.
	BITUMEN FOR TACK COAT (RS-1) TO BE APPLIED AT A RATE OF 0.07 TO 0.09 GAL/SY OVER MILLED SURFACES AND 0.06 TO 0.08 GAL/SY ON BASE AND INTERMEDIATE PAVEMENT COURSES.

PROPOSED HOT MIX ASPHALT DRIVEWAY :

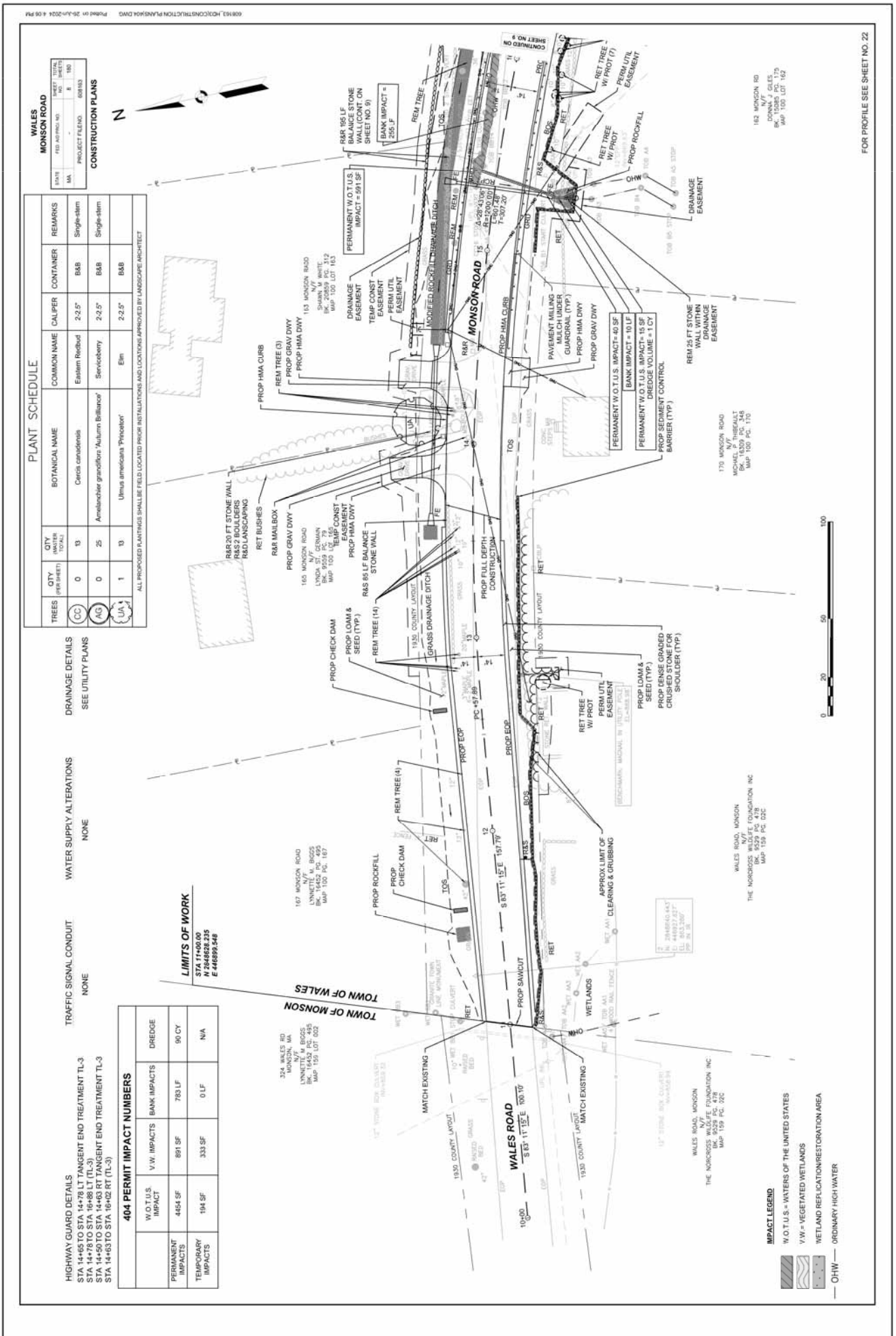
SURFACE COURSE:	1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 2.50" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5)
FOUNDATION:	8" GRAVEL BORROW, TYPE B

PROPOSED GRAVEL DRIVEWAY:

8" GRAVEL BORROW, TYPE B

PROPOSED CEMENT CONCRETE WALK

4" CEMENT CONCRETE OVER
8" GRAVEL BORROW, TYPE B


WALES
MONSON ROAD
CONSTRUCTION PLANS
PLANT SCHEDULE
TREES
QTY (PER SHEET)
QTY (MASTER TOTAL)
BOTANICAL NAME
COMMON NAME
CALIPER
CONTAINER
REMARKS
Cercis canadensis
Eastern Redbud
2-2.5"
B&B
Single-stem
Amelanchier grandiflora 'Autumn Brilliance'
Serviceberry
2-2.5"
B&B
Single-stem
Ulmus americana 'Princeton'
Elm
2-2.5"
B&B
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 14+65 TO STA 14+78 LT TANGENT END TREATMENT TL-3
STA 14+78 TO STA 16+88 LT (TL-3)
STA 14+50 TO STA 14+63 RT TANGENT END TREATMENT TL-3
STA 14+63 TO STA 16+02 RT (TL-3)
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
404 PERMIT IMPACT NUMBERS
W.O.T.U.S. IMPACT
V.W. IMPACTS
BANK IMPACTS
DREDGE
PERMANENT IMPACTS
4454 SF
891 SF
783 LF
90 CY
TEMPORARY IMPACTS
194 SF
333 SF
0 LF
N/A
LIMITS OF WORK
STA 11+00.00
N 2951282.535
E 446892.548
WALES ROAD
MONSON ROAD
TOWN OF MONSON
TOWN OF WALES
PROP ROCKFILL
PROP CHECK DAM
PROP SAWCUT
MATCH EXISTING
APPROX LIMIT OF CLEARING & GRUBBING
WETLANDS
PROP HMA CURB
PROP GRAV DWY
PROP HMA DWY
PROP LOAM & SEED (TYP.)
PROP DENSE GRADED CRUSHED STONE FOR SHOULDER (TYP.)
PROP FULL DEPTH CONSTRUCTION
PROP EOP
PROP SEDIMENT CONTROL BARRIER (TYP.)
PAVEMENT MILLING AND OVERLAY
GUARDRAIL (TYP.)
R&R 20 FT STONE WALL
R&S 2 BOULDERS
R&D LANDSCAPING
R&R MAILBOX
RET BUSHES
R&S 85 LF BALANCE STONE WALL
R&R 195 LF BALANCE STONE WALL (CONT. ON SHEET NO. 9)
BANK IMPACT = 255 LF
PERMANENT W.O.T.U.S. IMPACT = 891 SF
PERMANENT W.O.T.U.S. IMPACT= 40 SF
BANK IMPACT = 10 LF
PERMANENT W.O.T.U.S. IMPACT= 15 SF
DREDGE VOLUME = 1 CY
REM 25 FT STONE WALL WITHIN DRAINAGE EASEMENT
DRAINAGE EASEMENT
TEMP CONST EASEMENT
PERM UTIL EASEMENT
MODIFIED ROCKFILL DRAINAGE DITCH
GRASS DRAINAGE DITCH
REM TREE
REM TREE (3)
REM TREE (4)
REM TREE (14)
RET TREE W/ PROT
RET TREE W/ PROT (7)
PROP ROCKFILL
CONTINUED ON SHEET NO. 9
FOR PROFILE SEE SHEET NO. 22
IMPACT LEGEND
W.O.T.U.S. = WATERS OF THE UNITED STATES
V.W. = VEGETATED WETLANDS
WETLAND REPLICATION/RESTORATION AREA
ORDINARY HIGH WATER

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	9	180
PROJECT FILE NO.	608163		

CONSTRUCTION PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	3	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	0	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	4	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

HIGHWAY GUARD DETAILS

STA 14+78 TO STA 16+88 LT (TL-3)
STA 16+88 TO STA 17+00 LT TANGENT END TREATMENT TL-3
STA 14+63 TO STA 16+02 RT (TL-3)
STA 16+02 TO STA 16+14 RT TANGENT END TREATMENT TL-3
STA 20+25 TO STA 20+37 RT TANGENT END TREATMENT TL-3
STA 20+37 TO STA 23+10 RT (TL-3)

TRAFFIC SIGNAL CONDUIT

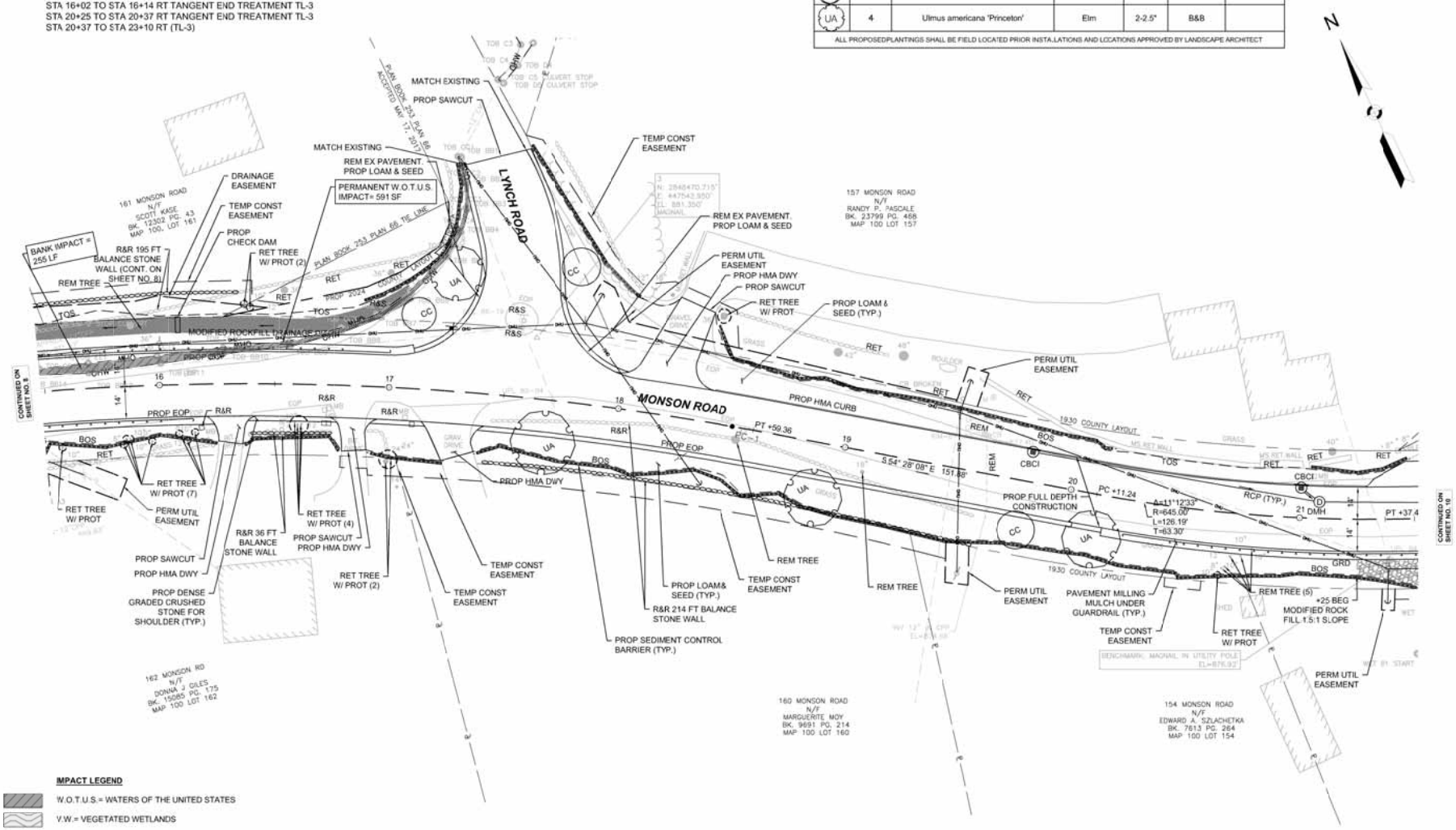
NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

SEE UTILITY PLANS



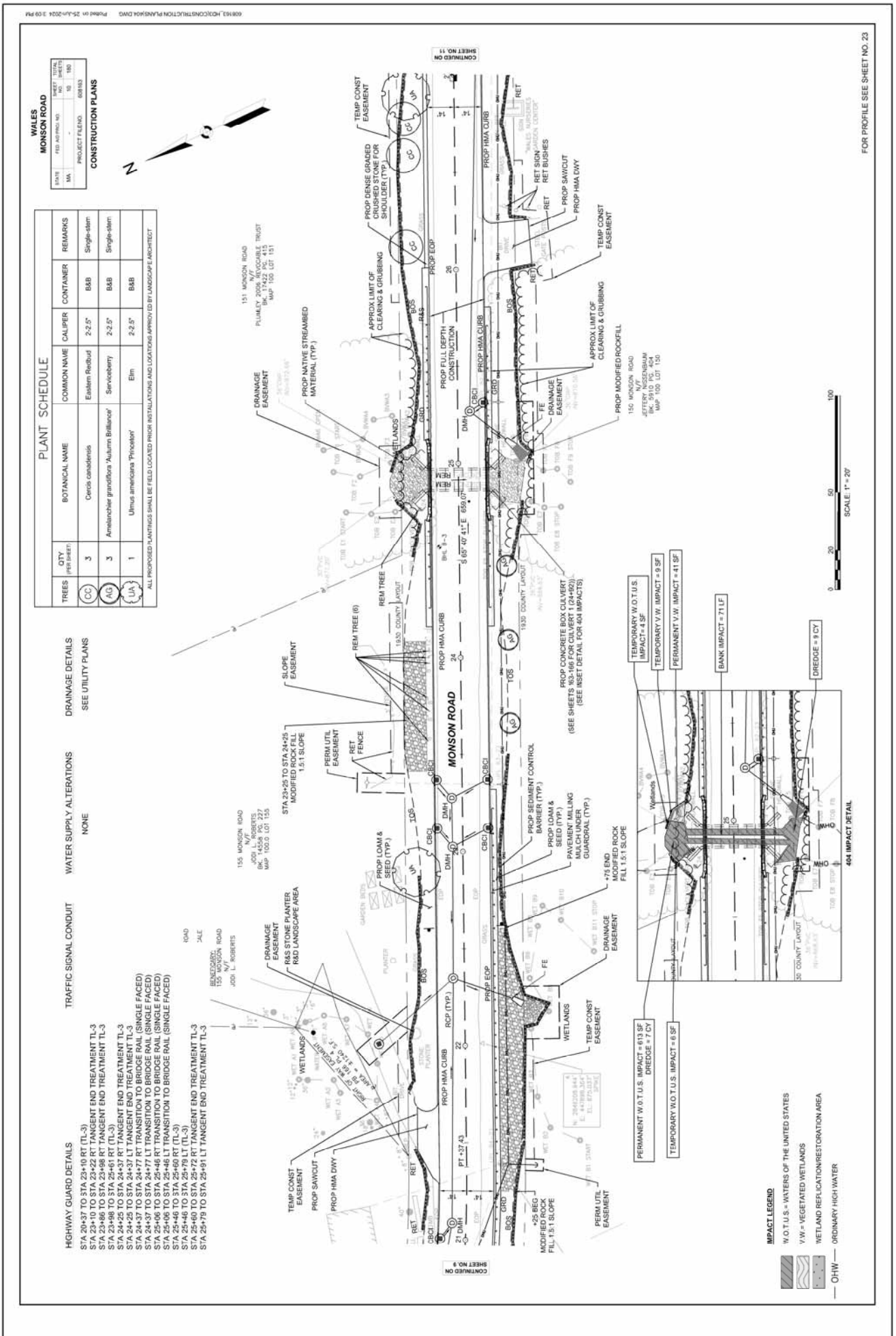
IMPACT LEGEND

- W.O.T.U.S.= WATERS OF THE UNITED STATES
- V.W.= VEGETATED WETLANDS
- WETLAND REPLICATION/RESTORATION AREA
- — OHW — ORDINARY HIGH WATER

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 22

608163_HD3(CONSTRUCTION PLANS)404.DWG Plotted on 25-Jun-2024 3:09 PM


WALES
MONSON ROAD
CONSTRUCTION PLANS
PROJECT FILE NO. 608163
PLANT SCHEDULE
TREES
QTY (PER SHEET)
BOTANICAL NAME
COMMON NAME
CALIPER
CONTAINER
REMARKS
CC
3
Cercis canadensis
Eastern Redbud
2-2.5"
B&B
Single-stem
AG
3
Amelanchier grandiflora 'Autumn Brilliance'
Serviceberry
2-2.5"
B&B
Single-stem
UA
1
Ulmus americana 'Princeton'
Elm
2-2.5"
B&B
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 20+37 TO STA 23+10 RT (TL-3)
STA 23+10 TO STA 23+22 RT TANGENT END TREATMENT TL-3
STA 23+66 TO STA 23+98 RT TANGENT END TREATMENT TL-3
STA 23+98 TO STA 25+01 RT (TL-3)
STA 24+25 TO STA 24+37 RT TANGENT END TREATMENT TL-3
STA 24+25 TO STA 24+37 LT TANGENT END TREATMENT TL-3
STA 24+37 TO STA 24+77 RT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 24+37 TO STA 24+77 LT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+06 TO STA 25+46 RT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+06 TO STA 25+46 LT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+46 TO STA 25+60 RT (TL-3)
STA 25+46 TO STA 25+79 LT (TL-3)
STA 25+60 TO STA 25+72 RT TANGENT END TREATMENT TL-3
STA 25+79 TO STA 25+91 LT TANGENT END TREATMENT TL-3
TRAFFIC SIGNAL CONDUIT
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
MONSON ROAD
PROP HMA CURB
PROP EOP
PROP SAWCUT
PROP HMA DWY
TEMP CONST EASEMENT
PERM UTIL EASEMENT
DRAINAGE EASEMENT
SLOPE EASEMENT
PROP LOAM & SEED (TYP.)
PROP SEDIMENT CONTROL BARRIER (TYP.)
PROP NATIVE STREAMBED MATERIAL (TYP.)
PROP DENSE GRADED CRUSHED STONE FOR SHOULDER (TYP.)
PROP FULL DEPTH CONSTRUCTION
APPROX LIMIT OF CLEARING & GRUBBING
PROP MODIFIED ROCKFILL
PROP CONCRETE BOX CULVERT (SEE SHEETS 163-166 FOR CULVERT 1 (24+92)) (SEE INSET DETAIL FOR 404 IMPACTS)
PAVEMENT MILLING AND OVERLAY
REM TREE
RET TREE
RET
RET BUSHES
RET SIGN
PROP SAWCUT
PROP HMA DWY
+75 END MODIFIED ROCK FILL 1.5:1 SLOPE
+25 BEG MODIFIED ROCK FILL 1.5:1 SLOPE
STA 23+25 TO STA 24+25 MODIFIED ROCK FILL 1.5:1 SLOPE
PERMANENT W.O.T.U.S. IMPACT = 613 SF
DREDGE = 7 CY
TEMPORARY W.O.T.U.S. IMPACT = 4 SF
TEMPORARY V.W. IMPACT = 9 SF
PERMANENT V.W. IMPACT = 41 SF
BANK IMPACT = 71 LF
DREDGE = 9 CY
404 IMPACT DETAIL
IMPACT LEGEND
W.O.T.U.S. = WATERS OF THE UNITED STATES
V.W. = VEGETATED WETLANDS
WETLAND REPLICATION/RESTORATION AREA
OHW — ORDINARY HIGH WATER
SCALE: 1" = 20'
FOR PROFILE SEE SHEET NO. 23
CONTINUED ON SHEET NO. 9
CONTINUED ON SHEET NO. 11
151 MONSON ROAD N/F PLUMLEY 2006 REVOCABLE TRUST BK: 1422 PG: 415 MAP 100 LOT 151
155 MONSON ROAD N/F JODI L ROBERTS BK: 14558 PG: 227 MAP 100.0 LOT 155
150 MONSON ROAD N/F JEFFERY NISSENBAUM BK: 5910 PG: 404 MAP 100 LOT 150
WALES NURSERIES GARDEN CENTER
BENEDIKSEN 155 MONSON ROAD N/F JODI L ROBERTS
DRIVE
ROAD
SALE
WETLANDS
Wetlands
N 29482208.944
E 447898.354
ELEV 875.033
N 29482208.944
E 447898.354
ELEV 875.033
S 65° 40' 41" E 659.07'
1930 COUNTY LAYOUT
1630 COUNTY LAYOUT
50' COUNTY LAYOUT
PT +37.43
21' DMH
22'
25'
14'
12'
40'
24"
36"
30"
18"
CBCI
DMH
RCP (TYP.)
BOS
GRD
FE
WHO
TOB
TOE
WET A1
WET A2
WET A3
WET B1
WET B9
WET B10
WET B11
WET B12
WET B13
WET B14
WET B15
WET B16
WET B17
WET B18
WET B19
WET B20
WET B21
WET B22
WET B23
WET B24
WET B25
WET B26
WET B27
WET B28
WET

HIGHWAY GUARD DETAILS
STA 30+62 TO STA 30+75 RT TANGENT END TREATMENT TL-3
STA 30+75 TO STA 33+25 RT (TL-3)

TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
NONE

DRAINAGE DETAILS
SEE UTILITY PLANS

PLANT SCHEDULE

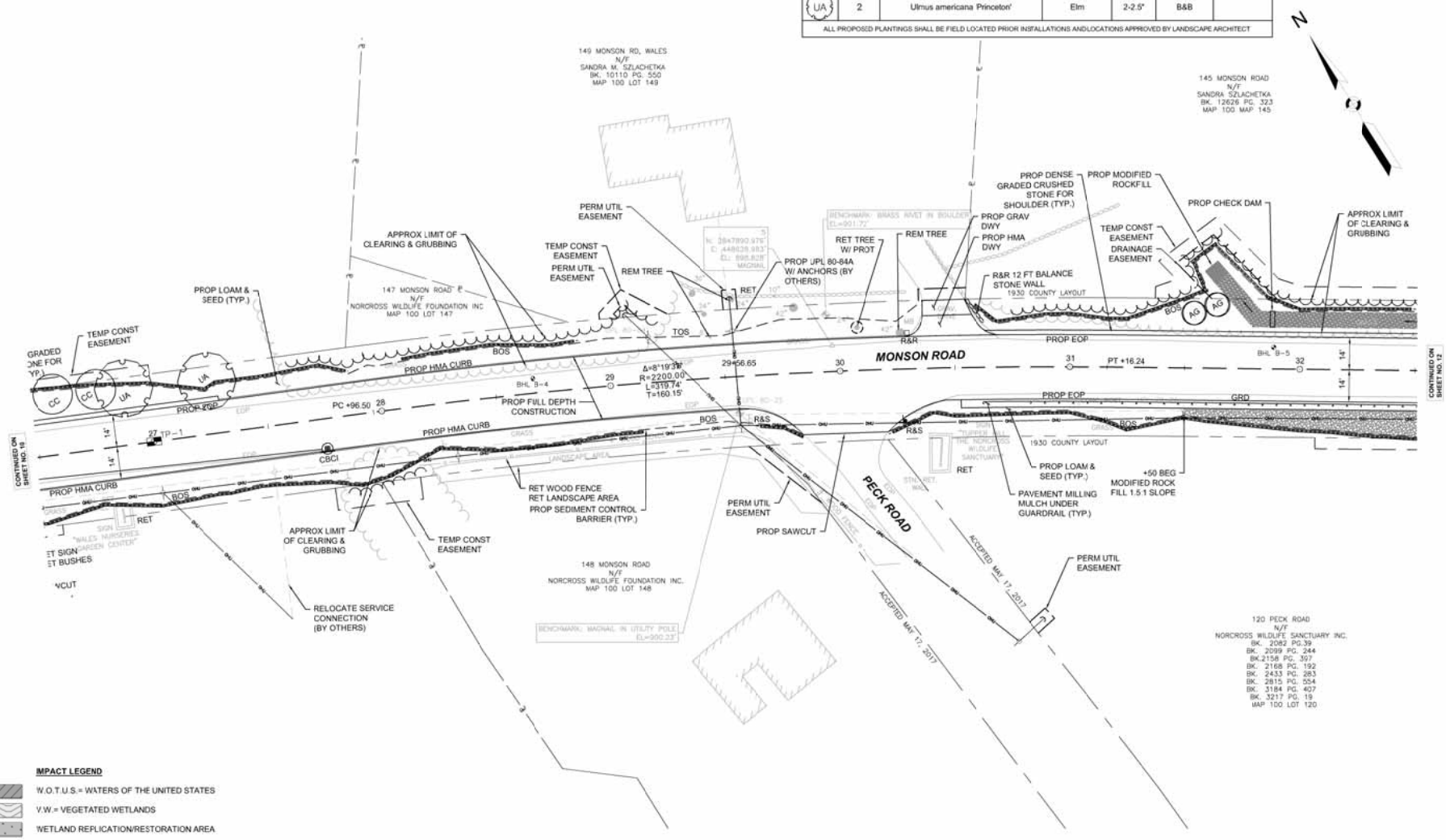
TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	2	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	2	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	180
PROJECT FILE NO.		608163	

CONSTRUCTION PLANS



IMPACT LEGEND
W.O.T.U.S.= WATERS OF THE UNITED STATES
V.W.= VEGETATED WETLANDS
WETLAND REPLICATION/RESTORATION AREA
— OHW — ORDINARY HIGH WATER

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 24

608163_HD3(CONSTRUCTION PLANS)404.DWG Plotted on 25-Jun-2024 3:09 PM

HIGHWAY GUARD DETAILS
STA 30+75 TO STA 33+25 RT (TL-3)
STA 33+25 TO STA 33+38 RT TANGENT END TREATMENT TL-3
STA 35+22 TO STA 35+34 RT TANGENT END TREATMENT TL-3
STA 35+34 TO STA 36+84 RT (TL-3)
STA 36+84 TO STA 36+97 RT TANGENT END TREATMENT TL-3

TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
NONE

DRAINAGE DETAILS
SEE UTILITY PLANS

PLANT SCHEDULE

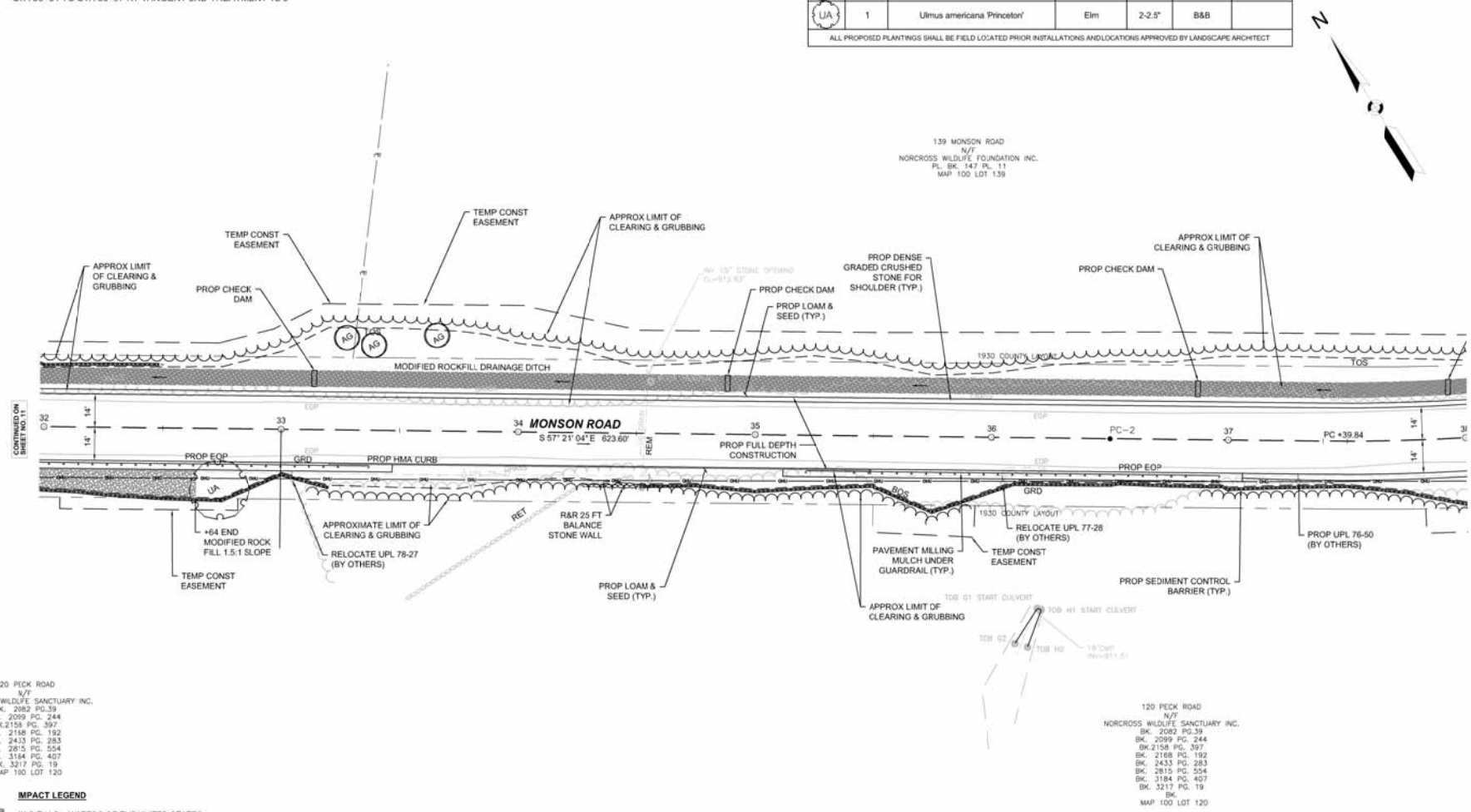
TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	3	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	1	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	12	180
PROJECT FILE NO.	608163		

CONSTRUCTION PLANS



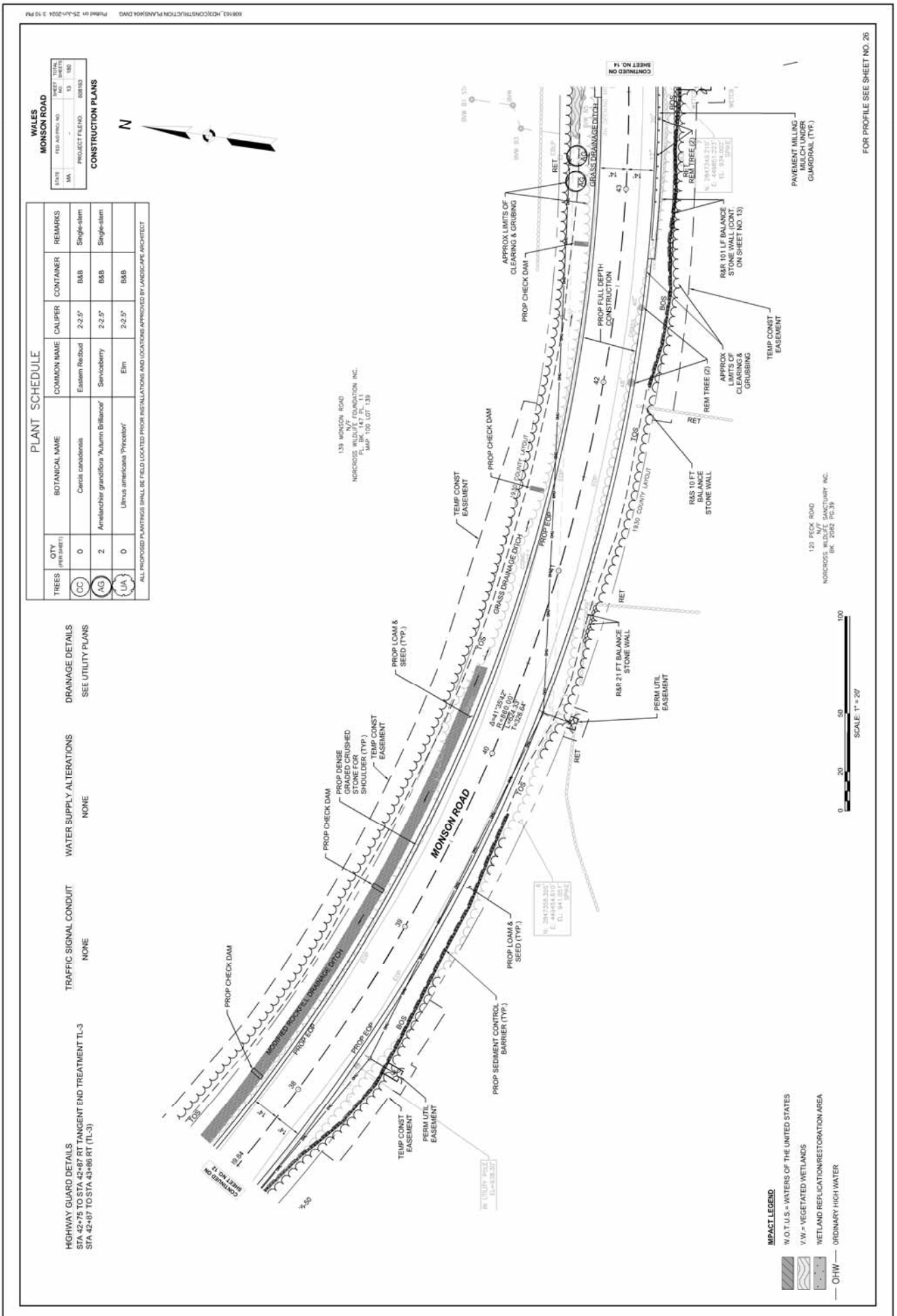
IMPACT LEGEND

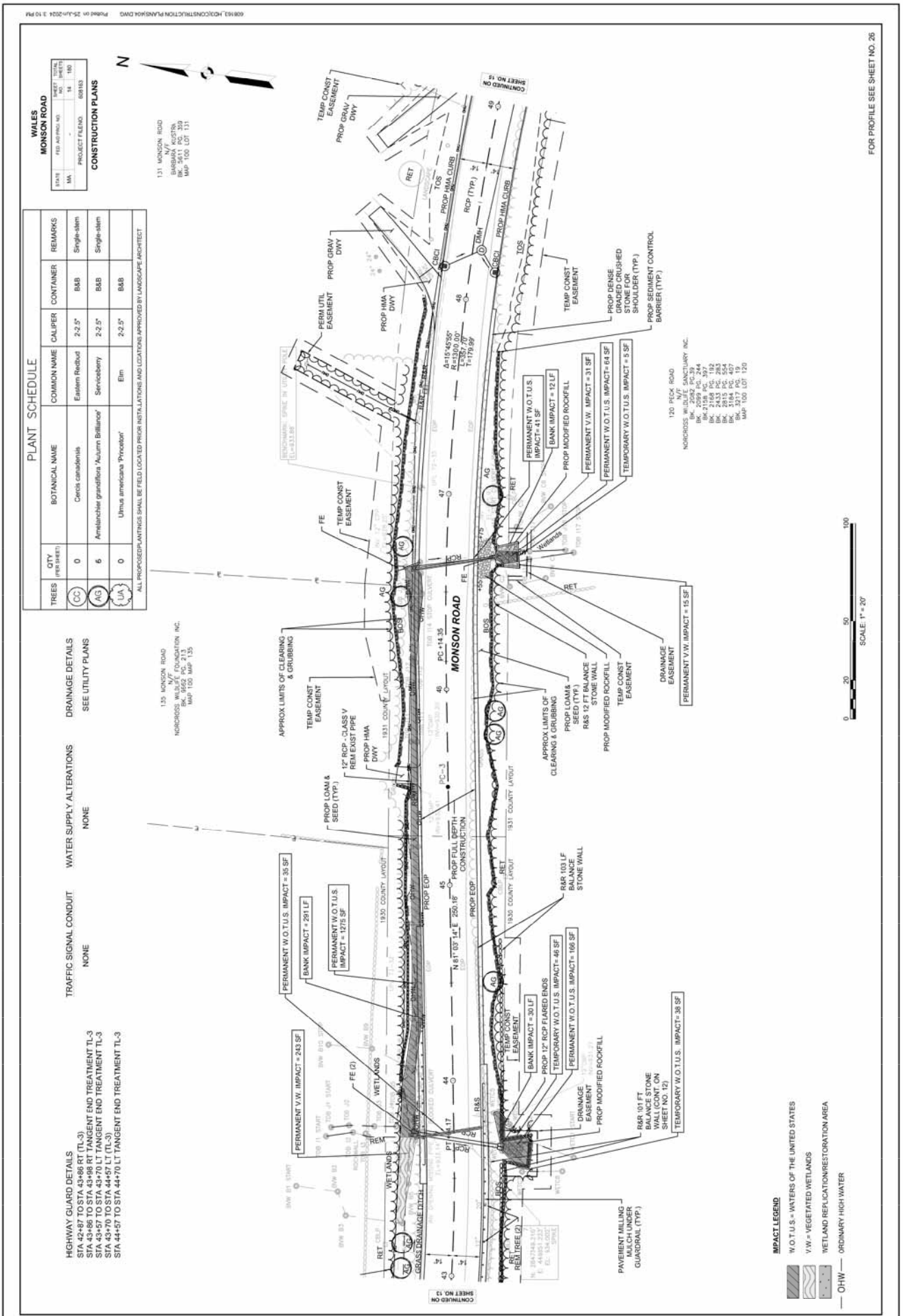
W.O.T.U.S.= WATERS OF THE UNITED STATES
V.W.= VEGETATED WETLANDS
WETLAND REPLICATION/RESTORATION AREA
— OHW — ORDINARY HIGH WATER

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 25

608163_HD3(CONSTRUCTION PLANS)404.DWG Plotted on 25-Jun-2024 3:09 PM


WALES
MONSON ROAD
CONSTRUCTION PLANS
PLANT SCHEDULE
TREES
QTY (PER SHEET)
BOTANICAL NAME
COMMON NAME
CALIPER
CONTAINER
REMARKS
CC 0 Cercis canadensis Eastern Redbud 2-2.5" B&B Single-stem
AG 2 Amelanchier grandiflora 'Autumn Brilliance' Serviceberry 2-2.5" B&B Single-stem
UA 0 Ulmus americana 'Princeton' Elm 2-2.5" B&B
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 42+75 TO STA 42+87 RT TANGENT END TREATMENT TL-3
STA 42+87 TO STA 43+86 RT (TL-3)
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
IMPACT LEGEND
W.O.T.U.S. = WATERS OF THE UNITED STATES
V.W. = VEGETATED WETLANDS
WETLAND REPLICATION/RESTORATION AREA
ORDINARY HIGH WATER
MONSON ROAD
MODIFIED ROCKFILL DRAINAGE DITCH
GRASS DRAINAGE DITCH
PROP CHECK DAM
PROP DENSE GRADED CRUSHED STONE FOR SHOULDER (TYP.)
PROP LOAM & SEED (TYP.)
PROP SEDIMENT CONTROL BARRIER (TYP.)
PROP EOP
PROP FULL DEPTH CONSTRUCTION
TEMP CONST EASEMENT
PERM UTIL EASEMENT
APPROX LIMITS OF CLEARING & GRUBBING
REM TREE (2)
RET
R&R 21 FT BALANCE STONE WALL
RAS 10 FT BALANCE STONE WALL
R&R 101 LF BALANCE STONE WALL (CONT. ON SHEET NO. 13)
PAVEMENT MILLING MULCH UNDER GUARDRAIL (TYP.)
CONTINUED ON SHEET NO. 14
CONTINUED ON SHEET NO. 12
FOR PROFILE SEE SHEET NO. 26
SCALE: 1" = 20'
139 MONSON ROAD
N/F
NORCROSS WILDLIFE FOUNDATION INC.
PL BK 141 PG 11
MAP 100 LOT 139
121 PECK ROAD
N/F SANCTUARY INC.
NORCROSS WILDLIFE
BK 2082 PG.39


608163_HDD\CONSTRUCTION PLANS\A04.DWG Plotted on 25-Jun-2024 3:10 PM
WALES
MONSON ROAD
STATE MA
FED. AID PROJ. NO. -
SHEET NO. 14
TOTAL SHEETS 180
PROJECT FILE NO. 608163
CONSTRUCTION PLANS
PLANT SCHEDULE
TREES | QTY (PER SHEET) | BOTANICAL NAME | COMMON NAME | CALIPER | CONTAINER | REMARKS
CC | 0 | Cercis canadensis | Eastern Redbud | 2-2.5" | B&B | Single-stem
AG | 6 | Amelanchier grandiflora 'Autumn Brilliance' | Serviceberry | 2-2.5" | B&B | Single-stem
UA | 0 | Ulmus americana 'Princeton' | Elm | 2-2.5" | B&B
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 42+87 TO STA 43+86 RT (TL-3)
STA 43+86 TO STA 43+98 RT TANGENT END TREATMENT TL-3
STA 43+57 TO STA 43+70 LT TANGENT END TREATMENT TL-3
STA 43+70 TO STA 44+57 LT (TL-3)
STA 44+57 TO STA 44+70 LT TANGENT END TREATMENT TL-3
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
MONSON ROAD
PC +14.35
PC-3
PROP FULL DEPTH CONSTRUCTION
N 81° 03' 14" E 250.18'
PERMANENT V.W. IMPACT = 243 SF
PERMANENT W.O.T.U.S. IMPACT = 35 SF
BANK IMPACT = 291 LF
PERMANENT W.O.T.U.S. IMPACT = 1275 SF
PERMANENT W.O.T.U.S. IMPACT = 41 SF
BANK IMPACT = 12 LF
PERMANENT V.W. IMPACT = 31 SF
PERMANENT W.O.T.U.S. IMPACT = 64 SF
TEMPORARY W.O.T.U.S. IMPACT = 5 SF
PERMANENT V.W. IMPACT = 15 SF
BANK IMPACT = 30 LF
PROP 12" RCP FLARED ENDS
TEMPORARY W.O.T.U.S. IMPACT = 46 SF
PERMANENT W.O.T.U.S. IMPACT = 166 SF
TEMPORARY W.O.T.U.S. IMPACT = 38 SF
R&R 103 LF BALANCE STONE WALL
R&R 101 FT BALANCE STONE WALL (CONT. ON SHEET NO. 12)
PAVEMENT MILLING MULCH UNDER GUARDRAIL (TYP.)
PROP DENSE GRADED CRUSHED STONE FOR SHOULDER (TYP.)
PROP SEDIMENT CONTROL BARRIER (TYP.)
PROP MODIFIED ROCKFILL
TEMP CONST EASEMENT
DRAINAGE EASEMENT
APPROX LIMITS OF CLEARING & GRUBBING
PROP LOAM & SEED (TYP.)
R&S 12 FT BALANCE STONE WALL
12" RCP - CLASS V REM EXIST PIPE
PROP HMA DWY
PROP GRAV DWY
PERM UTIL EASEMENT
PROP HMA CURB
RCP (TYP.)
TEMP CONST EASEMENT
PROP GRAV DWY
131 MONSON ROAD N/F BARBARA KUSTRA BK. 5611 PG. 359 MAP 100 LOT 131
135 MONSON ROAD N/F NORCROSS WILDLIFE FOUNDATION INC. BK. 9662 PG. 213 MAP 100 MAP 135
120 PECK ROAD N/F NORCROSS WILDLIFE SANCTUARY INC. BK. 2082 PG. 39 BK. 2099 PG. 244 BK. 2158 PG. 397 BK. 2168 PG. 192 BK. 2433 PG. 283 BK. 2815 PG. 554 BK. 3184 PG. 407 BK. 3217 PG. 19 MAP 100 LOT 120
CONTINUED ON SHEET NO. 15
CONTINUED ON SHEET NO. 13
SCALE: 1" = 20'
FOR PROFILE SEE SHEET NO. 26
IMPACT LEGEND
W.O.T.U.S. = WATERS OF THE UNITED STATES
V.W. = VEGETATED WETLANDS
WETLAND REPLICATION/RESTORATION AREA
OHW — ORDINARY HIGH WATER

HIGHWAY GUARD DETAILS
STA 49+96 TO STA 50+08 LT TANGENT END TREATMENT TL-3
STA 50+08 TO STA 51+46 LT (TL-3)
STA 51+46 TO STA 51+58 LT TANGENT END TREATMENT TL-3
STA 49+33 TO STA 49+46 RT TANGENT END TREATMENT TL-3
STA 49+46 TO STA 51+71 RT (TL-3)
STA 51+71 TO STA 51+84 RT TANGENT END TREATMENT TL-3

TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS
NONE	NONE	SEE UTILITY PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	1	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	0	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	1	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	

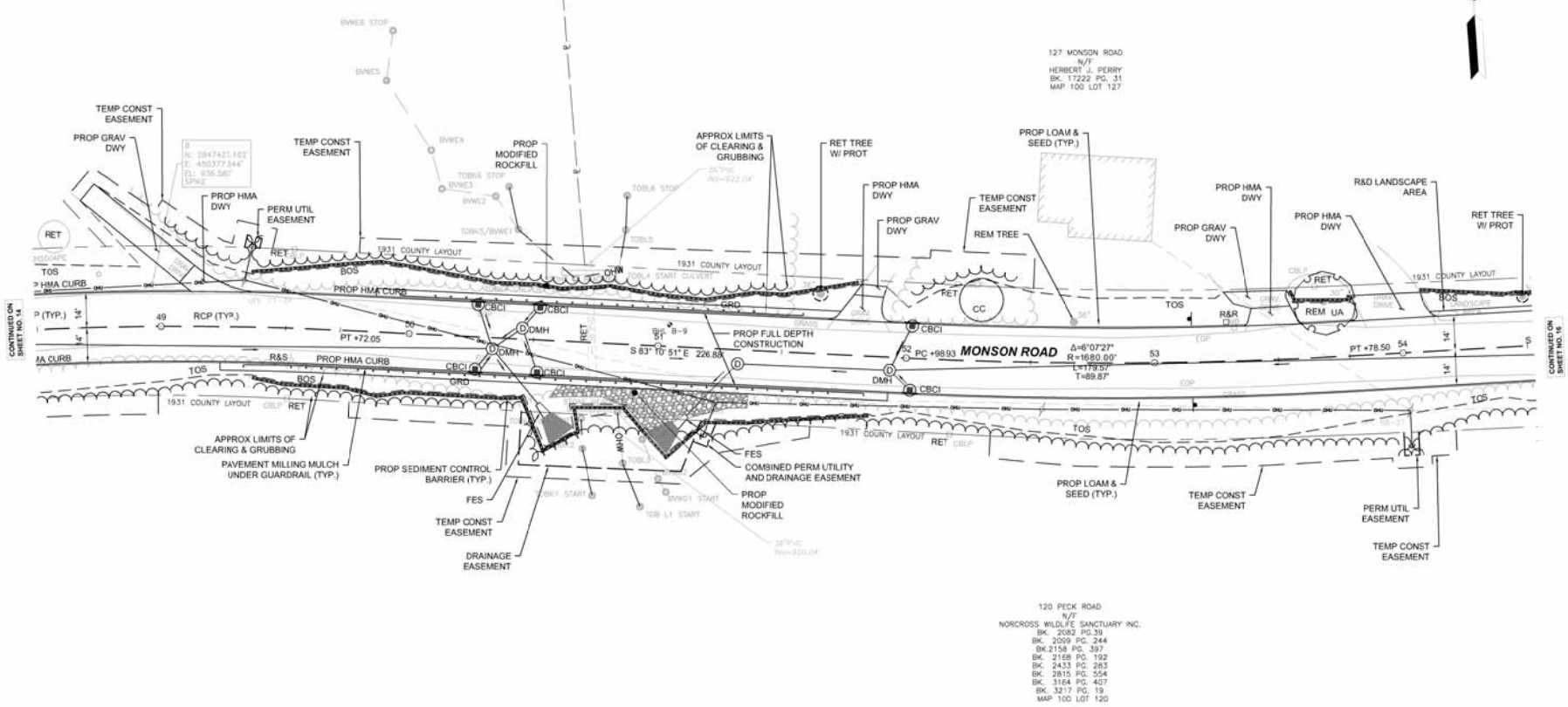
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	15	180
PROJECT FILE NO.		608163	

CONSTRUCTION PLANS

N

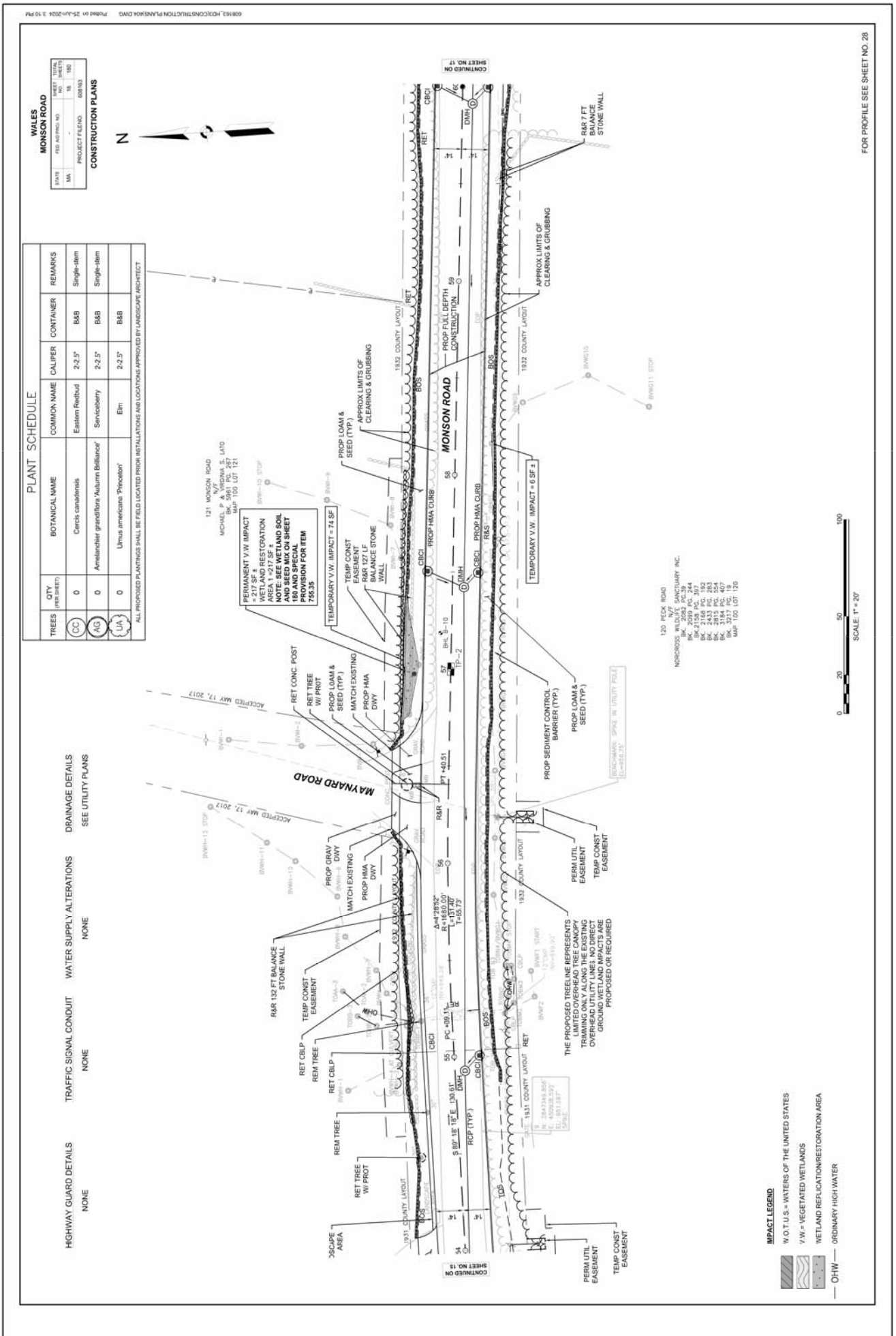


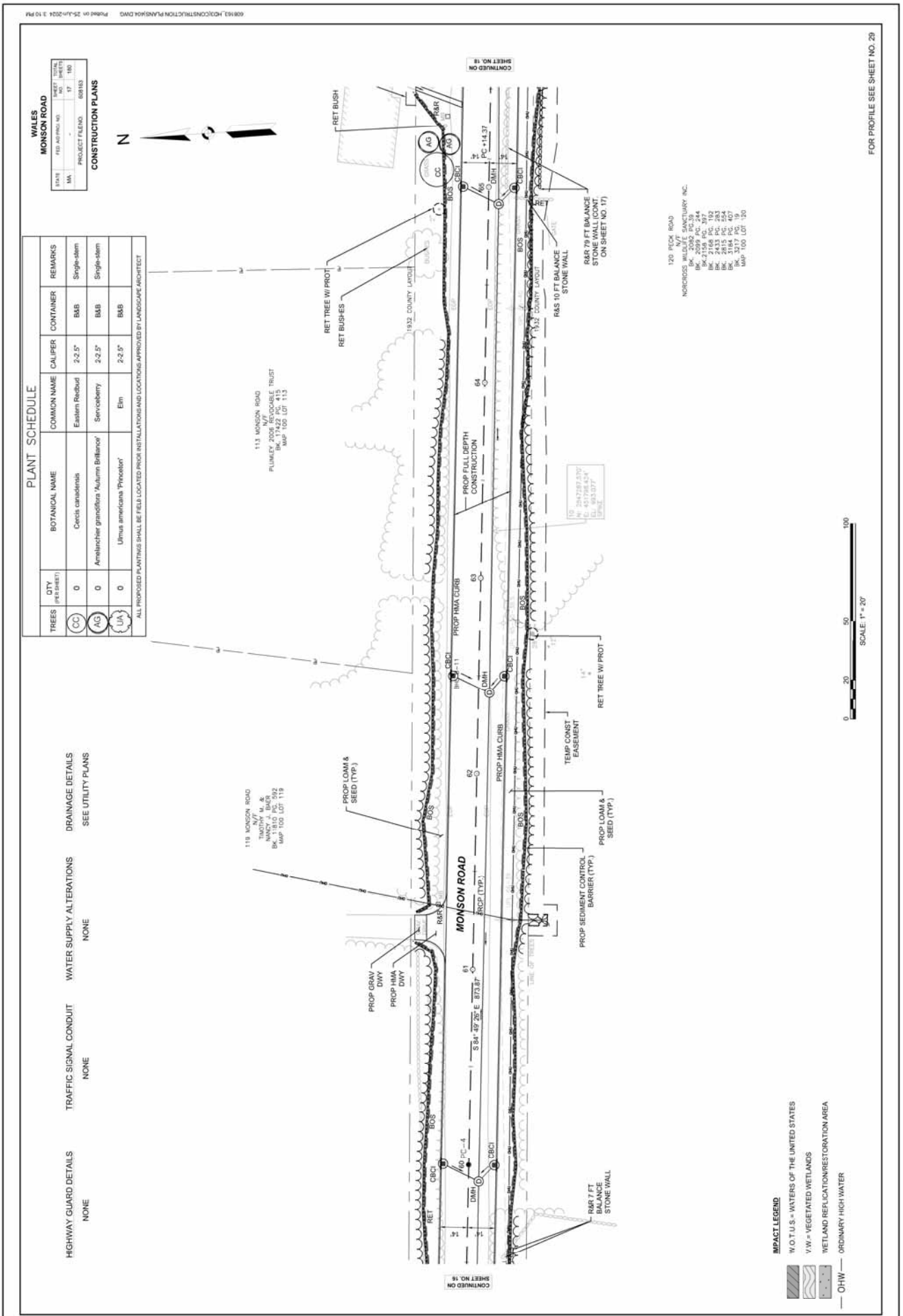
IMPACT LEGEND
W.O.T.U.S.= WATERS OF THE UNITED STATES
V.W.= VEGETATED WETLANDS
WETLAND REPLICATION/RESTORATION AREA
— OHW — ORDINARY HIGH WATER

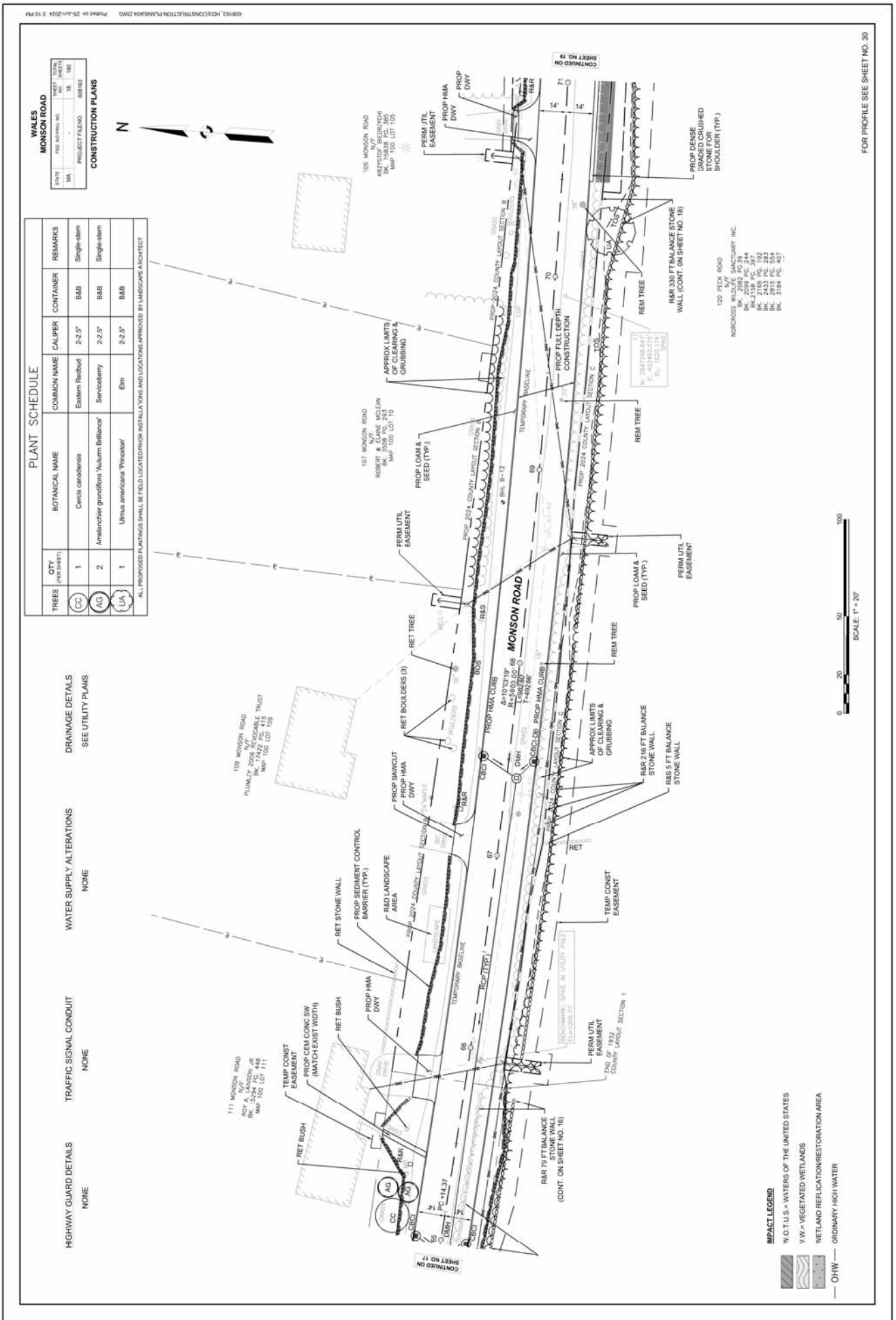
0 20 50 100
SCALE: 1" = 20'

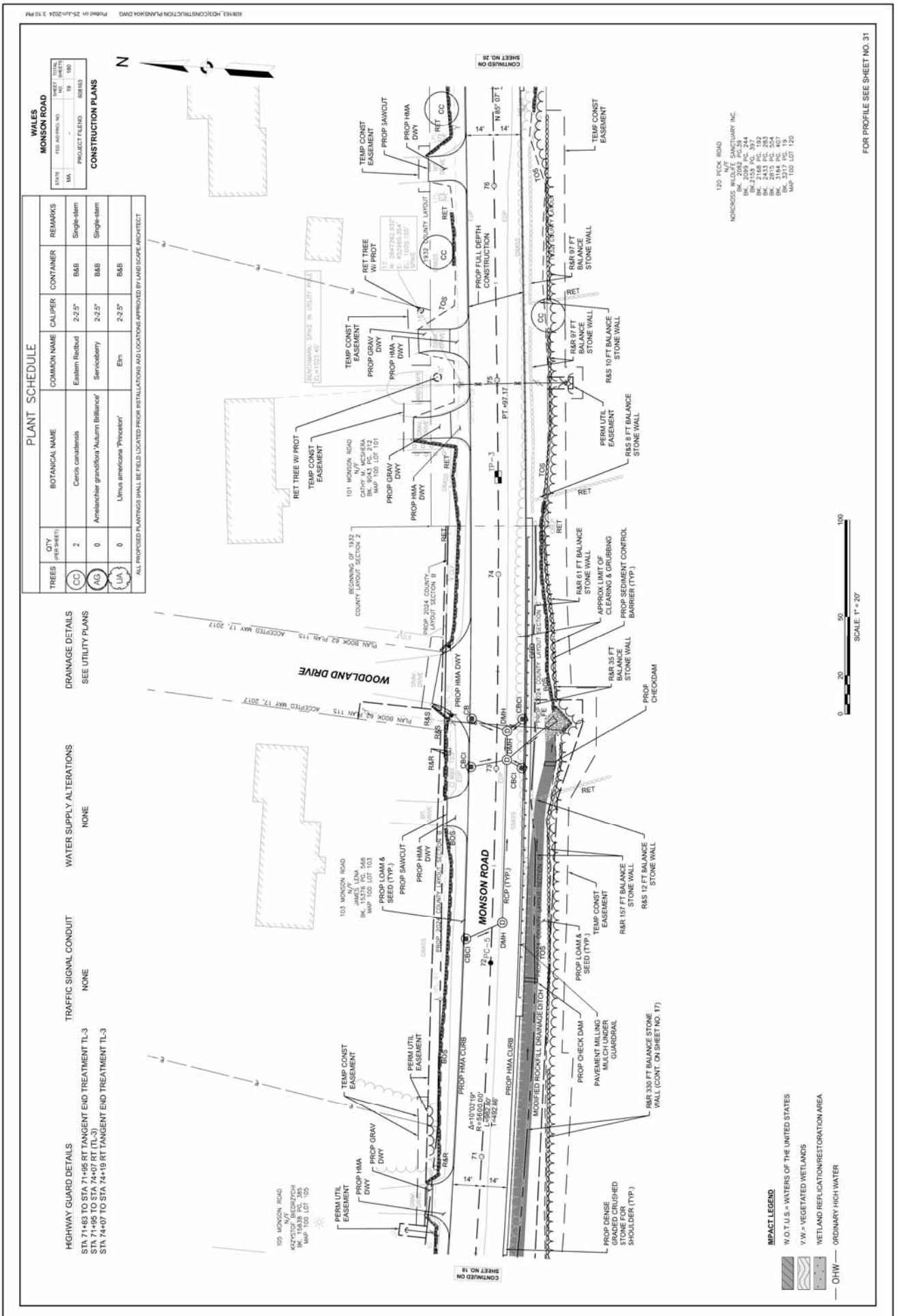
FOR PROFILE SEE SHEET NO. 27

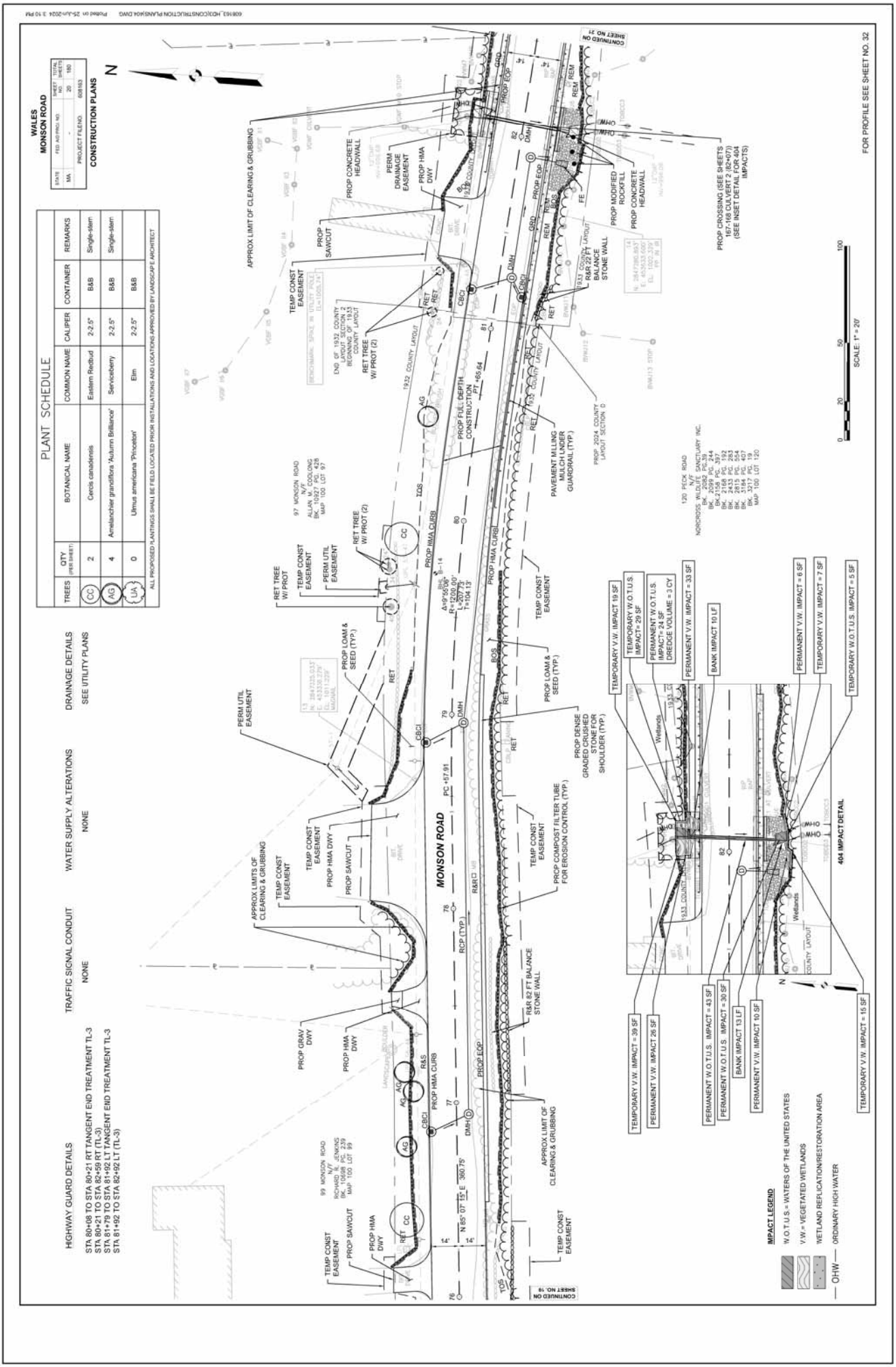
608163_HD3(CONSTRUCTION PLANS)404.DWG Plotted on 25-Jun-2024 3:10 PM

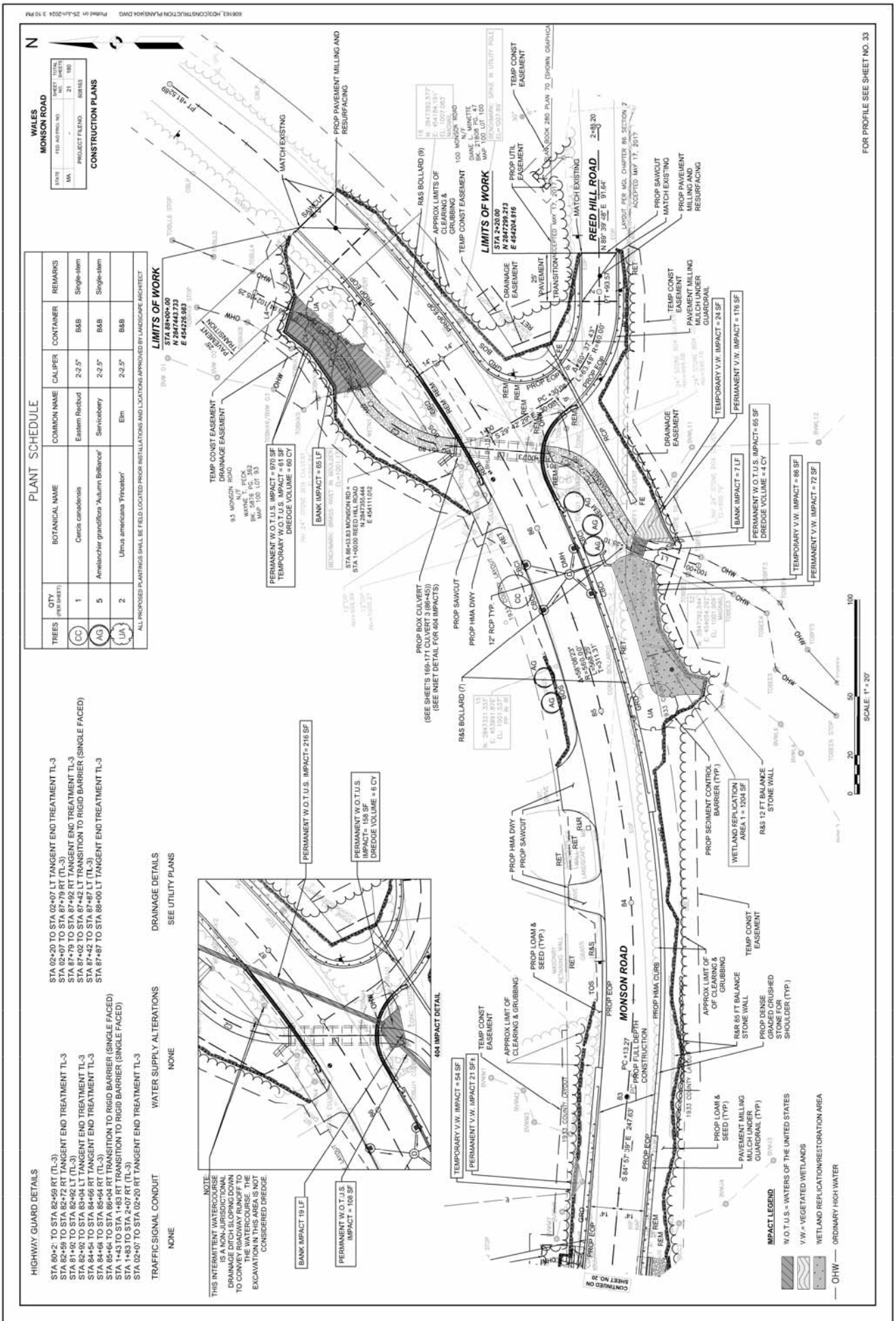

WALES
MONSON ROAD
CONSTRUCTION PLANS
PLANT SCHEDULE
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
NONE
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
MONSON ROAD
MAYNARD ROAD
IMPACT LEGEND
W.O.T.U.S. = WATERS OF THE UNITED STATES
V.W. = VEGETATED WETLANDS
WETLAND REPLICATION/RESTORATION AREA
ORDINARY HIGH WATER
FOR PROFILE SEE SHEET NO. 28
SCALE: 1" = 20'

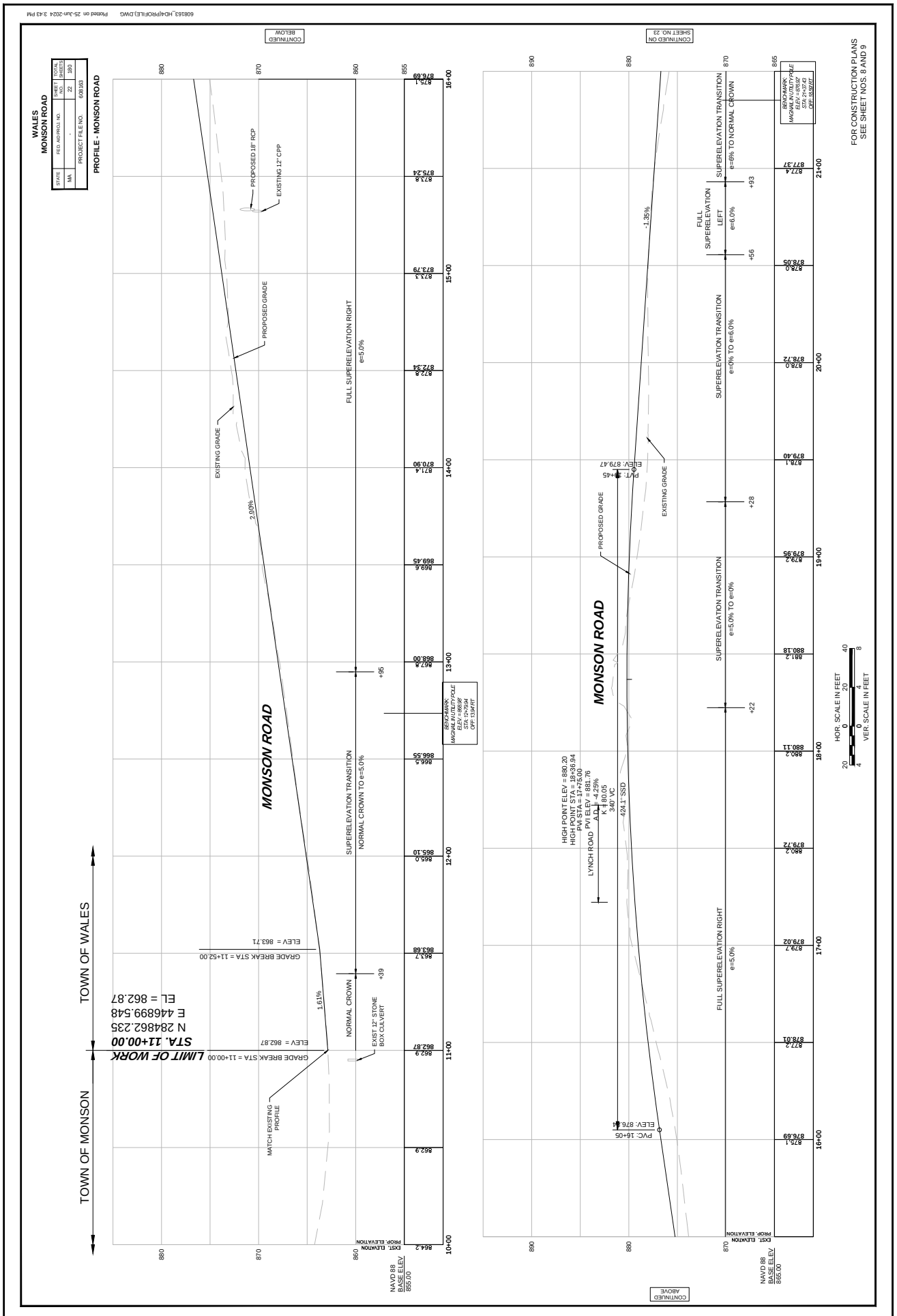

WALES
MONSON ROAD
CONSTRUCTION PLANS
PROJECT FILE NO. 608163
PLANT SCHEDULE
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
NONE
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
MONSON ROAD
FOR PROFILE SEE SHEET NO. 29
SCALE: 1" = 20'
IMPACT LEGEND
W.O.T.U.S. = WATERS OF THE UNITED STATES
V.W. = VEGETATED WETLANDS
WETLAND REPLICATION/RESTORATION AREA
ORDINARY HIGH WATER

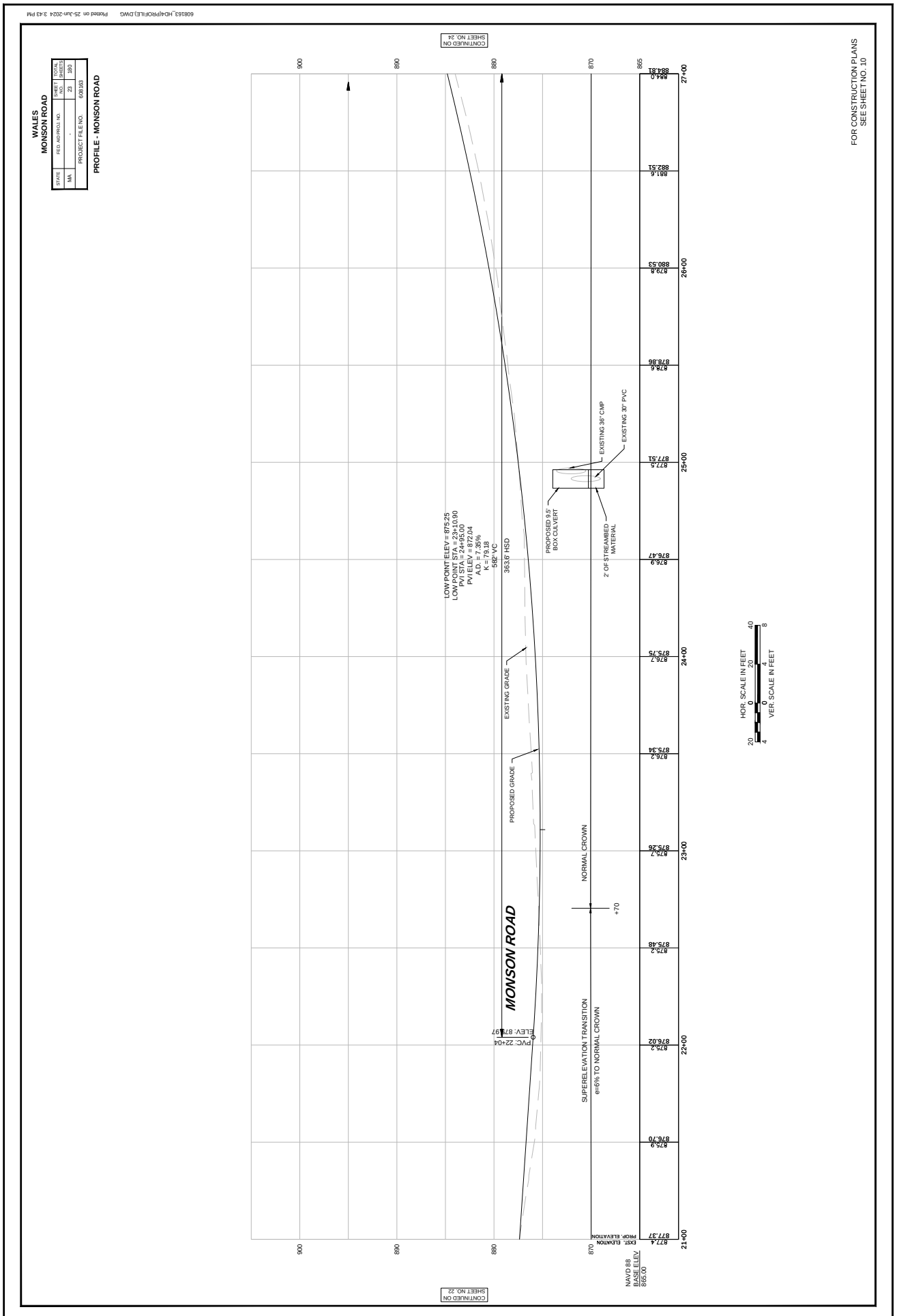

WALES
MONSON ROAD
CONSTRUCTION PLANS
PROJECT FILE NO. 608163
PLANT SCHEDULE
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
NONE
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
MONSON ROAD
PROP 2024 COUNTY LAYOUT SECTION B
PROP 2024 COUNTY LAYOUT SECTION C
TEMPORARY BASELINE
PROP FULL DEPTH CONSTRUCTION
PROP LOAM & SEED (TYP.)
PROP DENSE GRADED CRUSHED STONE FOR SHOULDER (TYP.)
APPROX LIMITS OF CLEARING & GRUBBING
PERM UTIL EASEMENT
TEMP CONST EASEMENT
PROP HMA DWY
PROP SAWCUT
PROP HMA CURB
PROP CEM CONC SW (MATCH EXIST WIDTH)
PROP SEDIMENT CONTROL BARRIER (TYP.)
R&D LANDSCAPE AREA
RET STONE WALL
RET BUSH
RET BOULDERS (3)
RET TREE
REM TREE
R&R 330 FT BALANCE STONE WALL (CONT. ON SHEET NO. 18)
R&R 216 FT BALANCE STONE WALL
R&S 5 FT BALANCE STONE WALL
R&R 79 FT BALANCE STONE WALL (CONT. ON SHEET NO. 16)
CONTINUED ON SHEET NO. 17
CONTINUED ON SHEET NO. 19
FOR PROFILE SEE SHEET NO. 30
SCALE: 1" = 20'
IMPACT LEGEND
W.O.T.U.S. = WATERS OF THE UNITED STATES
V.W. = VEGETATED WETLANDS
WETLAND REPLICATION/RESTORATION AREA
OHW — ORDINARY HIGH WATER

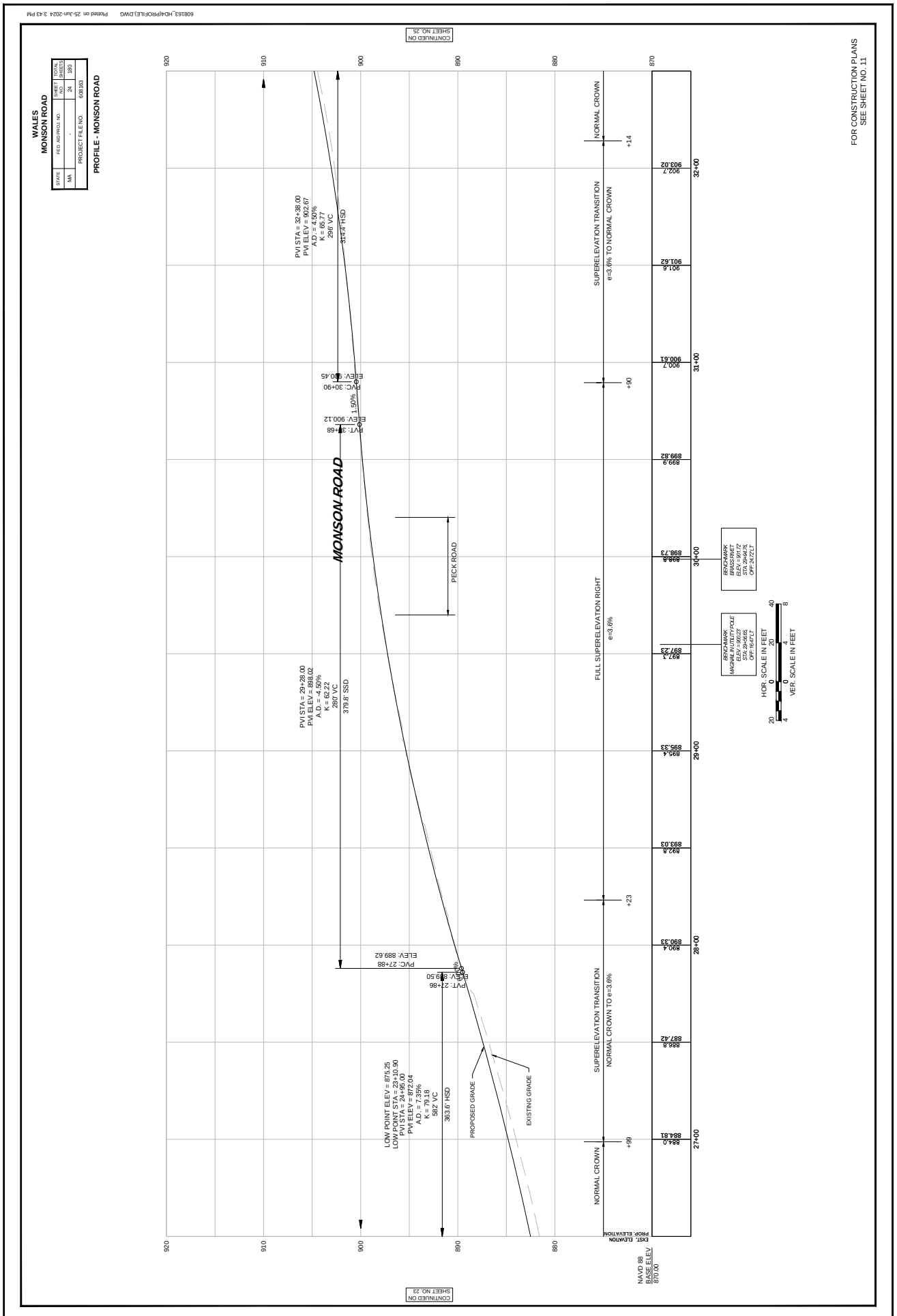

WALES
MONSON ROAD
CONSTRUCTION PLANS
PLANT SCHEDULE
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 71+83 TO STA 71+95 RT TANGENT END TREATMENT TL-3
STA 71+95 TO STA 74+07 RT (TL-3)
STA 74+07 TO STA 74+19 RT TANGENT END TREATMENT TL-3
TRAFFIC SIGNAL CONDUIT
NONE
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
MONSON ROAD
WOODLAND DRIVE
SCALE: 1" = 20'
FOR PROFILE SEE SHEET NO. 31
IMPACT LEGEND
W.O.T.U.S. = WATERS OF THE UNITED STATES
V.W. = VEGETATED WETLANDS
WETLAND REPLICATION/RESTORATION AREA
ORDINARY HIGH WATER

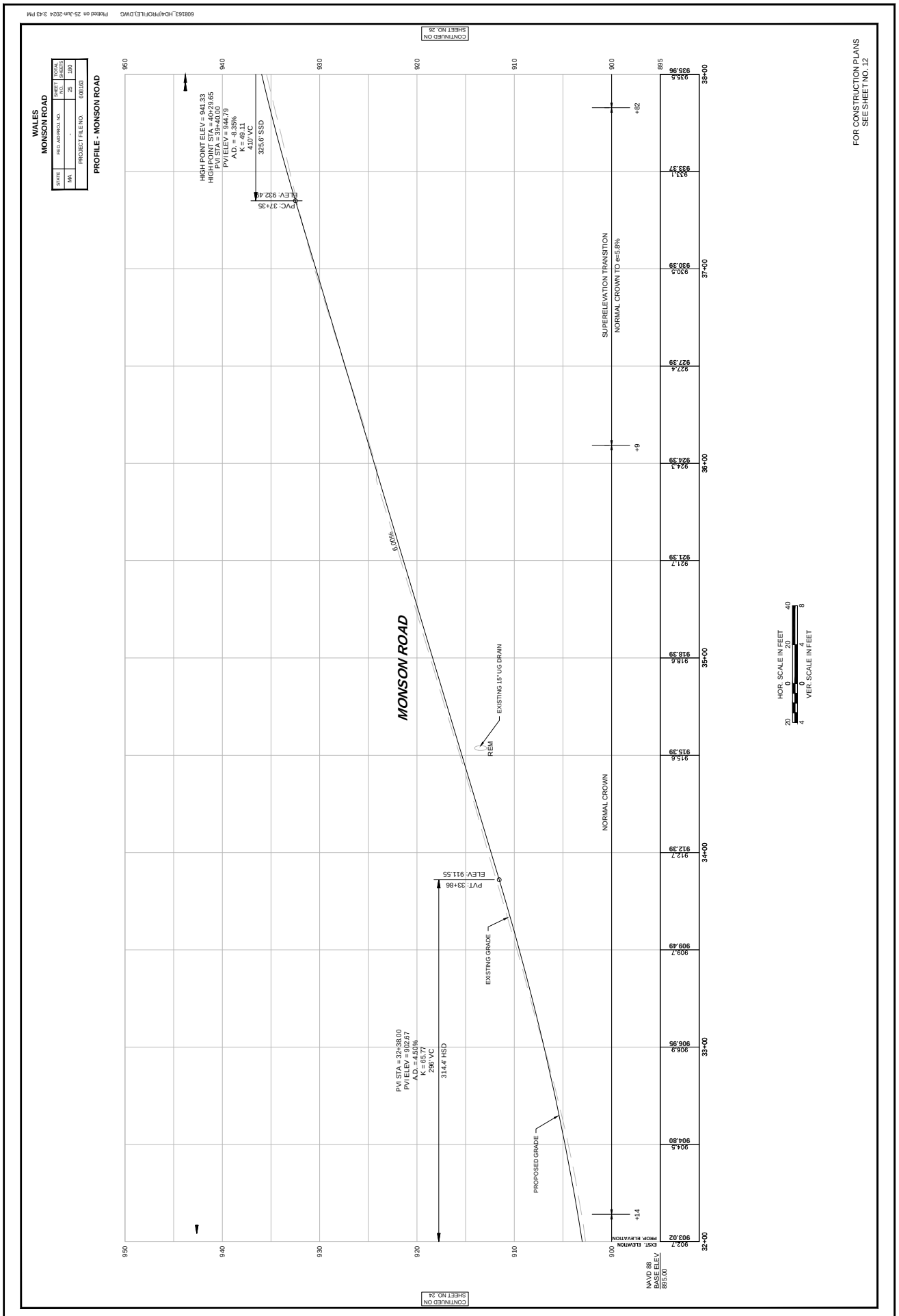

WALES
MONSON ROAD
CONSTRUCTION PLANS
PROJECT FILE NO. 608163
PLANT SCHEDULE
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 80+08 TO STA 80+21 RT TANGENT END TREATMENT TL-3
STA 80+21 TO STA 82+58 RT (TL-3)
STA 81+79 TO STA 81+92 LT TANGENT END TREATMENT TL-3
STA 81+92 TO STA 82+92 LT (TL-3)
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
MONSON ROAD
FOR PROFILE SEE SHEET NO. 32
SCALE: 1" = 20'
404 IMPACT DETAIL
IMPACT LEGEND
W.O.T.U.S. = WATERS OF THE UNITED STATES
V.W. = VEGETATED WETLANDS
WETLAND REPLICATION/RESTORATION AREA
OHW — ORDINARY HIGH WATER

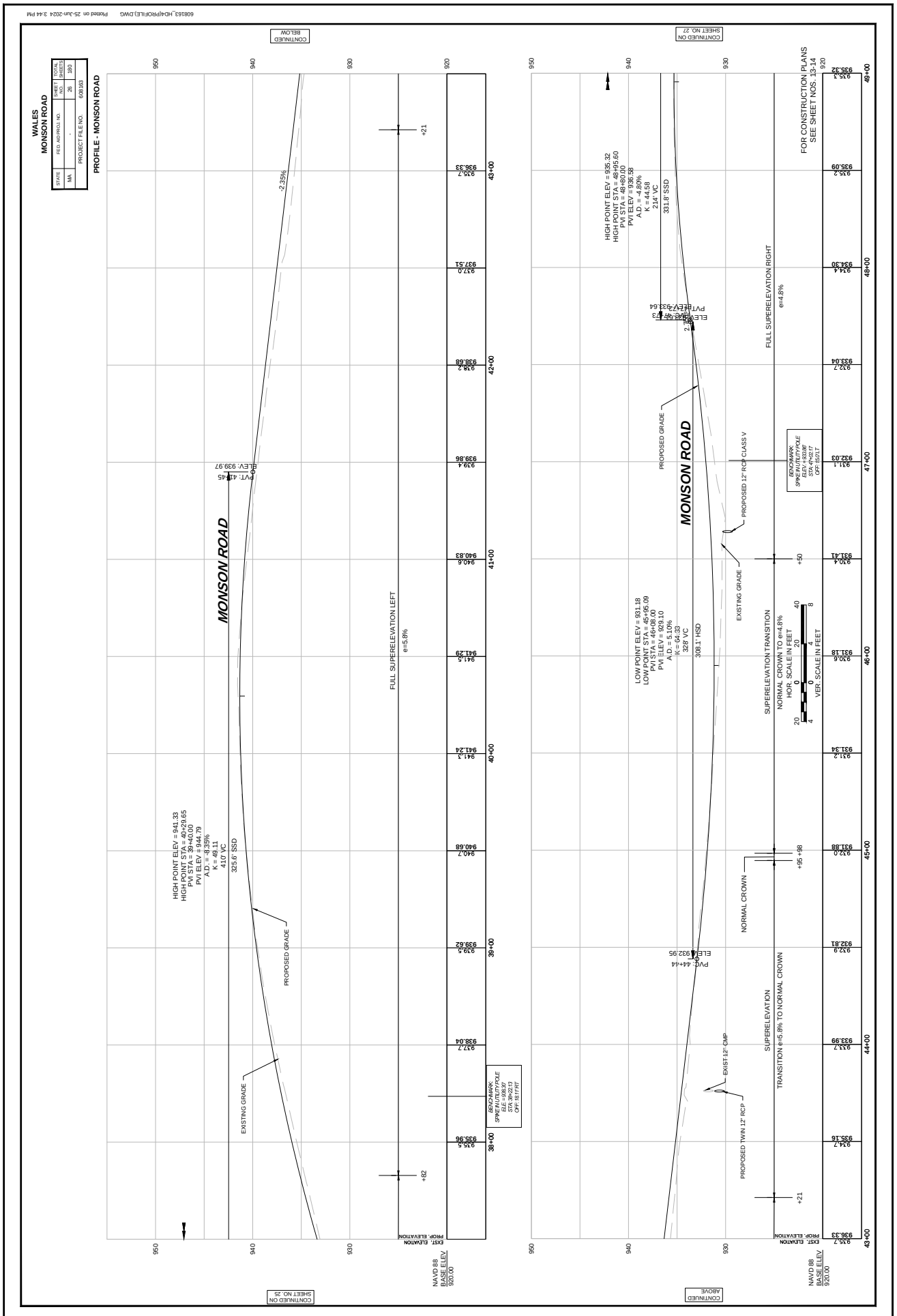

WALES
MONSON ROAD
CONSTRUCTION PLANS
PROJECT FILE NO. 608163
PLANT SCHEDULE
TREES
QTY (PER SHEET)
BOTANICAL NAME
COMMON NAME
CALIPER
CONTAINER
REMARKS
CC 1 Cercis canadensis Eastern Redbud 2-2.5" B&B Single-stem
AG 5 Amelanchier grandiflora 'Autumn Brilliance' Serviceberry 2-2.5" B&B Single-stem
UA 2 Ulmus americana 'Princeton' Elm 2-2.5" B&B
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 80+92 TO STA 83+59 RT (TL-3)
STA 82+92 TO STA 83+59 RT TANGENT END TREATMENT TL-3
STA 82+92 TO STA 82+72 LT (TL-3)
STA 82+92 TO STA 83+04 LT TANGENT END TREATMENT TL-3
STA 84+54 TO STA 84+66 RT TANGENT END TREATMENT TL-3
STA 84+66 TO STA 85+54 RT (TL-3)
STA 85+64 TO STA 86+04 RT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 1+43 TO STA 1+83 RT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 1+83 TO STA 2+07 RT (TL-3)
STA 02+07 TO STA 02+20 RT TANGENT END TREATMENT TL-3
STA 02+20 TO STA 02+07 LT TANGENT END TREATMENT TL-3
STA 02+07 TO STA 87+79 RT (TL-3)
STA 87+79 TO STA 87+92 RT TANGENT END TREATMENT TL-3
STA 87+02 TO STA 87+42 LT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 87+42 TO STA 87+87 LT (TL-3)
STA 87+87 TO STA 88+00 LT TANGENT END TREATMENT TL-3
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
LIMITS OF WORK
STA 88+00+.00
N 284744.733
E 454226.983
LIMITS OF WORK
STA 2+20.00
N 284799.213
E 454204.816
REED HILL ROAD
MONSON ROAD
404 IMPACT DETAIL
PERMANENT W.O.T.U.S. IMPACT= 216 SF
PERMANENT W.O.T.U.S. IMPACT= 158 SF DREDGE VOLUME = 6 CY
BANK IMPACT 19 LF
PERMANENT W.O.T.U.S. IMPACT = 108 SF
BANK IMPACT = 65 LF
PERMANENT W.O.T.U.S. IMPACT = 970 SF
TEMPORARY W.O.T.U.S. IMPACT = 61 SF
DREDGE VOLUME = 60 CY
TEMP CONST EASEMENT
DRAINAGE EASEMENT
PROP BOX CULVERT
(SEE SHEETS 169-171 CULVERT 3 (88+45))
(SEE INSET DETAIL FOR 404 IMPACTS)
PROP SAWCUT
PROP HMA DWY
12' RCP TYP.
R&S BOLLARD (7)
R&S BOLLARD (9)
APPROX LIMITS OF CLEARING & GRUBBING
TEMP CONST EASEMENT
PROP PAVEMENT MILLING AND RESURFACING
MATCH EXISTING
PROP UTIL EASEMENT
PAVEMENT TRANSITION
PROP SAWCUT
MATCH EXISTING
PROP PAVEMENT MILLING AND RESURFACING
TEMP CONST EASEMENT
PAVEMENT MILLING MULCH UNDER GUARDRAIL
TEMPORARY V.W. IMPACT = 24 SF
PERMANENT V.W. IMPACT = 176 SF
BANK IMPACT = 7 LF
PERMANENT W.O.T.U.S. IMPACT= 65 SF
DREDGE VOLUME = 4 CY
TEMPORARY V.W. IMPACT = 86 SF
PERMANENT V.W. IMPACT = 72 SF
PROP SEDIMENT CONTROL BARRIER (TYP.)
WETLAND REPLICATION AREA 1 = 1204 SF
R&S 12 FT BALANCE STONE WALL
TEMPORARY V.W. IMPACT = 54 SF
PERMANENT V.W. IMPACT 21 SF±
TEMP CONST EASEMENT
APPROX LIMIT OF CLEARING & GRUBBING
PROP LOAM & SEED (TYP.)
PROP HMA DWY
PROP SAWCUT
PROP HMA CURB
PROP EOP
PROP FULL DEPTH CONSTRUCTION
R&R 85 FT BALANCE STONE WALL
PROP DENSE GRADED CRUSHED STONE SHOULDER (TYP.)
PAVEMENT MILLING MULCH UNDER GUARDRAIL (TYP.)
IMPACT LEGEND
W.O.T.U.S. = WATERS OF THE UNITED STATES
V.W. = VEGETATED WETLANDS
WETLAND REPLICATION/RESTORATION AREA
ORDINARY HIGH WATER
NOTE:
THIS INTERMITTENT WATERCOURSE IS A NON-JURISDICTIONAL DRAINAGE DITCH SLOPING DOWN TO CONVEY ROADWAY RUNOFF TO THE WATERCOURSE. THE EXCAVATION IN THIS AREA IS NOT CONSIDERED DREDGE.
CONTINUED ON SHEET NO. 20
FOR PROFILE SEE SHEET NO. 33
SCALE: 1" = 20'
0
20
50
100
N
S

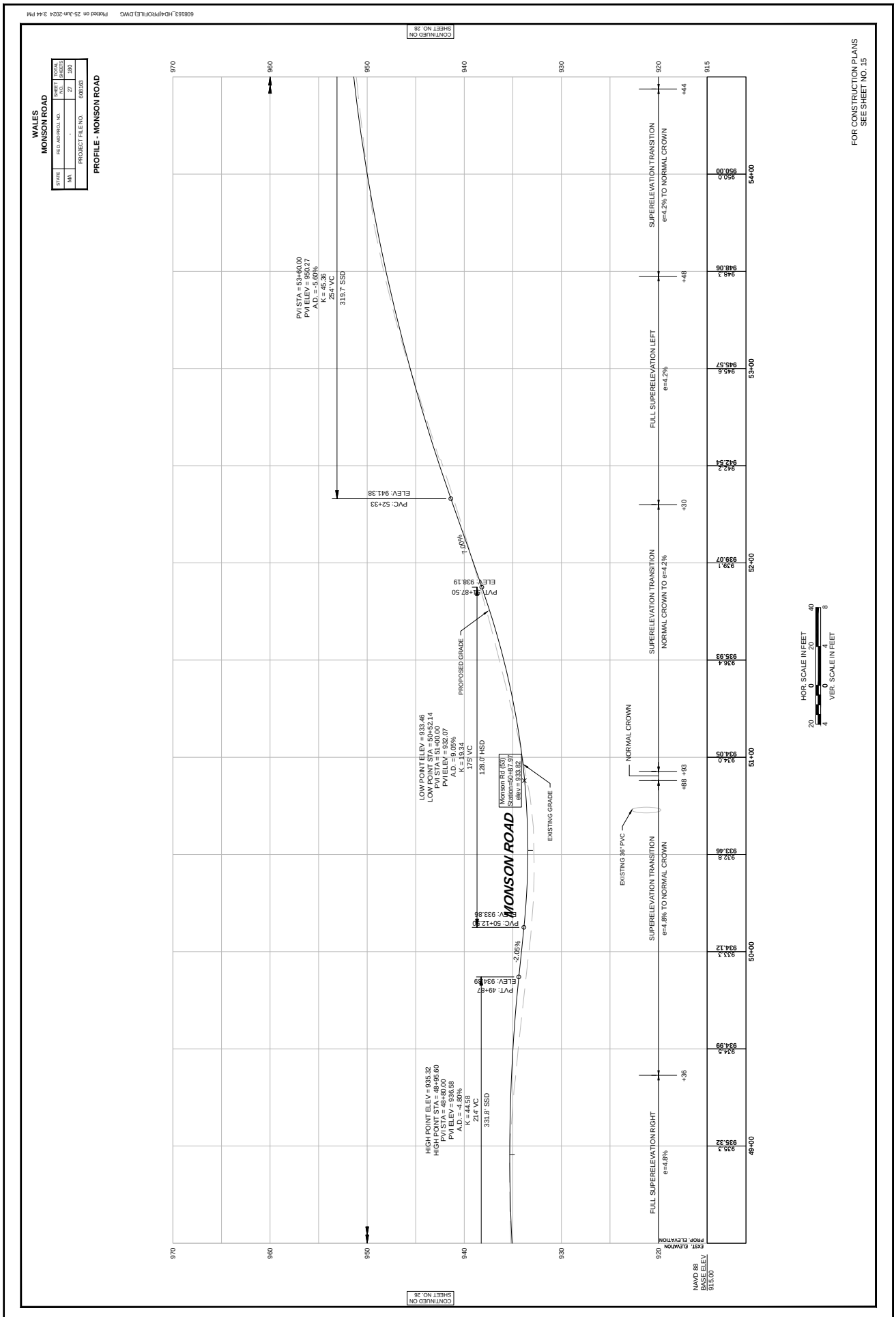

WALES
MONSON ROAD
PROFILE - MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
22
TOTAL SHEETS
180
608163_HD4/PROFILE).DWG
Plotted on 25-Jun-2024 3:43 PM
CONTINUED BELOW
CONTINUED ON SHEET NO. 23
CONTINUED ABOVE
FOR CONSTRUCTION PLANS
SEE SHEET NOS. 8 AND 9
TOWN OF MONSON
TOWN OF WALES
MONSON ROAD
LIMIT OF WORK
STA. 11+00.00
N 2848622.235
E 446899.548
EL = 862.87
GRADE BREAK STA = 11+00.00
ELEV = 862.87
GRADE BREAK STA = 11+52.00
ELEV = 863.71
MATCH EXISTING PROFILE
NORMAL CROWN
EXIST 12" STONE BOX CULVERT
1.61%
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=5.0%
FULL SUPERELEVATION RIGHT
e=5.0%
PROPOSED 18" RCP
EXISTING 12" CPP
EXISTING GRADE
PROPOSED GRADE
2.09%
BENCHMARK
MAGNAIL IN UTILITY POLE
ELEV = 868.96
STA 24+79.94
OFF 19.84 RT
HIGH POINT ELEV = 880.20
HIGH POINT STA = 18+36.94
PVI STA = 17+55.00
PVI ELEV = 881.76
LYNCH ROAD
A.D.T. = 4.29%
K = 80.05
340' VC
424.1' SSD
PVC: 16+05
ELEV: 876.44
PVT: 21+45
ELEV: 879.47
-1.35%
SUPERELEVATION TRANSITION
e=0% TO e=5.0%
SUPERELEVATION TRANSITION
e=5.0% TO e=0%
FULL SUPERELEVATION RIGHT
e=5.0%
FULL SUPERELEVATION LEFT
e=6.0%
SUPERELEVATION TRANSITION
e=6% TO NORMAL CROWN
BENCHMARK
MAGNAIL IN UTILITY POLE
ELEV = 877.43
STA 21+37.43
OFF 18.82 RT
HOR. SCALE IN FEET
VER. SCALE IN FEET
NAVD 88
BASE ELEV
855.00
EXIST. ELEVATION
PROP. ELEVATION


608163_HD4\PROFILE).DWG Plotted on 25-Jun-2024 3:43 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
23
TOTAL SHEETS
180
PROFILE - MONSON ROAD
FOR CONSTRUCTION PLANS
SEE SHEET NO. 10
CONTINUED ON SHEET NO. 24
CONTINUED ON SHEET NO. 22
MONSON ROAD
EXISTING GRADE
PROPOSED GRADE
NORMAL CROWN
+70
SUPERELEVATION TRANSITION
e=6% TO NORMAL CROWN
PVC: 22+04
ELEV: 873.97
LOW POINT ELEV = 875.25
LOW POINT STA = 24+10.90
PVI STA = 24+95.00
PVI ELEV = 872.04
A.D. = 7.35%
K = 79.18
582' VC
363.6' HSD
PROPOSED 9.5' BOX CULVERT
2' OF STREAMBED MATERIAL
EXISTING 36" CMP
EXISTING 30" PVC
EXIST. ELEVATION
PROP. ELEVATION
NAVD 88 BASE ELEV. 865.00
HOR. SCALE IN FEET
VER. SCALE IN FEET
900
890
880
870
865
21+00
22+00
23+00
24+00
25+00
26+00
27+00


608163_HD4\PROFILE).DWG Plotted on 25-Jun-2024 3:43 PM
WALES
MONSON ROAD
PROFILE - MONSON ROAD
STATE MA
FED. AID PROJ. NO. -
PROJECT FILE NO. 608163
SHEET NO. 24
TOTAL SHEETS 180
FOR CONSTRUCTION PLANS
SEE SHEET NO. 11
CONTINUED ON SHEET NO. 23
CONTINUED ON SHEET NO. 25
MONSON ROAD
PECK ROAD
PVI STA = 32+38.00
PVI ELEV = 902.67
A.D. = 4.50%
K = 65.77
280' VC
314.4' HSD
PVT: 32+68
ELEV: 900.12
PVC: 30+90
ELEV: 890.45
-1.50%
PVI STA = 29+28.00
PVI ELEV = 888.02
A.D. = -4.50%
K = 62.22
280' VC
379.8' SSD
PVC: 27+88
ELEV: 889.62
PVT: 27+86
ELEV: 889.50
-3.60%
LOW POINT ELEV = 875.25
LOW POINT STA = 23+10.90
PVI STA = 24+95.00
PVI ELEV = 872.04
A.D. = 7.35%
K = 79.18
582' VC
363.6' HSD
PROPOSED GRADE
EXISTING GRADE
NORMAL CROWN
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=3.6%
FULL SUPERELEVATION RIGHT
e=3.6%
SUPERELEVATION TRANSITION
e=3.6% TO NORMAL CROWN
NORMAL CROWN
+99
+23
+90
+14
BENCHMARK
MAGNAIL AND WASHER ON POLE
ELEV = 903.23
STA 29+94.76
OFF 24.72 LT
BENCHMARK
MAGNAIL AND WASHER
ELEV = 901.77
STA 29+66.65
OFF 16.47 LT
HOR. SCALE IN FEET
0 20 40
VER. SCALE IN FEET
0 4 8
EXIST. ELEVATION
PROP. ELEVATION
NAVD 88
BASE ELEV
870.00
920
910
900
890
880
870
884.81
884.0
887.42
886.8
890.33
890.4
893.03
892.8
895.33
895.4
898.73
898.8
901.62
901.6
903.02
902.7
899.82
899.9
897.23
897.1
900.61
900.7
27+00
28+00
29+00
30+00
31+00
32+00


608163_HD4\PROFILE).DWG Plotted on 25-Jun-2024 3:43 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
25
TOTAL SHEETS
180
PROFILE - MONSON ROAD
FOR CONSTRUCTION PLANS
SEE SHEET NO. 12
CONTINUED ON SHEET NO. 24
CONTINUED ON SHEET NO. 26
MONSON ROAD
HIGH POINT ELEV = 941.33
HIGH POINT STA = 40+29.65
PVI STA = 39+40.00
PVI ELEV = 944.79
A.D. = -8.35%
K = 49.11
410' VC
325.6' SSD
PVC: 37+35
ELEV: 922.49
6.00%
REM
EXISTING 15" UG DRAIN
EXISTING GRADE
PVT: 33+86
ELEV: 911.55
PVI STA = 33+38.00
PVI ELEV = 902.67
A.D. = 4.50%
K = 65.77
296' VC
314.4' HSD
PROPOSED GRADE
NORMAL CROWN
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=5.8%
+82
+9
+14
EXIST. ELEVATION
PROP. ELEVATION
(NAVD 88)
BASE ELEV.
895.00
HOR. SCALE IN FEET
VER. SCALE IN FEET


WALES
MONSON ROAD
PROFILE - MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
28
TOTAL SHEETS
180
MONSON ROAD
HIGH POINT ELEV = 941.33
HIGH POINT STA = 40+29.65
PVI STA = 39+40.00
PVI ELEV = 944.79
A.D. = 4.35%
K = 48.11
410' VC
325.6' SSD
-2.35%
PVT: 41+45
ELEV. 939.97
PROPOSED GRADE
EXISTING GRADE
FULL SUPERELEVATION LEFT
e=5.8%
BENCHMARK
SPIKE IN UTILITY POLE
ELEV. = 936.20
STA. 38+22.63
OFF: 18.11'RT
+82
+21
CONTINUED ON SHEET NO. 25
CONTINUED BELOW
EXIST. ELEVATION
PROP. ELEVATION
NAVD 88
BASE ELEV
920.00
LOW POINT ELEV = 931.18
LOW POINT STA = 46+05.09
PVI STA = 46+08.00
PVI ELEV = 929.10
A.D. = 5.10%
K = 64.33
328' VC
308.1' HSD
ELEV. 932.95
PVC: 44+44
NORMAL CROWN
EXISTING GRADE
PROPOSED 12" RCP CLASS V
PROPOSED GRADE
HIGH POINT ELEV = 935.32
HIGH POINT STA = 48+95.60
PVI STA = 48+80.00
PVI ELEV = 936.58
A.D. = -4.80%
K = 44.58
224' VC
331.8' SSD
PVT: 49+16
ELEV. 933.64
FULL SUPERELEVATION RIGHT
e=4.8%
BENCHMARK
SPIKE IN UTILITY POLE
ELEV. = 933.66'
STA. 47+02.17
OFF: 45.01' LT
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=4.8%
HOR. SCALE IN FEET
VER. SCALE IN FEET
+95
+98
+50
+21
EXIST 12" CMP
PROPOSED TWIN 12" RCP
SUPERELEVATION
TRANSITION e=5.8% TO NORMAL CROWN
CONTINUED ABOVE
CONTINUED ON SHEET NO. 27
FOR CONSTRUCTION PLANS
SEE SHEET NOS. 13-14
608163_HD4/PROFILE).DWG Plotted on 25-Jun-2024 3:44 PM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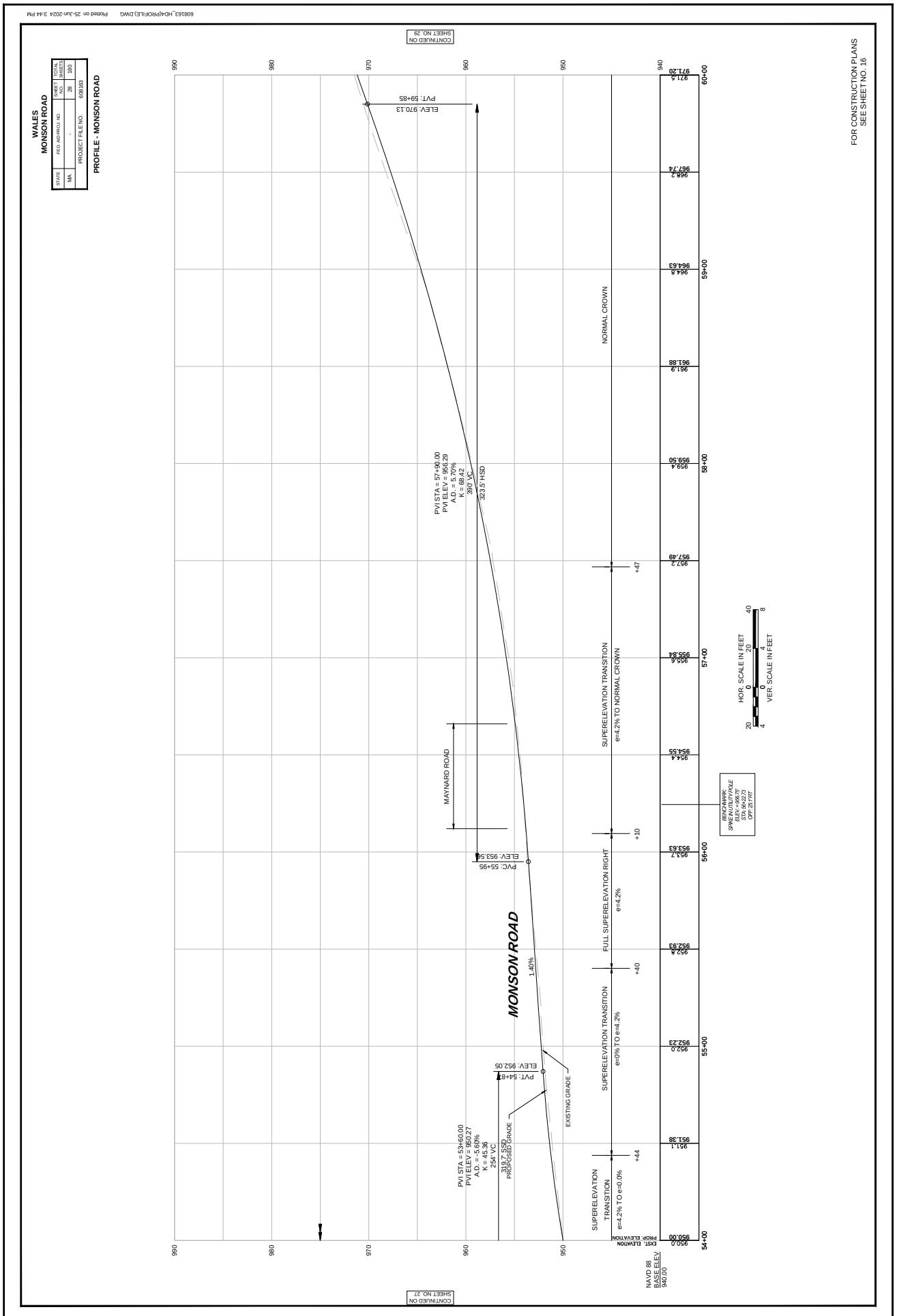
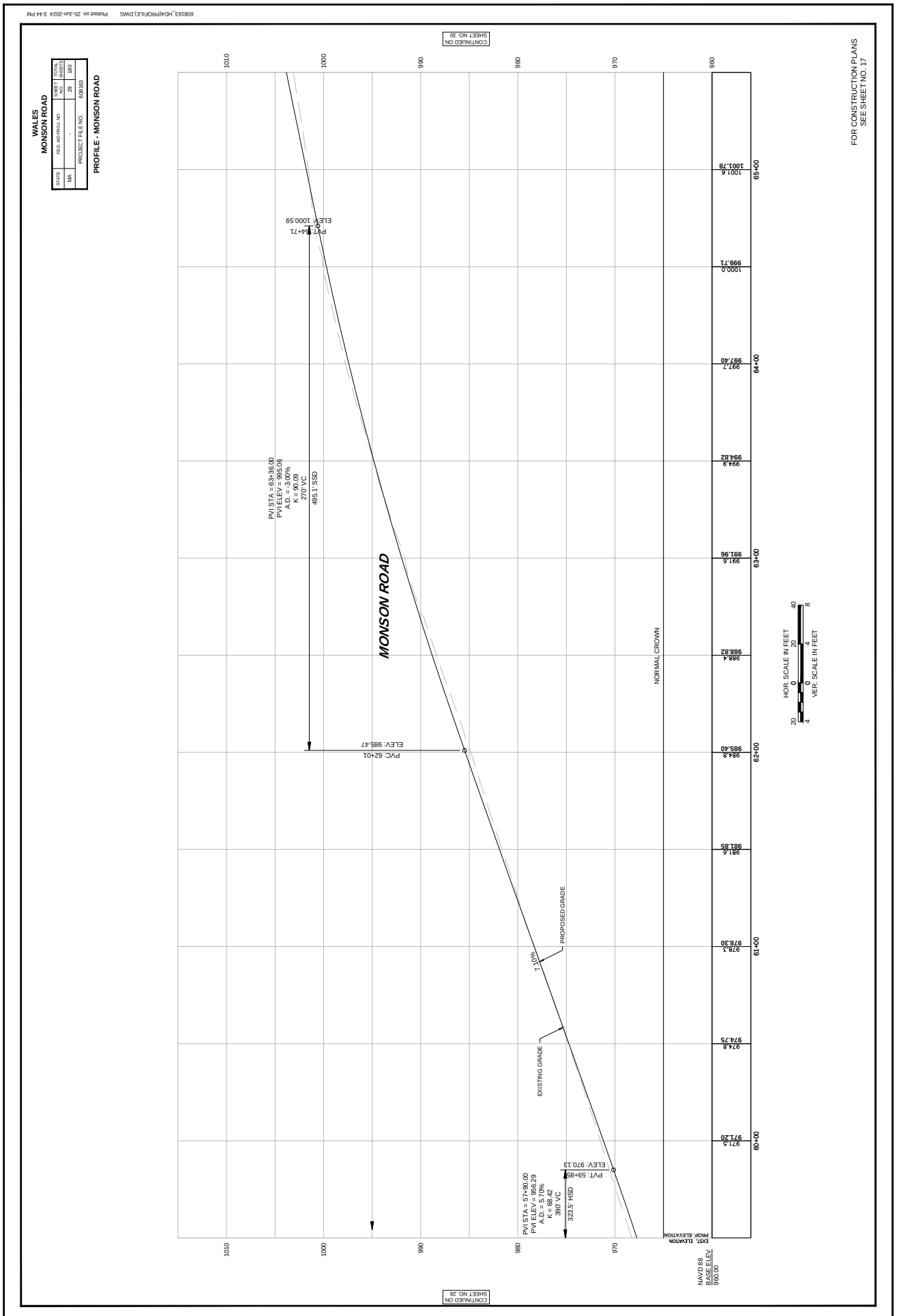
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
27
TOTAL SHEETS
180
PROFILE - MONSON ROAD
CONTINUED ON SHEET NO. 28
CONTINUED ON SHEET NO. 28
FOR CONSTRUCTION PLANS
SEE SHEET NO. 15
970
960
950
940
930
920
915
PVI STA = 53+60.00
PVI ELEV = 950.27
A.D. = -5.60%
K = 46.36
254' VC
319.7' SSD
PVC: 52+33
ELEV: 941.38
-1.00%
PVT: 54+87.50
ELEV: 938.19
PROPOSED GRADE
LOW POINT ELEV = 933.46
LOW POINT STA = 50+52.14
PVI STA = 51+00.00
PVI ELEV = 934.07
A.D. = 5.05%
K = 19.34
175' VC
128.0' HSD
Monson Rd (59)
Station=50+87.97
elev = 933.82
EXISTING GRADE
MONSON ROAD
PVC: 50+12.50
ELEV: 933.86
-2.05%
PVT: 49+87
ELEV: 934.89
HIGH POINT ELEV = 935.32
HIGH POINT STA = 48+35.60
PVI STA = 48+80.00
PVI ELEV = 936.58
A.D. = 4.80%
K = 44.58
214' VC
331.8' SSD
NORMAL CROWN
EXISTING 36" PVC
SUPERELEVATION TRANSITION
e=4.2% TO NORMAL CROWN
FULL SUPERELEVATION LEFT
e=4.2%
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=4.2%
SUPERELEVATION TRANSITION
e=4.8% TO NORMAL CROWN
FULL SUPERELEVATION RIGHT
e=4.8%
+44
+48
+30
+88
+93
+36
54+00
53+00
52+00
51+00
50+00
49+00
950.00
948.06
945.57
942.54
939.07
935.93
934.05
933.46
934.99
935.32
950.0
948.3
945.6
942.2
939.1
936.4
934.0
932.8
934.12
934.5
935.3
EXIST. ELEVATION
PROP. ELEVATION
NAVD 88
BASE ELEV
915.00
HOR. SCALE IN FEET
0
20
40
20
4
8
VER. SCALE IN FEET
0
4


WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
28
180
PROJECT FILE NO.
608163
PROFILE - MONSON ROAD
FOR CONSTRUCTION PLANS
SEE SHEET NO. 16
CONTINUED ON SHEET NO. 29
CONTINUED ON SHEET NO. 27
MONSON ROAD
MAYNARD ROAD
NORMAL CROWN
SUPERELEVATION TRANSITION
e=4.2% TO NORMAL CROWN
FULL SUPERELEVATION RIGHT
e=4.2%
SUPERELEVATION TRANSITION
e=0% TO e=4.2%
SUPERELEVATION TRANSITION
e=4.2% TO e=0.0%
PVI STA = 57+90.00
PVI ELEV = 956.29
A.D. = 5.70%
K = 68.42
390' VC
323.5' HSD
PVI STA = 53+60.00
PVI ELEV = 950.27
A.D. = -5.60%
K = 45.36
254' VC
319.7' SSD
PROPOSED GRADE
EXISTING GRADE
PVT: 59+85
ELEV: 970.13
PVC: 55+95
ELEV: 953.54
PVT: 54+87
ELEV: 952.05
1.40%
+47
+10
+40
+44
BENCHMARK:
SPIKE IN UTILITY POLE
ELEV = 936.75'
STA: 56+22.73
OFF: 25.1' RT
HOR. SCALE IN FEET
VER. SCALE IN FEET
NAVD 88
BASE ELEV
940.00
EXST. ELEVATION
PROP. ELEVATION
950.0
950.00
951.1
951.38
952.0
952.23
952.8
952.93
953.7
953.63
954.4
954.55
955.6
955.84
957.2
957.49
959.4
959.50
961.9
961.88
964.8
964.63
968.2
967.74
971.5
971.20
54+00
55+00
56+00
57+00
58+00
59+00
60+00
990
980
970
960
950
940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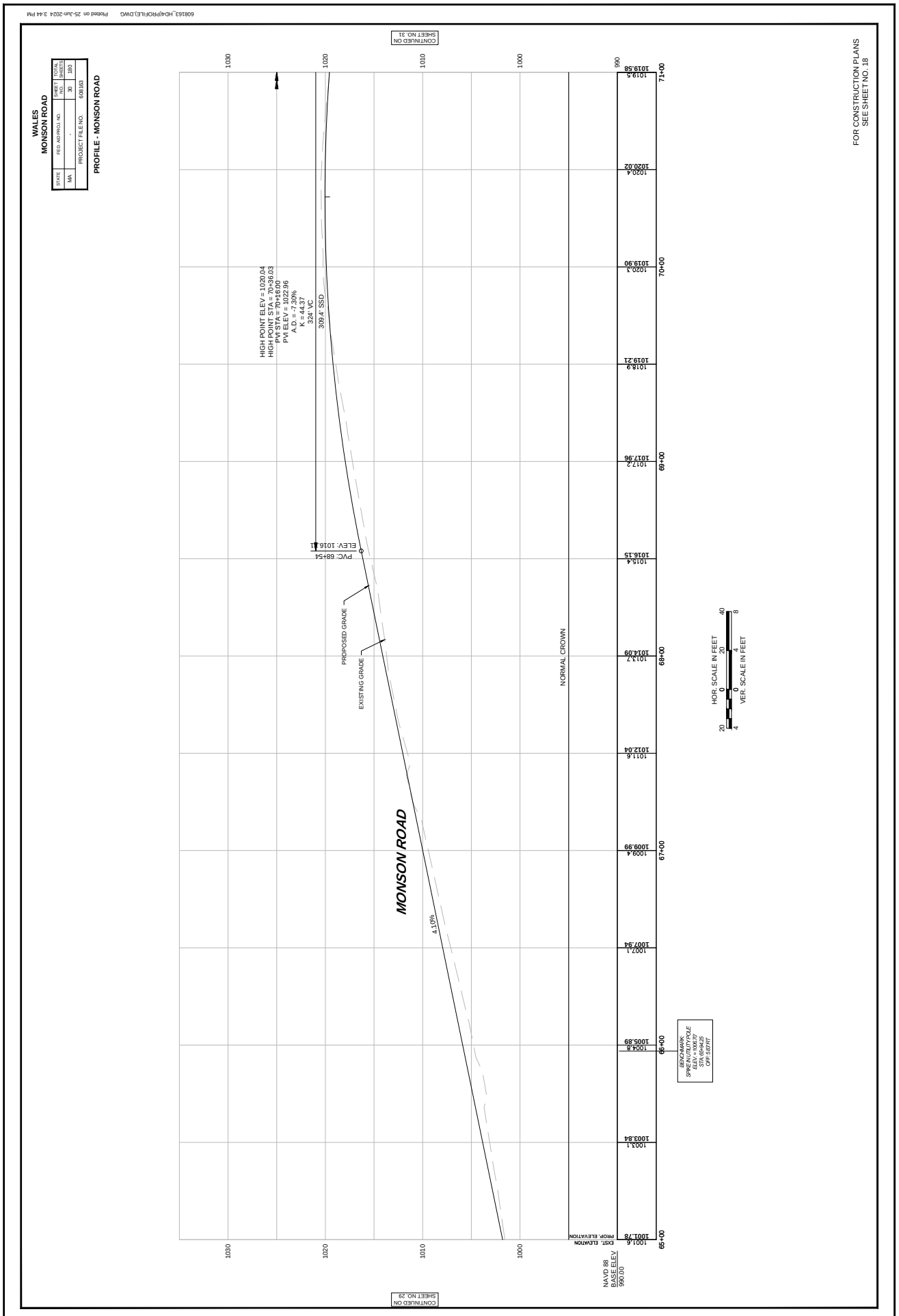
WALES
MONSON ROAD
PROFILE - MONSON ROAD
STATE MA
FED. AID PROJ. NO. -
PROJECT FILE NO. 608163
SHEET NO. 29
TOTAL SHEETS 180
FOR CONSTRUCTION PLANS
SEE SHEET NO. 17
CONTINUED ON SHEET NO. 30
CONTINUED ON SHEET NO. 28
MONSON ROAD
PVC: 62+01
ELEV: 985.47
PVI STA = 63+36.00
PVI ELEV = 995.06
A.D. = -3.00%
K = 90.09
270' VC
495.1 SSD
PVT: 64+71
ELEV: 1000.59
PVT: 59+85
ELEV: 970.13
PVI STA = 57+90.00
PVI ELEV = 956.29
A.D. = 5.70%
K = 68.42
390' VC
323.5 HSD
EXISTING GRADE
PROPOSED GRADE
7.10%
NORMAL CROWN
EXIST. ELEVATION
PROP. ELEVATION
NAVD 88
BASE ELEV
960.00
HOR. SCALE IN FEET
VER. SCALE IN FEET
1010
1000
990
980
970
960
60+00
61+00
62+00
63+00
64+00
65+00
971.5
971.20
974.8
974.75
978.3
978.30
981.6
981.85
984.8
985.40
988.4
988.82
991.6
991.96
994.9
994.82
997.7
997.40
1000.0
999.71
1001.6
1001.78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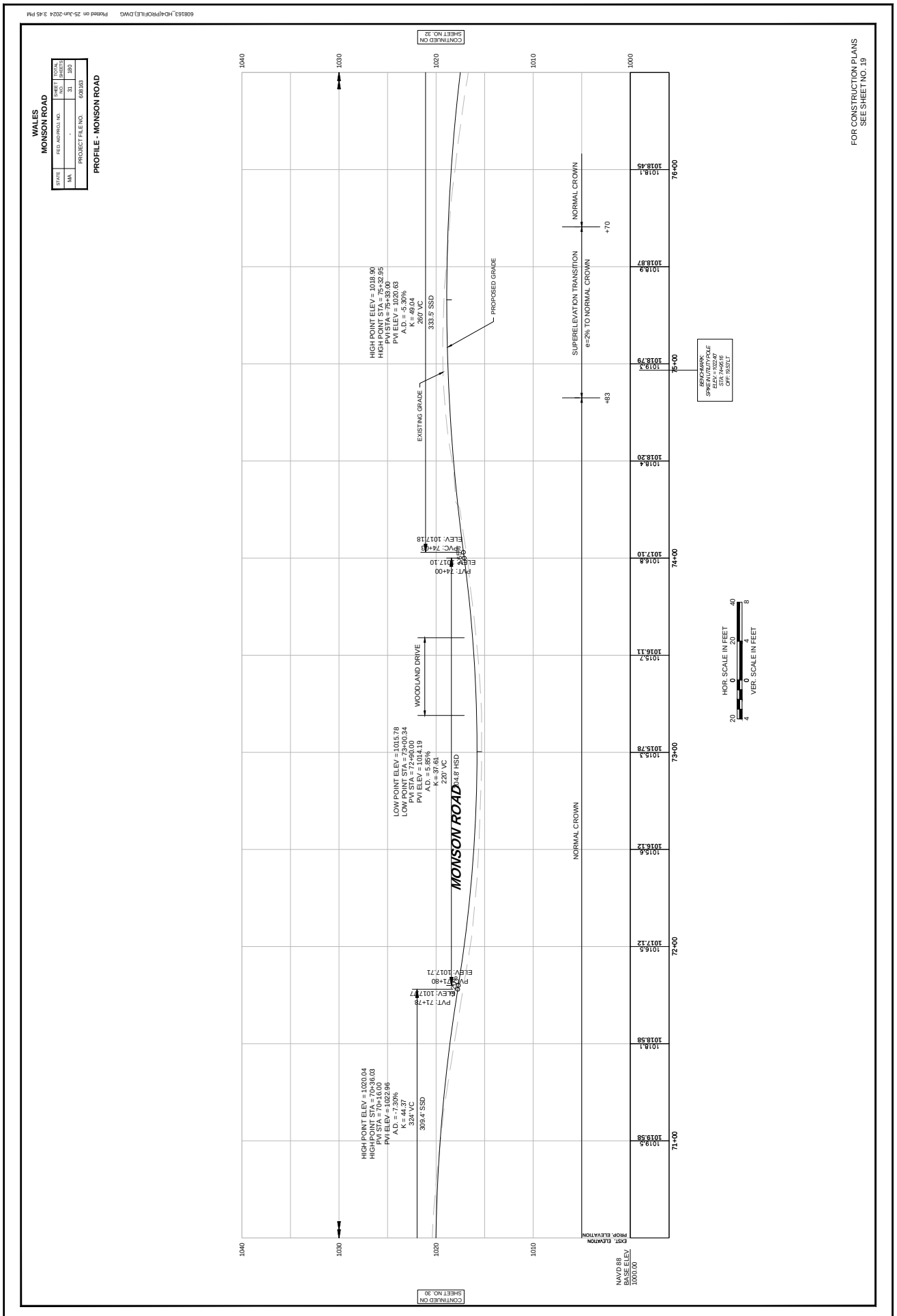
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
SHEET NO.
30
TOTAL SHEETS
180
PROJECT FILE NO.
608163
PROFILE - MONSON ROAD
CONTINUED ON SHEET NO. 31
CONTINUED ON SHEET NO. 29
FOR CONSTRUCTION PLANS
SEE SHEET NO. 18
HIGH POINT ELEV = 1020.04
HIGH POINT STA = 70+36.03
PVI STA = 70+16.00
PVI ELEV = 1022.96
A.D. = -7.30%
K = 44.37
324' VC
309.4' SSD
PVC: 68+54
ELEV: 1016.11
PROPOSED GRADE
EXISTING GRADE
NORMAL CROWN
MONSON ROAD
4.10%
BENCHMARK:
SPIKE IN UTILITY POLE
ELEV. = 1006.70'
STA. 65+94.25
OFF: 5.83' RT
HOR. SCALE IN FEET
VER. SCALE IN FEET
NAVD 88
BASE ELEV
990.00
EXIST. ELEVATION
PROP. ELEVATION
1001.6
1001.78
1003.1
1003.84
1004.8
1005.89
1007.1
1007.94
1009.4
1009.99
1011.6
1012.04
1013.7
1014.09
1015.4
1016.15
1017.2
1017.96
1018.9
1019.21
1020.3
1019.90
1020.4
1020.02
1019.5
1019.58
65+00
66+00
67+00
68+00
69+00
70+00
71+00
1030
1020
1010
1000
990


WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
31
180
PROJECT FILE NO.
608163
PROFILE - MONSON ROAD
FOR CONSTRUCTION PLANS
SEE SHEET NO. 19
CONTINUED ON SHEET NO. 32
CONTINUED ON SHEET NO. 30
MONSON ROAD
HIGH POINT ELEV = 1018.90
HIGH POINT STA = 75+32.95
PVI STA = 75+33.00
PVI ELEV = 1020.63
A.D. = -5.30%
K = 49.04
260' VC
333.5' SSD
PROPOSED GRADE
EXISTING GRADE
SUPERELEVATION TRANSITION
e=2% TO NORMAL CROWN
NORMAL CROWN
+70
+83
BENCHMARK:
SPIKE IN UTILITY POLE
ELEV. = 1022.40'
STA: 74+95.16
OFF: 19.53' LT
WOODLAND DRIVE
LOW POINT ELEV = 1015.78
LOW POINT STA = 73+00.34
PVI STA = 72+90.00
PVI ELEV = 1014.19
A.D. = 5.85%
K = 37.61
220' VC
04.8' HSD
HIGH POINT ELEV = 1020.04
HIGH POINT STA = 70+36.03
PVI STA = 70+16.00
PVI ELEV = 1022.96
A.D. = -7.30%
K = 44.37
324' VC
309.4' SSD
PVT: 71+78
ELEV: 1017.77
PVC: 71+80
ELEV: 1017.71
PVT: 74+00
ELEV: 1017.10
PVC: 74+08
ELEV: 1017.18
HOR. SCALE IN FEET
VER. SCALE IN FEET
NAVD 88
BASE ELEV
1000.00
EXIST. ELEVATION
PROP. ELEVATION
71+00
72+00
73+00
74+00
75+00
76+00
1018.45
1018.1
1018.87
1018.9
1018.79
1019.3
1018.20
1018.4
1017.10
1016.8
1016.11
1015.7
1015.78
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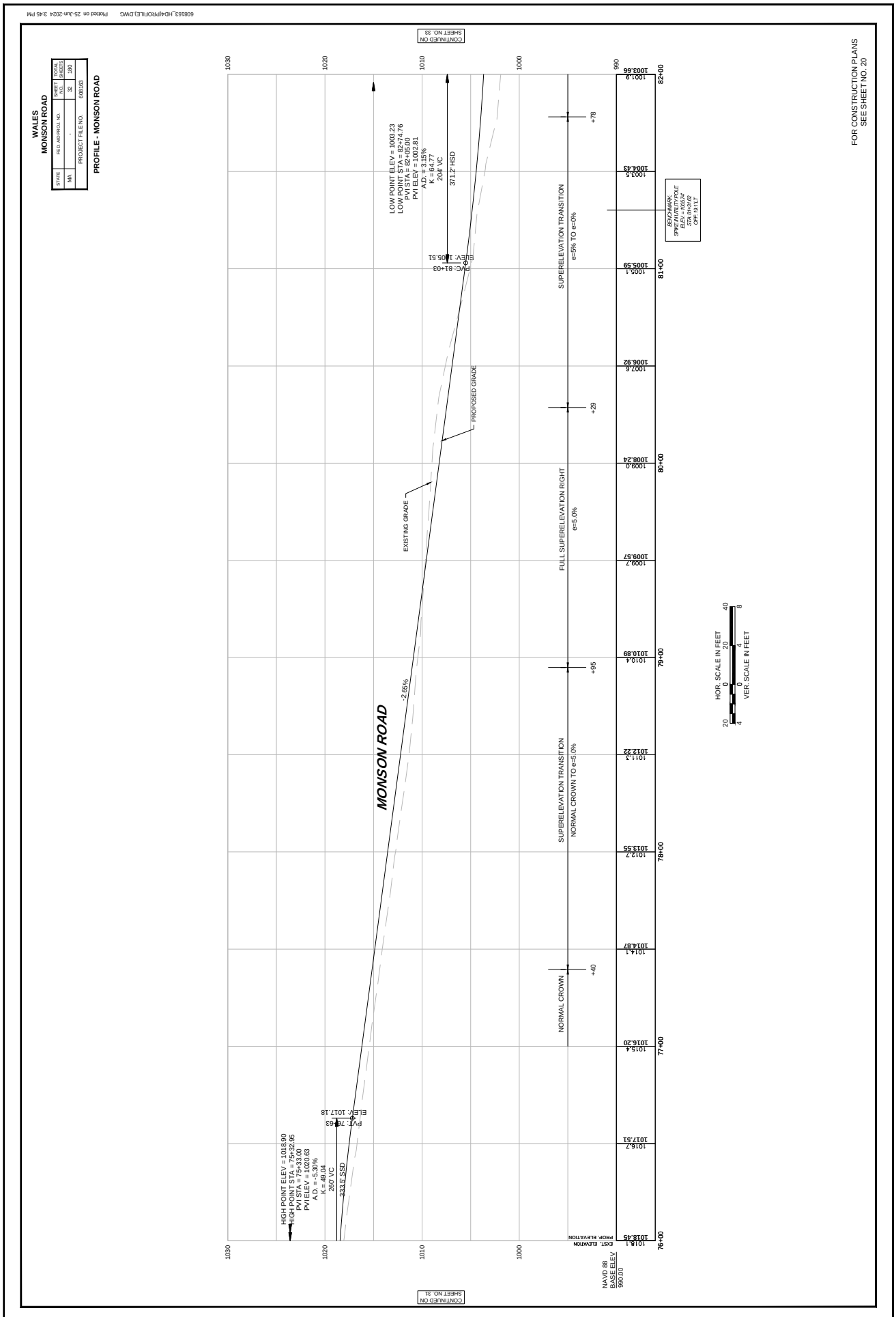
1016.12
1015.6
1017.12
1016.5
1018.58
1018.1
1019.58
1019.5


WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
32
180
PROJECT FILE NO.
608163
PROFILE - MONSON ROAD
FOR CONSTRUCTION PLANS
SEE SHEET NO. 20
CONTINUED ON SHEET NO. 33
CONTINUED ON SHEET NO. 31
MONSON ROAD
EXISTING GRADE
PROPOSED GRADE
-2.65%
LOW POINT ELEV = 1003.23
LOW POINT STA = 82+74.76
PVI STA = 82+05.00
PVI ELEV = 1002.81
A.D. = 3.15%
K = 64.77
204' VC
371.2' HSD
PVC: 81+03
ELEV: 1005.51
HIGH POINT ELEV = 1018.90
HIGH POINT STA = 75+32.95
PVI STA = 75+33.00
PVI ELEV = 1020.63
A.D. = -5.30%
K = 49.04
260' VC
333.5' SSD
PVT: 76+63
ELEV: 1017.18
SUPERELEVATION TRANSITION
e=5% TO e=0%
FULL SUPERELEVATION RIGHT
e=5.0%
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=5.0%
NORMAL CROWN
+78
+29
+95
+40
BENCHMARK:
SPIKE IN UTILITY POLE
ELEV.= 1005.74
STA. 81+31.62
OFF: 19.71' LT
HOR. SCALE IN FEET
VER. SCALE IN FEET
NAVD 88
BASE ELEV
990.00
EXIST. ELEVATION
PROP. ELEVATION
76+00
77+00
78+00
79+00
80+00
81+00
82+00
1018.45
1018.1
1016.7
1017.51
1015.4
1016.20
1014.1
1014.87
1012.7
1013.55
1011.3
1012.22
1010.4
1010.89
1009.7
1009.57
1009.0
1008.24
1007.6
1006.92
1005.1
1005.59
1003.5
1004.43
1001.9
1003.66
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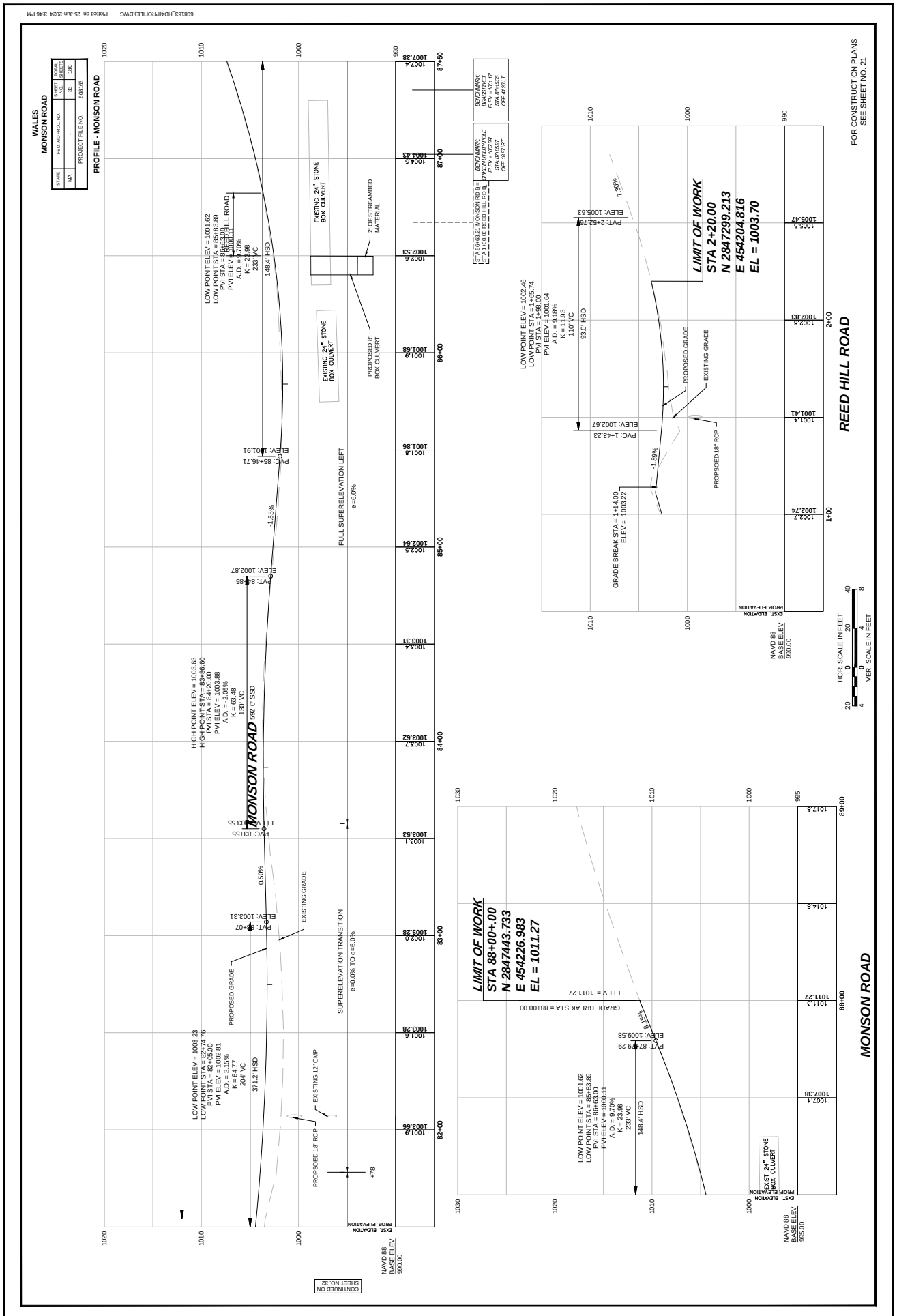
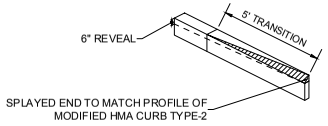
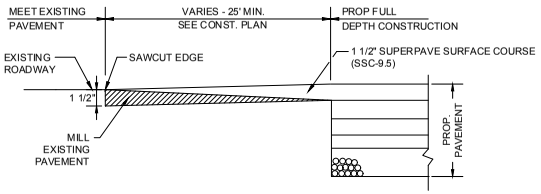
1020
1010
1000
990


WALES
MONSON ROAD
PROFILE - MONSON ROAD
MONSON ROAD
REED HILL ROAD
LIMIT OF WORK
STA 2+20.00
N 2847299.213
E 454204.816
EL = 1003.70
LIMIT OF WORK
STA 88+00+.00
N 2847443.733
E 454226.983
EL = 1011.27
FOR CONSTRUCTION PLANS
SEE SHEET NO. 21
CONTINUED ON
SHEET NO. 32
NAVD 88
BASE ELEV
990.00
EXIST. ELEVATION
PROP. ELEVATION
HOR. SCALE IN FEET
VER. SCALE IN FEET

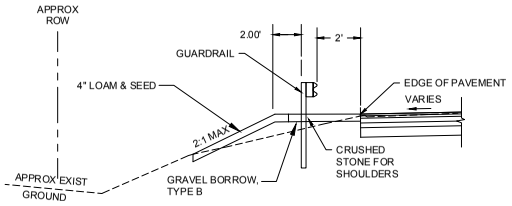
608163_HD9\CONSTRUCTION DETAILS.DWG Plotted on 25-Jun-2024 3:47 PM



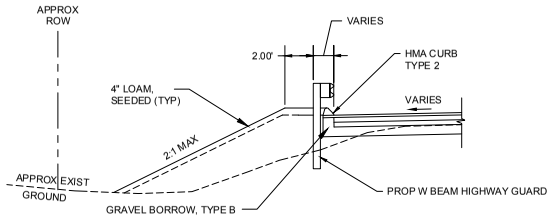
GRANITE CURB - SPLAYED END
NOT TO SCALE



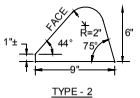
PROPOSED PAVEMENT TRANSITION
(LONGITUDINAL SECTION)
NOT TO SCALE



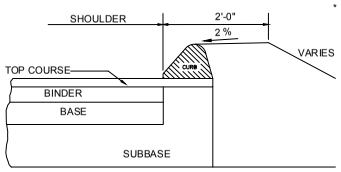
HIGHWAY GUARD INSTALLATION DETAIL
(WITHOUT CURB OR BERM)
NOT TO SCALE



HIGHWAY GUARD INSTALLATION DETAIL
(WITH HMA CURB TYPE 2)
NOT TO SCALE

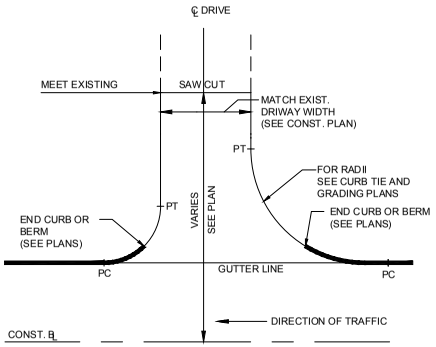


TYPE - 2

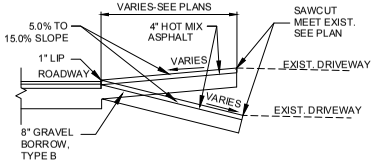


NOTE:
* SEE TYPICAL SECTIONS FOR PROJECT.

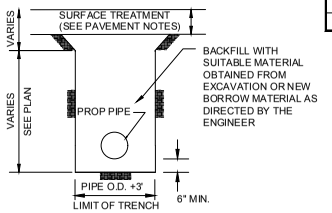
HOT MIX ASPHALT CURB
NOT TO SCALE



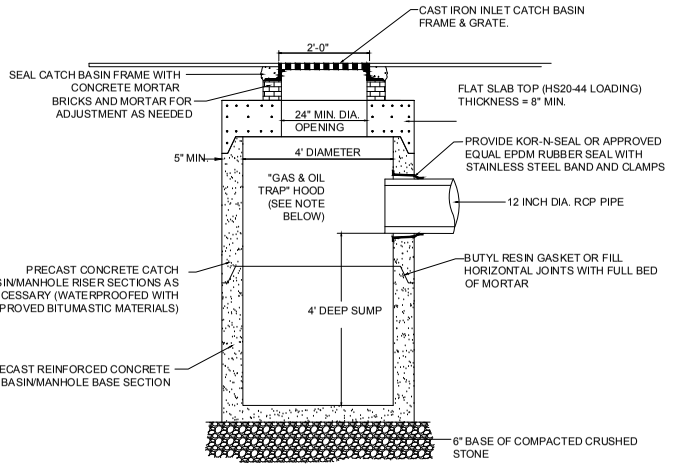
TYPICAL HMA OR GRAVEL DRIVE ENTRANCE
NOT TO SCALE



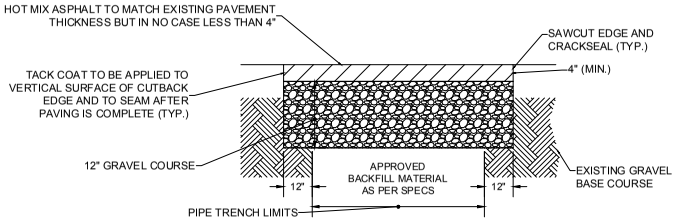
HOT MIX ASPHALT DRIVEWAY APRON
NOT TO SCALE



DRAINAGE TRENCH
NOT TO SCALE



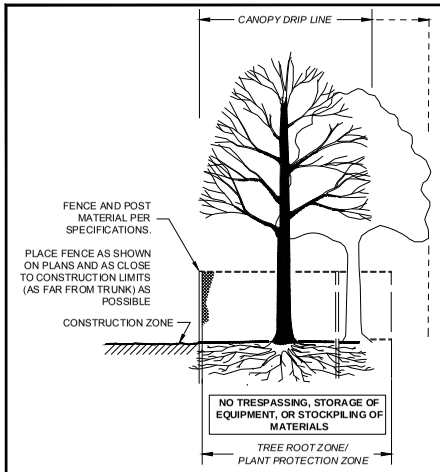
DEEP SUMP CATCH BASIN
NOT TO SCALE



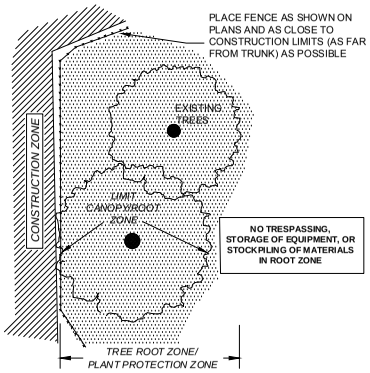
TEMPORARY ASPHALT PATCHING
NOT TO SCALE

A00830 -540

Proposal No. 608163-128112



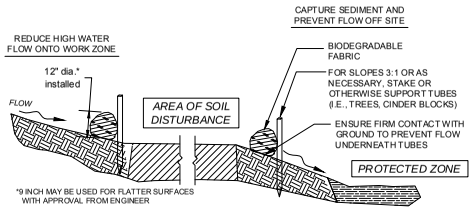
SECTION - FENCE PROTECTION OF ROOT ZONE



PLAN VIEW - FENCE PROTECTION OF ROOT ZONE

TREE PROTECTION - ROOT ZONE

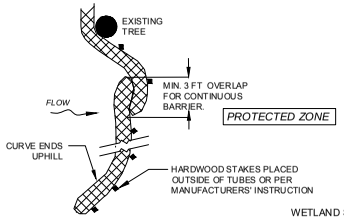
NOT TO SCALE



SECTION

SEDIMENT BARRIER - COMPOST FILTER TUBE

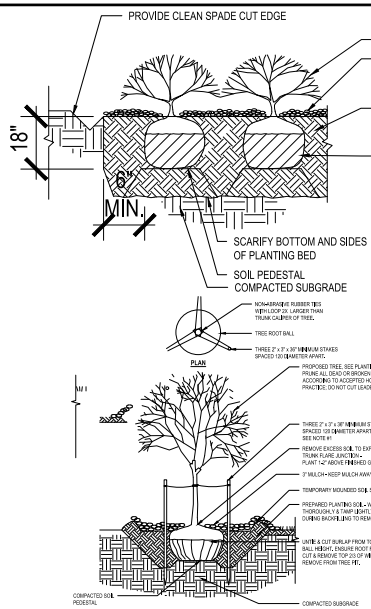
NOT TO SCALE



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



NOTES:
1. CONTRACTOR IS RESPONSIBLE FOR KEEPING THE TREE UPRIGHT AND PLUMB IN ALL DIRECTIONS. DO NOT STAKE TREES EXCEPT WHERE SPECIFIED. STAKE ALL TREES UNLESS SPECIFIED.
2. IF STAKING IS SPECIFIED PROVIDE:
   3" CAL. OR LESS- PROVIDE 2 STAKES MINIMUM
   3" CAL. OR GREATER, PROVIDE 3 STAKES MINIMUM
   OR AS DIRECTED BY LANDSCAPE ARCHITECT
3. REMOVE STAKES AT END OF YEAR 1, UNLESS SPECIFIED BY LANDSCAPE ARCHITECT

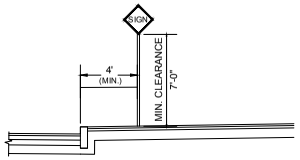
TREE AND SHRUB INSTALLATION

NOT TO SCALE

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	84	180
PROJECT FILE NO.	608163		

CONSTRUCTION DETAILS

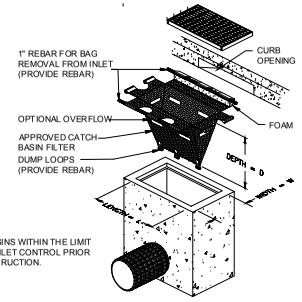


TRAFFIC SIGN PLACEMENT DETAIL

N.T.S.

SIDE VIEW INSTALLED

NOTE:
ALL EXISTING CATCH BASINS WITHIN THE LIMIT OF WORK SHALL HAVE INLET CONTROL PRIOR TO THE START OF CONSTRUCTION.



INLET SEDIMENT CONTROL

NOT TO SCALE

WETLAND SEED MIX -PART SHADE ROADSIDE MIX

BOTANICAL NAME	COMMON NAME	%PLS BY WEIGHT
GRASS		
FESTUCA RUBRA	CREEPING RED FESCUE	25.70%
ELYMUS VIRGINICUS	VIRGINIA WILD RYE	24.00%
SCHIZACHYRIUM SCOARIUM	LITTLE BLUE STEM	22.50%
PANICUM VIRGATUM	SWITCH GRASS	10.00%
PANICUM CLANDESTINUM 'TIOGA'	DEER TOUNF 'TIOGA'	7.00%
CAREX VULPINOIDEA	FOX SEDGE	2.00%
AGROSTIS PERENNANS	UPLAND BENTGRASS	2.00%
JUNCUS EFFUSUS	SOFT RUSH	0.20%
		93.40%
CHAMAECRISTA FASCICULATA	PARTRIDGE PEA	3.00%
PENSTEMON DIGITALIS	BEARD-TONGUE	1.00%
ZIZIA AUREA	GOLDEN ALEXANDERS	0.30%
DESMODIUM CANADENSE	SHOWY TICK TREFOIL	0.3%
SOLIDAGO BICOLOR	WHITE GOLDENROD	0.20%
SOLIDAGO CAESIA	WOODLAND GOLDENROD	0.20%
RUDBECKIA HIRTA-VT ECOTYPE	BLACK-EYED SUSAN-VT ECOTYPE	0.20%
ASTER NOVAE-ANGLIAE	NEW ENGLAND ASTER	0.20%
SOLIDAGO ODORA	LICORICE SCENTED GOLDENROD	0.20%
ASTER DIVARICATUS	WHITE WOOD ASTER	0.20%
HELIOPSIS HELIANTHOIDES	OX-EYE SUNFLOWER	0.20%
PYCANTHEMUM TENUIFOLIATUM	SLENDER MOUNTAIN MINT	0.20%
MONARDA FISTULOSA	WILD BERGAMONT	0.10%
EUPATORIUM PERFOLIATUM	BONESET	0.10%
ASTER LATERIFLORUS	CALICO ASTER	0.10%
OENOTHERA FRUTICOSA VAR. FRUTICOSA	SUNDROPS	0.10%
		6.60%
		100.00%

SEED RATING:
APPLY THIS MIX AT 15 LBS PLS/ACRE.

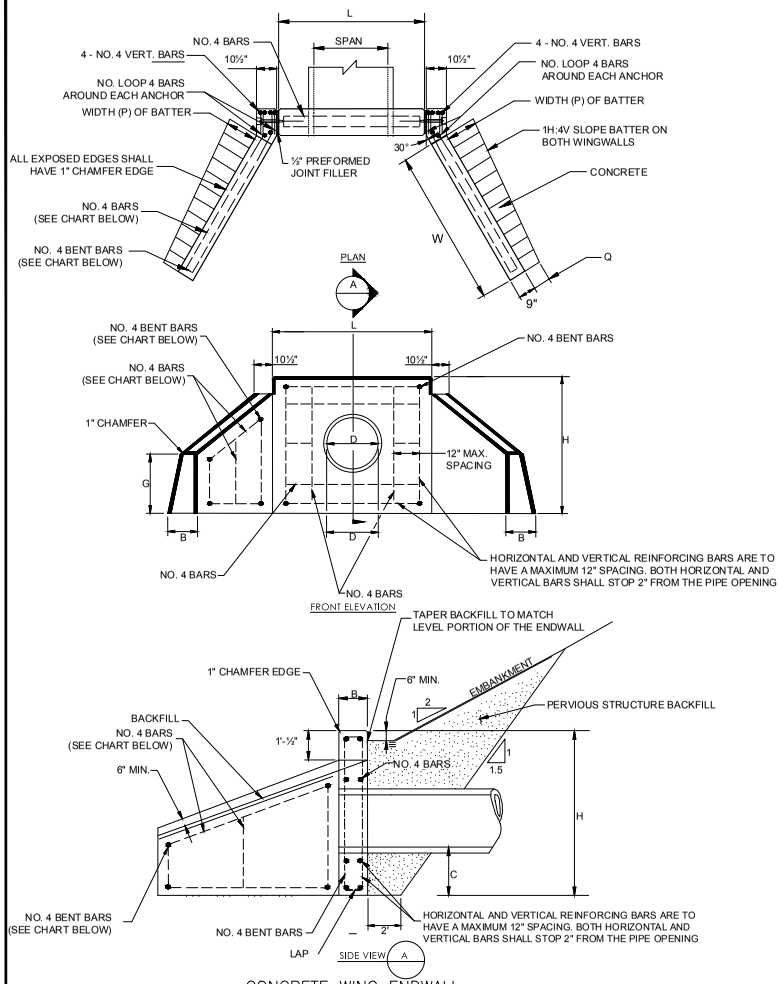
CONSTRUCTION SPECIFICATIONS ON SILTATION & EROSION CONTROL

1. EROSION CONTROL MEASURES SHALL BE INCORPORATED IN THE SEQUENCE OF CONSTRUCTION TO PREVENT SEDIMENT LADEN WATER FROM LEAVING THE SITE.
2. AREAS SUBJECT TO EROSION SHALL BE MINIMIZED IN TERMS OF TIME AND AREA.
3. IN GENERAL, WORK REQUIRING EROSION CONTROL INCLUDES EXCAVATIONS, FILLS, DRAINAGE, SWALES AND DITCHES, ROUGH AND FINISH GRADING, AND STOCKPILING OF EARTH.
4. DO NOT DISTURB VEGETATION AND TOPSOIL BEYOND THE PROPOSED LIMIT OF EROSION CONTROL BARRIERS (MULCH TUBE) ACTIVITIES.
5. TEMPORARY SILT CONTROLS SHALL BE PLACED AS SHOWN ON THE PLAN. PERMANENTLY STABILIZE EACH COMPLETED SEGMENT OF CONSTRUCTION.
6. THE CONTRACTOR SHALL REMOVE TEMPORARY SILT CONTROLS AND ALL ACCUMULATED SILT AND DEBRIS AFTER COMPLETION OF CONSTRUCTION OPERATIONS.
7. SILT CONTROLS SHALL BE IN PLACE AT ALL TIMES DURING CONSTRUCTION.
8. THE CONTRACTOR SHALL REMOVE AND LEGALLY DISPOSE OF ALL SILT AND DEBRIS FROM EACH DRAINAGE STRUCTURE UPON COMPLETION OF THE PROJECT.
9. OBJECTS AND/OR AREAS DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION.
10. ALL DISTURBED AREAS SHALL BE RESTORED TO EXISTING GRADE. INSPECTION SHALL BE FREQUENT AND REPAIR OR REPLACEMENT SHALL BE MADE AS NEEDED.
11. SILT CONTROLS SHALL BE REMOVED UPON THE SATISFACTORY COMPLETION OF ALL WORK SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.
12. SITE PERIMETER SHALL HAVE COMPOST FILTER TUBES INSTALLED AT THE LIMIT OF WORK.

WALES
MONSON ROAD

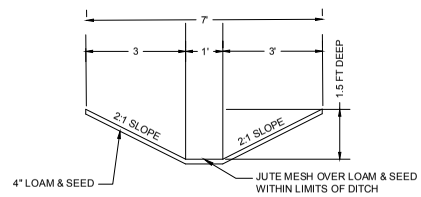
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	85	180
PROJECT FILE NO.		608163	

CONSTRUCTION DETAILS



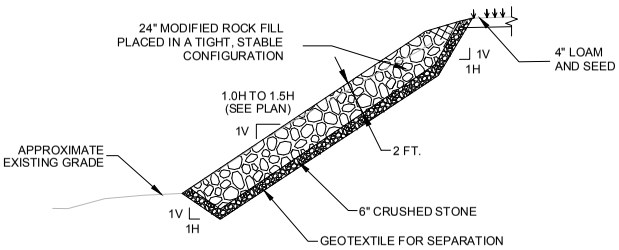
CONCRETE WING ENDWALL

N.T.S.



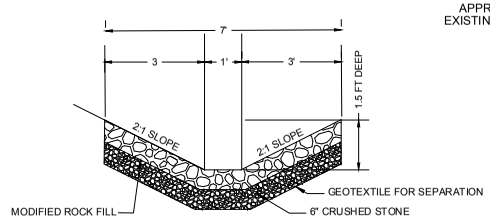
GRASS DRAINAGE DITCH

NOT TO SCALE



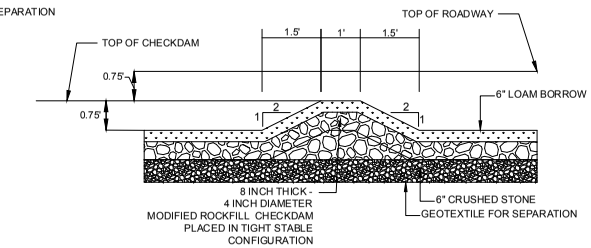
STEEP SLOPE WITH MODIFIED ROCK FILL

NOT TO SCALE

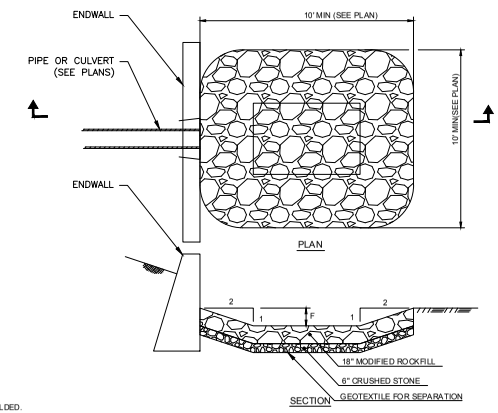


MODIFIED ROCKFILL DRAINAGE DITCH

NOT TO SCALE

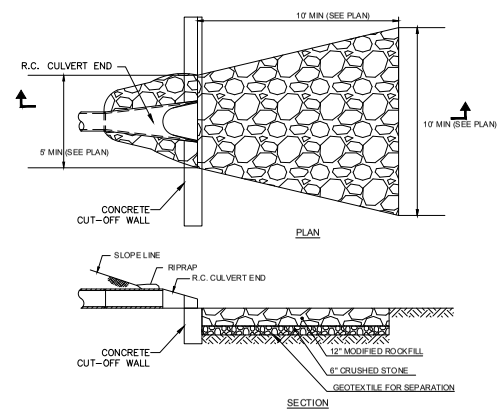


CHECKDAM



PREFORMED MODIFIED ROCK FILL SCOUR HOLE

N.T.S.



MODIFIED ROCK FILL APRON

N.T.S

WING ENDWALL DIMENSIONS ONLY (SEE NOTE # 4 FOR STRAIGHT ENDWALL COMPONENT INFORMATION)									
CONCRETE									
DIAMETER (D)	BASE (B)	DEPTH OF CUTOFF WALL TO INVERT (C)	HEIGHT OF WINGWALL (G)	TOTAL HEIGHT (H)	LENGTH OF ENDWALL (L)	WIDTH OF BATTER (P)	WIDTH OF BATTER AT ENDPOINT (Q)	TAPERED WINGWALL LENGTH (W)	VOLUME
IN.	FT.-IN.	FT.-IN.	FT.-IN.	FT.-IN.	FT.-IN.	FT.-IN.	FT.-IN.	FT.-IN.	C.Y.
12"	1'-3"	2'-0"	2'-0"	4'-6"	4'-6"	0'-10¾"	0'-6"	2'-11"	1.8

WINGWALL STEEL REINFORCEMENT			
DIAMETER (D)	NO. 4 BENT BARS	NO. 4 BARS	THREADED ROD CONNECTIONS PER WINGWALL
IN.	EA.	EA.	EA.
12"	4	8	3

GENERAL NOTES:

1. ALL REINFORCING BARS SHALL HAVE 2" COVER MIN.
2. ALL REINFORCING BARS ARE TO BE TIED AND NOT WELDED.
3. WET SETTING OF ANY STEEL IS NOT PERMITTED.
4. REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF ASTM A615, GRADE 60 AND SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A767, CLASS 1.
5. WHEN USING PRECAST ALL PORTIONS OF LIFTING AND SEATING DEVICES THAT EXTEND TO OR BEYOND THE FINISHED CONCRETE SURFACE SHALL BE REMOVED. ALL FIXTURES OR HOLES CAST INTO THE SECTIONS FOR LIFTING OR SEATING SHALL BE COMPLETELY FILLED WITH NON-SHRINK GROUT AND FINISHED SMOOTH AND FLUSH WITH THE ADJACENT CONCRETE SURFACE.
6. NON-SHRINK GROUT SHALL CONFORM TO SECTION M4. THE NON-SHRINK GROUT SHALL ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI PRIOR TO ALLOWING THE PASSAGE OF WATER OVER THE GROUT.

608163_HD9(CONSTRUCTION DETAILS).DWG Plotted on 25-Jun-2024 3:47 PM

608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:26 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.
MA	-
	PROJECT FILE NO. 608163

SHEET NO.	TOTAL SHEETS
86	180

CROSS SECTIONS

HOR. SCALE IN FEET
0 4 8
VER. SCALE IN FEET
4 0 4 8

Cut: 47.3 S.F
Fill: 0.01 S.F

11+00

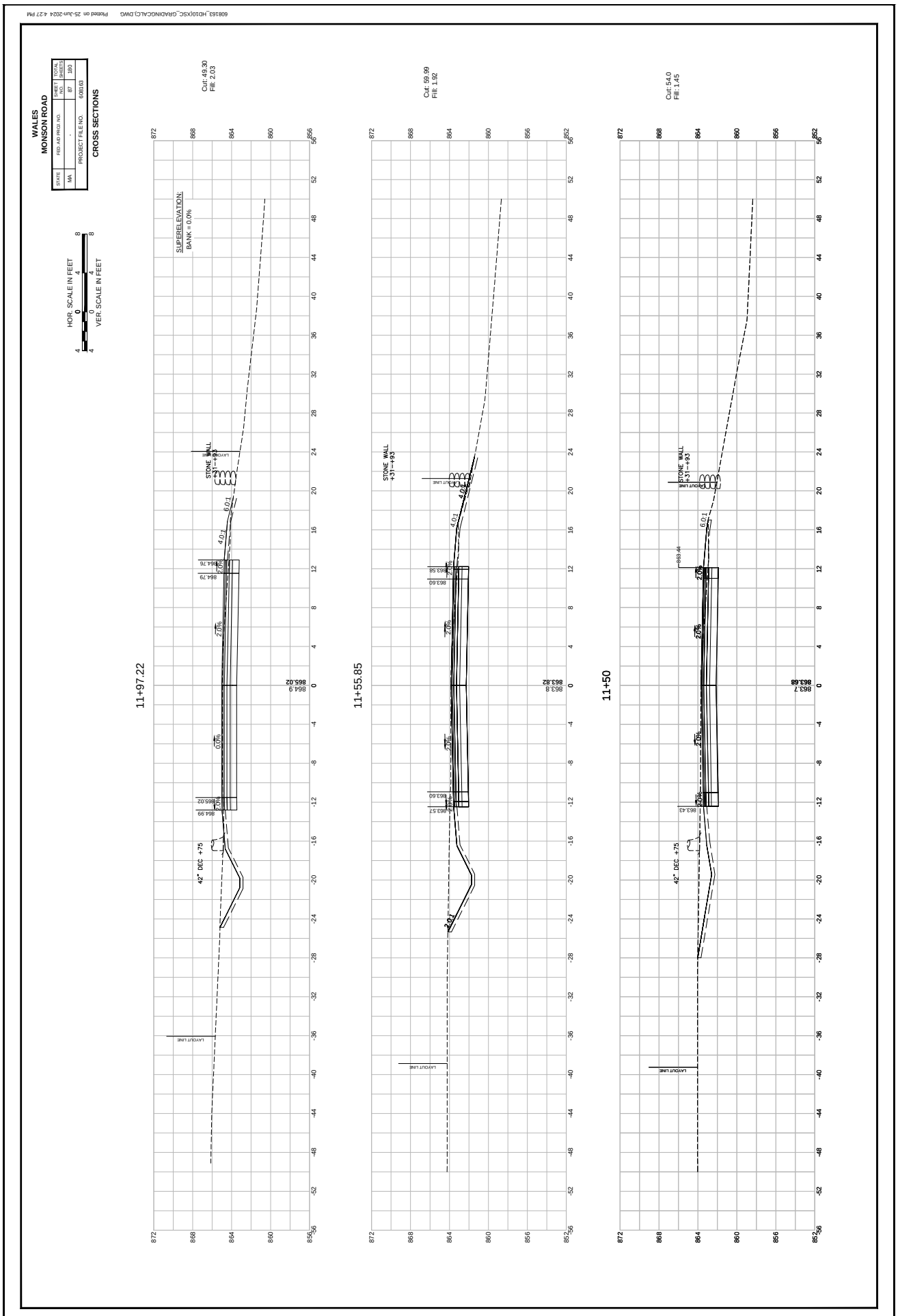
4" FENCE +75–+25
WETLAND LIMIT
STONE WALL +31–+93
LAYOUT LINE
862.65
2.00%
2.00%
862.9

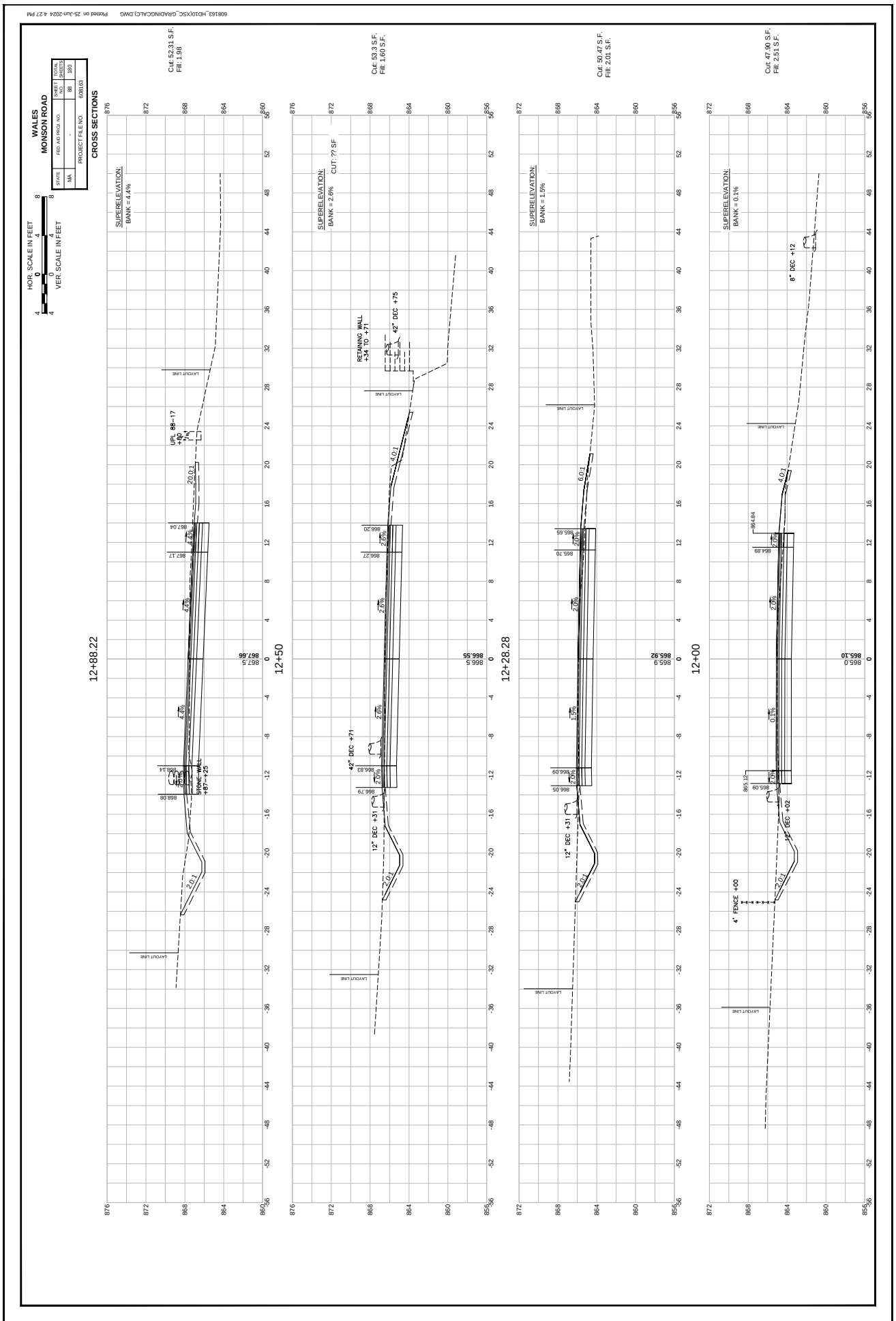
10+50

4" FENCE +25–+75
UPL 86 +80
10" DEC +82
862.9

10+00

4" FENCE +00–+25
42" DEC +28
864.2


608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:27 PM
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
87
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
SUPERELEVATION:
BANK = 0.0%
Cut: 49.30
Fill: 2.03
Cut: 59.99
Fill: 1.92
Cut: 54.0
Fill: 1.45
11+97.22
11+55.85
11+50
STONE WALL
+31--+93
42" DEC +75
LAYOUT LINE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WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
88
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 52.31 S.F.
Fill: 1.98
SUPERELEVATION:
BANK = 4.4%
UPL 88-17
+80
STONE WALL
+87-+25
12+88.22
Cut: 53.3 S.F.
Fill: 1.60 S.F.
SUPERELEVATION:
BANK = 2.6%
CUT: ?? SF
RETAINING WALL
+34 TO +71
42" DEC +75
42" DEC +71
12" DEC +31
12+50
Cut: 50.47 S.F.
Fill: 2.01 S.F.
SUPERELEVATION:
BANK = 1.5%
12" DEC +31
12+28.28
Cut: 47.90 S.F.
Fill: 2.51 S.F.
SUPERELEVATION:
BANK = 0.1%
8" DEC +12
4" FENCE +00
12" DEC +02
12+00
LAYOUT LINE

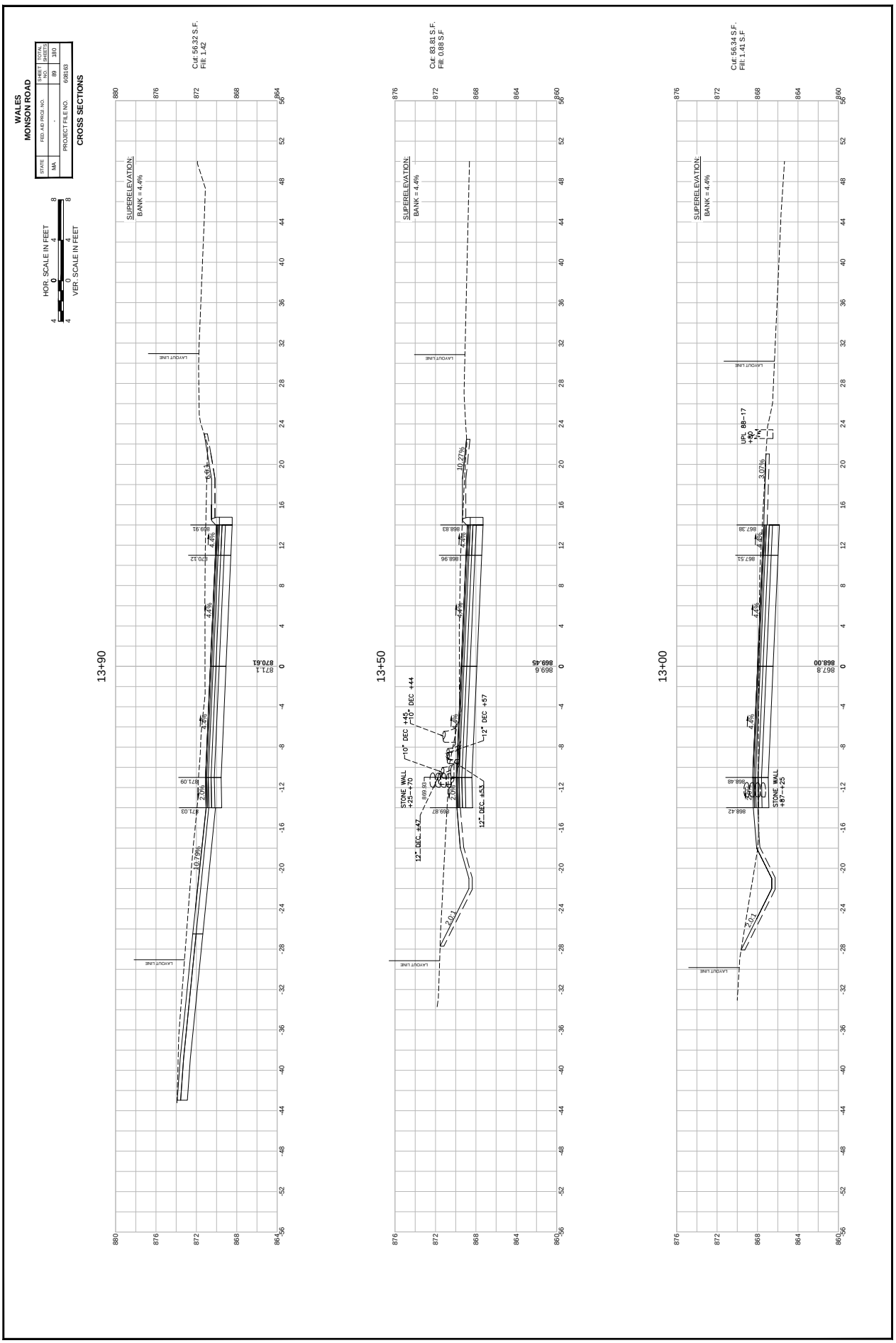
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:28 PM

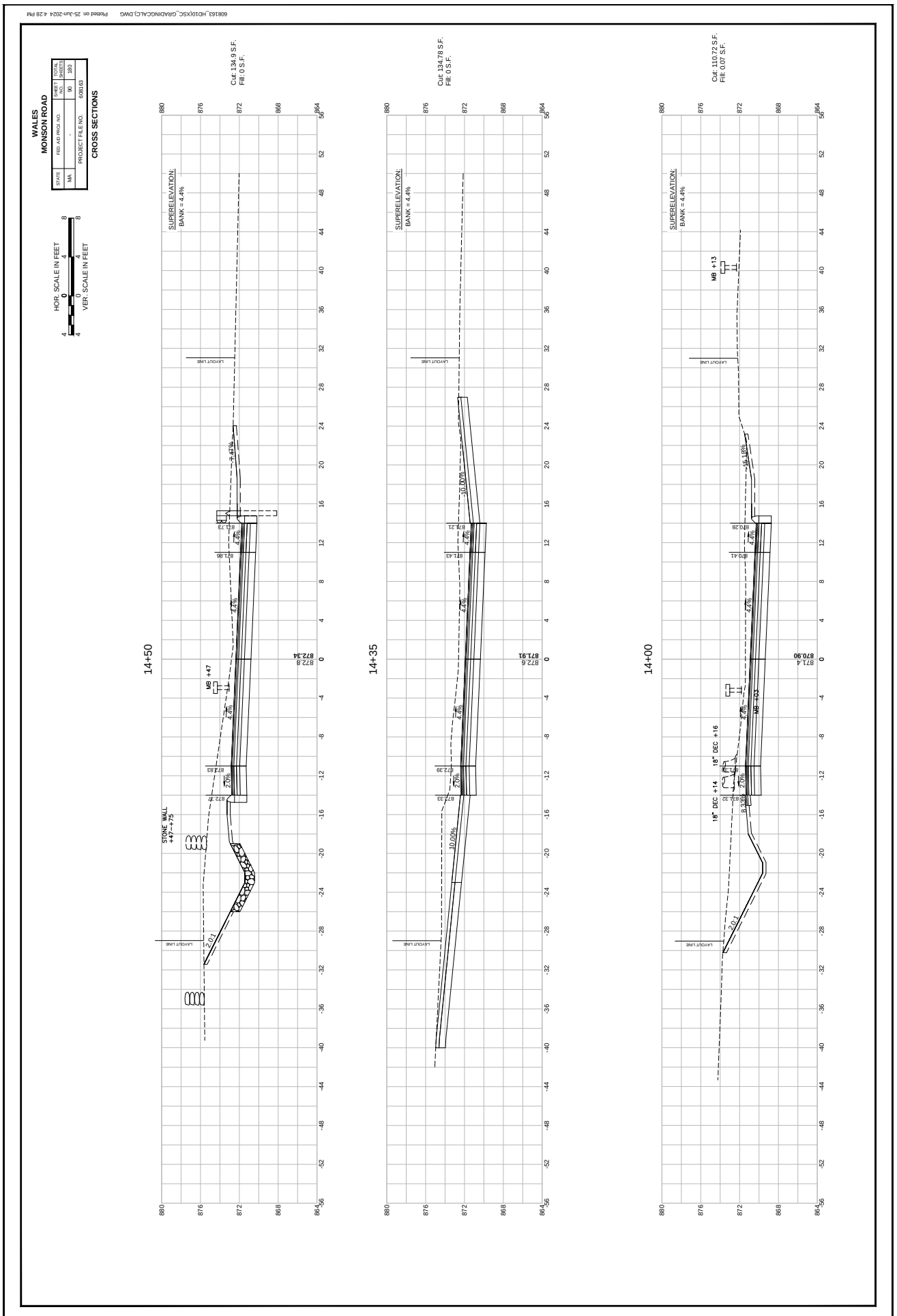
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	89	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 0 4 8
VER. SCALE IN FEET 0 4 8

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WALES
MONSON ROAD
CROSS SECTIONS
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
90
TOTAL SHEETS
180
HOR. SCALE IN FEET
VER. SCALE IN FEET
14+50
Cut: 134.9 S.F.
Fill: 0 S.F.
SUPERELEVATION:
BANK = 4.4%
STONE WALL
+47'-+75'
MB +47
14+35
Cut: 134.78 S.F.
Fill: 0 S.F.
SUPERELEVATION:
BANK = 4.4%
MB +13
14+00
Cut: 110.72 S.F.
Fill: 0.07 S.F.
SUPERELEVATION:
BANK = 4.4%
18" DEC +14
18" DEC +16
MB +03
LAYOUT LINE

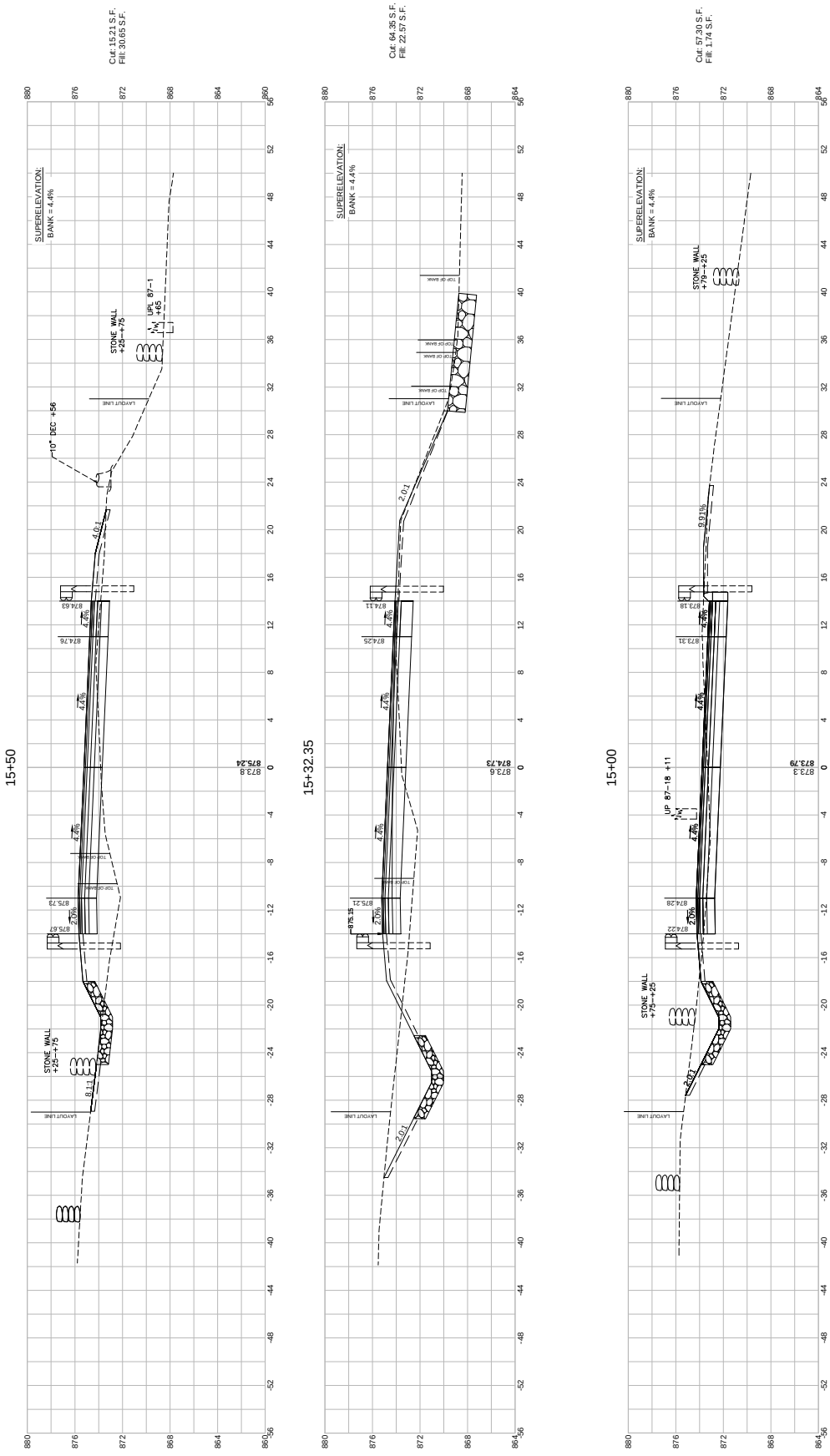
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:29 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	91	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



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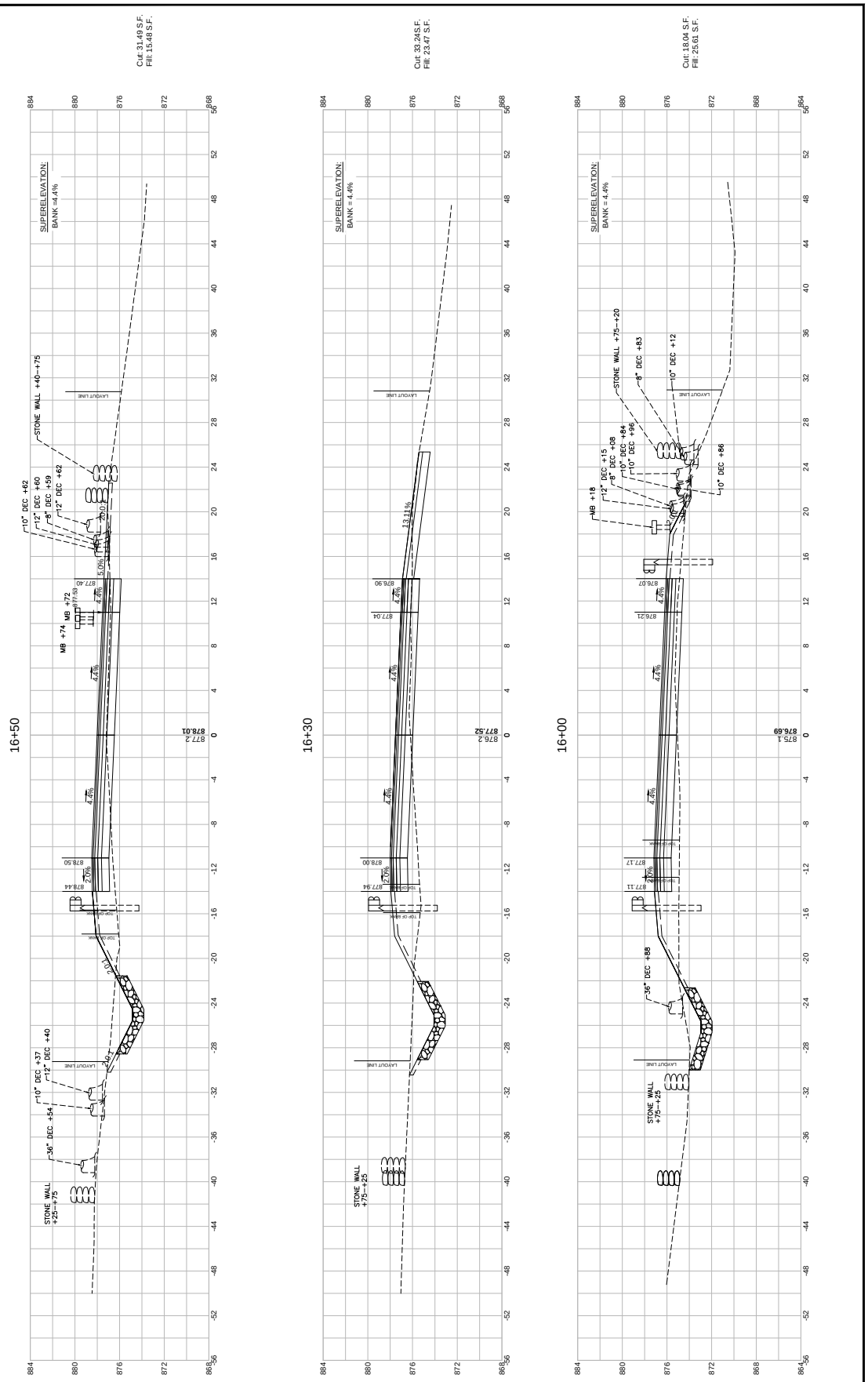
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	92	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
4 0 4 8
VER. SCALE IN FEET
4 0 4 8



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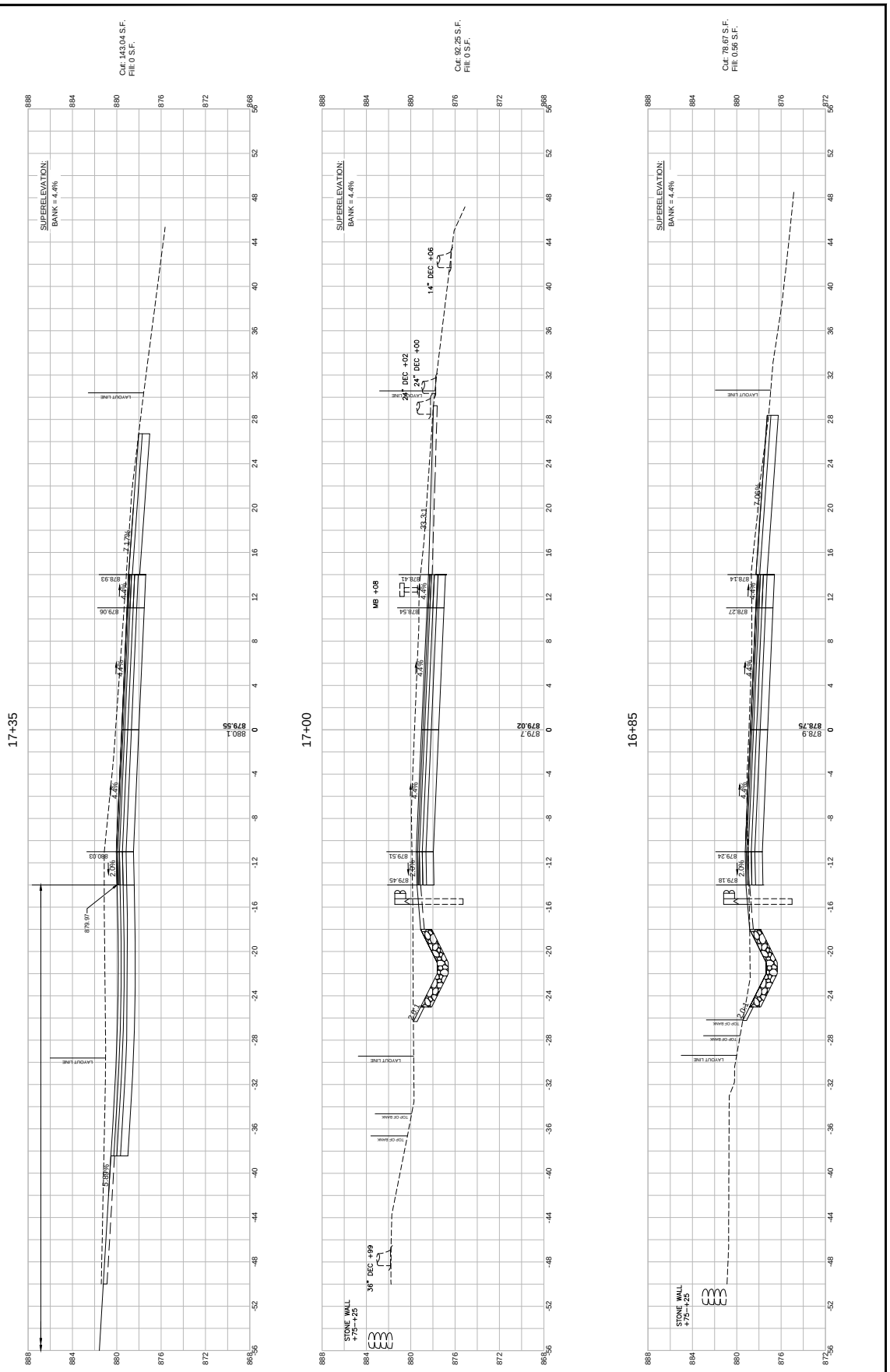
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.
MA	-
	PROJECT FILE NO.
	608163

SHEET NO.	TOTAL SHEETS
93	180

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



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WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	94	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
4 0 4 8

VER. SCALE IN FEET
4 0 4 8

Cut: 73.38 S.F.
Fill: 25.94 S.F.

18+00

SUPERELEVATION:
BANK = 4.4%

STONE WALL
+75--+25

12" DEC +23
18" DEC +15
24" DEC +23
12" DEC +09

Cut 65.23 S.F.
Fill: 24.09 S.F.

17+91

SUPERELEVATION:
BANK = 4.4%

STONE WALL
+72--+11

48" DEC +19
42" DEC +89
18" DEC +09

Cut 145.84 S.F
Fill: 1.01 S.F

17+50

SUPERELEVATION:
BANK = 4.4%

STONE WALL +45--+75

UPL 86-84
+71

UPL 86-19
+45

608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:31 PM

WALES
MONSON ROAD

CROSS SECTIONS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	95	180
	PROJECT FILE NO.	608163	

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8

19+00

Cut: 20.39 S.F.
Fill: 26.01 S.F.

SUPERELEVATION:
BANK = 1.1%

18+50

Cut: 90.33 S.F.
Fill: 0 S.F.

SUPERELEVATION:
BANK = 3.4%

18+29.03

Cut: 103.64 S.F.
Fill: 3.61 S.F.

SUPERELEVATION:
BANK = 4.4%

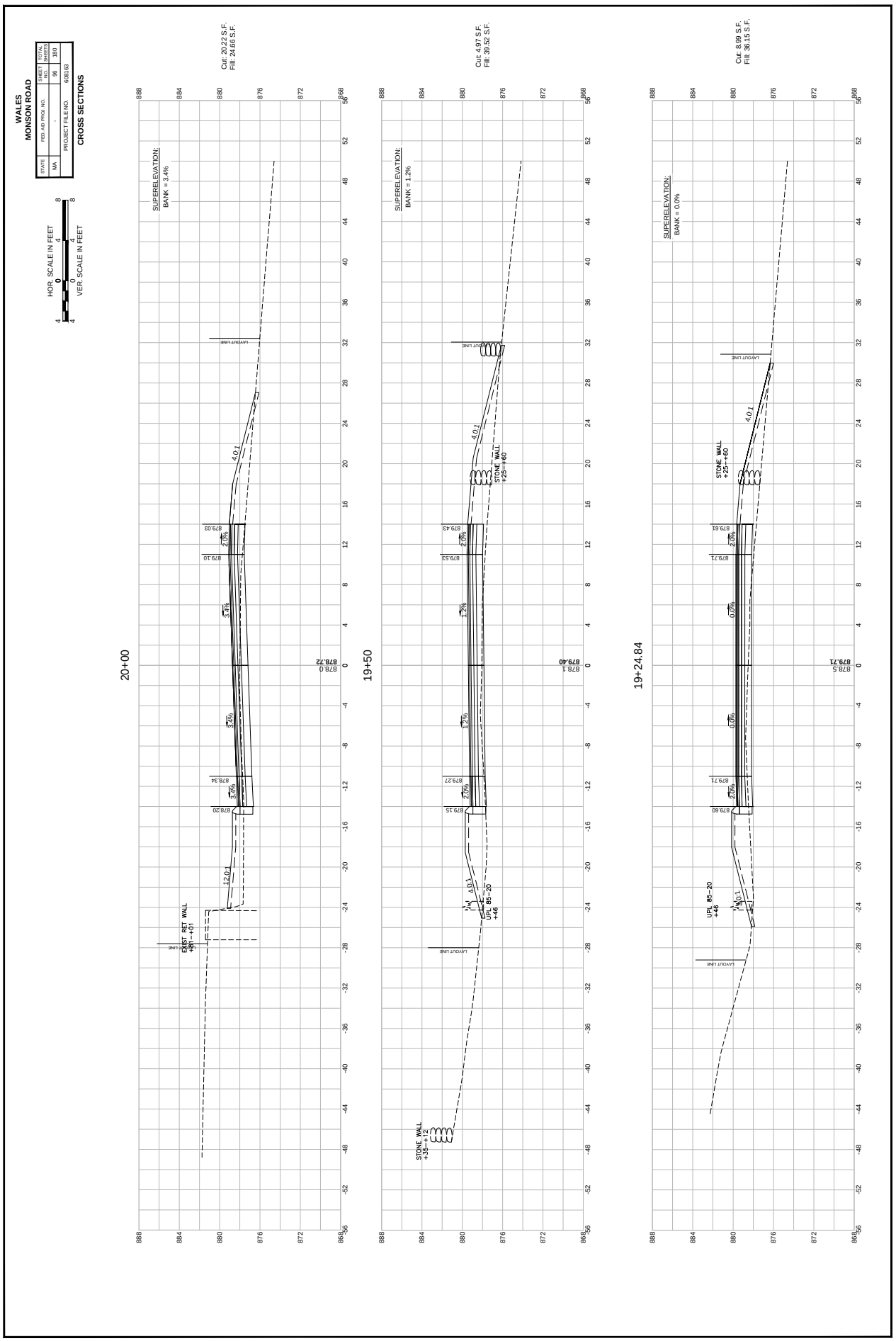
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:31 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	98	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



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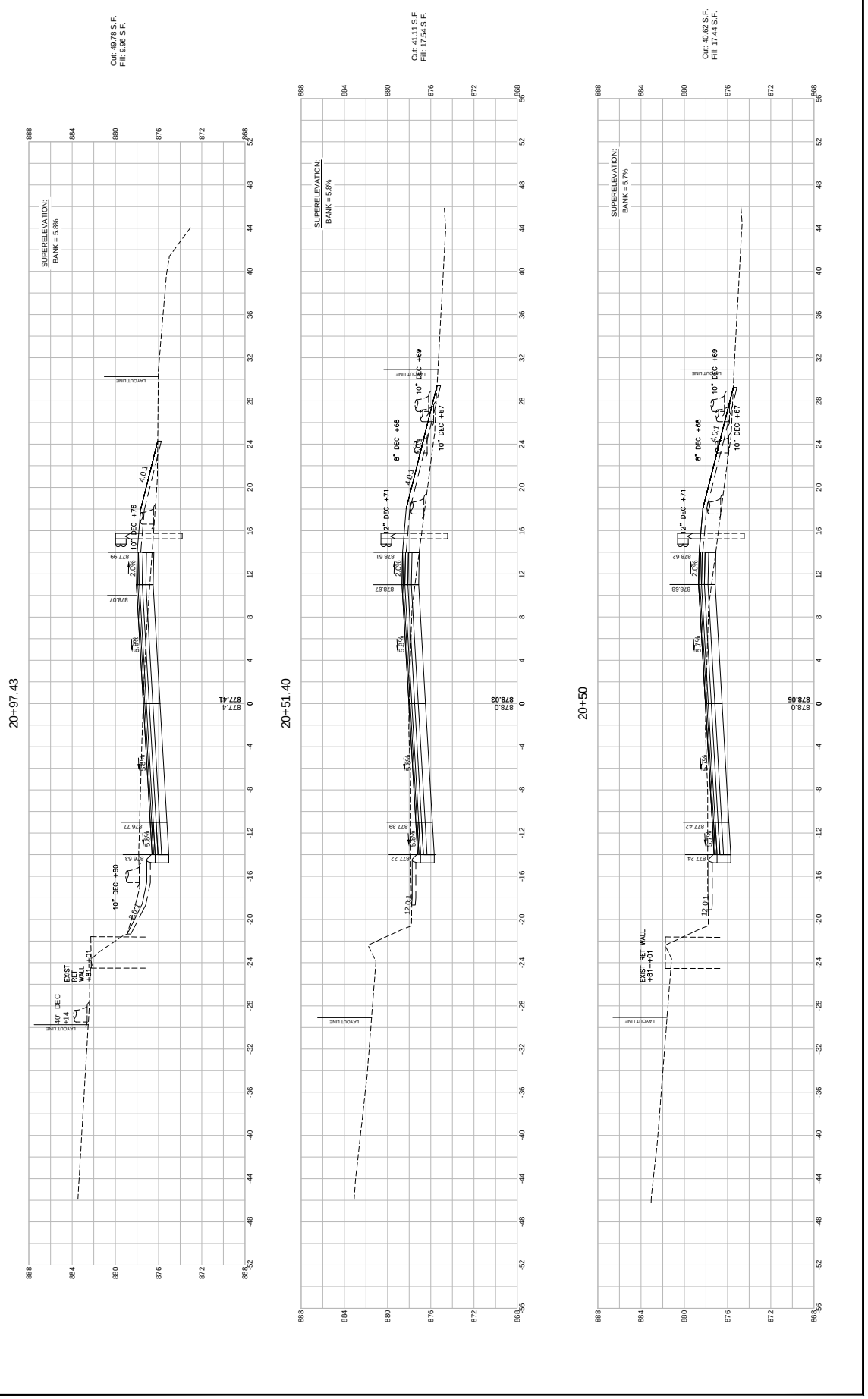
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	97	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 0 4 8
VER. SCALE IN FEET 4 0 4 8



608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:32 PM

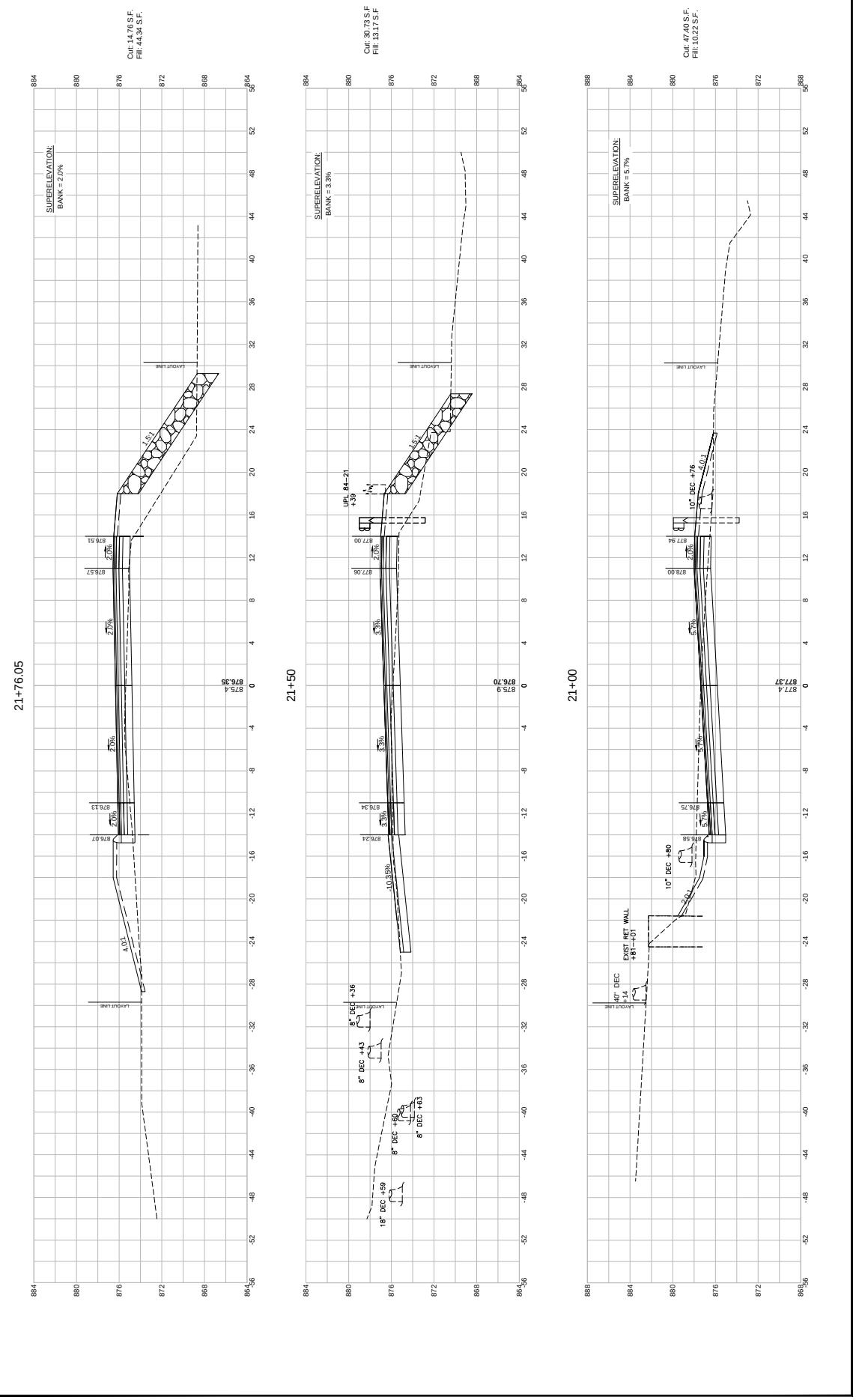
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.
MA	-
	PROJECT FILE NO. 608163

SHEET NO.	TOTAL SHEETS
98	180

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



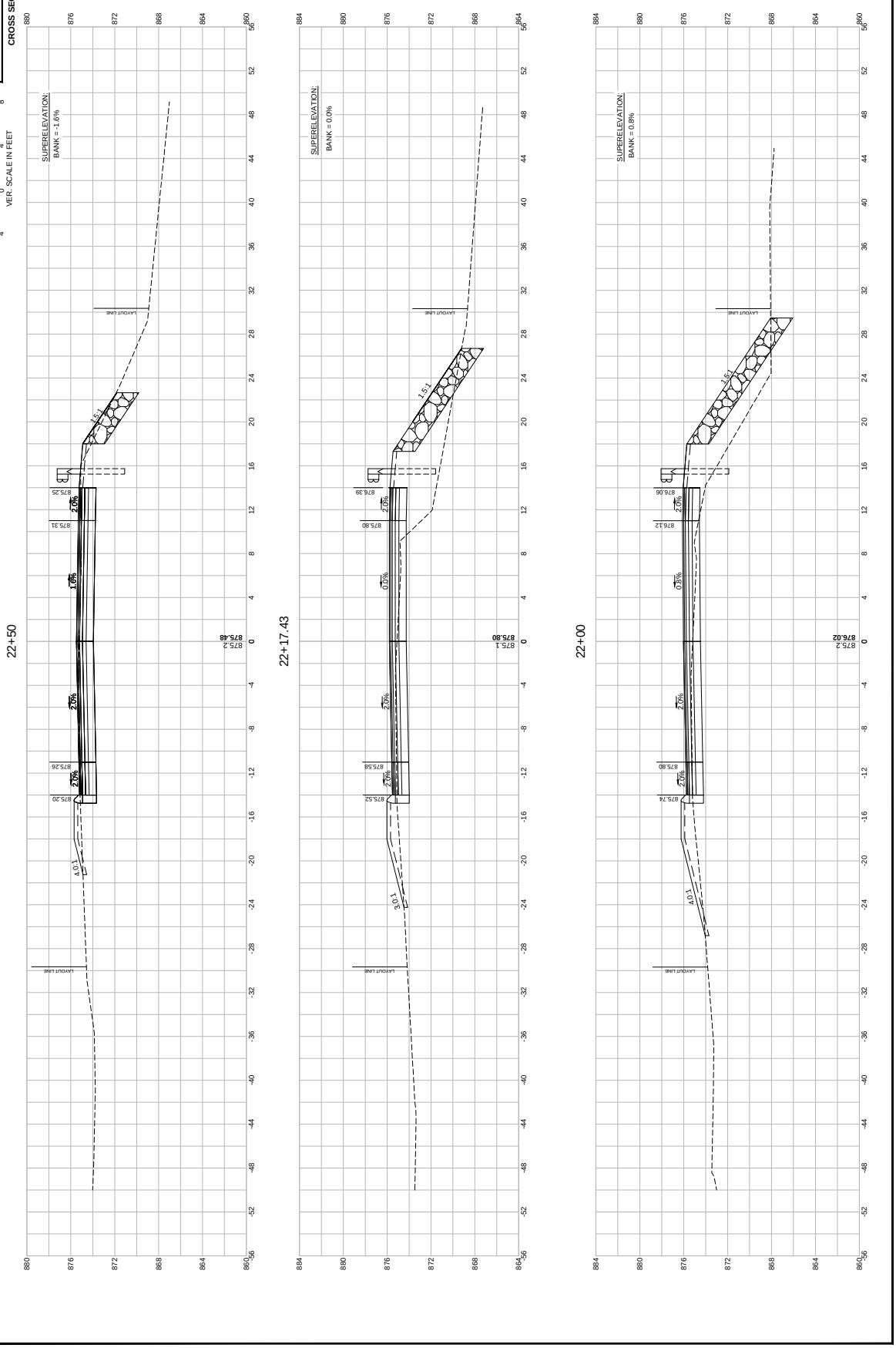
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:33 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	99	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:33 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	100	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
VER. SCALE IN FEET

23+00

Cut: 68.97 S.F.
Fill: 0.0 S.F.

22+58.81

Cut: 45.96 S.F.
Fill: 4.28 S.F.

22+57.48

Cut: 49.08 S.F.
Fill: 3.68 S.F.

SUPERELEVATION:
BANK = -1.9%

608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:33 PM

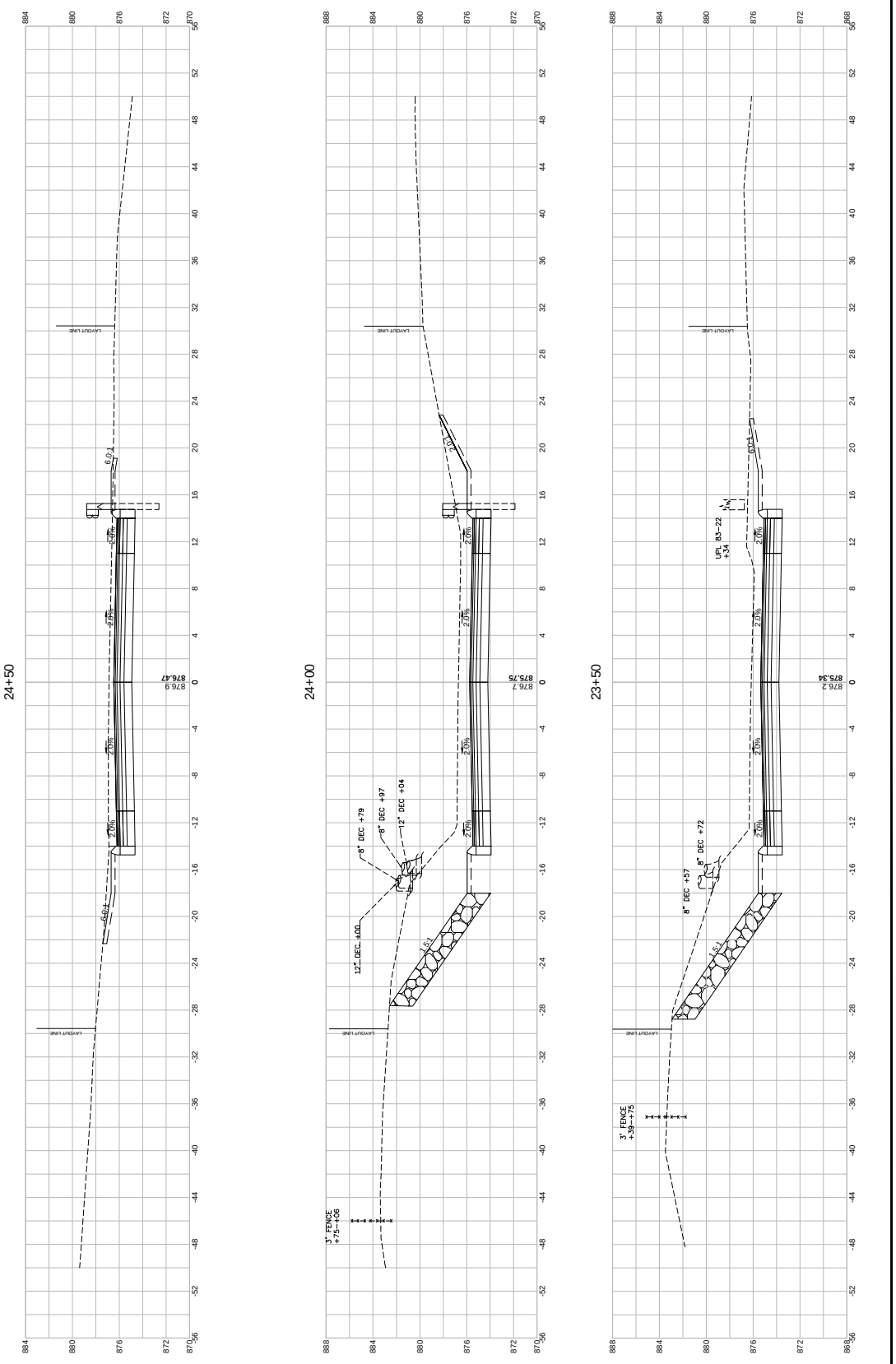
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	101	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
4 0 4 8

VER. SCALE IN FEET
4 0 4 8



608163_HD10XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:34 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	102	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
VER. SCALE IN FEET

Cut: 33.06 S.F.
Fill: 27.18 S.F.

25+50

Cut: 121.15 S.F.
Fill: 0.00 S.F

25+00

24+91.52

608163_HD10XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:34 PM

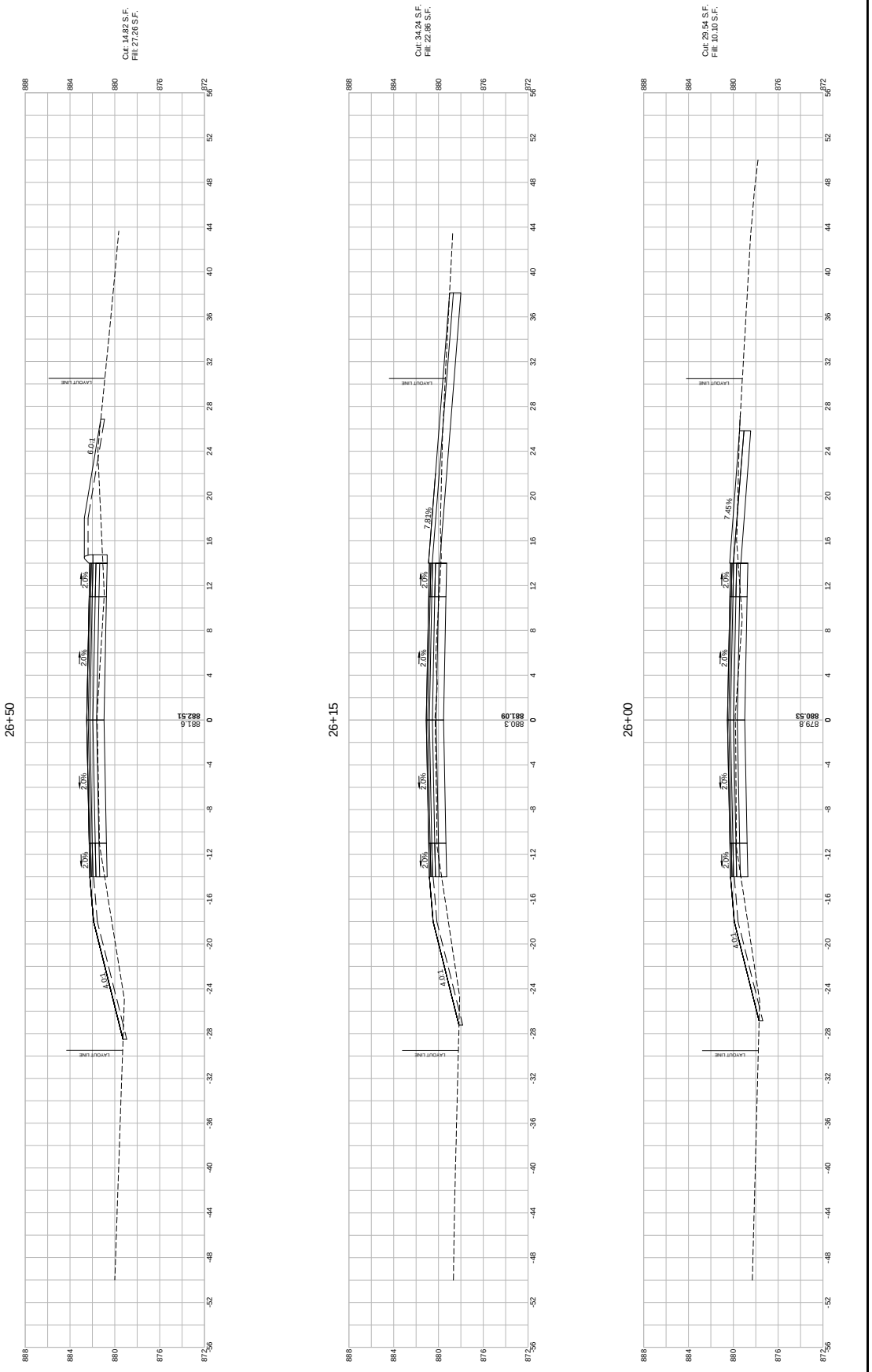
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.
MA	-
	PROJECT FILE NO.
	608163

SHEET NO.	TOTAL SHEETS
103	180

CROSS SECTIONS

HOR. SCALE IN FEET
4 0 4 8
VER. SCALE IN FEET
4 0 4 8



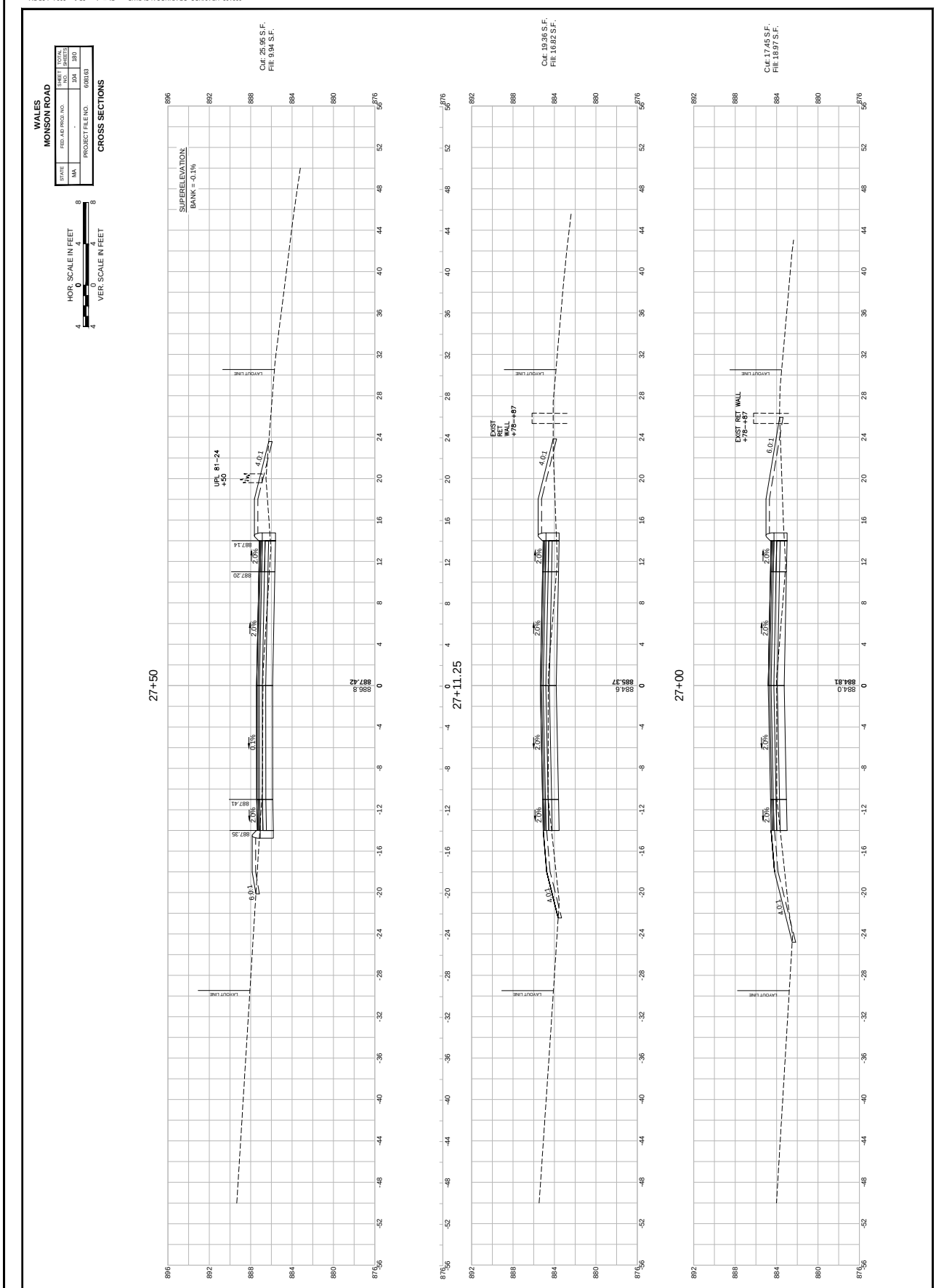
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:35 PM

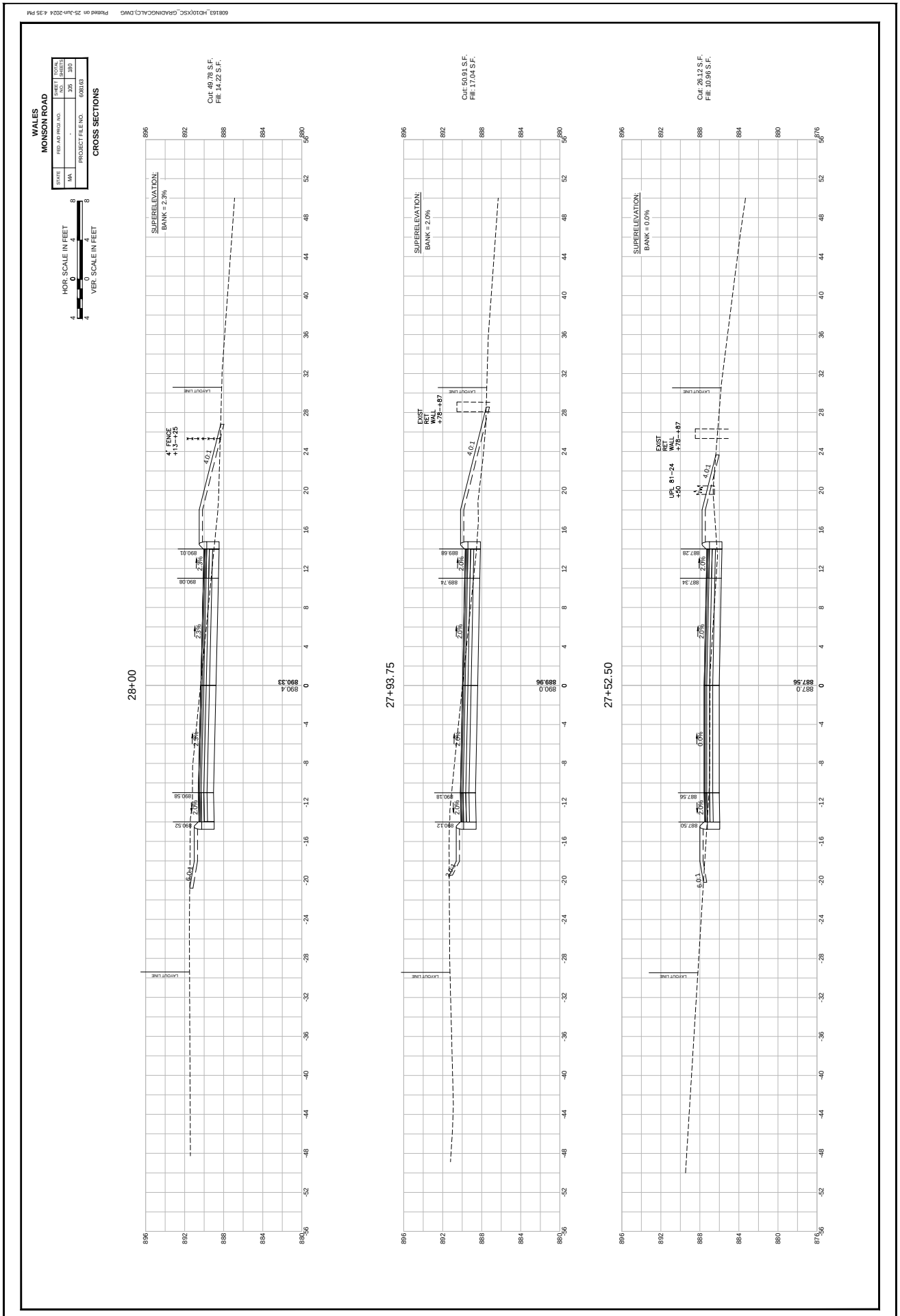
WALES
MONSON ROAD

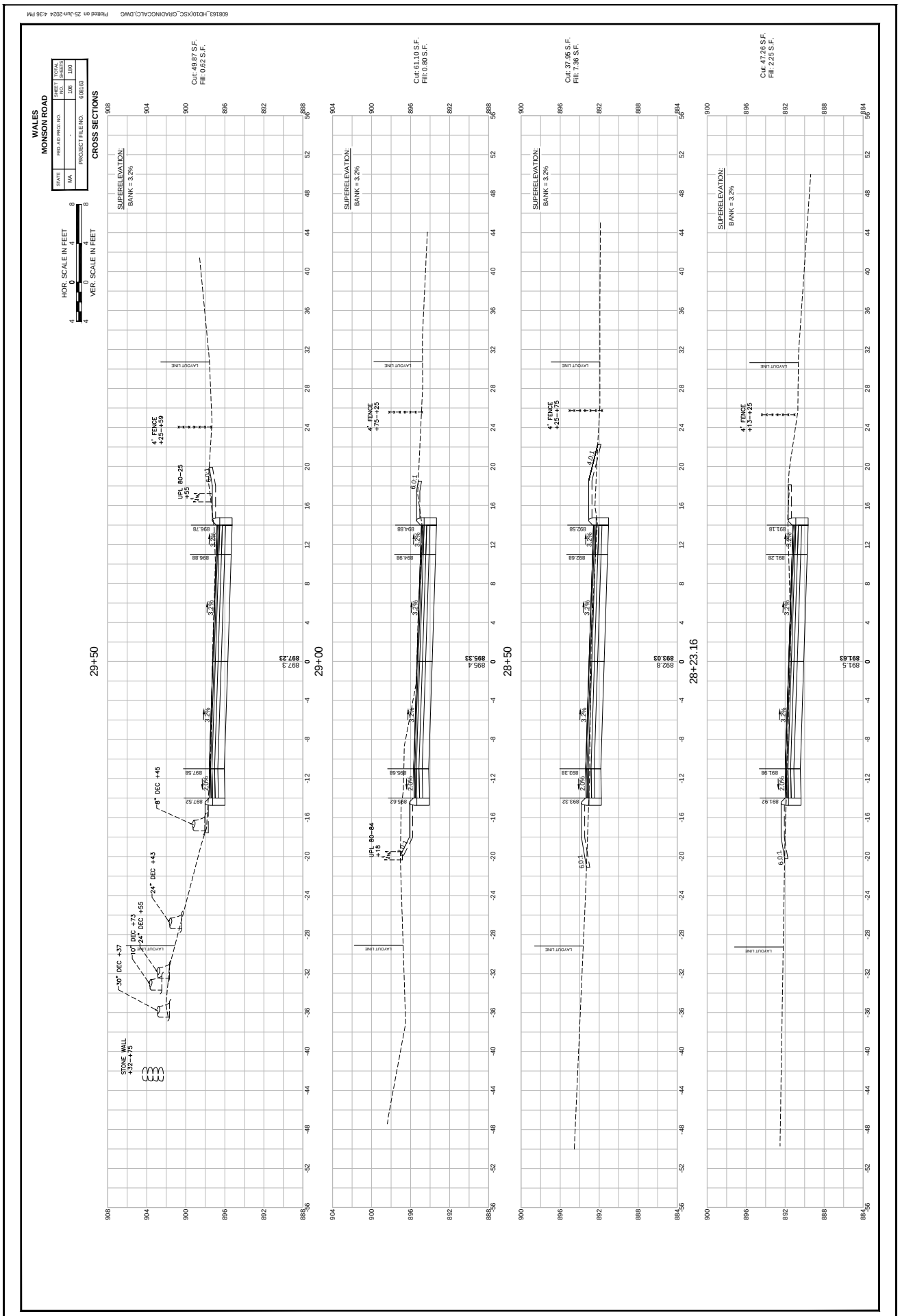
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	104	180
	PROJECT FILE NO.	608163	

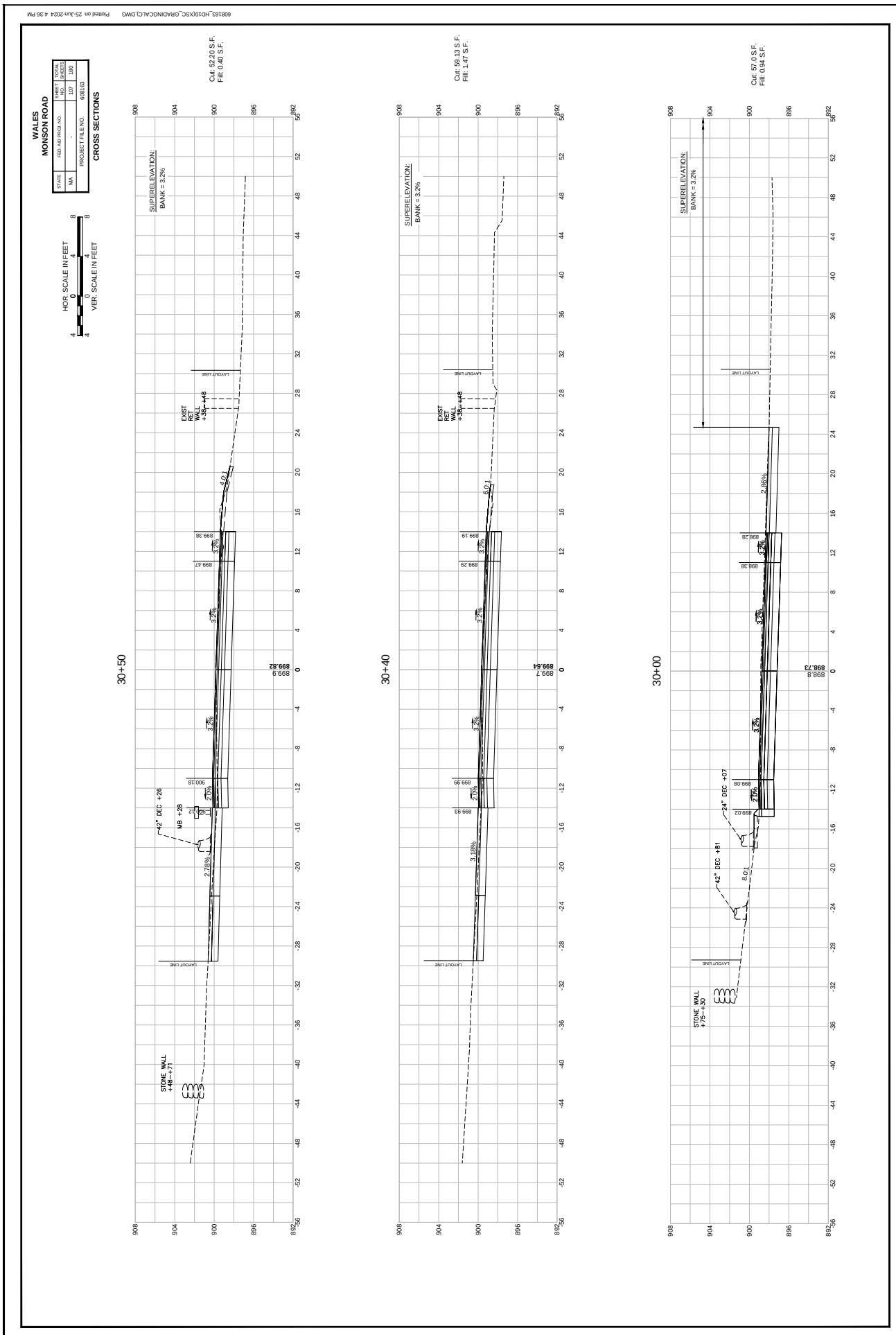
CROSS SECTIONS

HOR. SCALE IN FEET
VER. SCALE IN FEET




608163_HD10(XSC_GRADINGCALC).DWG
Plotted on 25-Jun-2024 4:35 PM
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
105
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
28+00
27+93.75
27+52.50
Cut: 49.78 S.F.
Fill: 14.22 S.F.
Cut: 50.91 S.F.
Fill: 17.04 S.F.
Cut: 26.12 S.F.
Fill: 10.96 S.F.
SUPERELEVATION:
BANK = 2.3%
BANK = 2.0%
BANK = 0.0%
4' FENCE
+13-+25
EXIST
RET
WALL
+78-+87
UPL 81-24
+50
LAYOUT LINE
890.33
890.4
889.96
890.0
887.56
887.0


608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:38 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
106
TOTAL SHEETS
180
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
29+50
29+00
28+50
28+23.16
Cut: 49.87 S.F.
Fill: 0.62 S.F.
Cut: 61.10 S.F.
Fill: 0.80 S.F.
Cut: 37.95 S.F.
Fill: 7.36 S.F.
Cut: 47.26 S.F.
Fill: 2.25 S.F.
SUPERELEVATION:
BANK = 3.2%
LAYDOUT LINE
4' FENCE
+25--+59
4' FENCE
+75--+25
4' FENCE
+25--+75
4' FENCE
+13--+25
UPL 80-25
+58
UPL 80-84
+18
STONE WALL
+52+75
30" DEC +37
10" DEC +73
24" DEC +55
24" DEC +43
8" DEC +45
897.3
897.23
895.4
895.33
892.8
892.03
891.5
891.63
896.78
896.88
894.88
894.98
892.58
892.68
891.18
891.28
897.58
897.52
895.68
895.62
893.38
893.32
891.38
891.32
6.0:1
4.0:1
3.2%
2.7%


608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:38 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
107
TOTAL SHEETS
180
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 52.20 S.F.
Fill: 0.40 S.F.
Cut: 59.13 S.F.
Fill: 1.47 S.F.
Cut: 57.0 S.F.
Fill: 0.94 S.F.
SUPERELEVATION:
BANK = 3.2%
30+50
30+40
30+00
EXIST RET WALL +35 +48
STONE WALL +46 +71
42" DEC +26
MB +28
24" DEC +07
42" DEC +81
STONE WALL +75 +93
LAYOUT LINE
899.9
899.82
899.7
899.64
898.8
898.73
899.38
899.47
899.19
899.29
898.28
898.38
900.18
899.99
899.53
899.08
899.02
2.78%
3.18%
2.86%
3.2%
2.7%
6.0:1
4.0:1

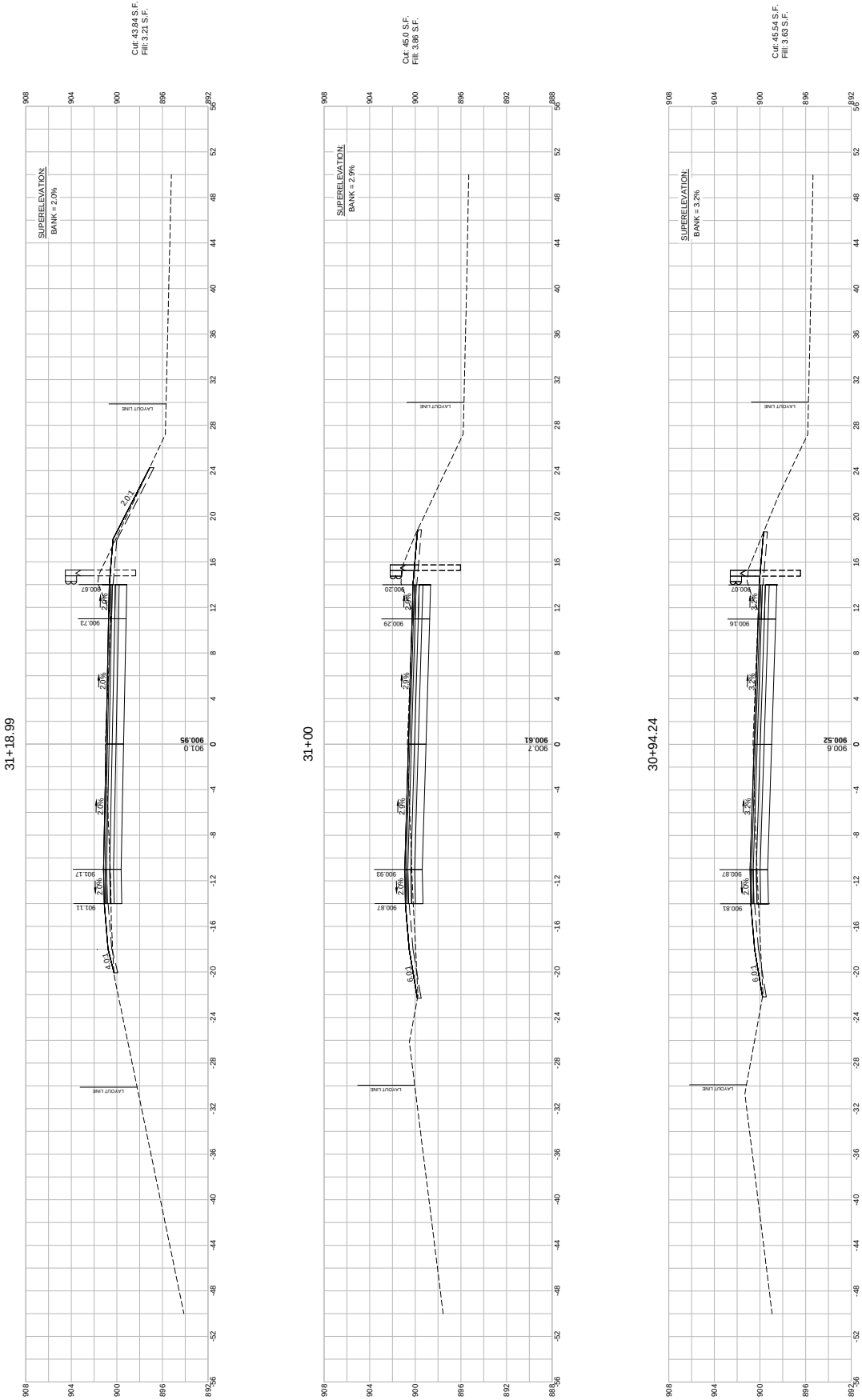
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:37 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	108	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
4 0 4 8
VER. SCALE IN FEET
4 0 4 8



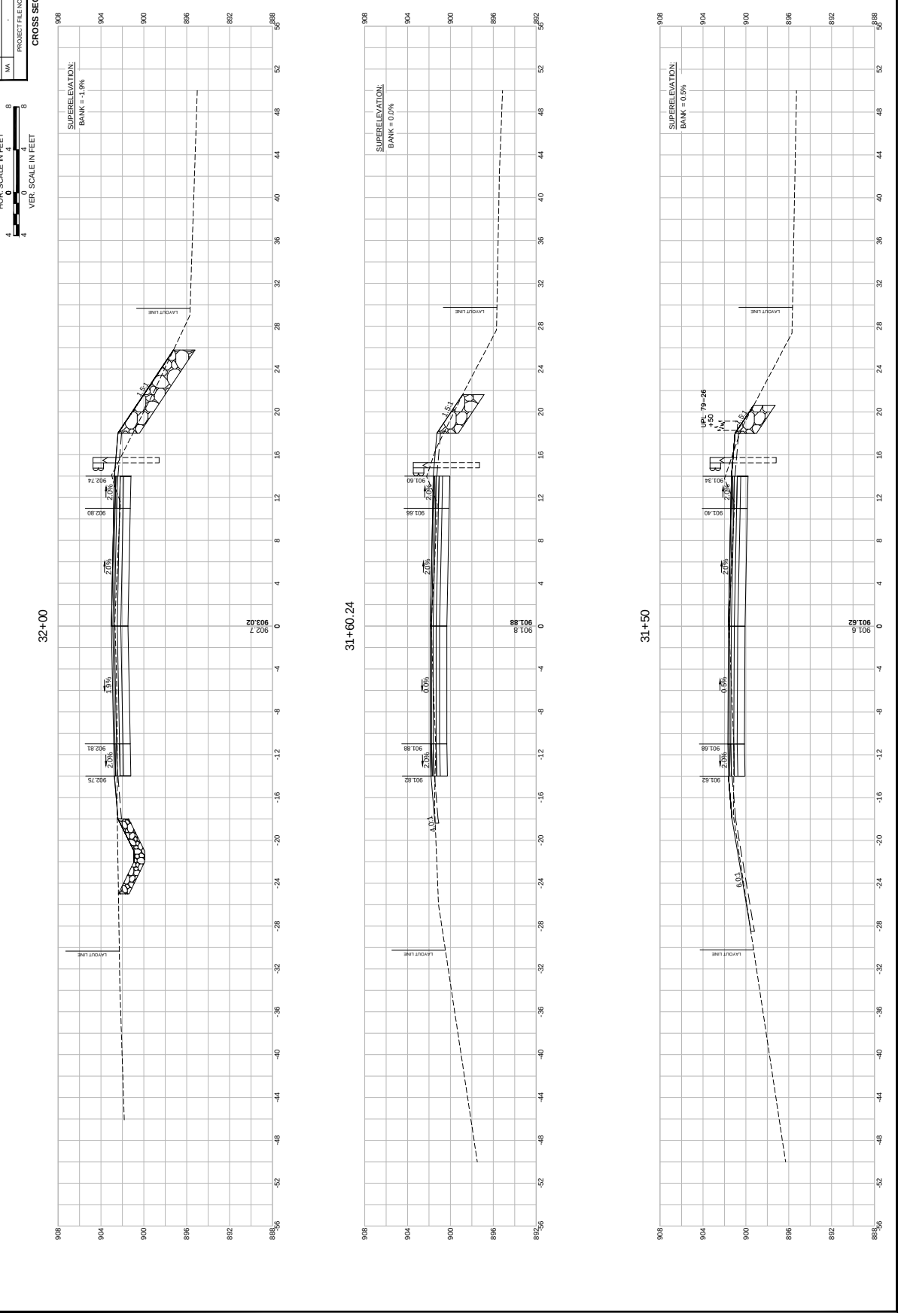
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:37 PM

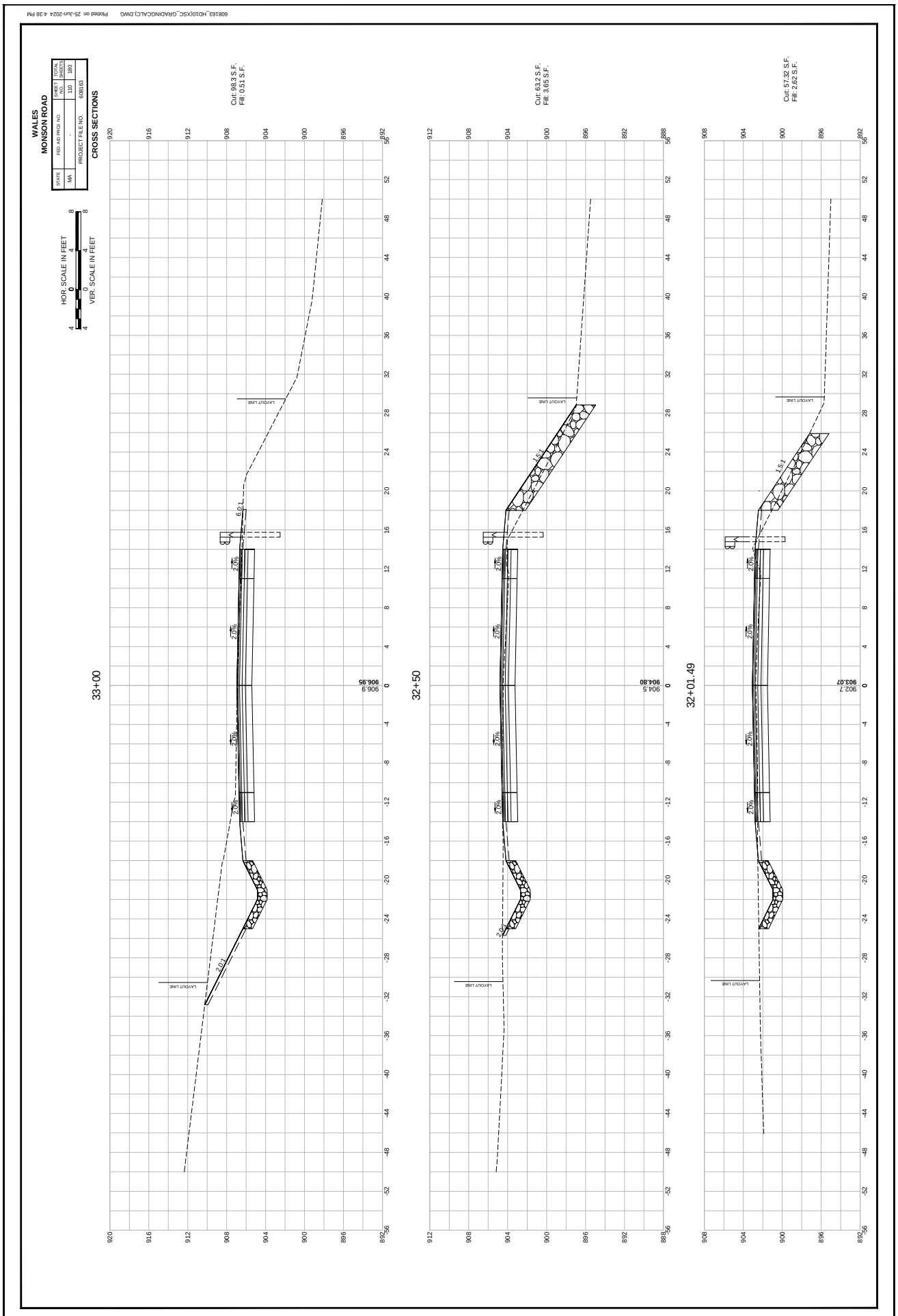
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	109	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8




608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:38 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
110
TOTAL SHEETS
180
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
33+00
Cut: 98.3 S.F.
Fill: 0.51 S.F.
906.9
906.95
32+50
Cut: 63.2 S.F.
Fill: 3.65 S.F.
904.5
904.80
32+01.49
Cut: 57.32 S.F.
Fill: 2.62 S.F.
902.7
903.07
LAYOUT LINE
1.5:1
2.0%

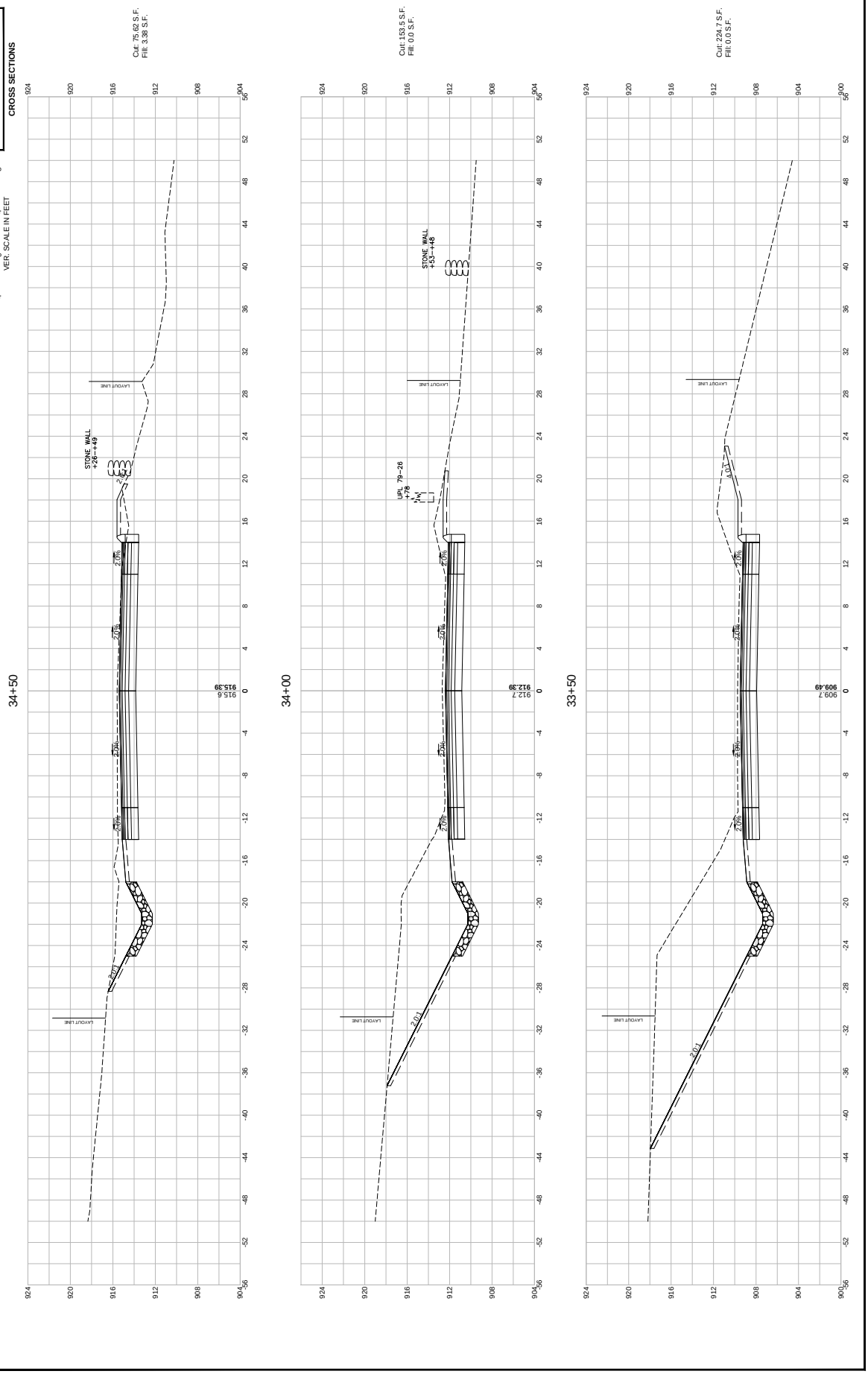
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:38 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	111	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8


34+50
Cut: 75.62 S.F.
Fill: 3.38 S.F.
STONE WALL
+26--+49
2.0%
2.0%
2.0%

608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:39 PM

WALES
MONSON ROAD

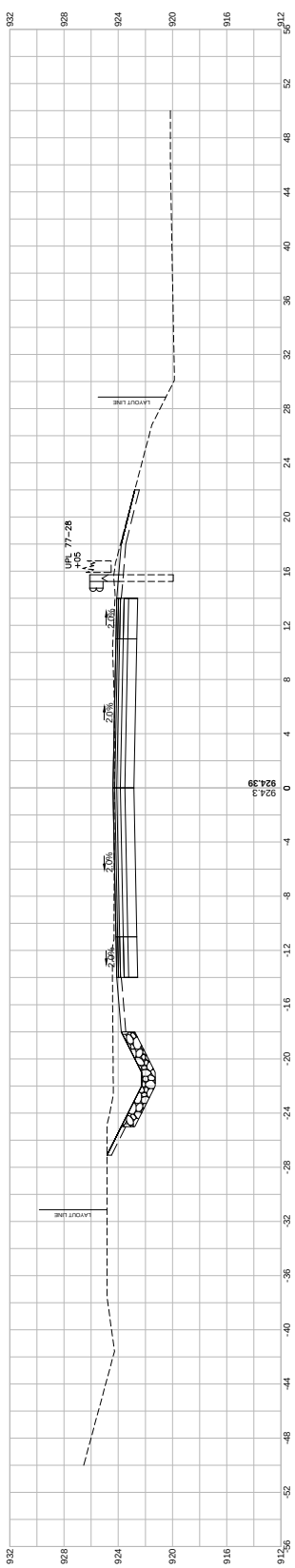
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	112	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8

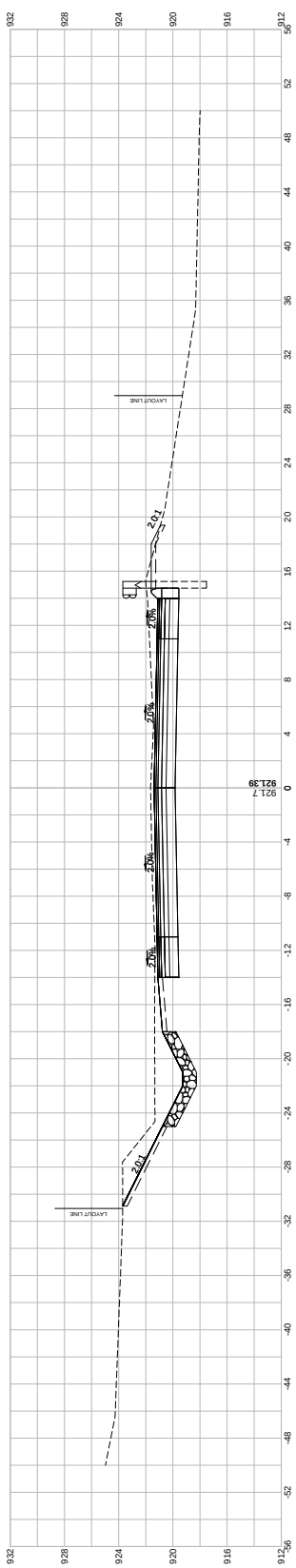
36+00

Cut: 71.9 S.F.
Fill: 0.0 S.F.



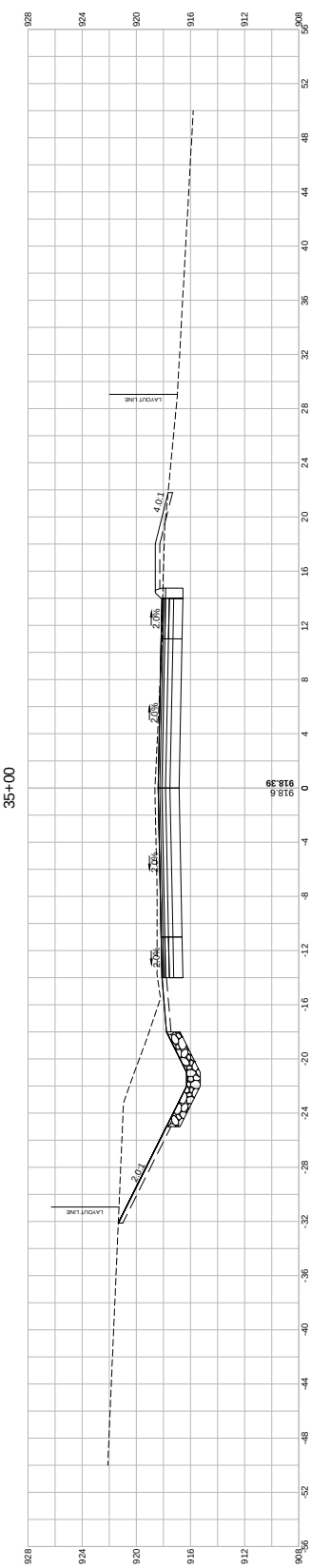
35+50

Cut: 83.19 S.F.
Fill: 0.41 S.F.



35+00

Cut: 97.26 S.F.
Fill: 3.20 S.F.



608163_HD10XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:39 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	113	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8

36+67.83

Cut: 92.62 S.F.
Fill: 1.13 S.F.

SUPERELEVATION:
BANK = 0.0%

928.5
928.46

928.40
928.46
928.24
928.18

36+50

Cut: 105.3 S.F.
Fill: 0.0 S.F.

SUPERELEVATION:
BANK = -0.9%

927.4
927.39

927.24
927.30
927.17
927.11

36+26.29

Cut: 86.86 S.F.
Fill: 0.92 S.F.

925.9
925.97

LAYOUT LINE

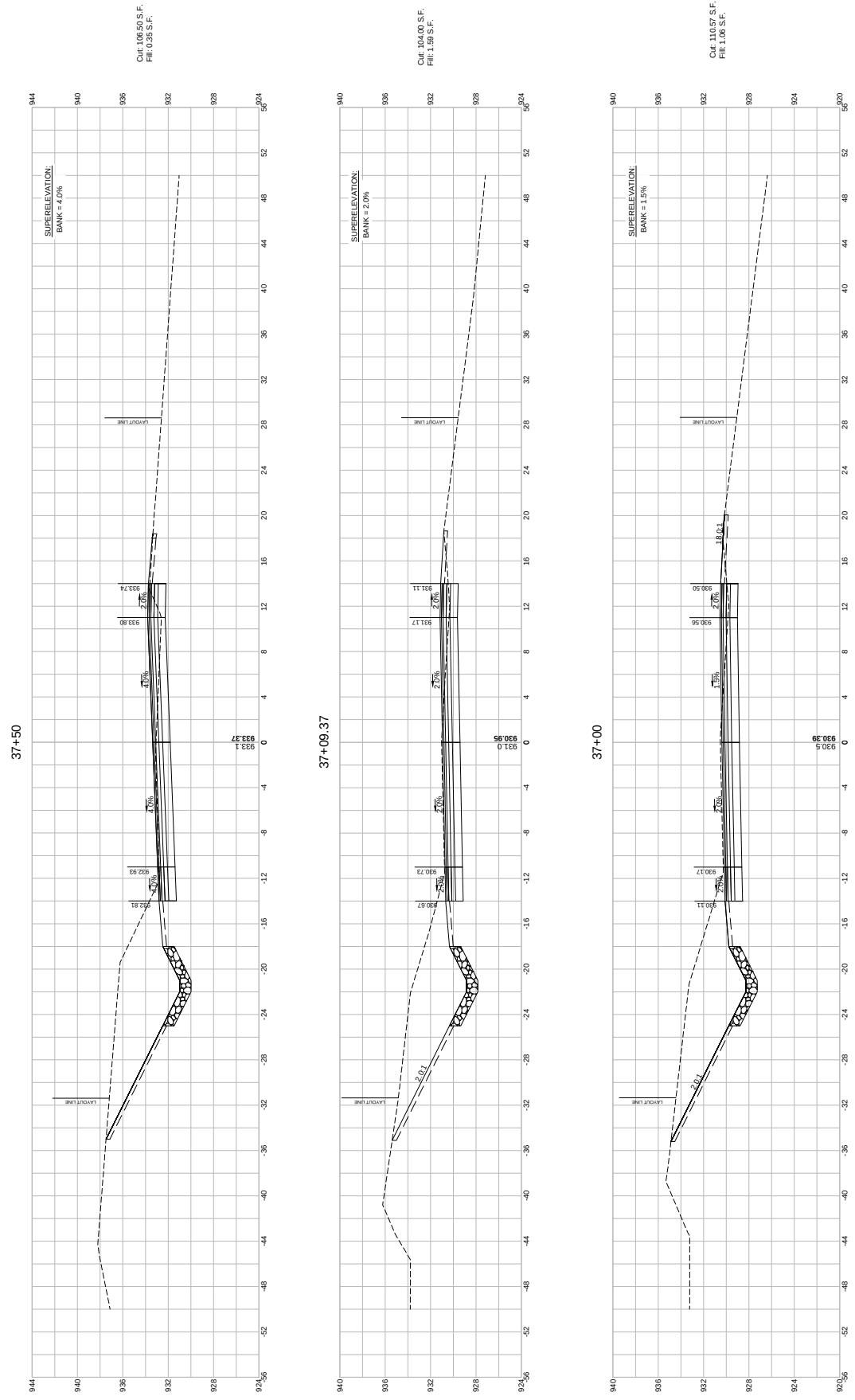
608163_HD10XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:40 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	114	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:40 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.
MA	-
	PROJECT FILE NO.
	608163

SHEET NO.	TOTAL SHEETS
115	180

CROSS SECTIONS

HOR. SCALE IN FEET
4 0 4 8

VER. SCALE IN FEET
4 0 4 8

39+00

Cut: 94.97 S.F.
Fill: 6.82 S.F.

SUPERELEVATION:
BANK = 5.2%

940.13
940.19
939.05
938.89
939.5
939.62
LAYOUT LINE
5.2%
2.0%

38+50

Cut: 78.10 S.F.
Fill: 16.61 S.F.

SUPERELEVATION:
BANK = 5.2%

938.56
938.62
937.47
937.32
937.7
938.04
LAYOUT LINE
UPL 76-29
+27
5.2%
2.0%

38+00

Cut: 82.00 S.F.
Fill: 9.78 S.F.

SUPERELEVATION:
BANK = 5.2%

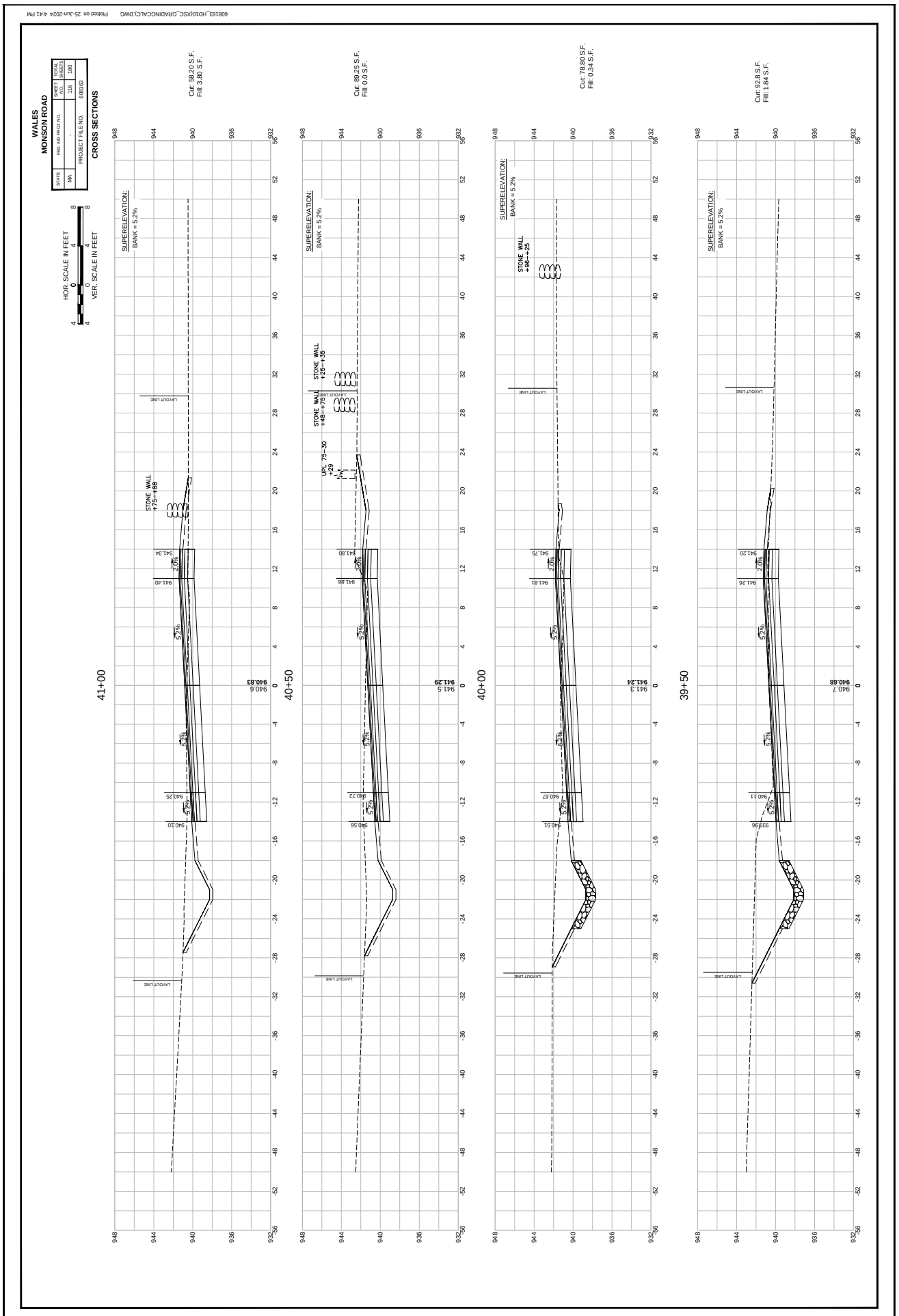
936.47
936.53
935.39
935.23
935.5
935.86
LAYOUT LINE
5.2%
2.0%

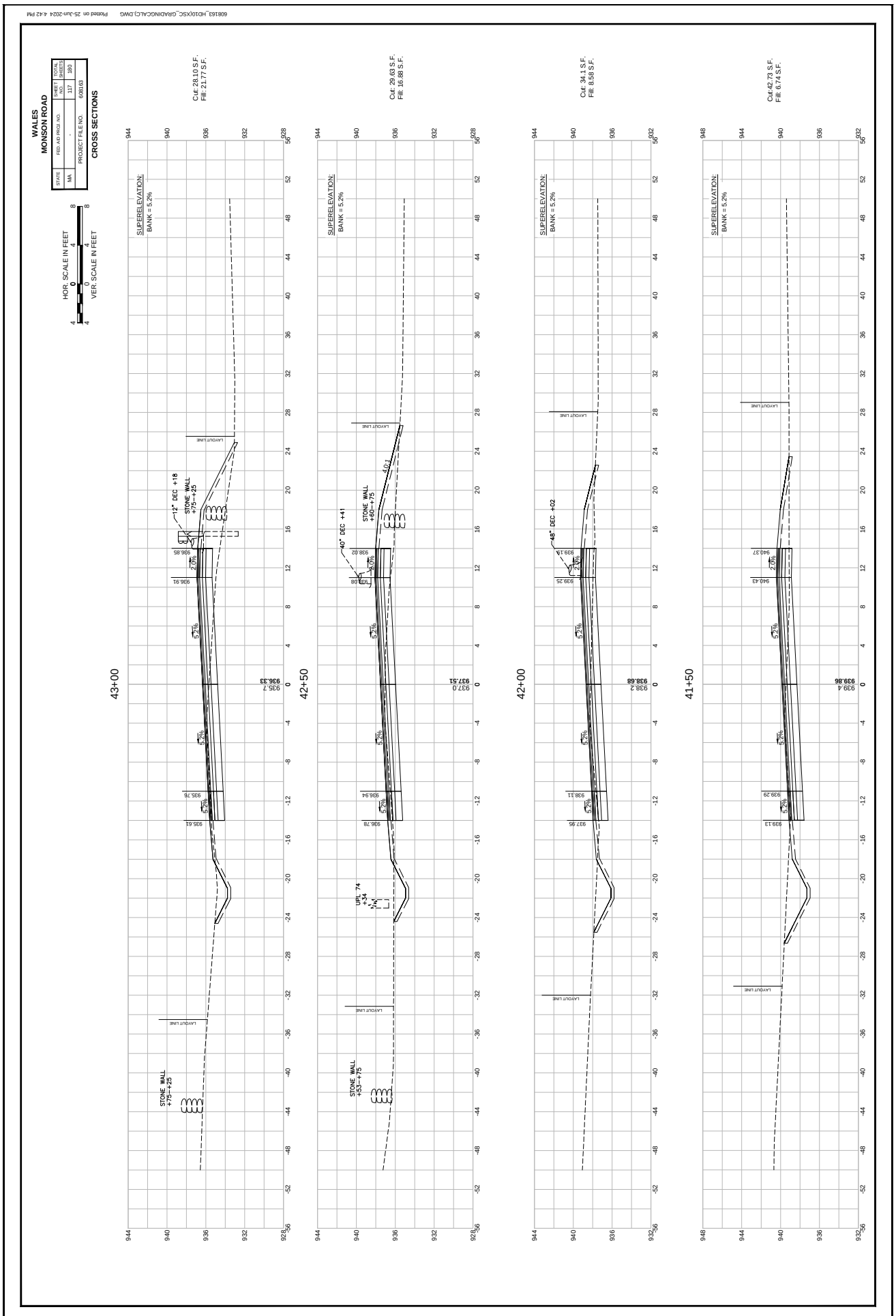
37+75.83

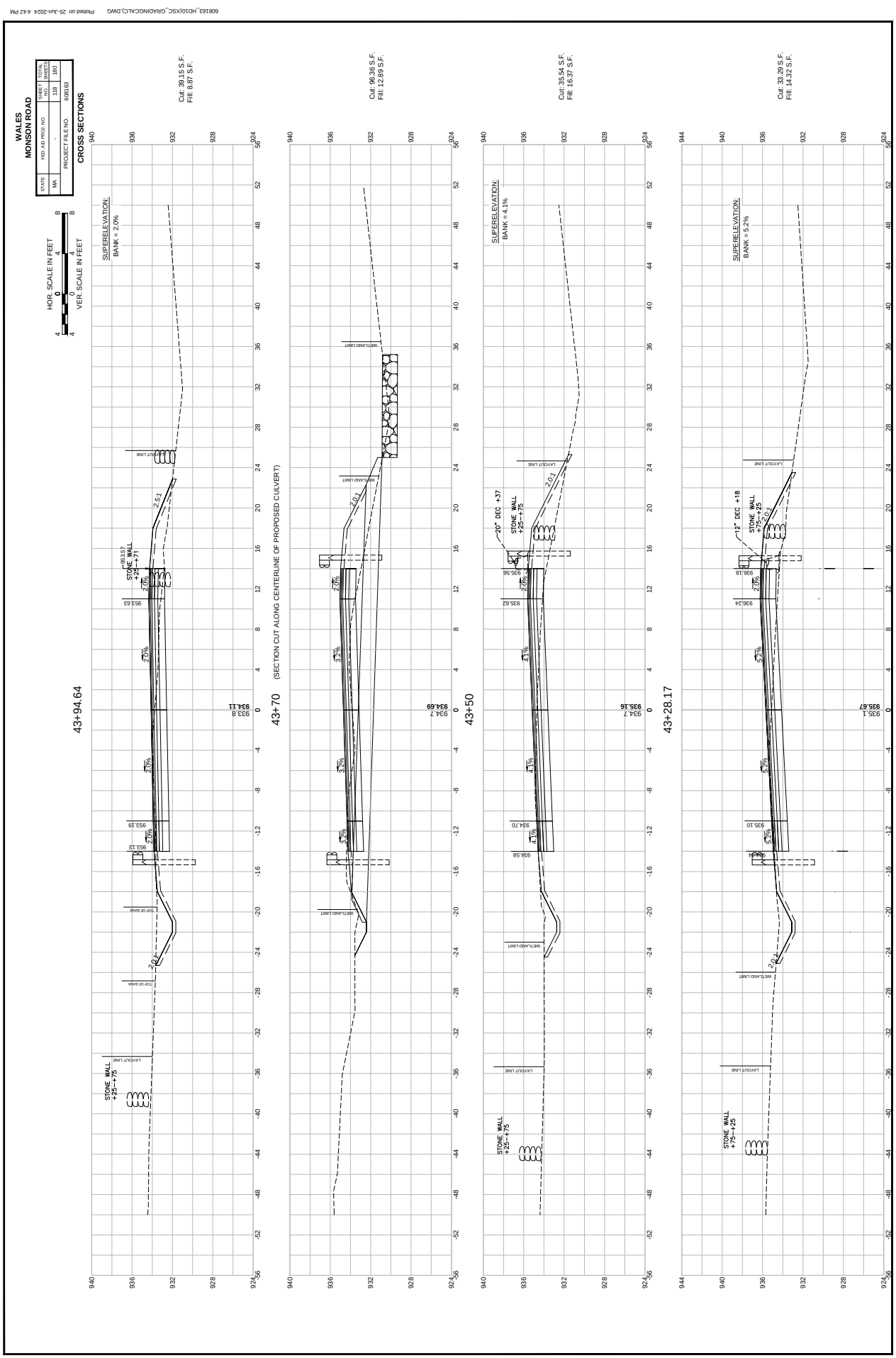
Cut: 96.57 S.F.
Fill: 3.07 S.F.

SUPERELEVATION:
BANK = 5.2%

935.28
935.34
934.20
934.04
934.3
934.77
LAYOUT LINE
4.0:1
5.2%
2.0%


608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:41 PM
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
116
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
41+00
40+50
40+00
39+50
Cut: 58.20 S.F.
Fill: 3.80 S.F.
Cut: 89.25 S.F.
Fill: 0.0 S.F.
Cut: 78.80 S.F.
Fill: 0.34 S.F.
Cut: 92.8 S.F.
Fill: 1.84 S.F.
SUPERELEVATION:
BANK = 5.2%
STONE WALL
+75-+88
STONE WALL
+48-+75
STONE WALL
+25-+35
UPL 75-30
+29
STONE WALL
+96-+25
LAYOUT LINE


608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:42 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
117
TOTAL SHEETS
180
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 28.10 S.F.
Fill: 21.77 S.F.
Cut: 29.63 S.F.
Fill: 16.88 S.F.
Cut: 34.1 S.F.
Fill: 8.58 S.F.
Cut:42.73 S.F.
Fill: 6.74 S.F.
SUPERELEVATION:
BANK = 5.2%
43+00
42+50
42+00
41+50
LAYOUT LINE
STONE WALL
+75--+25
STONE WALL
+60--+75
12" DEC +18
40" DEC +41
48" DEC +02
URL 74
+34
14"
401


608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:42 PM
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
118
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 39.15 S.F.
Fill: 8.87 S.F.
Cut: 96.36 S.F.
Fill: 12.89 S.F.
Cut: 35.54 S.F.
Fill: 16.37 S.F.
Cut: 33.29 S.F.
Fill: 14.32 S.F.
SUPERELEVATION:
BANK = 2.0%
BANK = 4.1%
BANK = 5.2%
43+94.64
43+70
43+50
43+28.17
(SECTION CUT ALONG CENTERLINE OF PROPOSED CULVERT)
STONE WALL
+25-+75
+75-+25
20" DEC +37
12" DEC +18
LAYOUT LINE
WETLAND LIMIT
TOP OF BANK

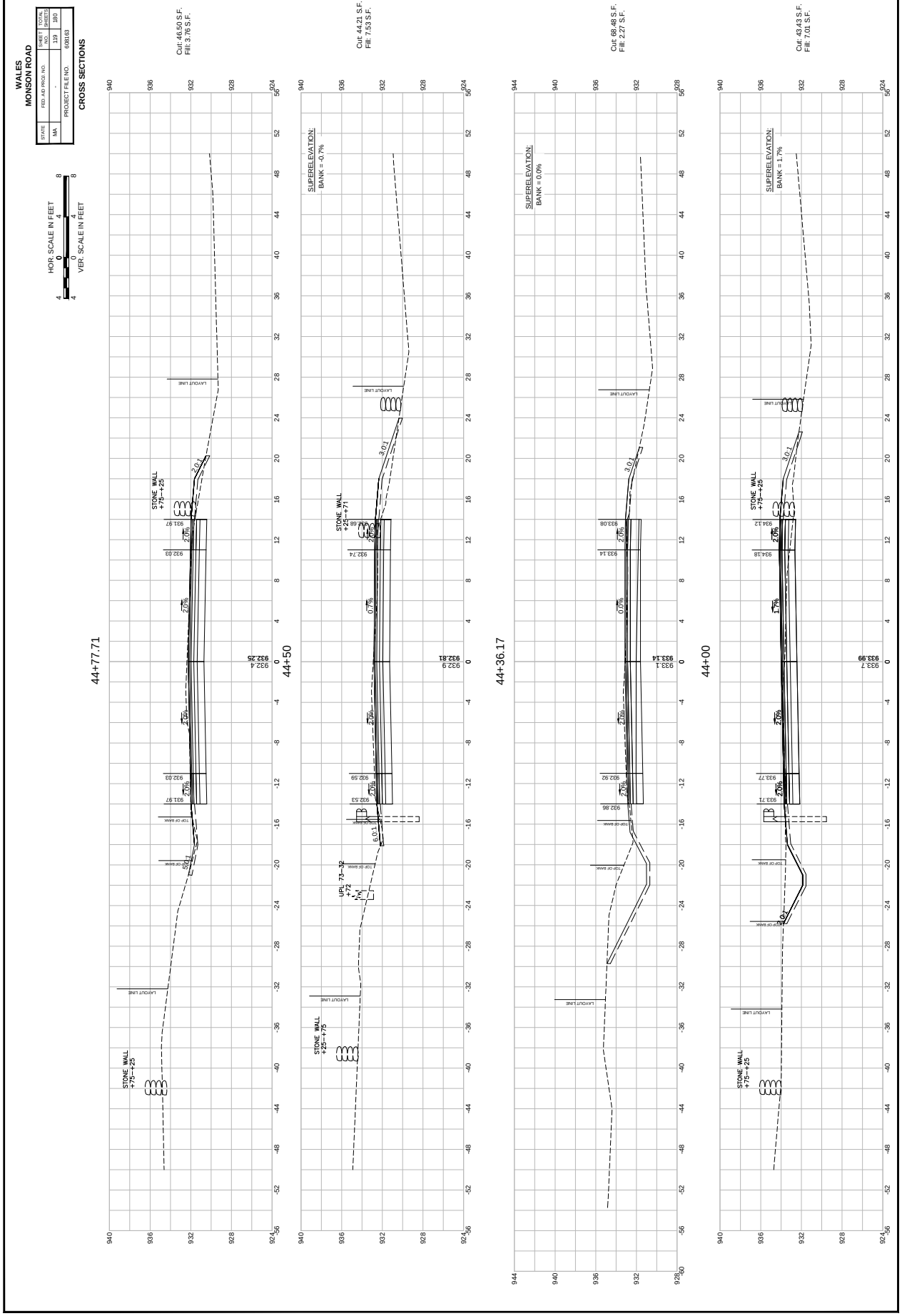
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:43 PM

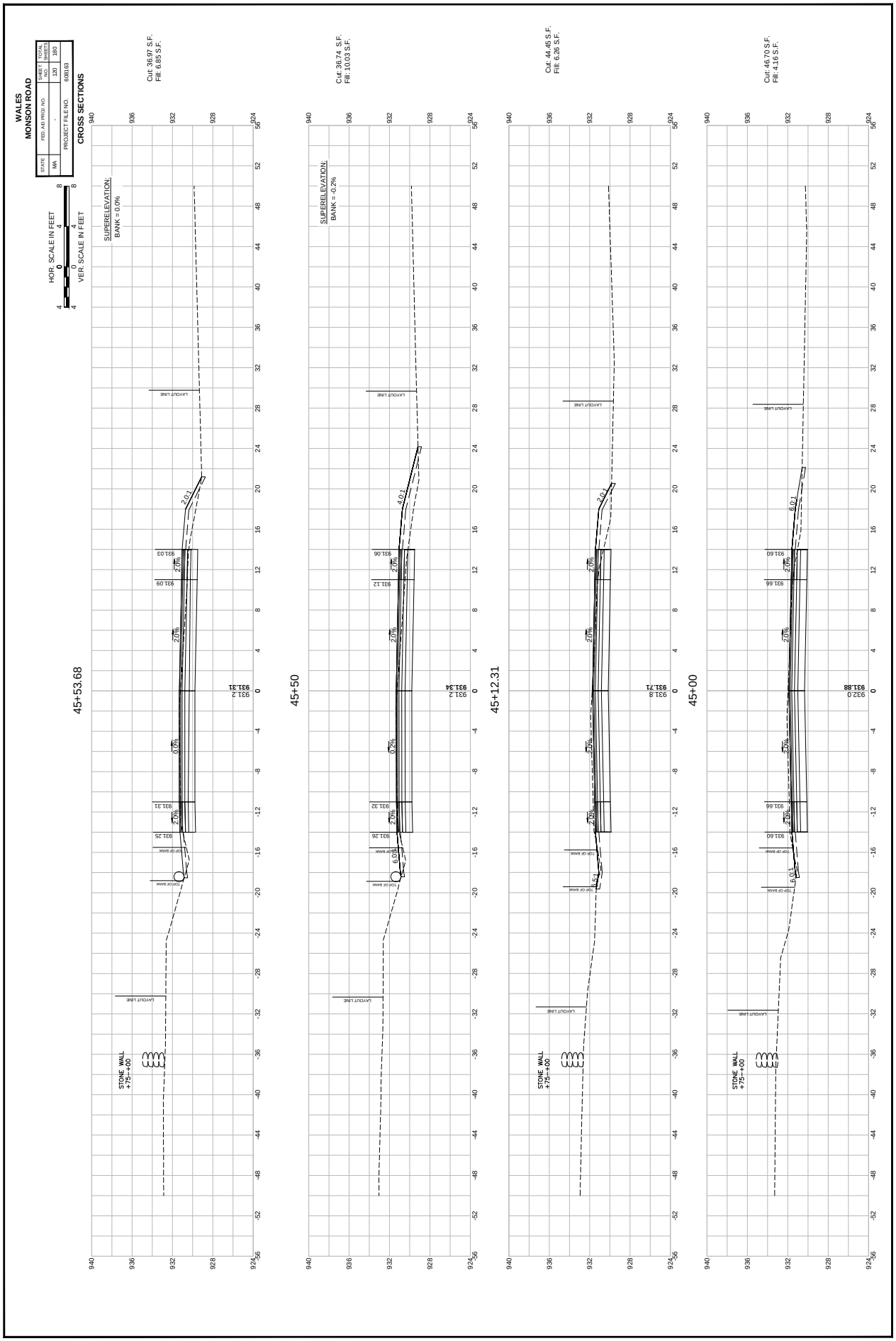
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	119	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR SCALE IN FEET
4 0 4 8
VER. SCALE IN FEET
4 0 4 8




608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:43 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
120
TOTAL SHEETS
180
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
SUPERELEVATION:
BANK = 0.0%
Cut: 36.97 S.F.
Fill: 6.85 S.F.
45+53.68
SUPERELEVATION:
BANK = -0.2%
Cut: 36.74 S.F.
Fill: 10.03 S.F.
45+50
Cut: 44.45 S.F.
Fill: 6.26 S.F.
45+12.31
Cut: 46.70 S.F.
Fill: 4.16 S.F.
45+00
LAYOUT LINE
TOP OF BANK
STONE WALL
4+75+-00

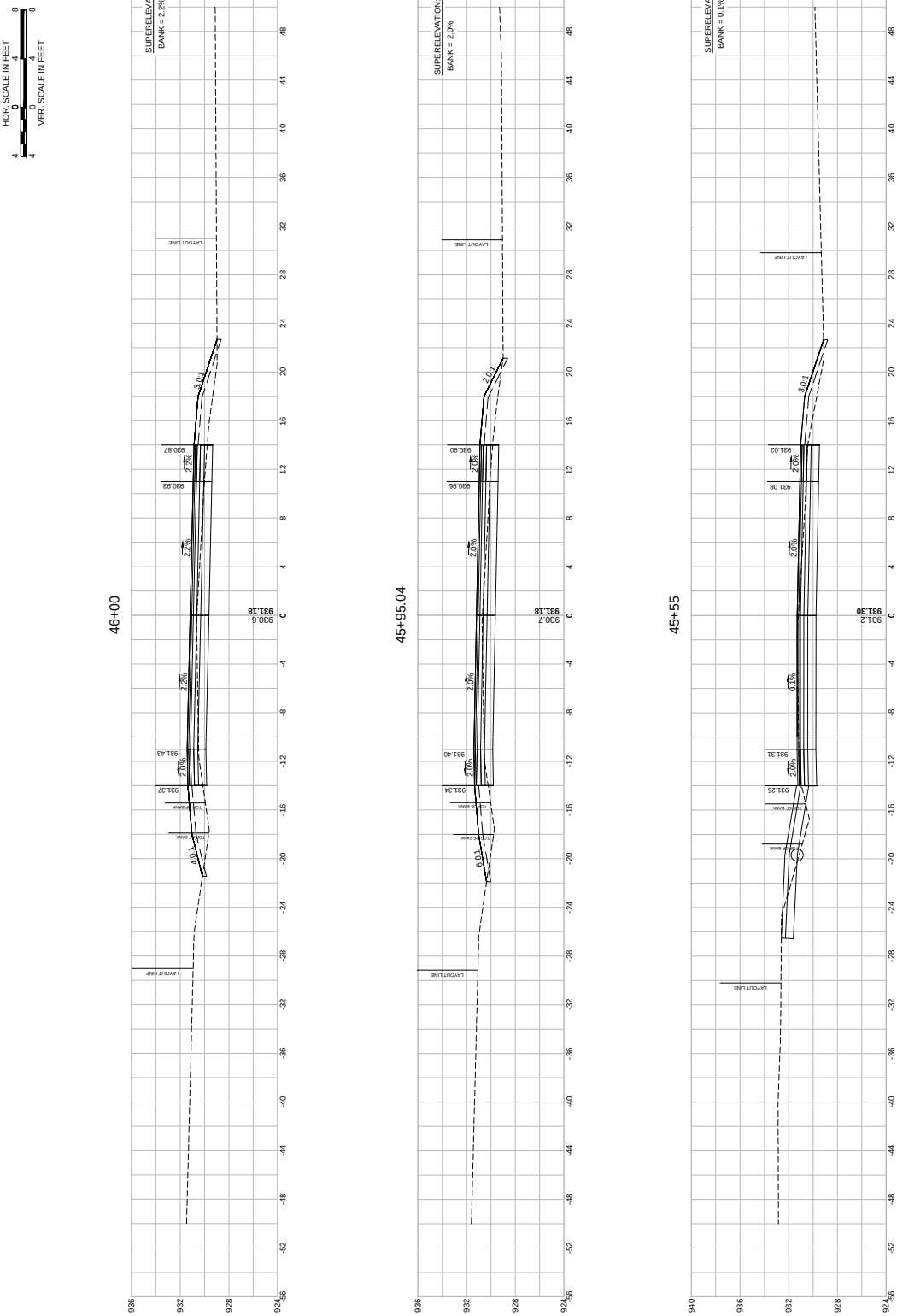
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:44 PM

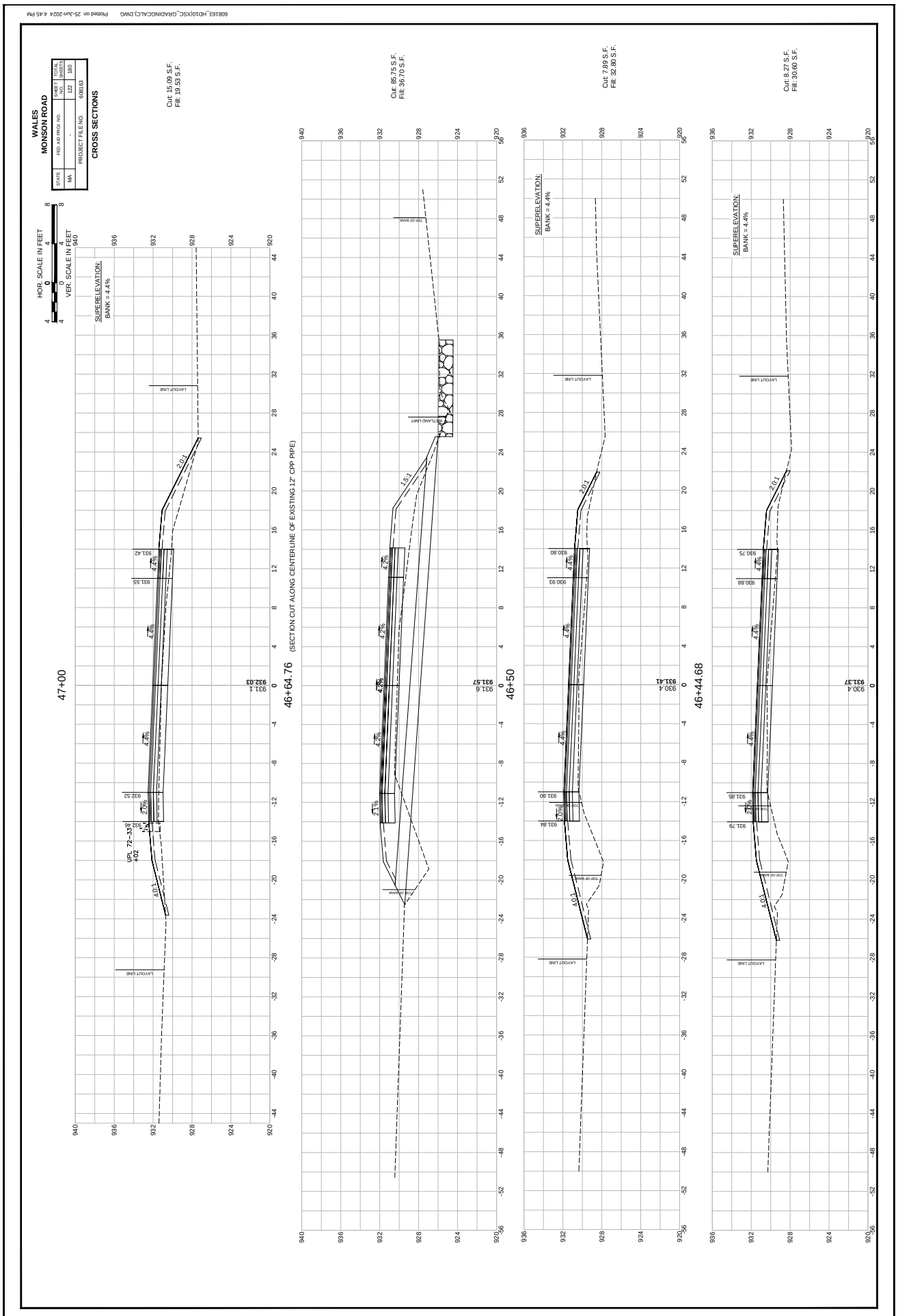
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	121	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
VER. SCALE IN FEET




608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:45 PM
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
122
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 15.09 S.F.
Fill: 19.53 S.F.
Cut: 85.75 S.F.
Fill: 36.70 S.F.
Cut: 7.89 S.F.
Fill: 32.80 S.F.
Cut: 8.27 S.F.
Fill: 30.60 S.F.
SUPERELEVATION:
BANK = 4.4%
47+00
46+64.76
(SECTION CUT ALONG CENTERLINE OF EXISTING 12" CPP PIPE)
46+50
46+44.68
LAYOUT LINE
TOP OF BANK
WETLAND LIMIT
UPL 72-33
+02

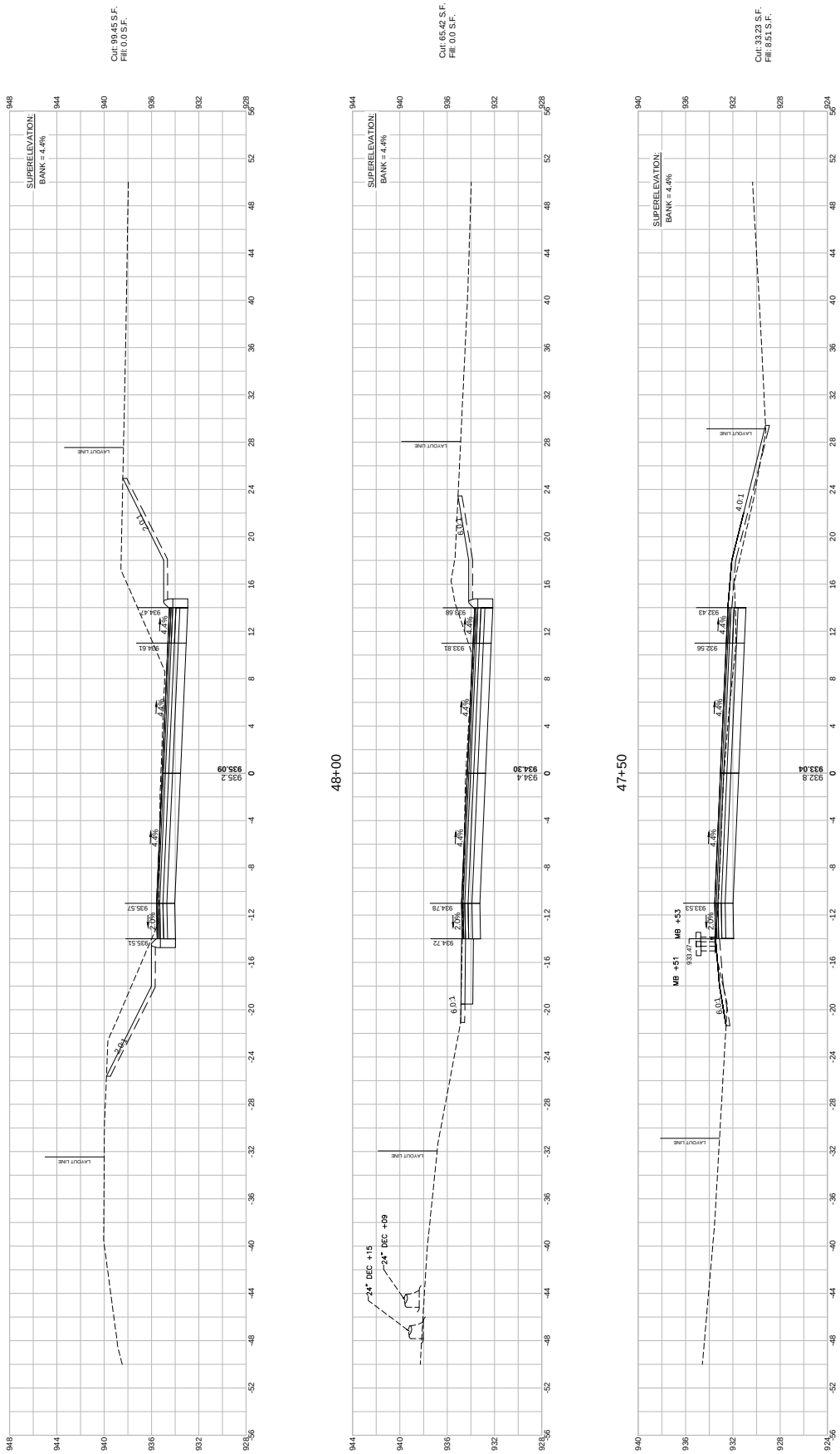
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:45 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	123	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



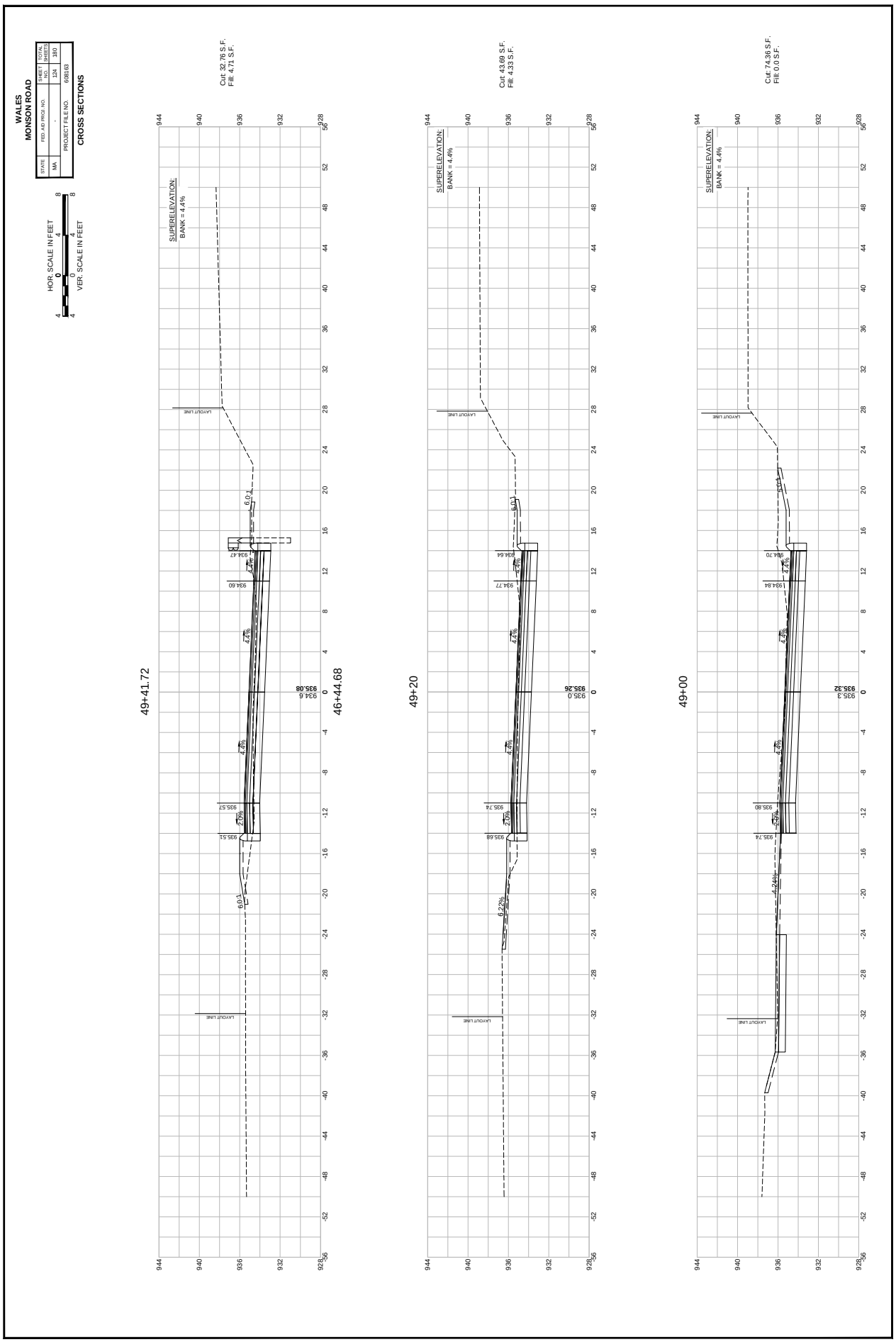
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:46 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	124	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
VER. SCALE IN FEET



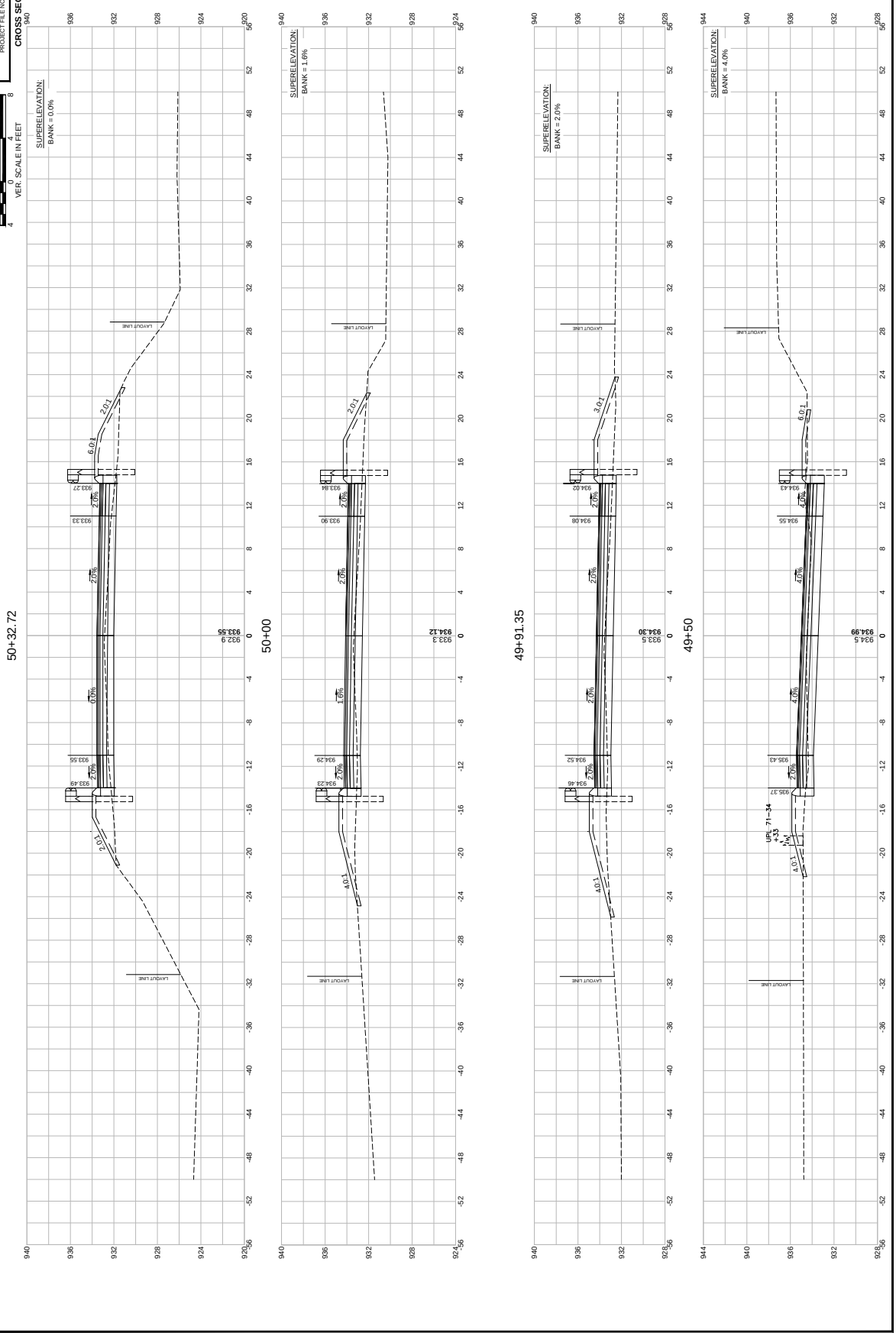
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:46 PM

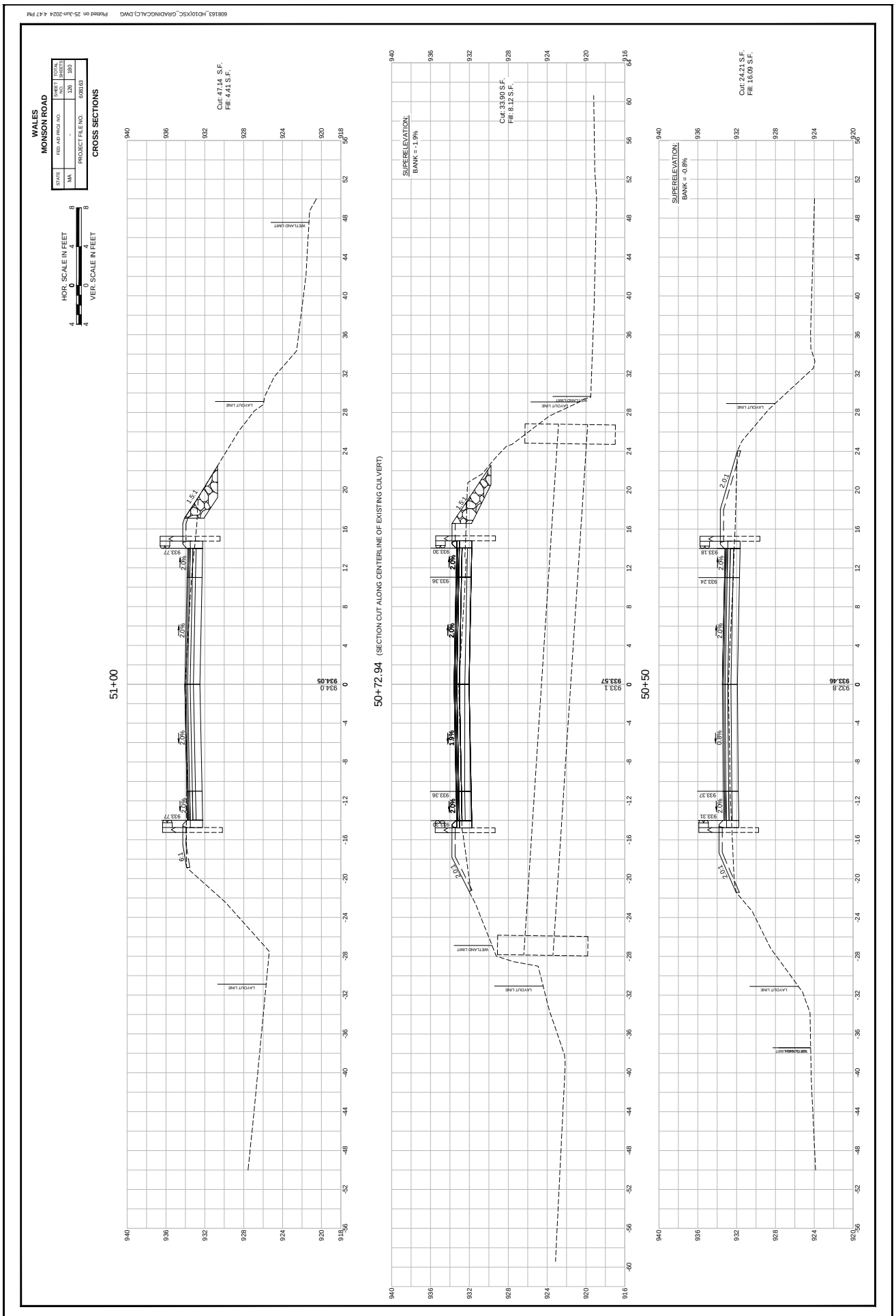
WALES
MONSON ROAD

CROSS SECTIONS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	125	180
	PROJECT FILE NO.	608163	

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8




608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:47 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
126
TOTAL SHEETS
180
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
51+00
Cut: 47.14 S.F.
Fill: 4.41 S.F.
50+72.94 (SECTION CUT ALONG CENTERLINE OF EXISTING CULVERT)
Cut: 33.90 S.F.
Fill: 8.12 S.F.
SUPERELEVATION:
BANK = 1.9%
50+50
Cut: 24.21 S.F.
Fill: 16.09 S.F.
SUPERELEVATION:
BANK = -0.8%
LAYDOUT LINE
WETLAND LIMIT

608163_HD10XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:47 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	127	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
VER. SCALE IN FEET

51+46.26

Cut: 53.78 S.F.
Fill: 4.89 S.F.

SUPERELEVATION:
BANK = 0.0%

51+36.93

Cut: 53.16 S.F.
Fill: 7.35 S.F.

SUPERELEVATION:
BANK = -0.4%

51+04.68

Cut: 76.43 S.F.
Fill: 4.20 S.F.

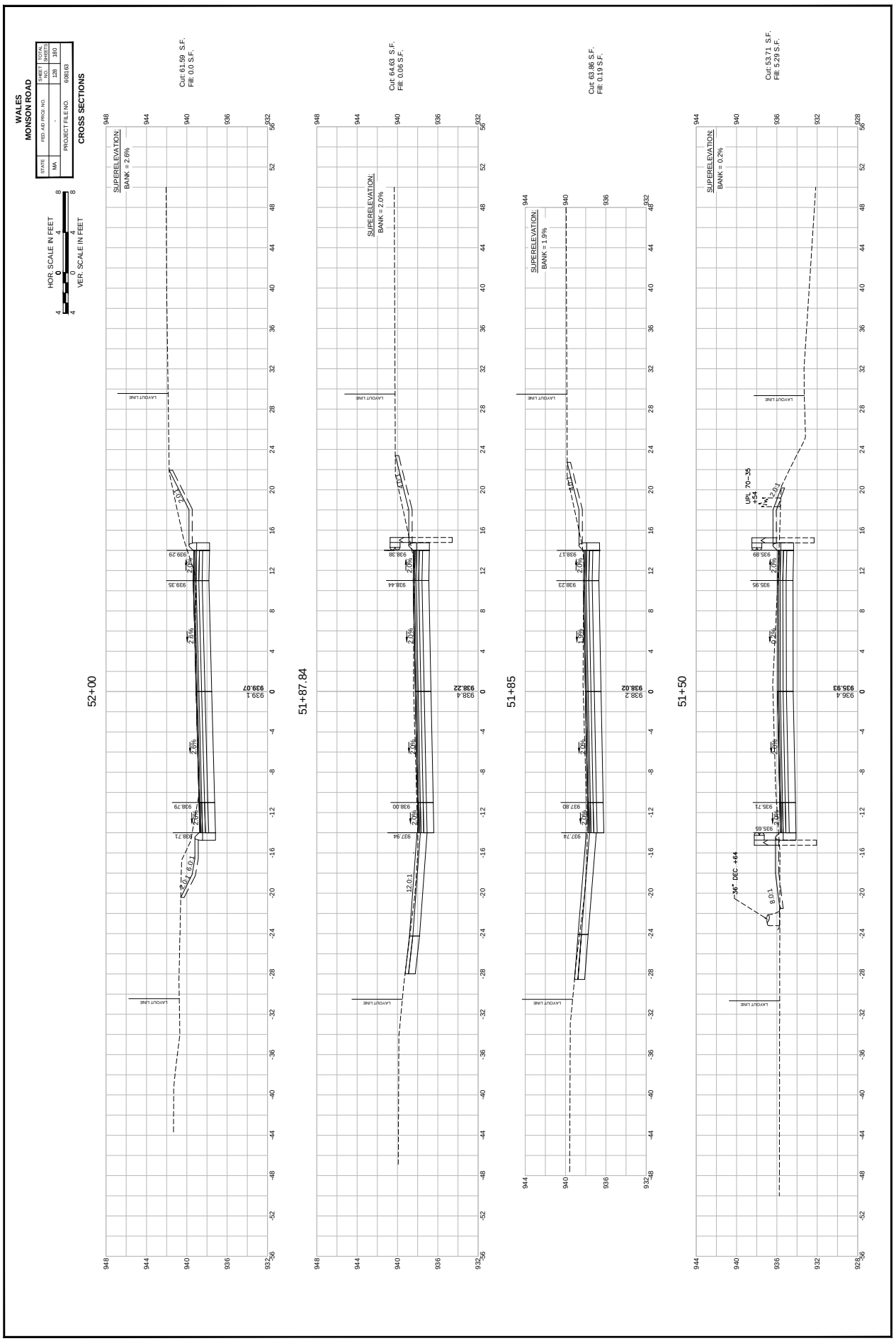
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:48 PM

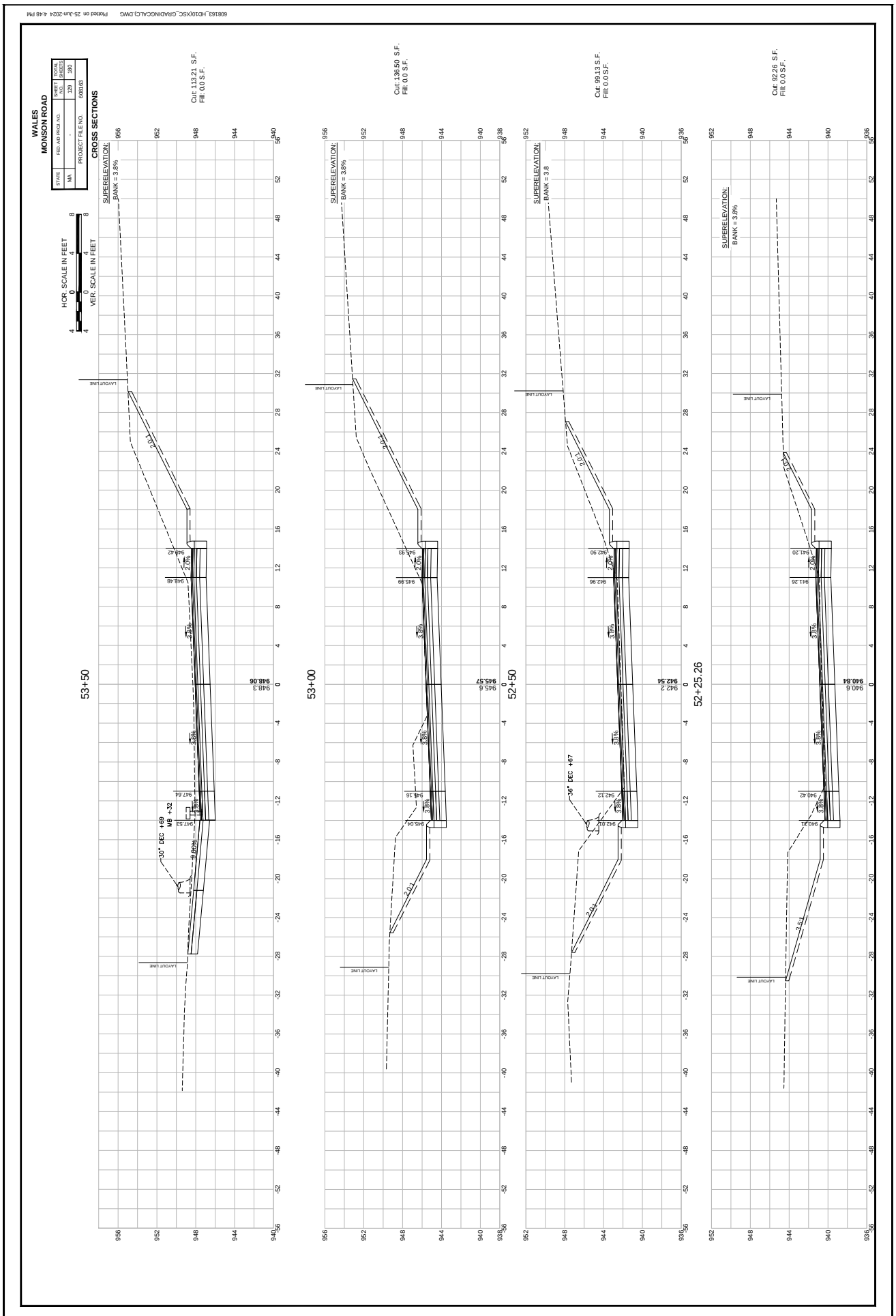
WALES
MONSON ROAD

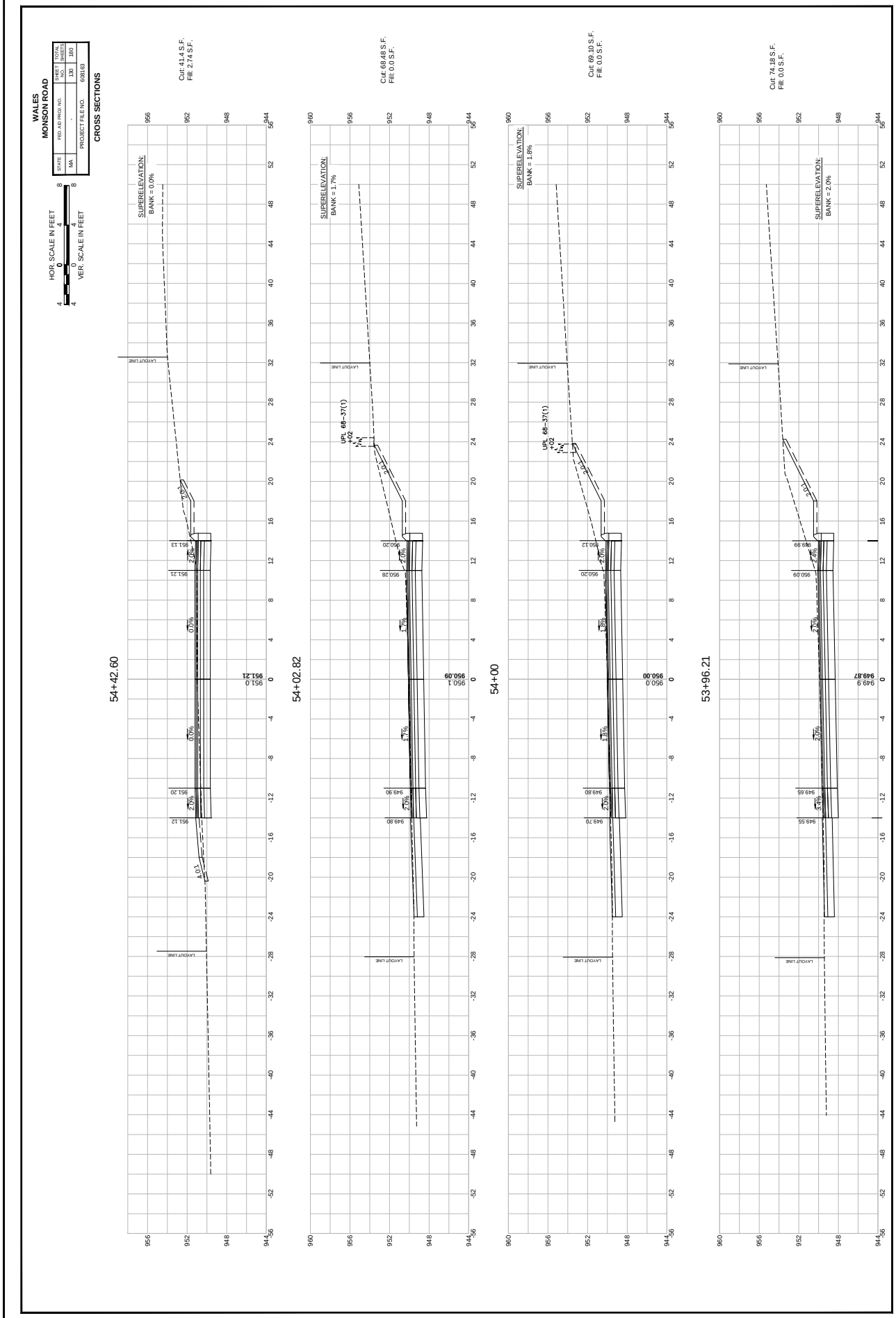
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	128	180
	PROJECT FILE NO.	608163	

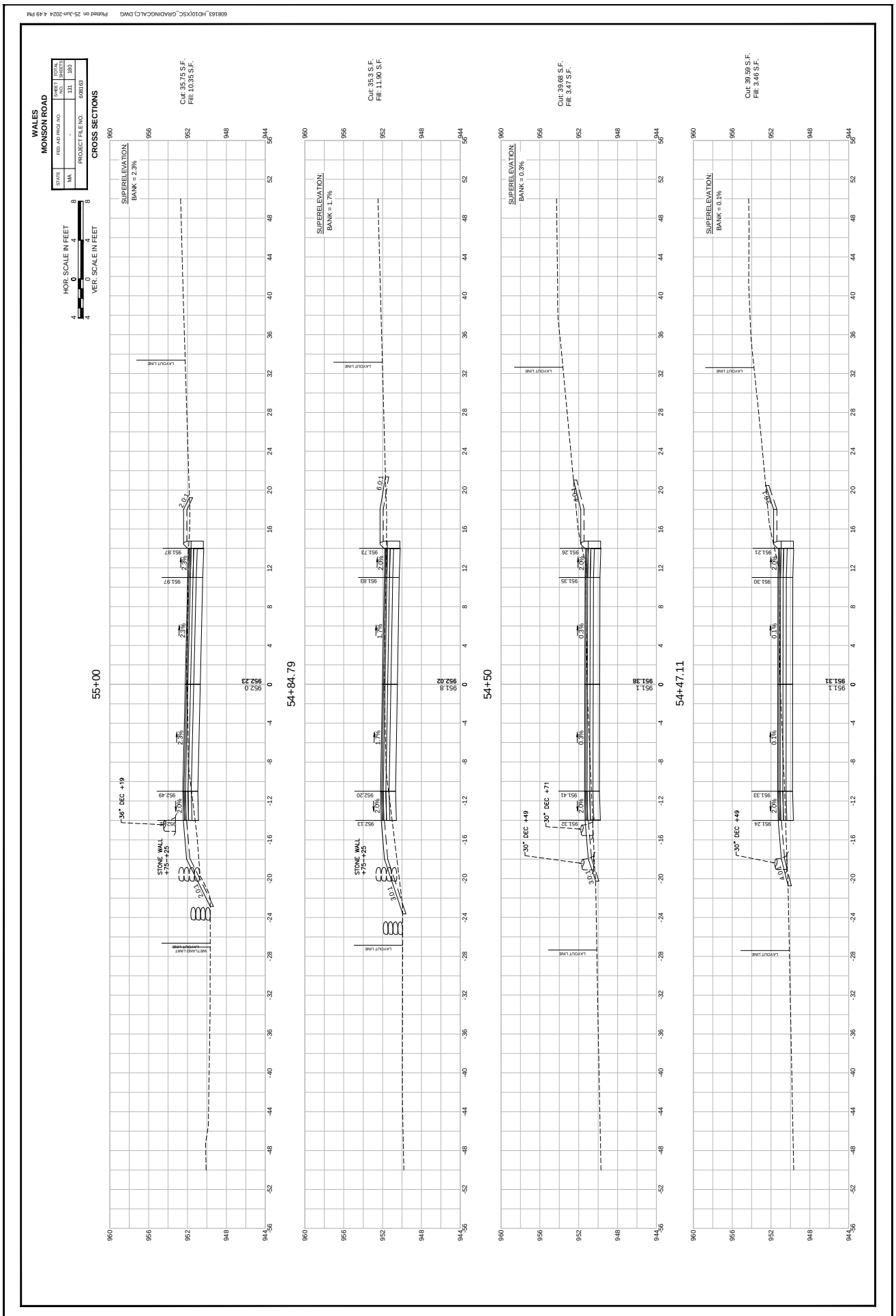
CROSS SECTIONS

HOR. SCALE IN FEET
VER. SCALE IN FEET




608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:48 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
129
TOTAL SHEETS
180
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
SUPERELEVATION:
BANK = 3.8%
Cut: 113.21 S.F.
Fill: 0.0 S.F.
53+50
Cut: 136.50 S.F.
Fill: 0.0 S.F.
53+00
Cut: 99.13 S.F.
Fill: 0.0 S.F.
52+50
Cut: 92.26 S.F.
Fill: 0.0 S.F.
52+25.26
LAYOUT LINE
30° DEC +69
MB +32


608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:49 PM
WALES
MONSON ROAD
CROSS SECTIONS
STATE MA
FED. AID PROJ. NO. -
PROJECT FILE NO. 608163
SHEET NO. 130
TOTAL SHEETS 180
HOR. SCALE IN FEET
VER. SCALE IN FEET
54+42.60
Cut: 41.4 S.F.
Fill: 2.74 S.F.
54+02.82
Cut: 68.48 S.F.
Fill: 0.0 S.F.
54+00
Cut: 69.10 S.F.
Fill: 0.0 S.F.
53+96.21
Cut: 74.18 S.F.
Fill: 0.0 S.F.
SUPERELEVATION:
BANK = 0.0%
BANK = 1.7%
BANK = 1.8%
BANK = 2.0%
UPL 68-37(1)
LAYOUT LINE


608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:49 PM
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
131
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
55+00
54+84.79
54+50
54+47.11
Cut: 35.75 S.F.
Fill: 10.35 S.F.
Cut: 35.3 S.F.
Fill: 11.90 S.F.
Cut: 39.68 S.F.
Fill: 3.47 S.F.
Cut: 39.59 S.F.
Fill: 3.46 S.F.
SUPERELEVATION:
BANK = 2.3%
SUPERELEVATION:
BANK = 1.7%
SUPERELEVATION:
BANK = 0.3%
SUPERELEVATION:
BANK = 0.1%
STONE WALL
+75-+25
36" DEC +19
30" DEC +49
30" DEC +71
LAYOUT LINE
WETLAND LIMIT
LAYOUT LINE

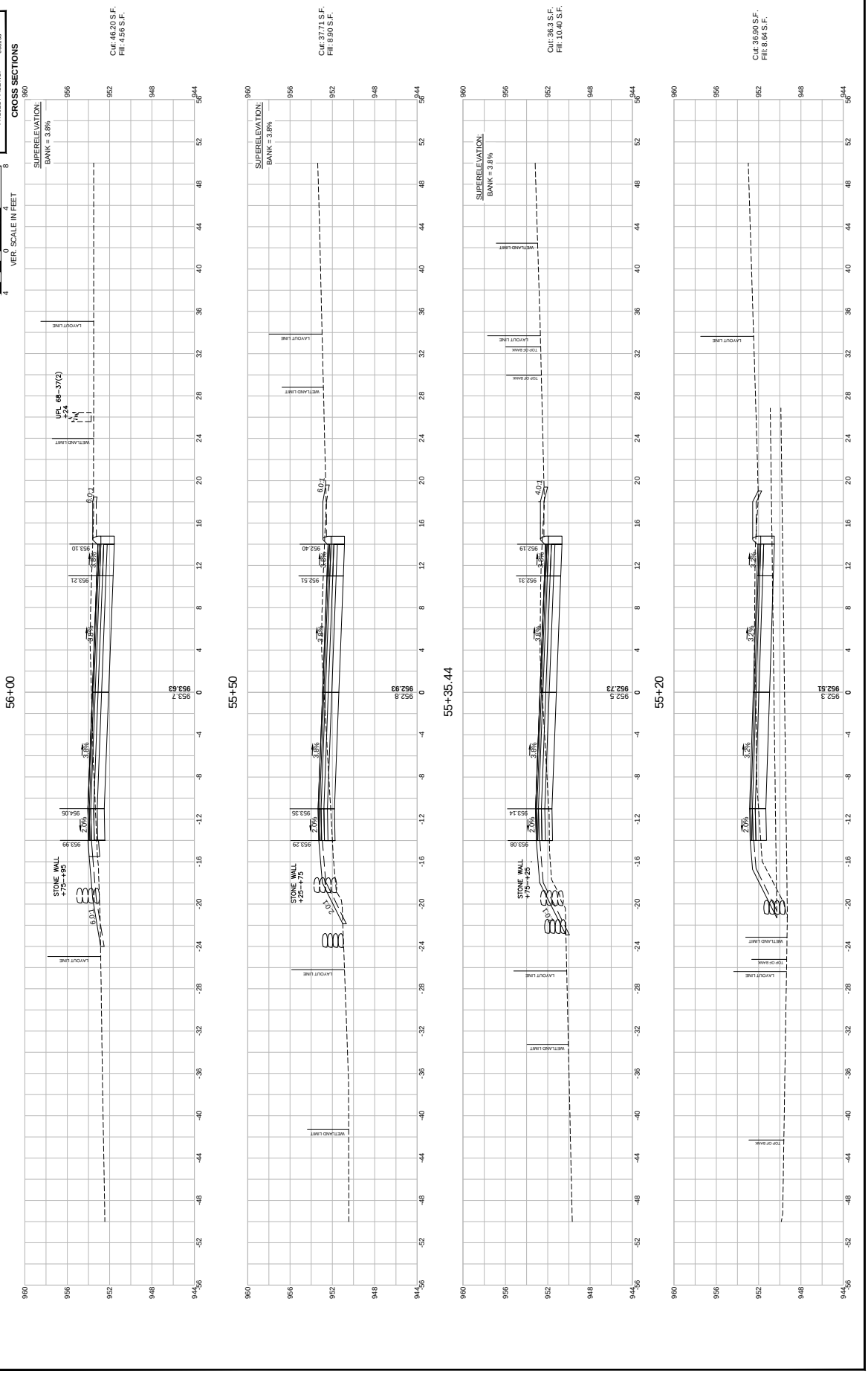
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:50 PM

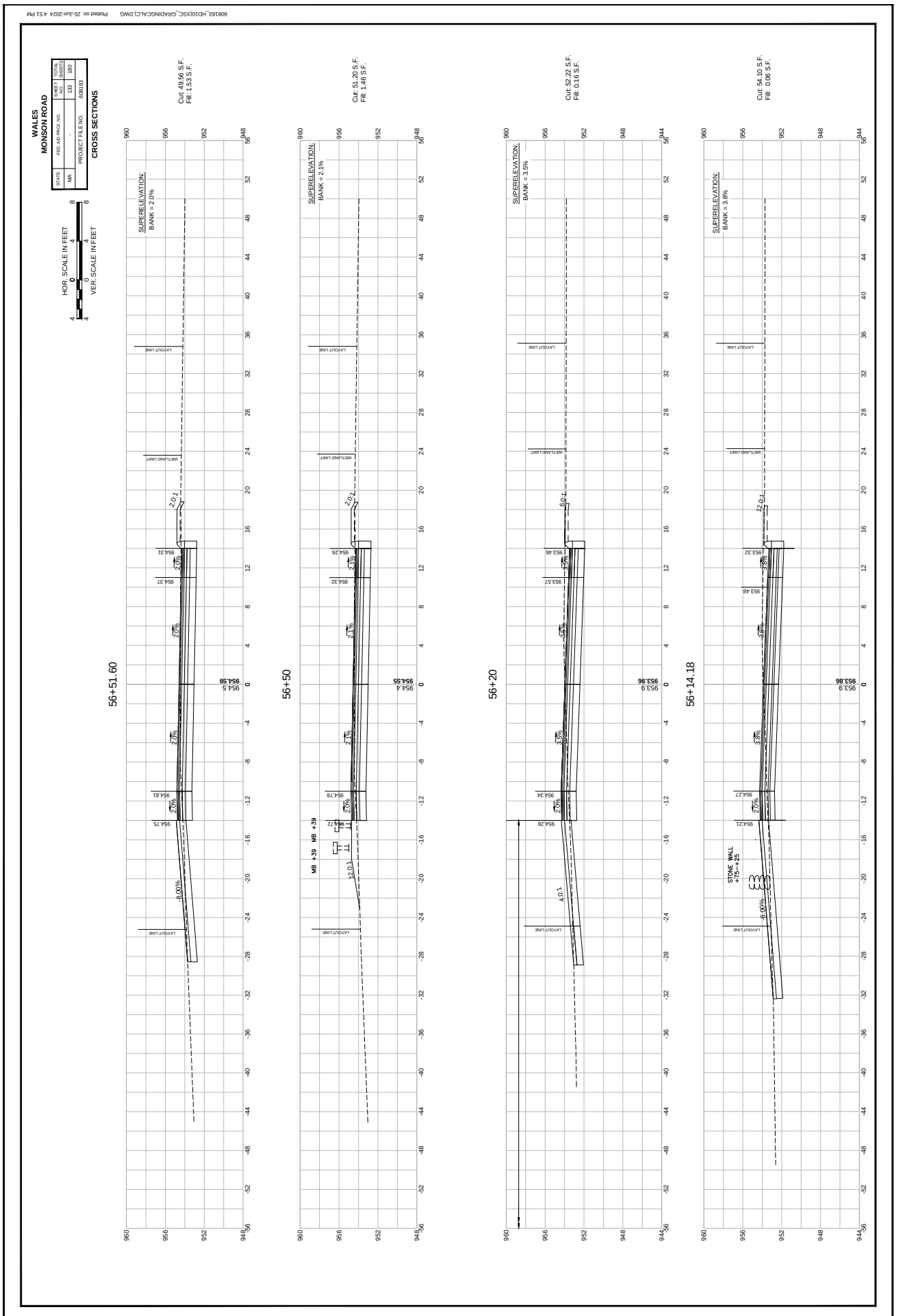
WALES
MONSON ROAD

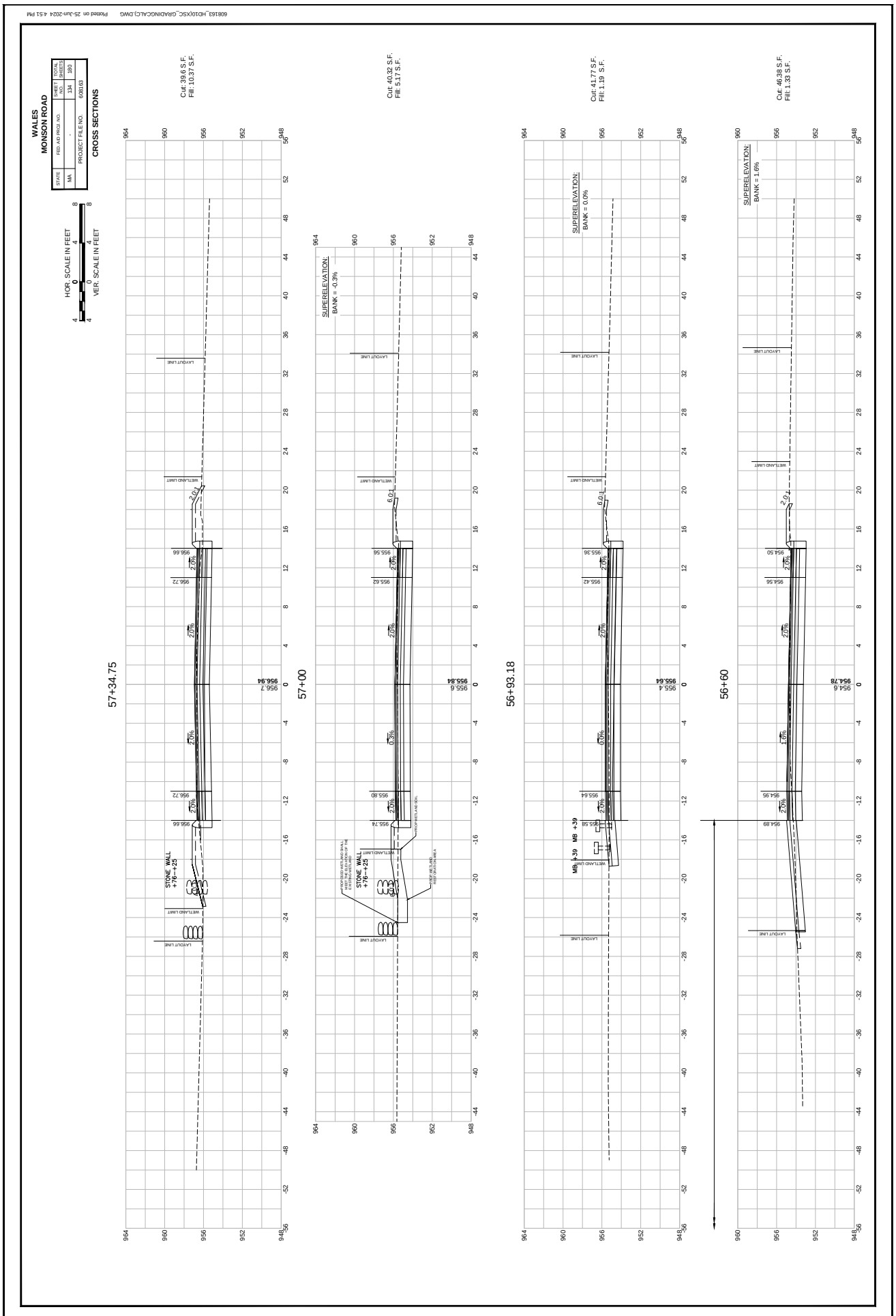
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	132	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8




608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:51 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
133
TOTAL SHEETS
180
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
56+51.60
Cut: 49.56 S.F.
Fill: 1.53 S.F.
56+50
Cut: 51.20 S.F.
Fill: 1.46 S.F.
56+20
Cut: 52.22 S.F.
Fill: 0.16 S.F.
56+14.18
Cut: 54.10 S.F.
Fill: 0.06 S.F.
SUPERELEVATION:
BANK = 2.0%
BANK = 2.1%
BANK = 3.5%
BANK = 3.8%
LAYOUT LINE
WETLAND LIMIT
MB +39
STONE WALL
+75—+25


608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:51 PM
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
134
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 39.6 S.F.
Fill: 10.37 S.F.
Cut: 40.32 S.F.
Fill: 5.17 S.F.
Cut: 41.77 S.F.
Fill: 1.19 S.F.
Cut: 46.38 S.F.
Fill: 1.33 S.F.
57+34.75
57+00
56+93.18
56+60
SUPERELEVATION:
BANK = -0.3%
SUPERELEVATION:
BANK = 0.0%
SUPERELEVATION:
BANK = 1.6%
STONE WALL
+76 - +25
MB +39
LAYOUT LINE
WETLAND LIMIT

608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:52 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	138	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 0 4 8
VER. SCALE IN FEET 0 4 8

58+50
Cut: 47.05 S.F.
Fill: 2.44 S.F.
961.9
961.88
LAYOUT LINE
6.0:1
2.0%
STONE WALL +75–+02

58+00
Cut: 41.36 S.F.
Fill: 5.13 S.F.
959.4
959.50
WETLAND LIMIT
LAYOUT LINE
6.0:1
2.0%
STONE WALL +75–+02

57+50
Cut: 33.54 S.F.
Fill: 9.34 S.F.
957.2
957.49
LAYOUT LINE
WETLAND LIMIT
UPL 67.5–37.5 +68
2.0%
STONE WALL +25–+75

57+46.79
Cut: 35.16 S.F.
Fill: 9.52 S.F.
957.1
957.37
LAYOUT LINE
WETLAND LIMIT
2.0%
STONE WALL +25–+75

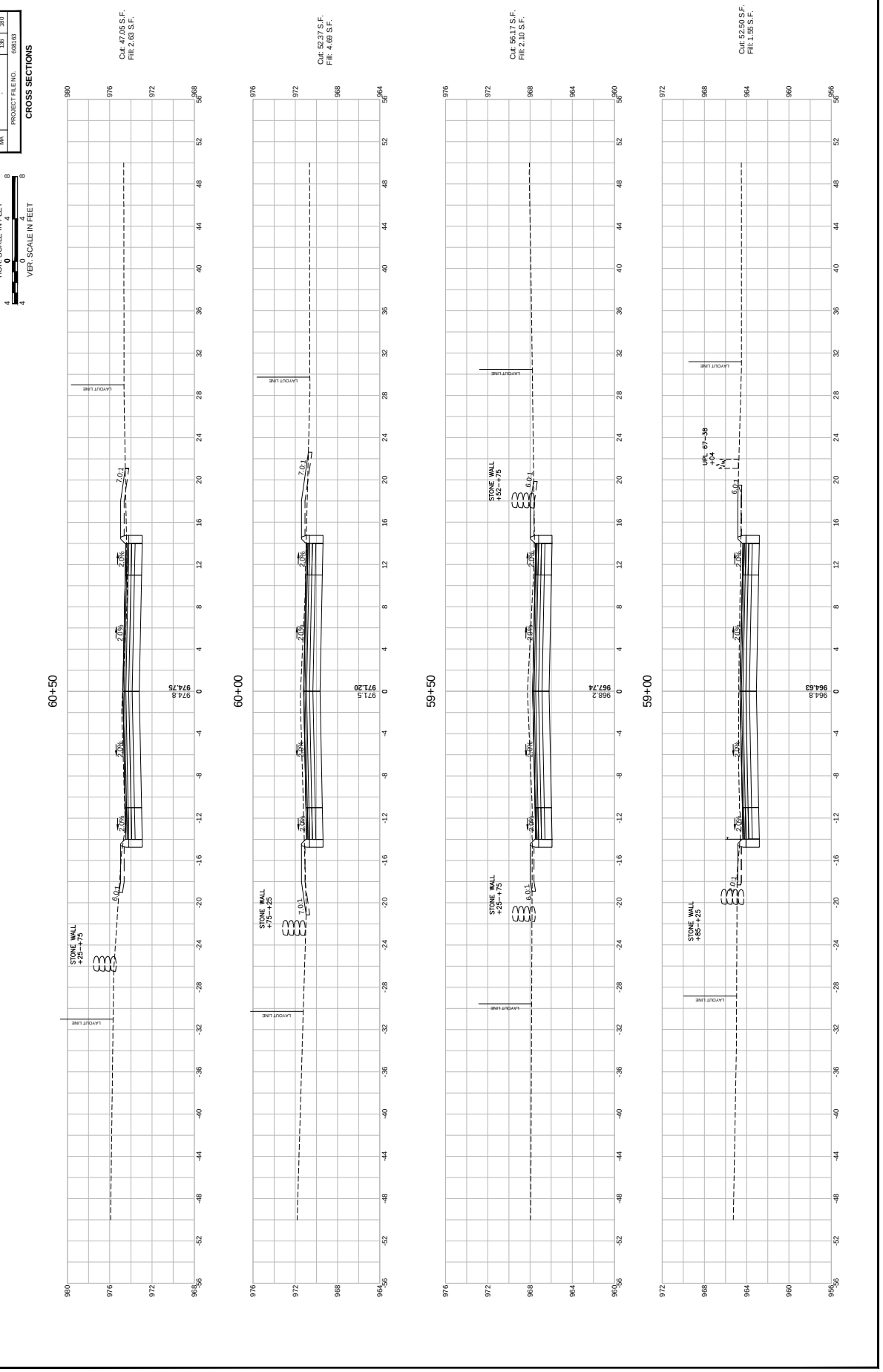
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:53 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	138	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:53 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	137	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

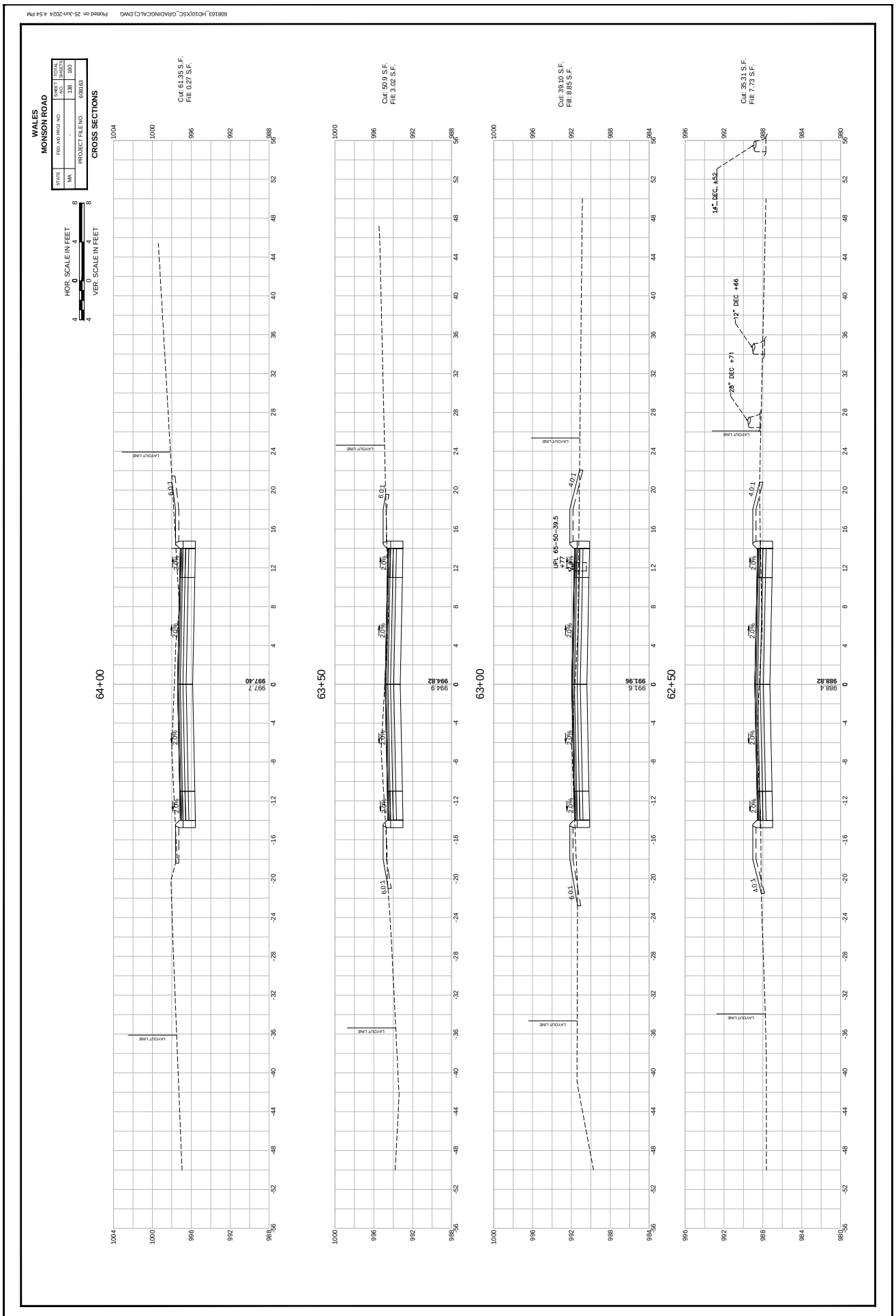
HOR. SCALE IN FEET
VER. SCALE IN FEET

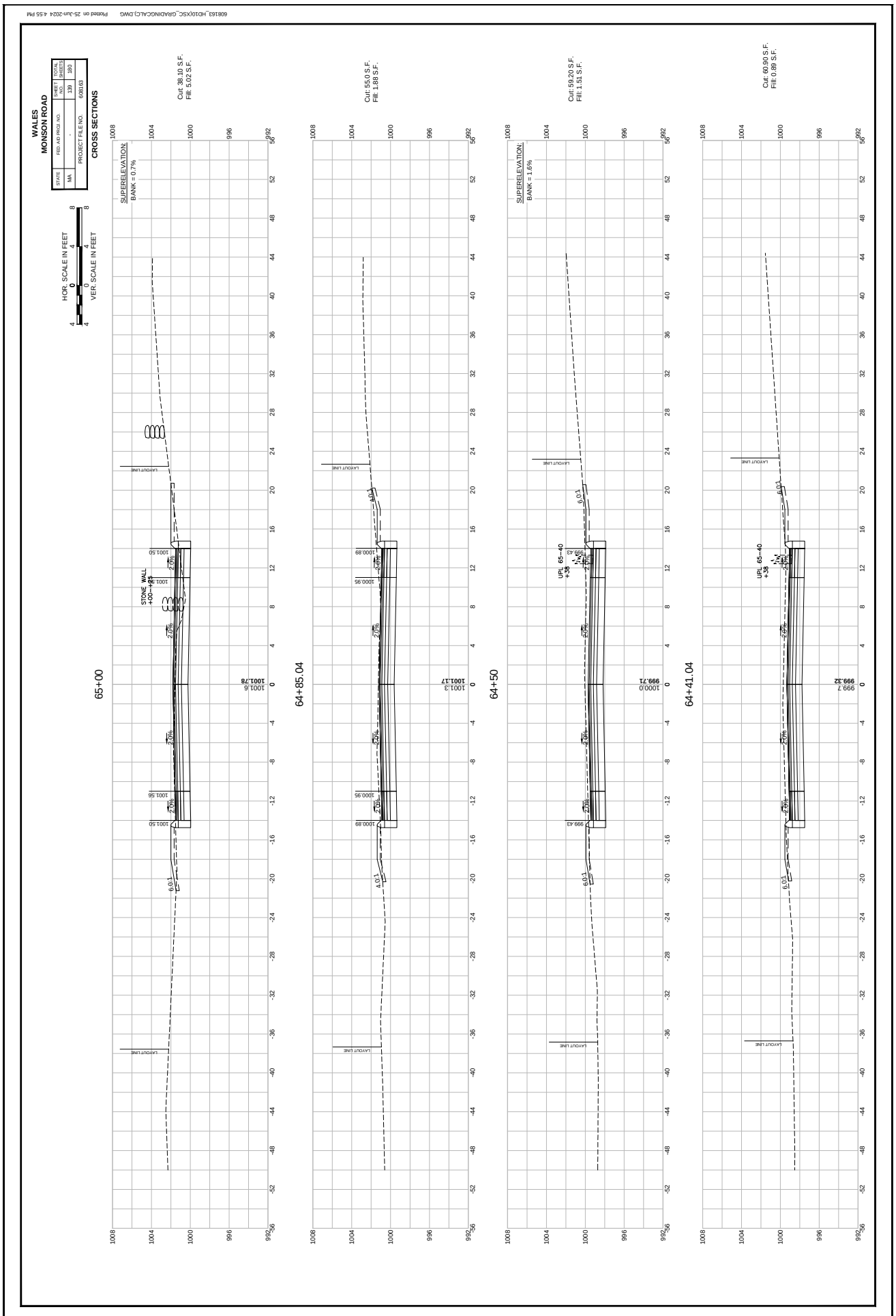
62+00
Cut: 30.14 S.F.
Fill: 12.60 S.F.
984.8
985.40
LAYOUT LINE
4.0:1
2.0%
6.0:1

61+50
Cut: 39.32 S.F.
Fill: 11.66 S.F.
981.6
981.85
MB +33
LAYOUT LINE
4.0:1
2.0%

61+20
Cut: 62.25 S.F.
Fill: 3.10 S.F.
979.7
979.72
LAYOUT LINE
6.0:1
2.0%

61+00
Cut: 46.67 S.F.
Fill: 1.72 S.F.
978.3
978.30
LAYOUT LINE
6.0:1
2.0%
UP: 66–39
+25
STONE WALL
+75–+09


608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:54 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
138
TOTAL SHEETS
180
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 61.35 S.F.
Fill: 0.27 S.F.
64+00
997.7
997.40
Cut: 50.9 S.F.
Fill: 3.02 S.F.
63+50
994.9
994.82
Cut: 39.10 S.F.
Fill: 9.85 S.F.
63+00
UPL 63+50-39.5
+77
991.6
991.96
Cut: 35.31 S.F.
Fill: 7.73 S.F.
62+50
988.4
988.82
14" DEC. ±52
12" DEC +66
28" DEC +71
LAYOUT LINE
6.0:1
4.0:1
2.0%


608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:55 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
139
TOTAL SHEETS
180
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
65+00
64+85.04
64+50
64+41.04
Cut: 38.10 S.F.
Fill: 5.02 S.F.
Cut: 55.0 S.F.
Fill: 1.88 S.F.
Cut: 59.20 S.F.
Fill: 1.51 S.F.
Cut: 60.90 S.F.
Fill: 0.89 S.F.
SUPERELEVATION
BANK = 0.7%
BANK = 1.6%
STONE WALL
+00+65
UPL 65+40
+38
LAYOUT LINE
1001.50
1001.56
1001.78
1001.6
1001.17
1001.3
1000.89
1000.95
1000.0
999.43
999.71
999.7
999.32
2.0%
4.0%
6.0%
-2.0%
-4.0%
-6.0%

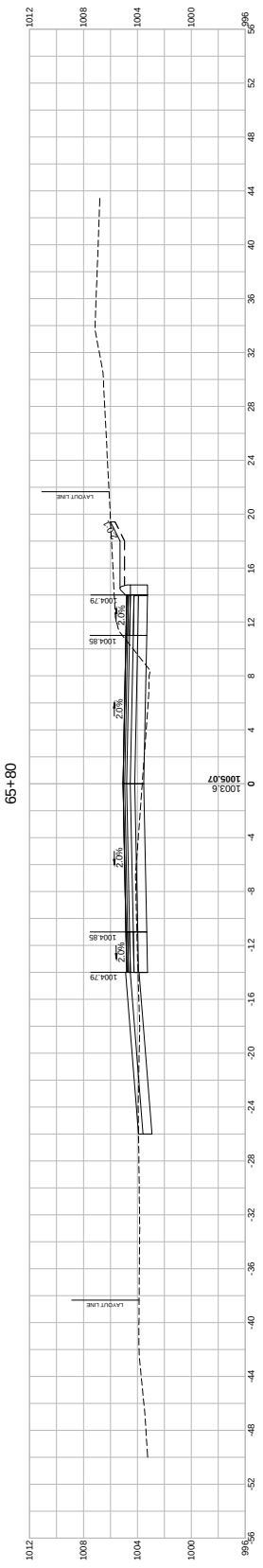
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:55 PM

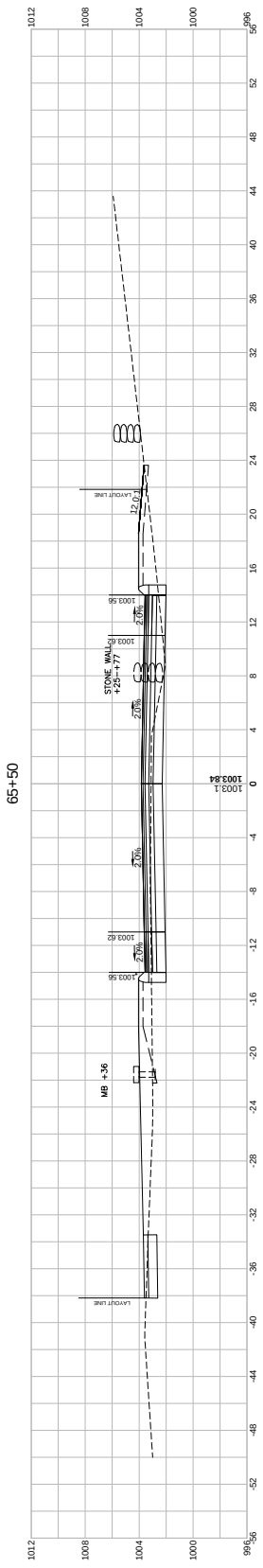
WALES
MONSON ROAD

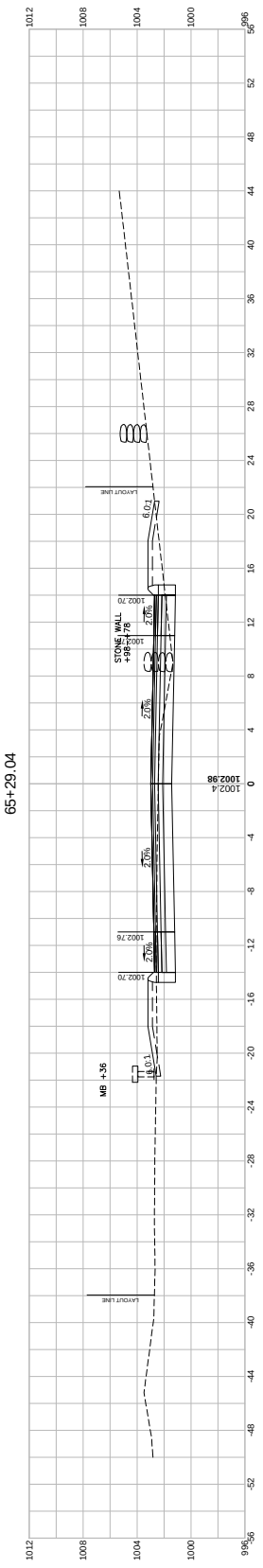
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	140	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8







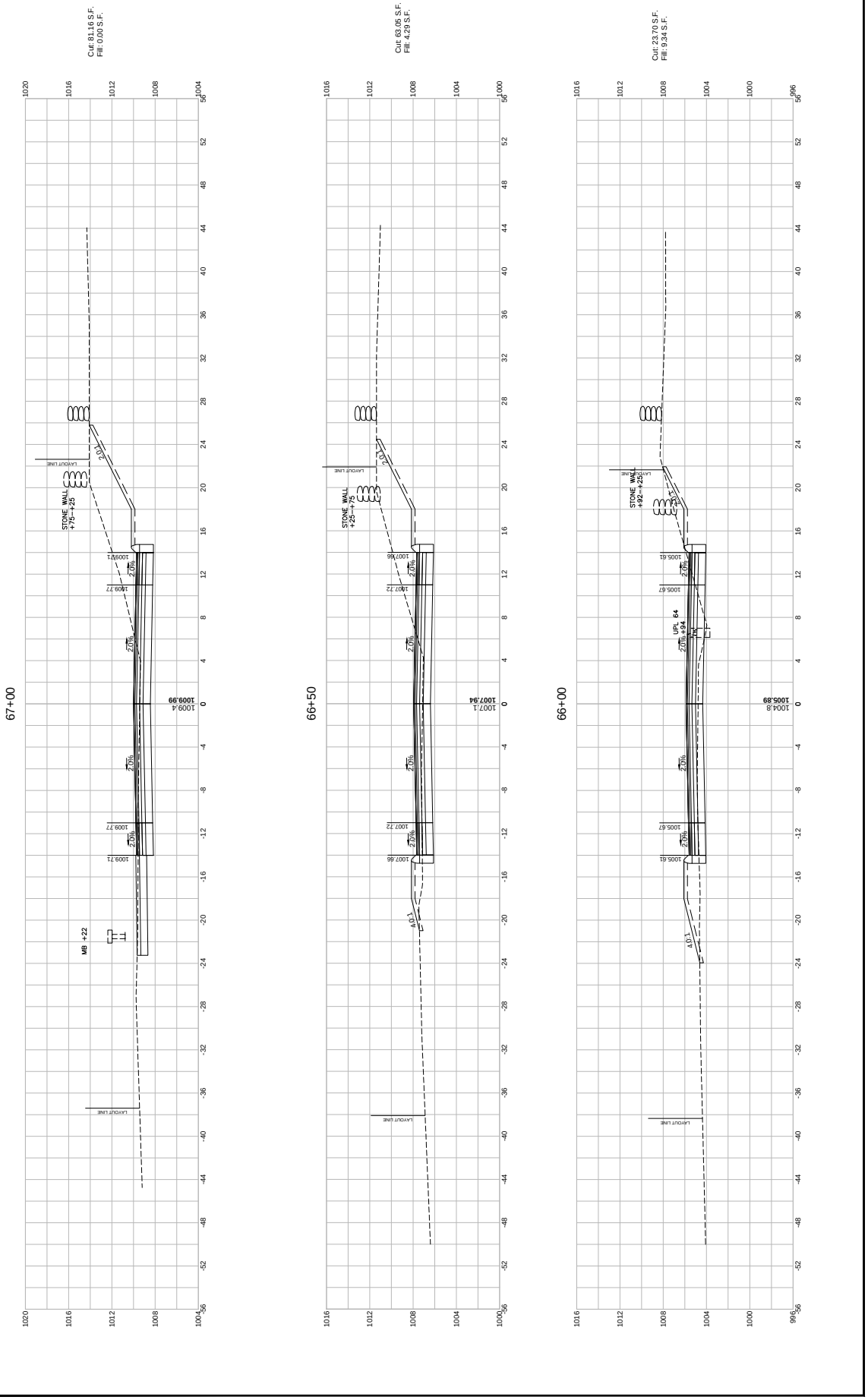
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:56 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	141	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 0 4 8
VER. SCALE IN FEET 0 4 8



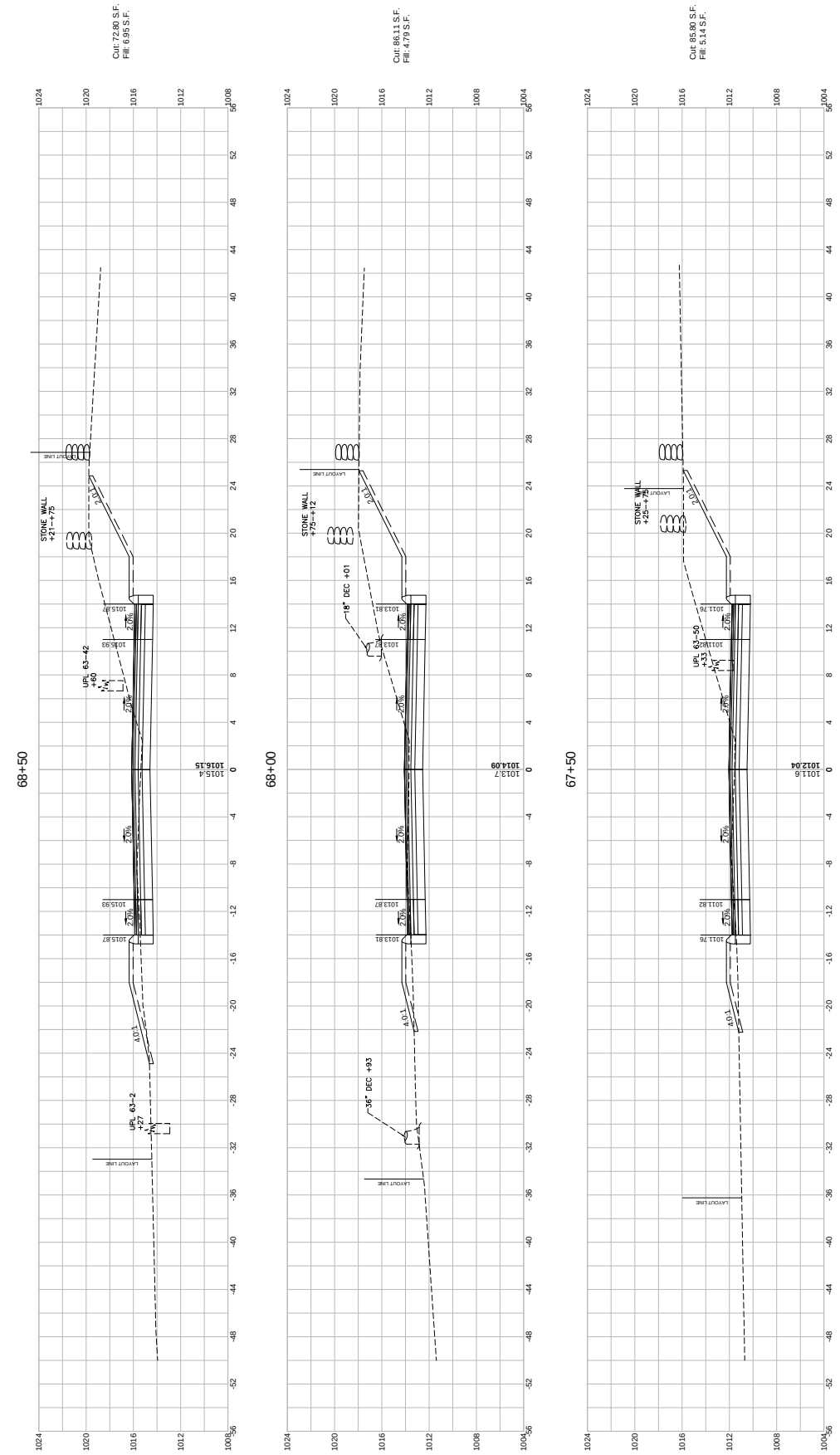
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:56 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	142	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 0 4 8
VER. SCALE IN FEET 0 4 8



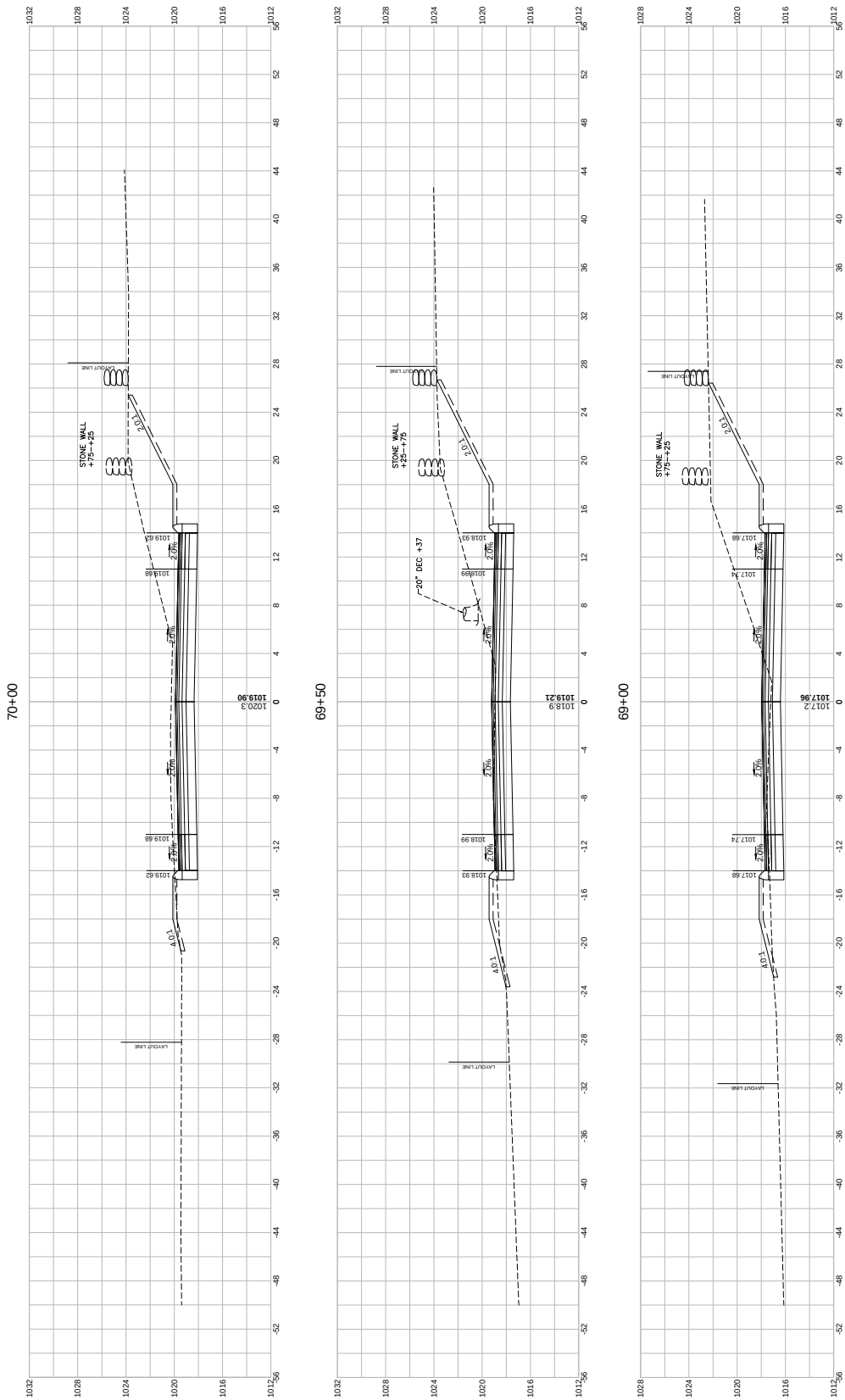
608163_HD10XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:57 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	143	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 0 4 8
VER. SCALE IN FEET 0 4 8



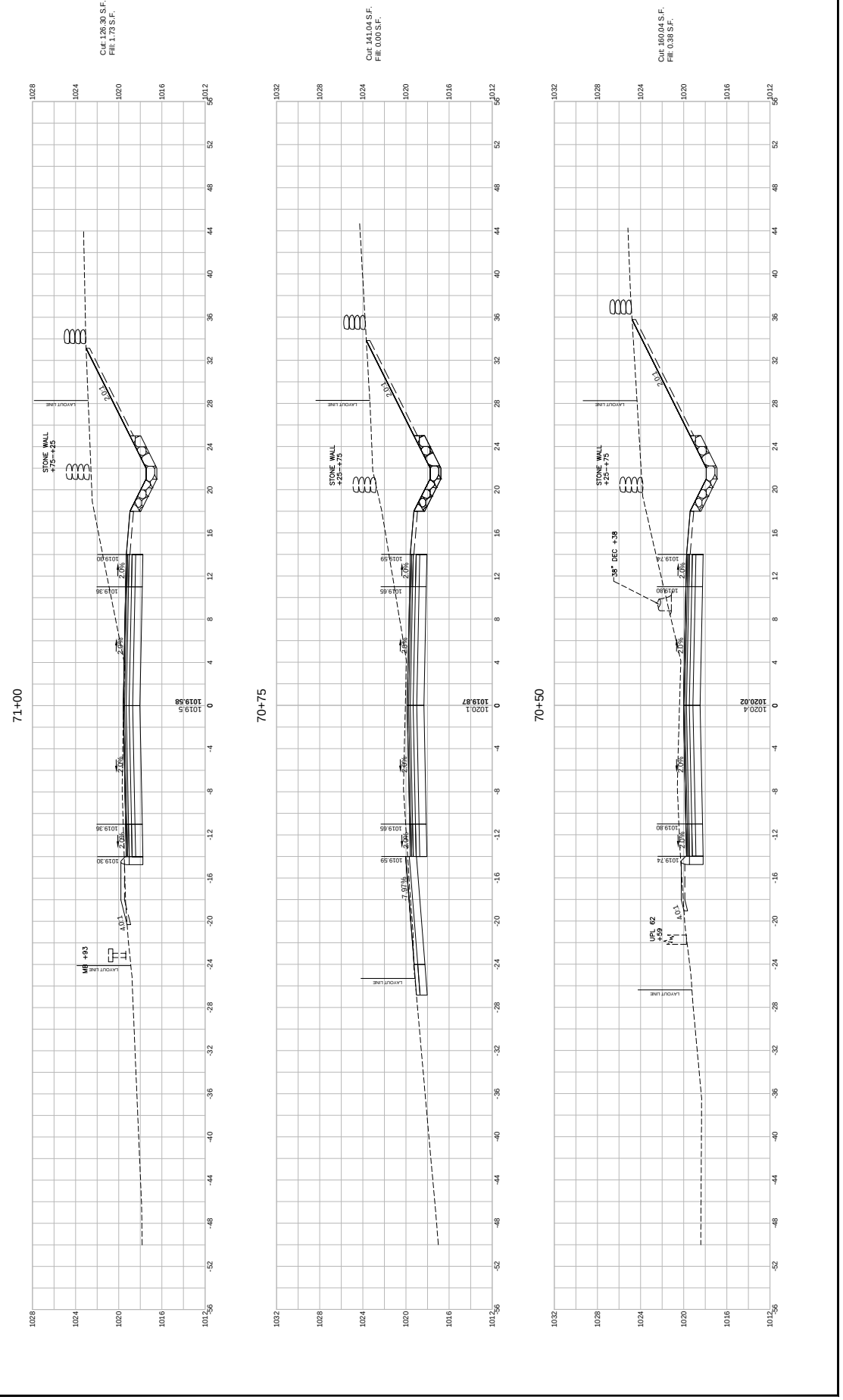
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:57 PM

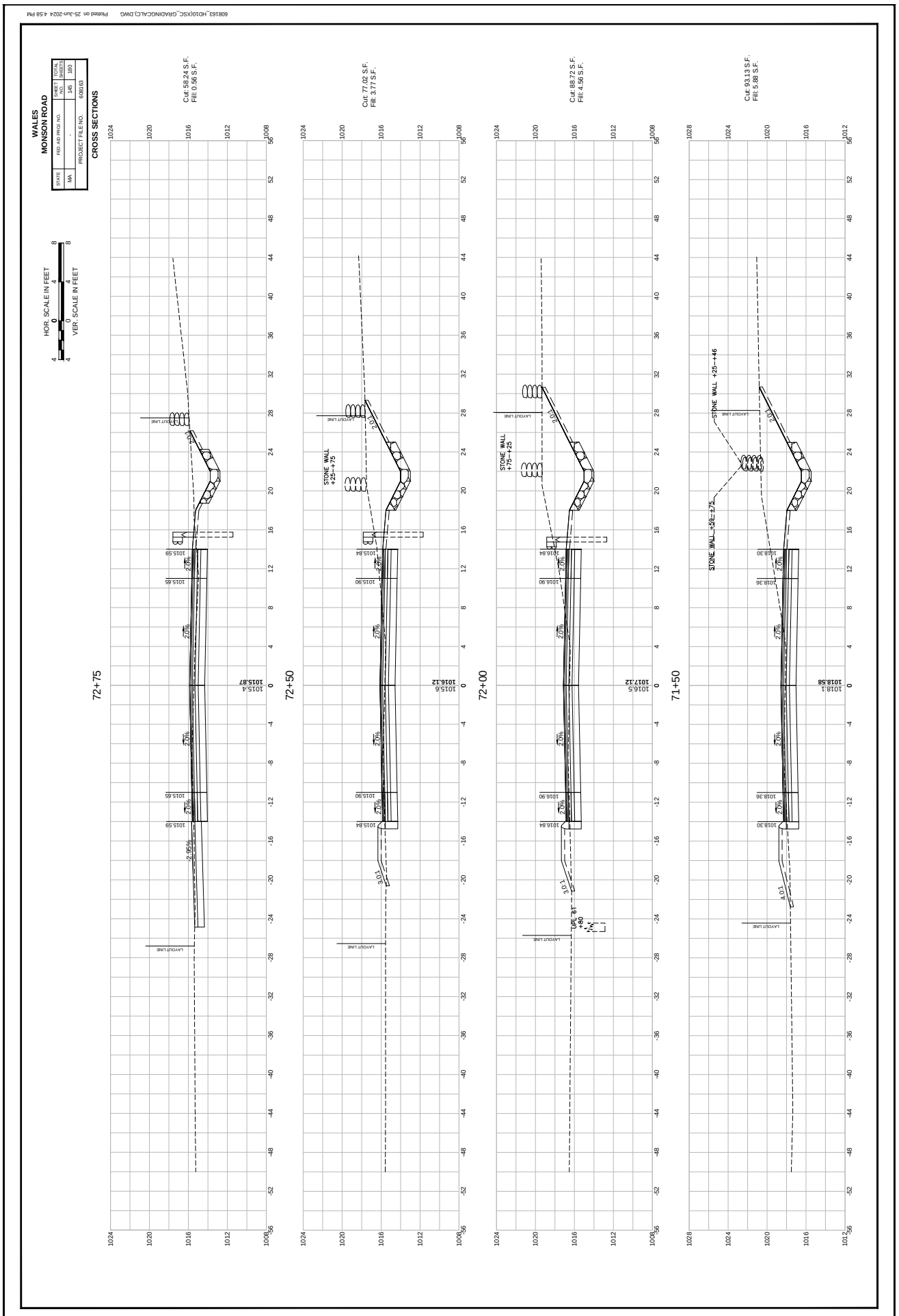
WALES
MONSON ROAD

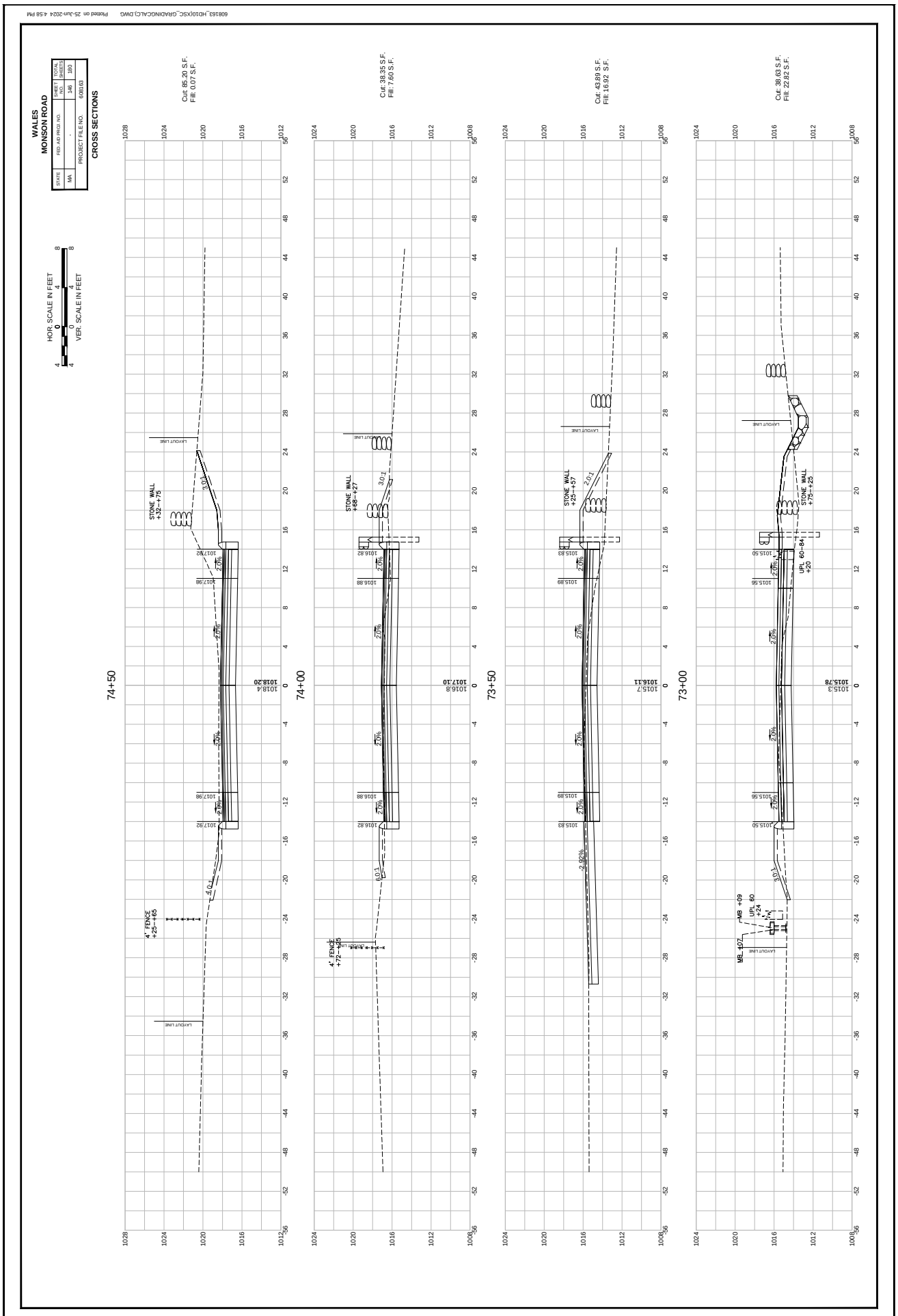
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	144	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 0 4 8
VER. SCALE IN FEET 4 0 8




608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:58 PM
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
145
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 58.24 S.F.
Fill: 0.56 S.F.
Cut: 77.02 S.F.
Fill: 3.77 S.F.
Cut: 88.72 S.F.
Fill: 4.56 S.F.
Cut: 93.13 S.F.
Fill: 5.88 S.F.
72+75
72+50
72+00
71+50
STONE WALL +25-+75
STONE WALL +75-+25
STONE WALL +25-+46
STONE WALL +59-+75
LAYOUT LINE
UPL 61 +80


608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:58 PM
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
146
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 85.20 S.F.
Fill: 0.07 S.F.
Cut: 38.35 S.F.
Fill: 7.60 S.F.
Cut: 43.89 S.F.
Fill: 16.92 S.F.
Cut: 38.63 S.F.
Fill: 22.82 S.F.
74+50
74+00
73+50
73+00
STONE WALL
+32--+75
STONE WALL
+68--+27
STONE WALL
+25--+57
STONE WALL
+75--+25
4' FENCE
+25--+65
4' FENCE
+72--+45
UPL 60--84
+20
UPL 60
+24
MB +09
MB +07
LAYOUT LINE

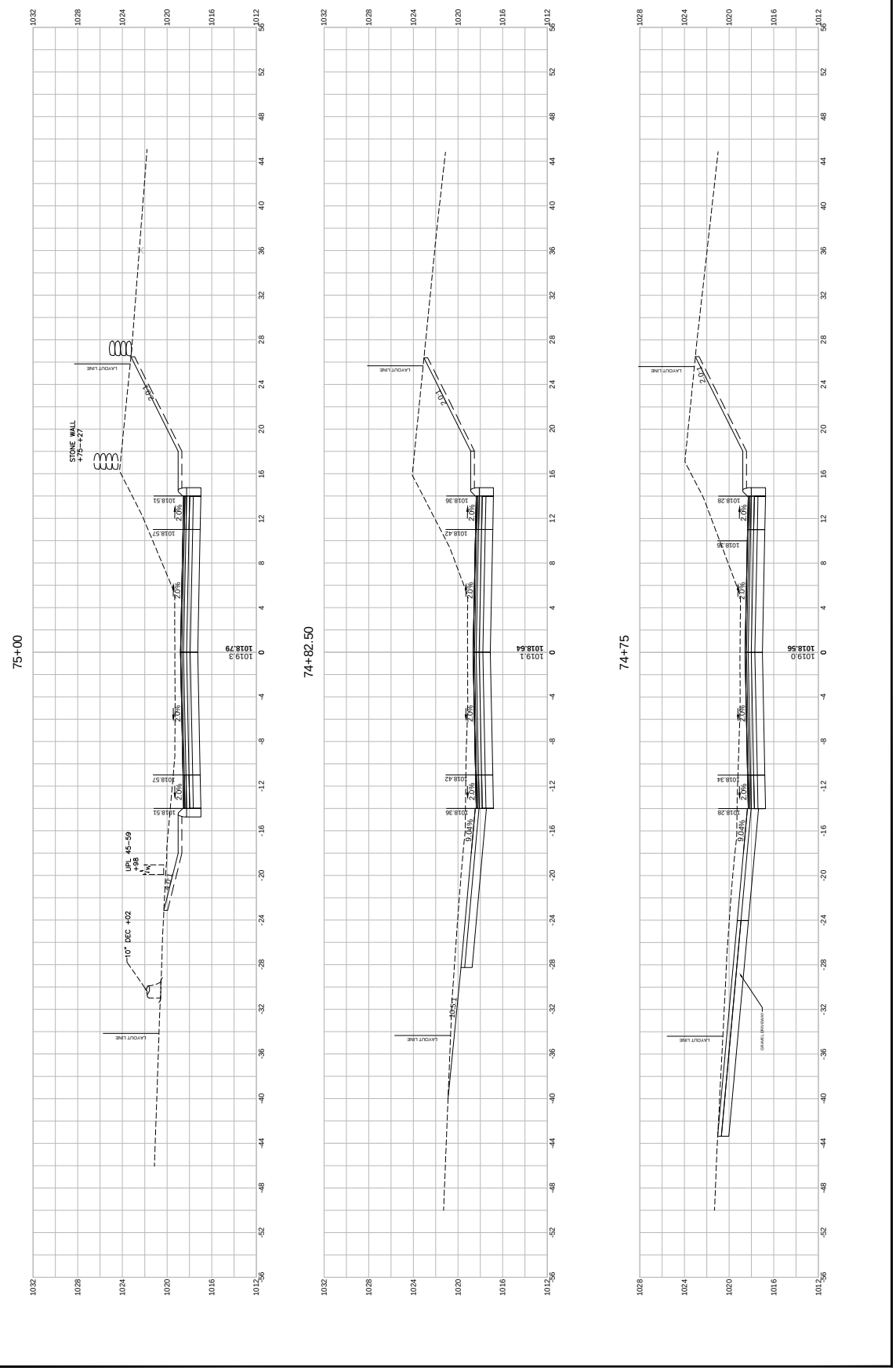
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 4:59 PM

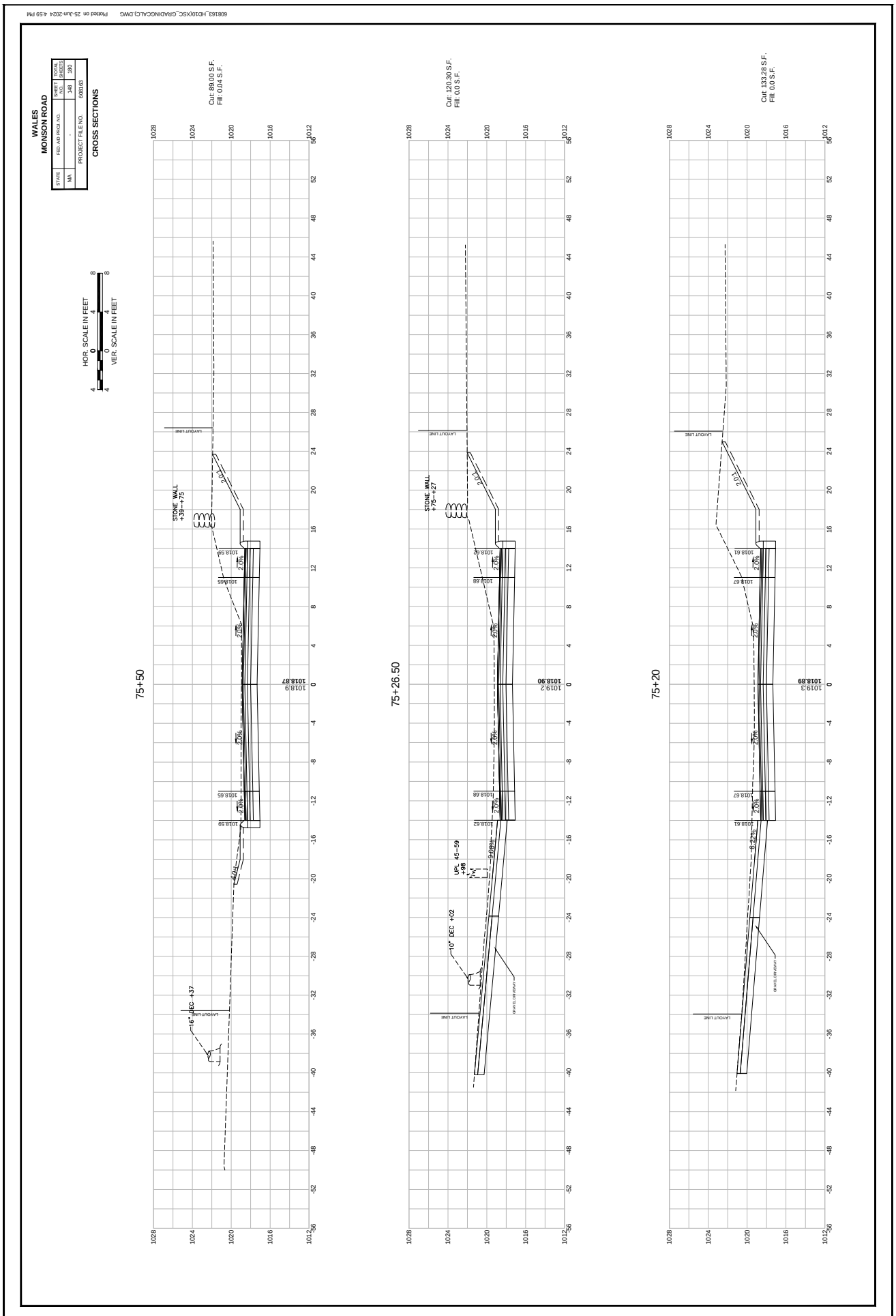
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	147	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
8 4 0 4 8
VER. SCALE IN FEET
4 0 4




608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 4:59 PM
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
148
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 89.00 S.F.
Fill: 0.04 S.F.
Cut: 120.30 S.F.
Fill: 0.0 S.F.
Cut: 133.28 S.F.
Fill: 0.0 S.F.
75+50
75+26.50
75+20
STONE WALL
+39--+75
STONE WALL
+75--+27
UPL 45-59
+98
16" DEC +37
10" DEC +02
LAYOUT LINE
GRAVEL DRIVEWAY
1018.9
1018.87
1019.2
1018.90
1019.3
1018.89

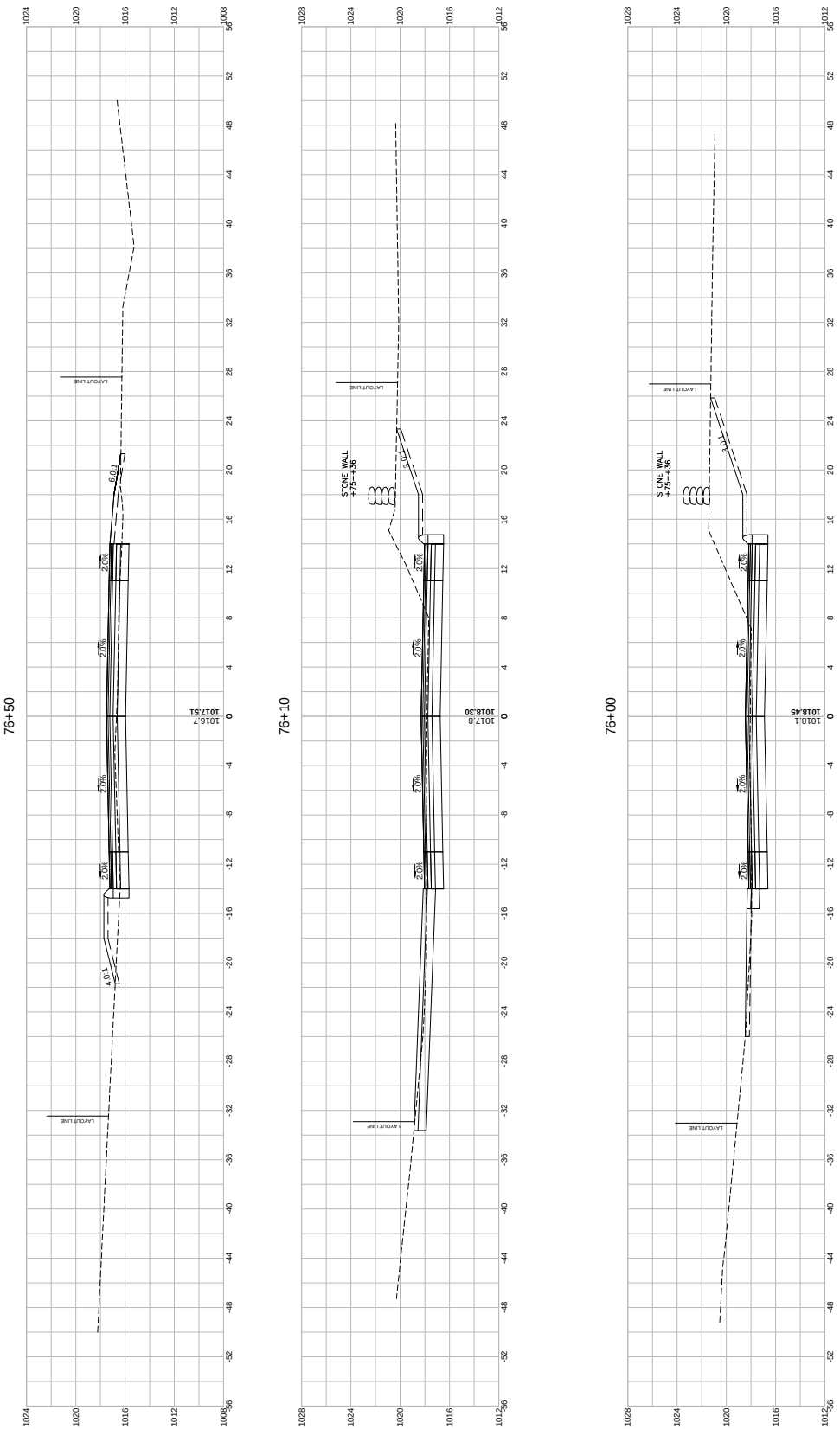
608163_HD10XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 5:00 PM

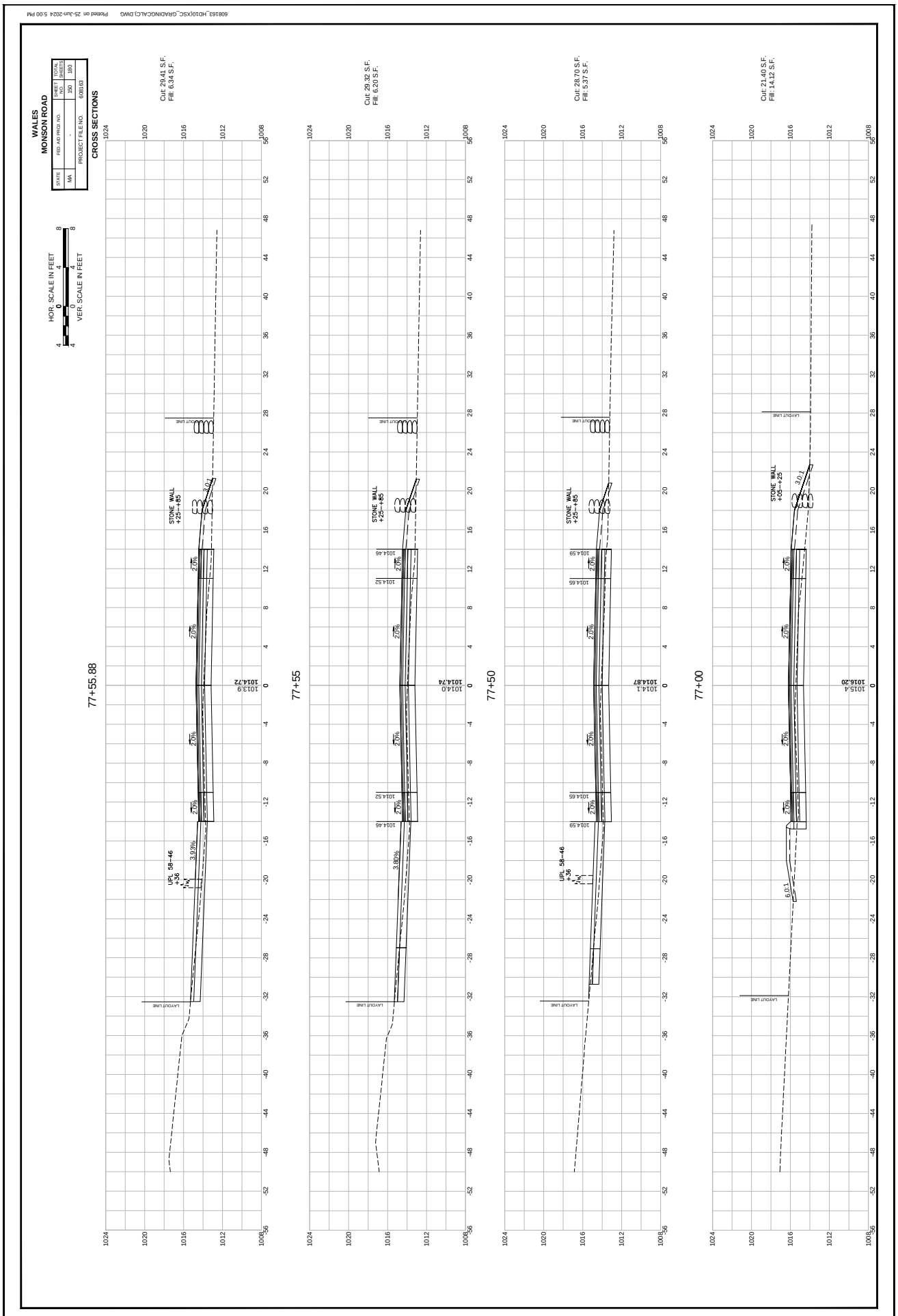
WALES
MONSON ROAD

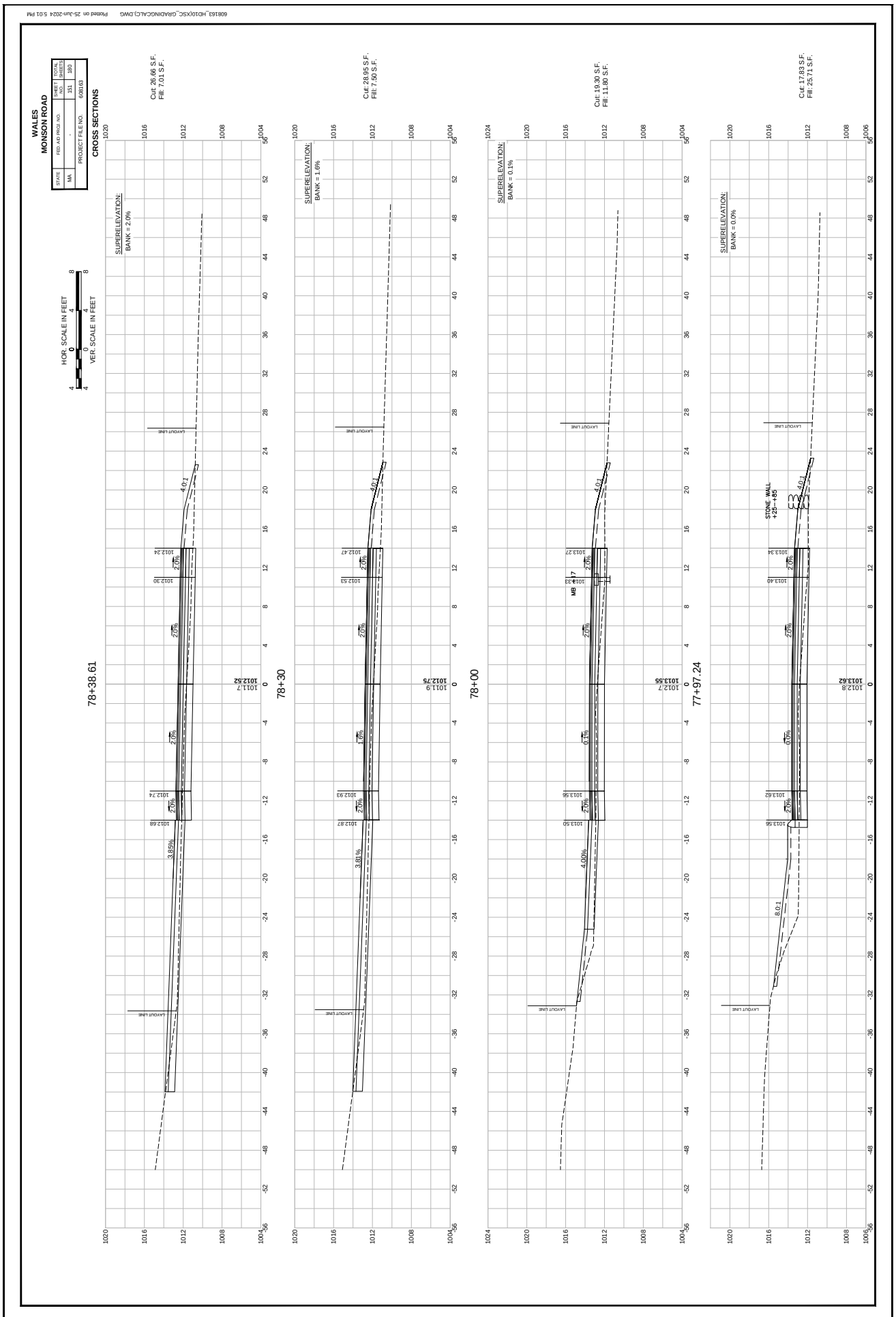
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	149	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8




608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 5:00 PM
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
150
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 29.41 S.F.
Fill: 6.34 S.F.
Cut: 29.32 S.F.
Fill: 6.20 S.F.
Cut: 28.70 S.F.
Fill: 5.37 S.F.
Cut: 21.40 S.F.
Fill: 14.12 S.F.
77+55.88
77+55
77+50
77+00
STONE WALL
+25--+85
UPL 58--46
+36
1013.9
1014.72
1014.0
1014.74
1014.1
1014.87
1015.4
1016.20
LAYOUT LINE


608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 5:01 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
151
TOTAL SHEETS
180
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 26.66 S.F.
Fill: 7.01 S.F.
SUPERELEVATION:
BANK = 2.0%
78+38.61
Cut: 28.95 S.F.
Fill: 7.50 S.F.
SUPERELEVATION:
BANK = 1.6%
78+30
Cut: 19.30 S.F.
Fill: 11.80 S.F.
SUPERELEVATION:
BANK = 0.1%
78+00
Cut: 17.83 S.F.
Fill: 25.71 S.F.
SUPERELEVATION:
BANK = 0.0%
77+97.24
STONE WALL
+25 — +85
LAYOUT LINE
4.0:1
8.0:1
2.0%
1.6%
0.1%
0.0%
3.81%
4.00%
MB 17

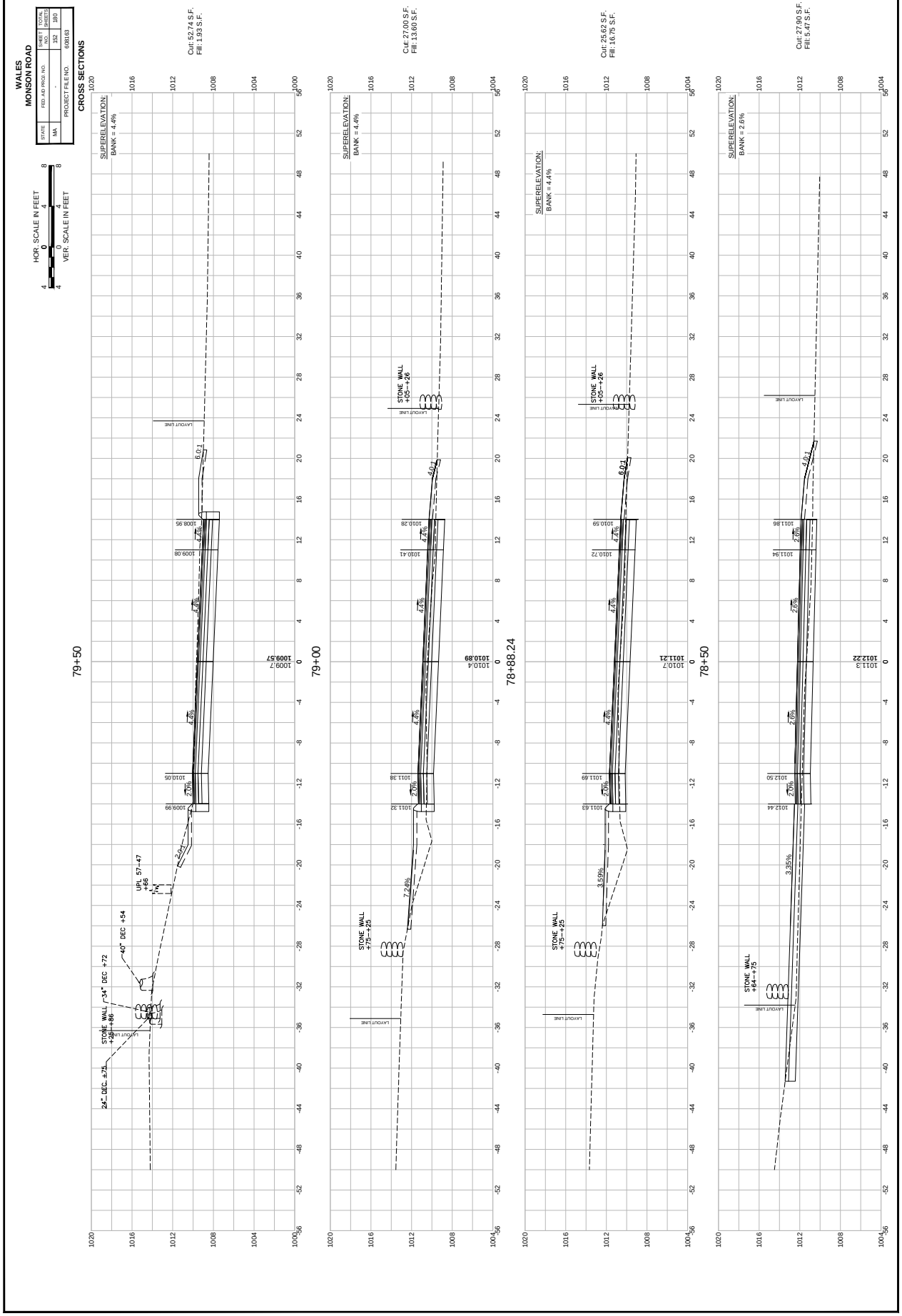
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 5:01 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	152	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



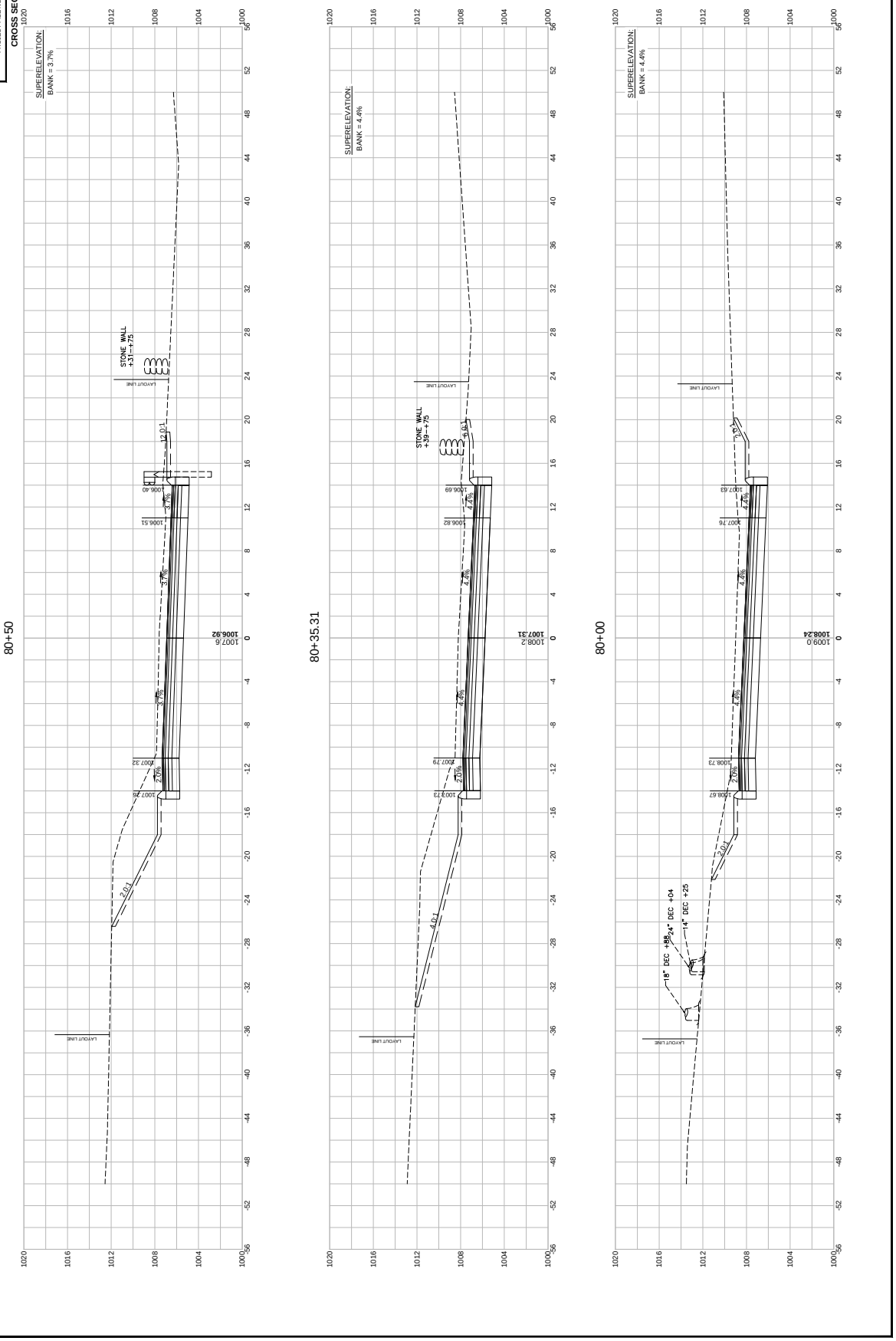
608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 5:02 PM

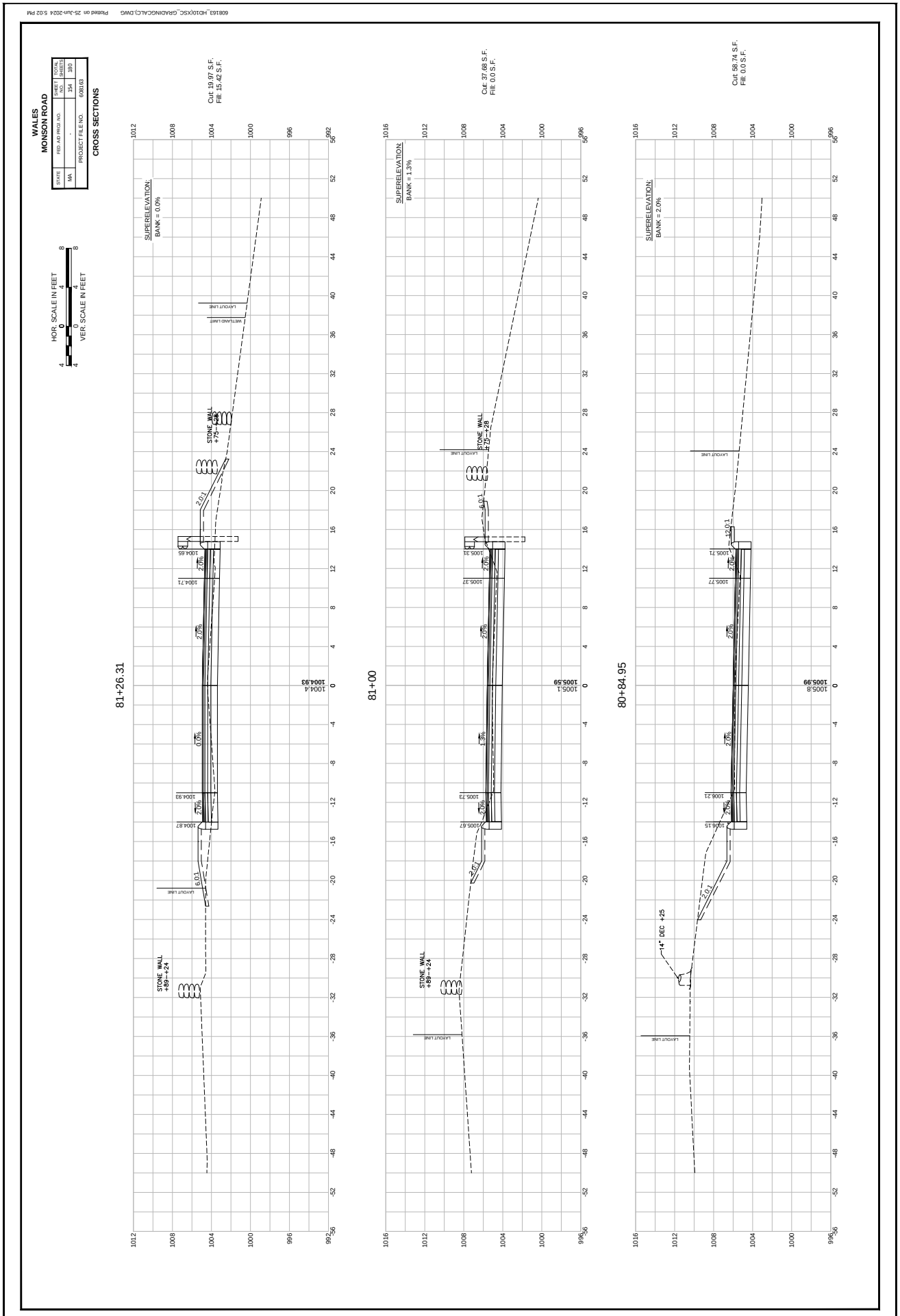
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	153	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 0 4 8
VER. SCALE IN FEET 0 4 8




608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 5:02 PM
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
-
154
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
81+26.31
SUPERELEVATION:
BANK = 0.0%
Cut: 19.97 S.F.
Fill: 15.42 S.F.
STONE WALL
+75 -+28
STONE WALL
+89 -+24
81+00
SUPERELEVATION:
BANK = 1.3%
Cut: 37.68 S.F.
Fill: 0.0 S.F.
80+84.95
SUPERELEVATION:
BANK = 2.0%
Cut: 58.74 S.F.
Fill: 0.0 S.F.
14" DEC +25
LAYOUT LINE
WETLAND LIMIT

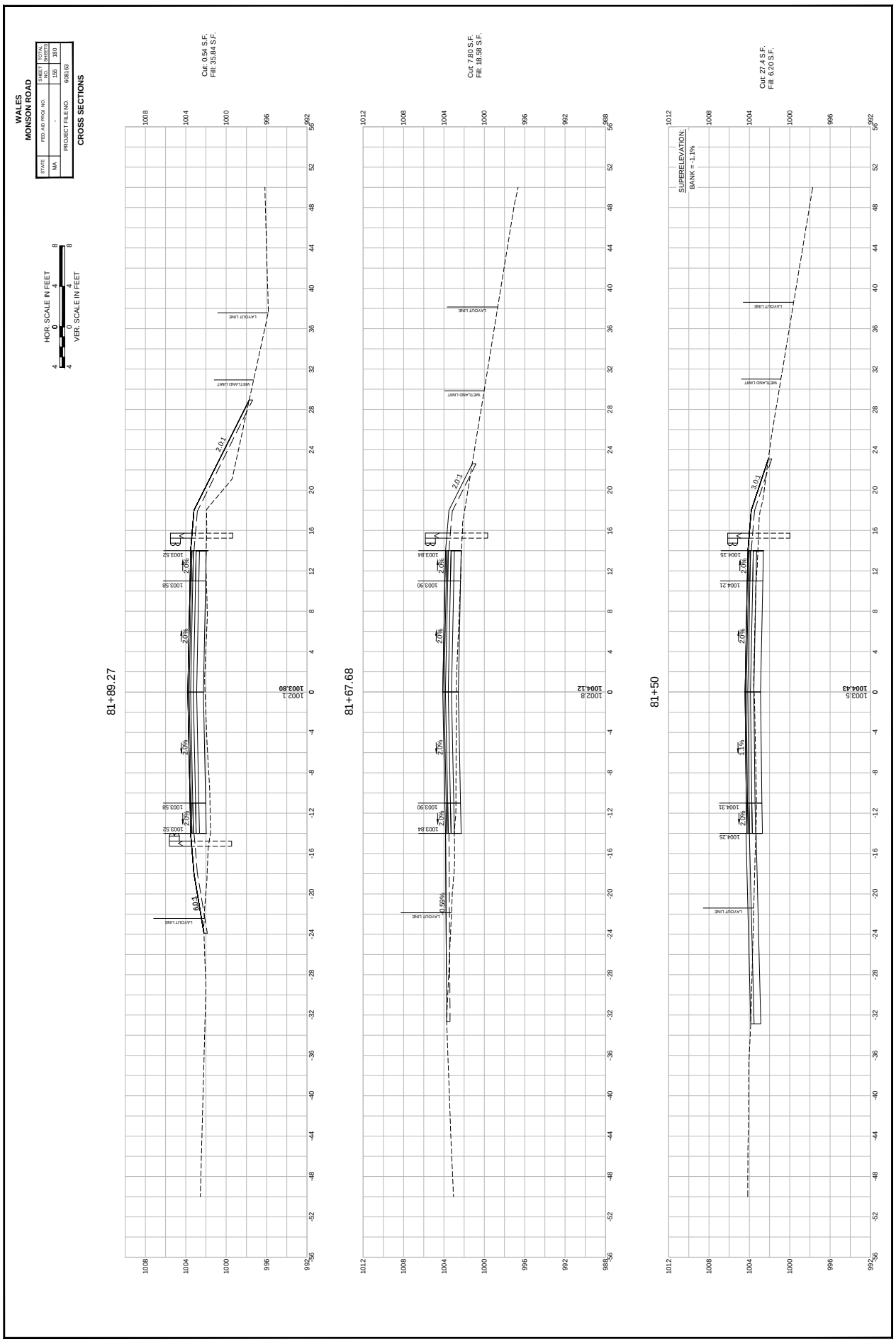
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 5:03 PM

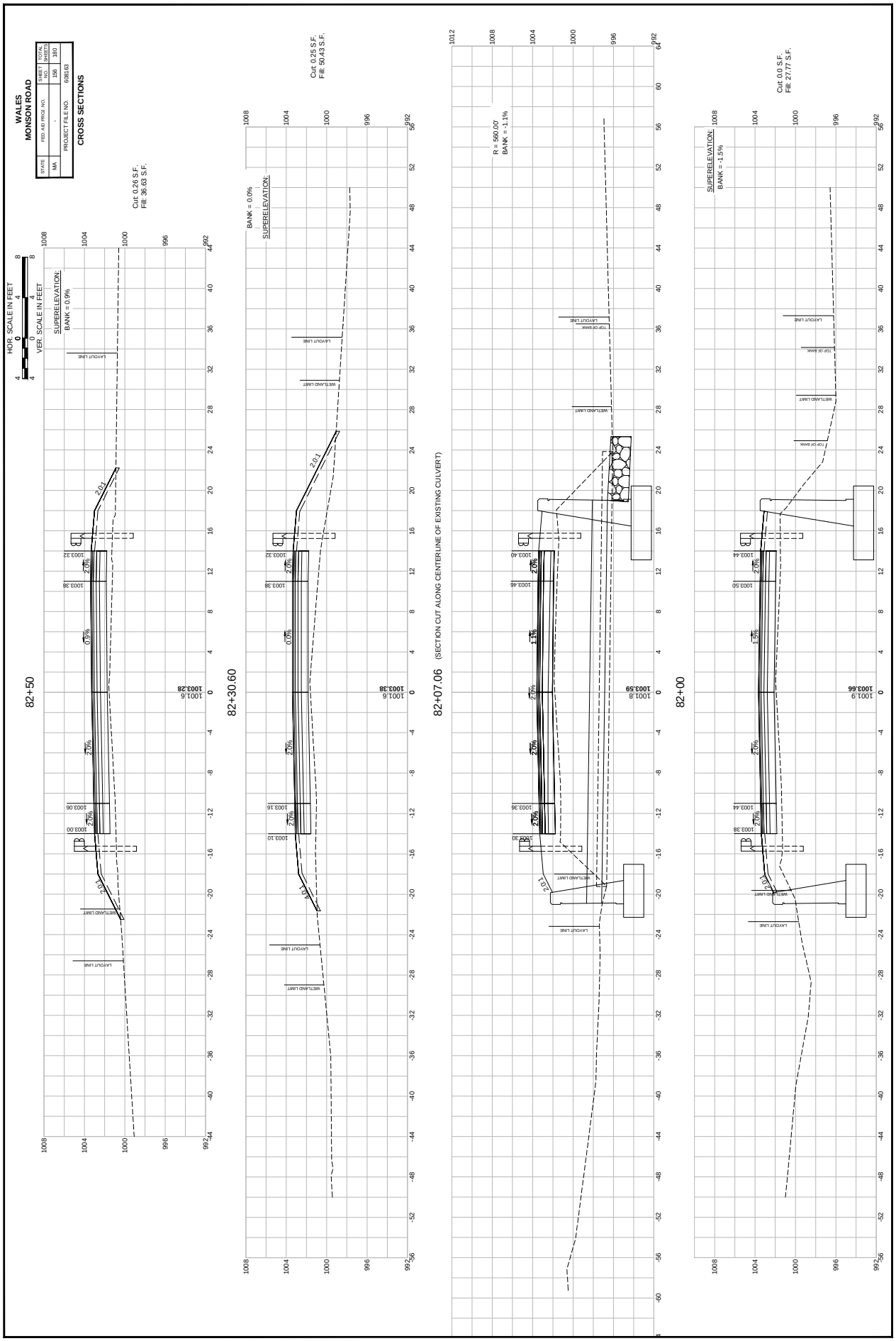
WALES
MONSON ROAD

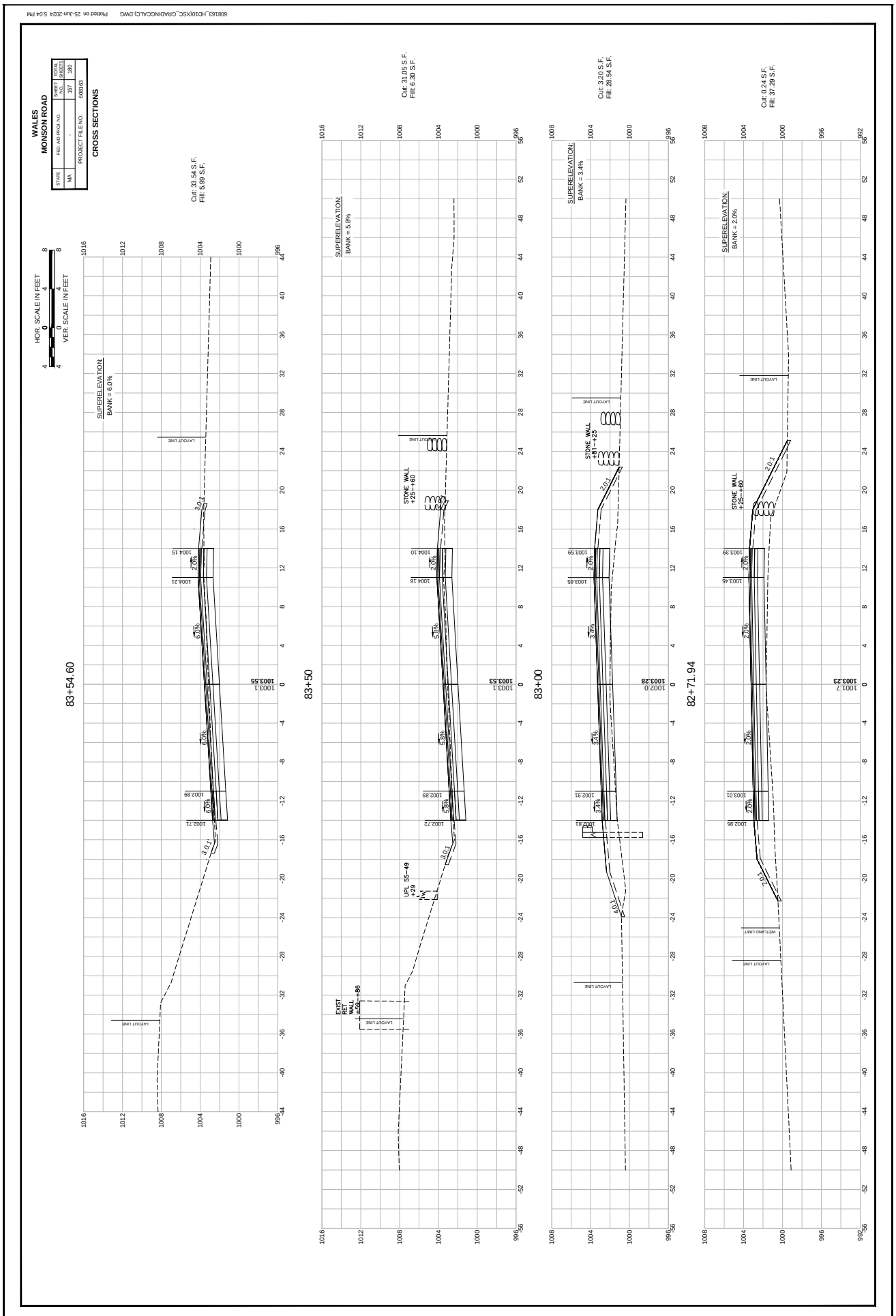
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	105	180
	PROJECT FILE NO.	608163	

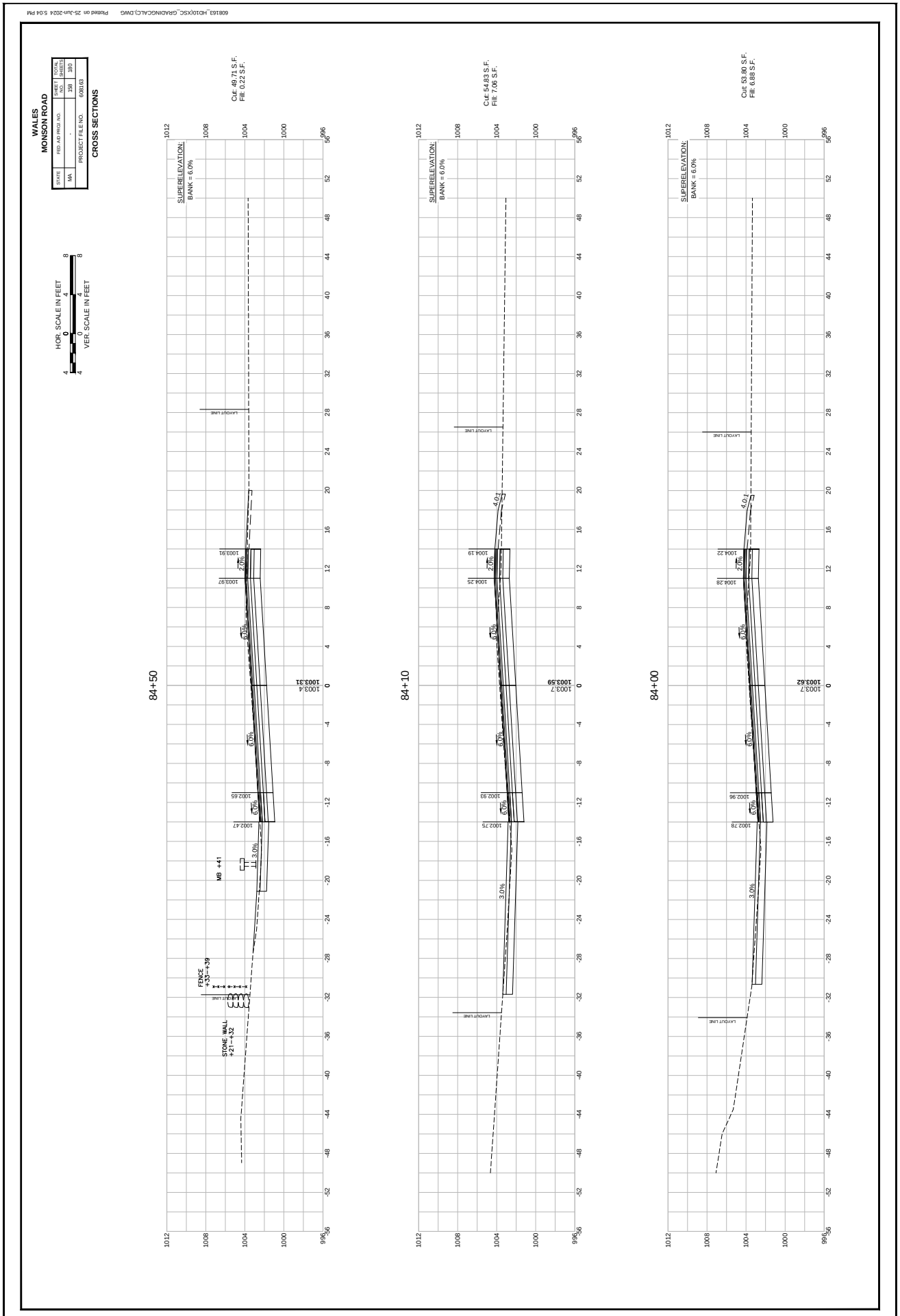
CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8




608163_HD10\XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 5:03 PM
WALES
MONSON ROAD
CROSS SECTIONS
STATE: MA
FED. AID PROJ. NO.: -
PROJECT FILE NO.: 608163
SHEET NO.: 156
TOTAL SHEETS: 180
HOR. SCALE IN FEET
VER. SCALE IN FEET
82+50
Cut: 0.26 S.F.
Fill: 36.63 S.F.
SUPERELEVATION:
BANK = 0.0%
82+30.60
Cut: 0.25 S.F.
Fill: 50.43 S.F.
82+07.06
(SECTION CUT ALONG CENTERLINE OF EXISTING CULVERT)
R = 560.00'
BANK = -1.1%
82+00
Cut: 0.0 S.F.
Fill: 27.77 S.F.
SUPERELEVATION:
BANK = -1.5%
LAYOUT LINE
WETLAND LIMIT
TOP OF BANK


608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 5:04 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
157
TOTAL SHEETS
180
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 33.54 S.F.
Fill: 5.99 S.F.
83+54.60
SUPERELEVATION
BANK = 6.0%
Cut: 31.05 S.F.
Fill: 6.30 S.F.
83+50
SUPERELEVATION
BANK = 5.8%
Cut: 3.20 S.F.
Fill: 28.54 S.F.
83+00
SUPERELEVATION
BANK = 3.4%
Cut: 0.24 S.F.
Fill: 37.29 S.F.
82+71.94
SUPERELEVATION
BANK = 2.0%
LAYOUT LINE
STONE WALL
EXIST RET WALL
UPR 55--49
WETLAND LIMIT


608163_HD10(XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 5:04 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
SHEET NO.
158
TOTAL SHEETS
180
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 49.71 S.F.
Fill: 0.22 S.F.
Cut: 54.83 S.F.
Fill: 7.06 S.F.
Cut: 53.80 S.F.
Fill: 6.88 S.F.
SUPERELEVATION:
BANK = 6.0%
84+50
84+10
84+00
LAYOUT LINE
FENCE
+33-+39
STONE WALL
+21-+32
MB +41
1003.4
1003.31
1003.7
1003.59
1003.7
1003.62
1003.91
1003.97
1002.65
1002.47
1004.19
1004.25
1002.93
1002.75
1004.22
1004.28
1002.96
1002.78
2.0%
6.0%
3.0%
4.0:1

608163_HD10XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 5:05 PM

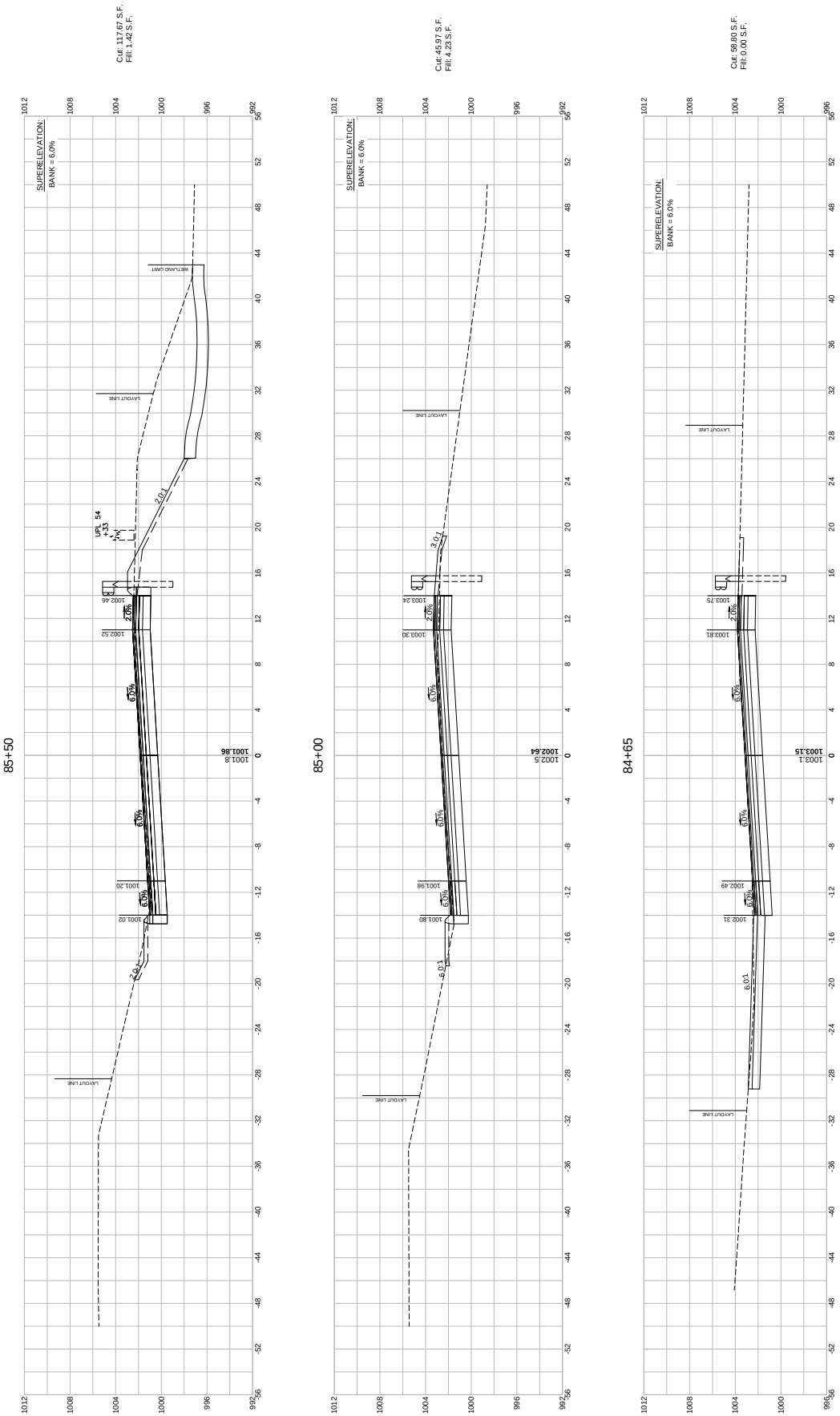
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	159	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
4 0 4 8

VER. SCALE IN FEET
4 0 4 8



608163_HD10XSC_GRADINGCALC).DWG Plotted on 25-Jun-2024 5:05 PM

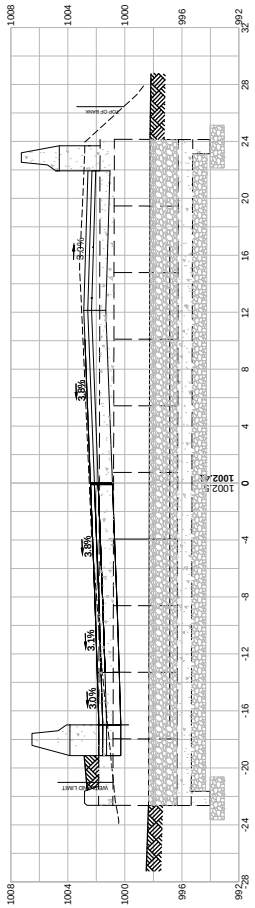
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	160	180
	PROJECT FILE NO.	608163	

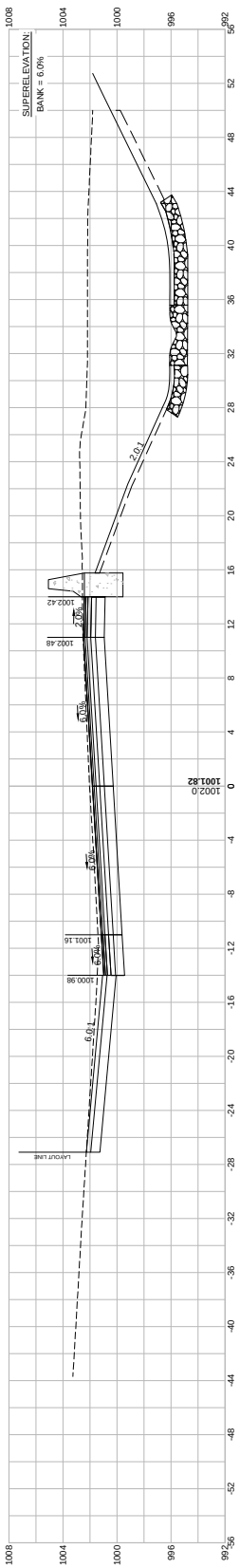
CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8

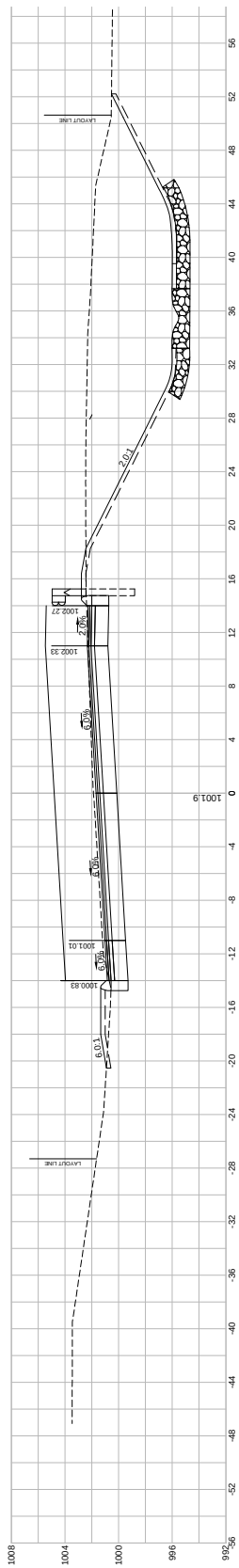
86+45.09 (SECTION CUT ALONG CENTERLINE OF EXISTING CULVERT)



86+15



86+00



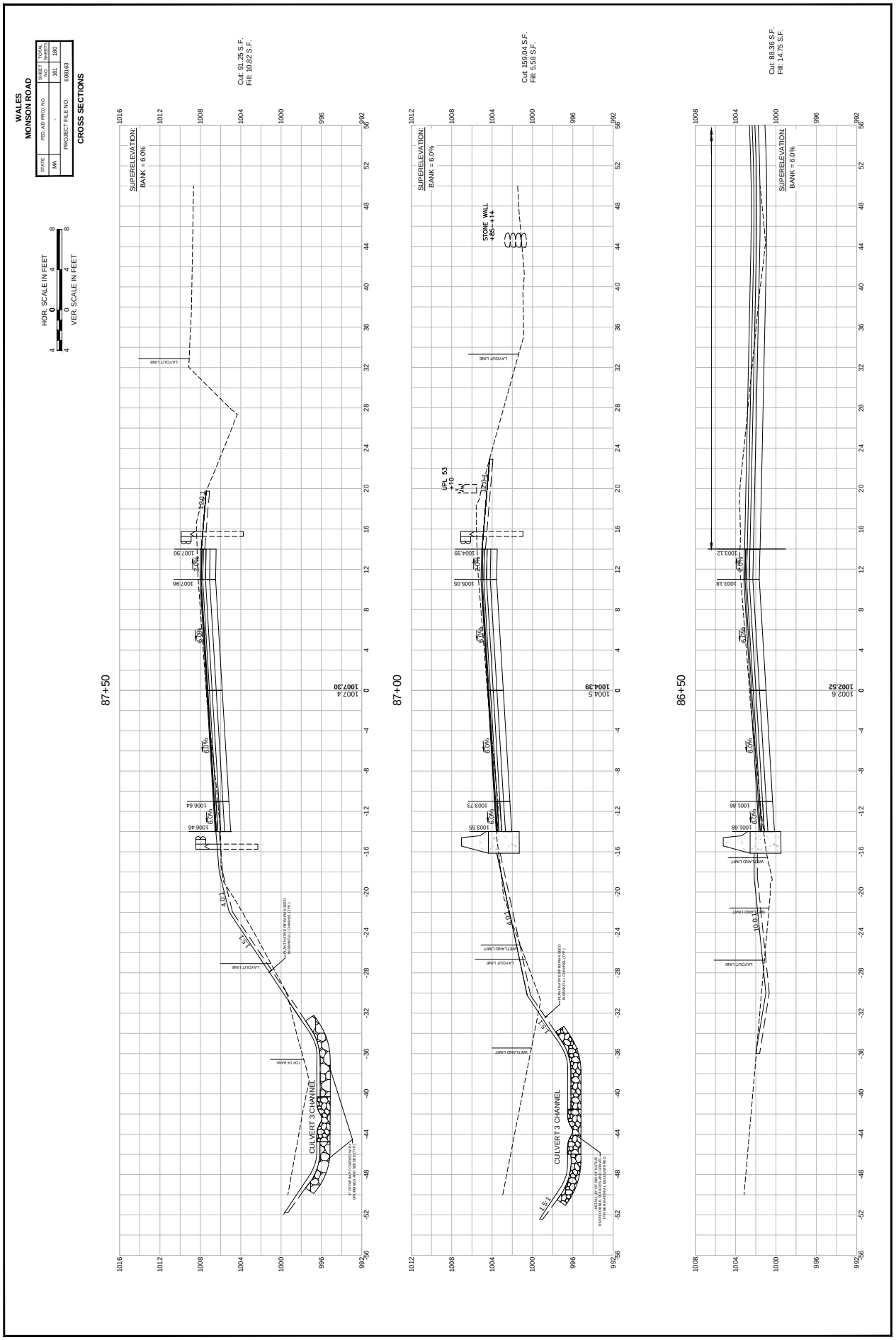
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 5:06 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	161	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



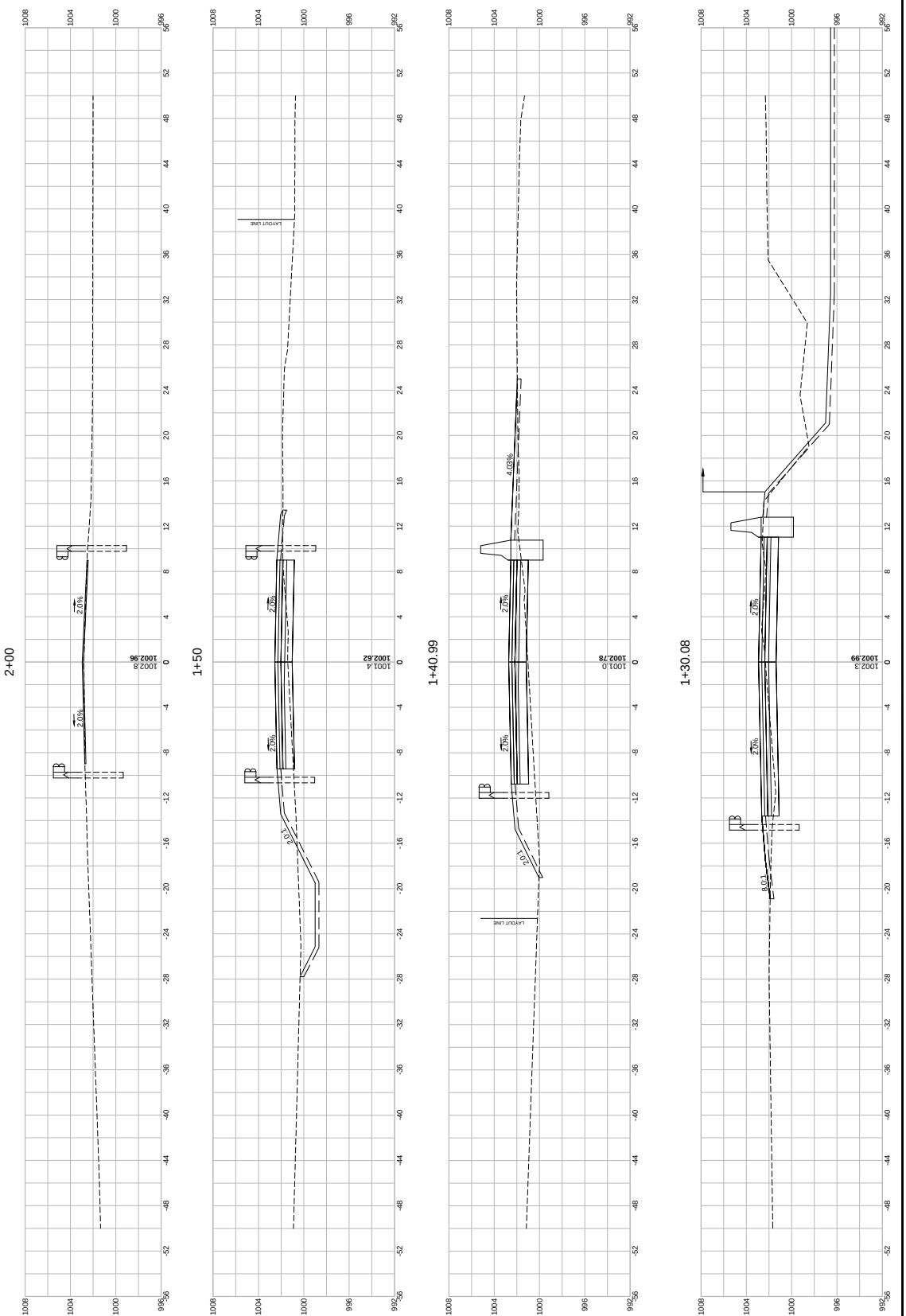
608163_HD10XSC_GRADINGCALC.DWG Plotted on 25-Jun-2024 5:07 PM

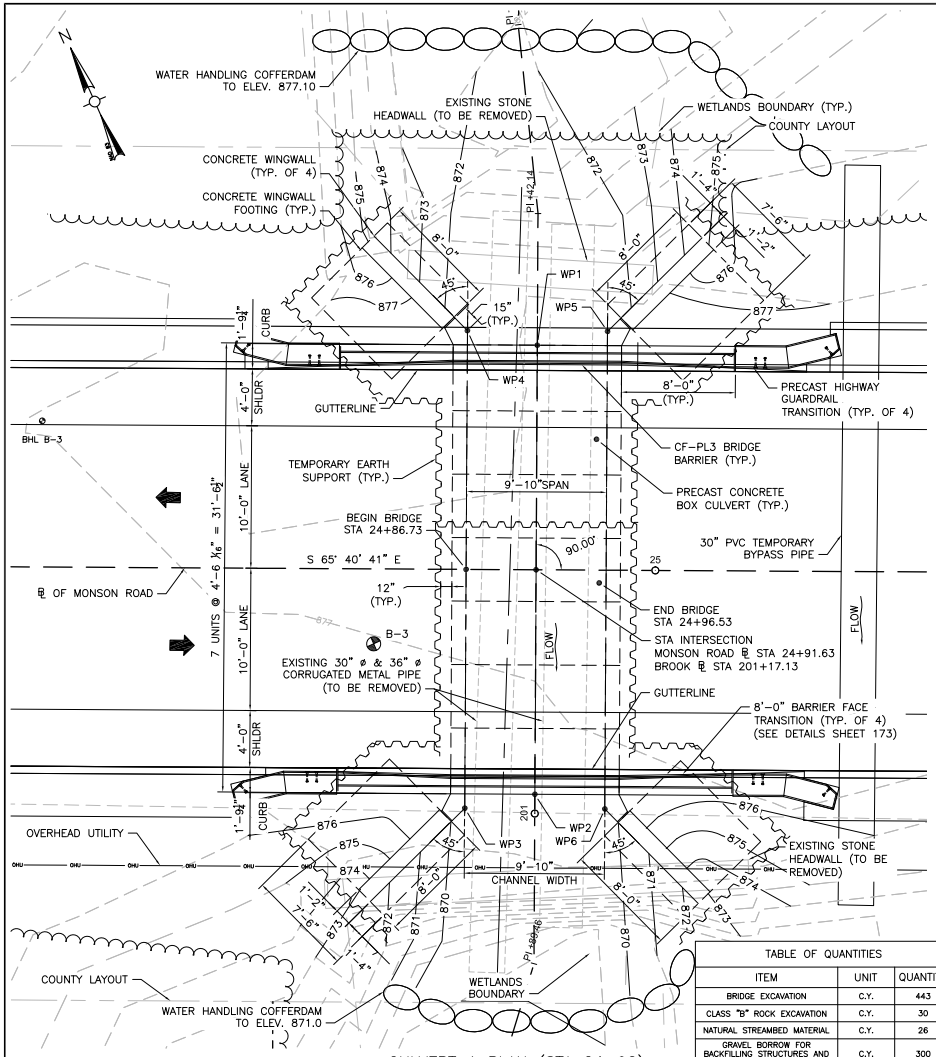
WALES
REED HILL ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	162	180
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8





CULVERT 1 PLAN (STA 24+92)
SCALE: 1" = 4'

WORKING POINTS		
POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2848111.9174	448173.3849
2	2848083.1730	448160.3979
3	2848084.2791	448155.5221
4	2848114.8452	448169.3343
5	2848110.8082	448178.2683
6	2848080.2408	448164.4559

NOTES:

1. THE FACTORED BEARING PRESSURE = 1.70 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 6.33 KSF.
   FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	443
CLASS "B" ROCK EXCAVATION	C.Y.	30
NATURAL STREAMBED MATERIAL	C.Y.	26
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	300
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	18
PRECAST GUARDRAIL HIGHWAY TRANSITION	EA.	4
4000 PSI, 1½", 565 CEMENT CONCRETE	C.Y.	50
5000 PSI, ¾", 685 CEMENT CONCRETE	C.Y.	27
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	17050
DAMPPROOFING	S.F.	1244
PRECAST CONCRETE BOX CULVERT – SITE 1	L.S.	1
TEMPORARY SUPPORT OF EARTH	L.S.	1

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 21+38± (RT) MAGNAIL IN UTILITY POLE: EL. 876.92 FT

BENCHMARK STA 29+60± (RT) MAGNAIL IN UTILITY POLE: EL. 900.23 FT

BENCHMARK STA 29+90± (LT) MAGNAIL BRASS RIVET: EL. 901.72 FT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

4000 PSI, 1½", 565 CEMENT CONCRETE.....WINGWALLS

5000 PSI, ¾", 685 CEMENT CONCRETE.....CF-PL3 BARRIER CURB, TRANSITION BARRIER CURB

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	163	180
PROJECT FILE NO.	608163		

CULVERT 1 KEY PLAN AND NOTES

TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

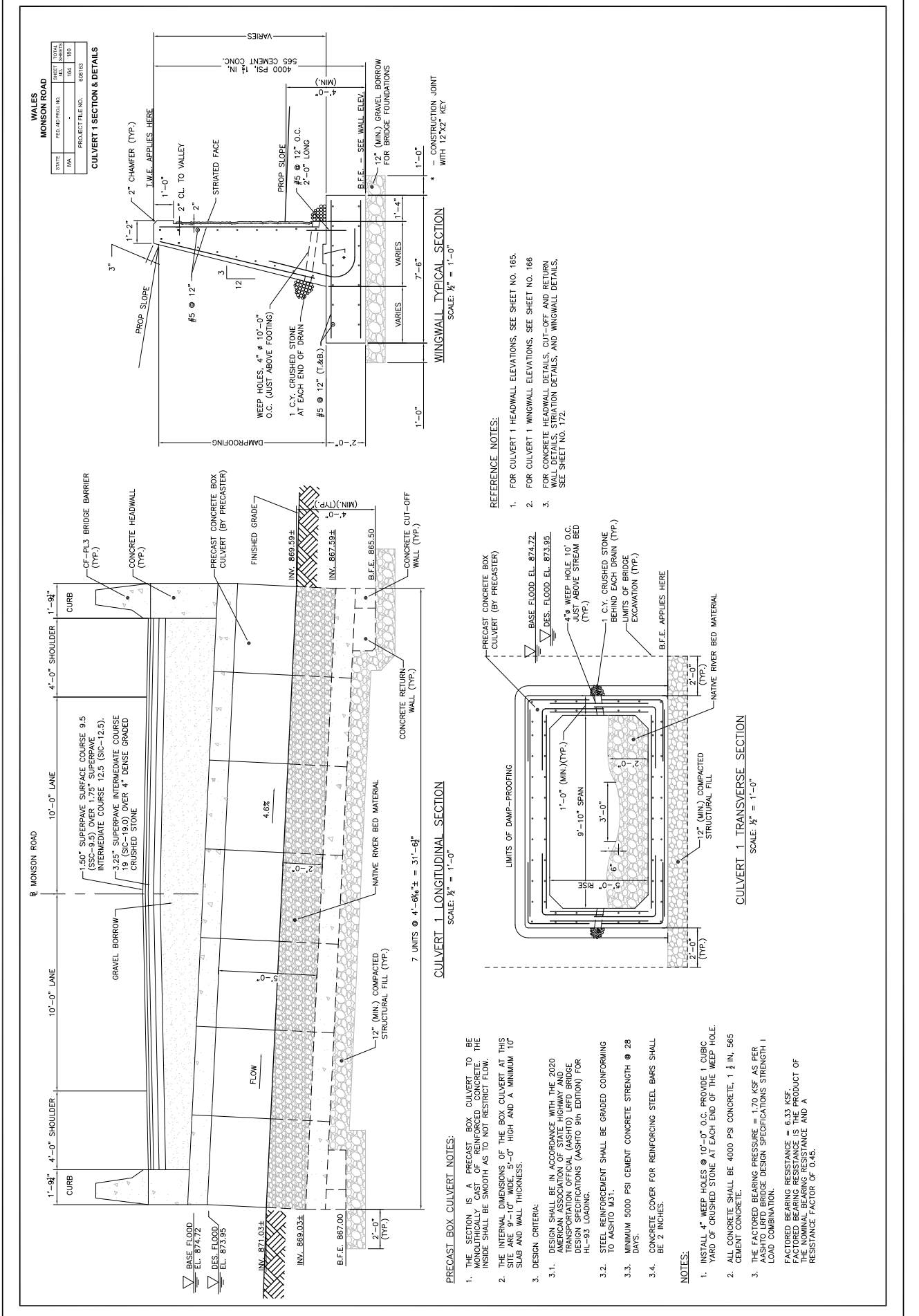
HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	0.903
DESIGN FLOOD DISCHARGE (C.F.S.)	123
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	6.32
DESIGN FLOOD ELEVATION (FEET, NAVD)	873.95
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	174
BASE FLOOD ELEVATION (FEET, NAVD)	874.72
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	43
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	7.72
DESIGN FLOOD ELEVATION (FEET, NAVD)	876.1

608163_HD11STRUCTURAL PLAN.DWG Plotted on 28-Jun-2024 8:15 AM

A00830-620

Proposal No. 608163-128112


WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
164
TOTAL SHEETS
180
CULVERT 1 SECTION & DETAILS
VARIES
4000 PSI, 1½ IN. SSS CEMENT CONC.
2" CHAMFER (TYP.)
I.W.F. APPLIES HERE
1'-0"
2"
CL. TO VALLEY
STRIATED FACE
PROP SLOPE
#5 @ 12" O.C.
2'-0" LONG
B.F.E. - SEE WALL ELEV.
12" (MIN.) GRAVEL BORROW FOR BRIDGE FOUNDATIONS
4'-0" (MIN.)
1'-2"
3"
#5 @ 12"
3
12
WEEP HOLES, 4" ø 10'-0" O.C. (JUST ABOVE FOOTING)
1 C.Y. CRUSHED STONE AT EACH END OF DRAIN
#5 @ 12" (T.&B.)
VARIES
7'-6"
1'-4"
1'-0"
2'-0"
DAMPROOFING
* - CONSTRUCTION JOINT WITH 12"X2" KEY
WINGWALL TYPICAL SECTION
SCALE: ½" = 1'-0"
℄ MONSON ROAD
1'-9½"
CURB
4'-0" SHOULDER
10'-0" LANE
10'-0" LANE
4'-0" SHOULDER
1'-9½"
CURB
CF-PL3 BRIDGE BARRIER (TYP.)
CONCRETE HEADWALL (TYP.)
PRECAST CONCRETE BOX CULVERT (BY PRECASTER)
FINISHED GRADE
1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5).
3.25" SUPERPAVE INTERMEDIATE COURSE 19 (SIC-19.0) OVER 4" DENSE GRADED CRUSHED STONE
GRAVEL BORROW
INV. 869.59±
INV. 867.59±
4'-0" (MIN.)(TYP.)
B.F.E. 865.50
CONCRETE CUT-OFF WALL (TYP.)
CONCRETE RETURN WALL (TYP.)
4.6%
FLOW
NATIVE RIVER BED MATERIAL
12" (MIN.) COMPACTED STRUCTURAL FILL (TYP.)
7 UNITS @ 4'-6"± = 31'-6"±
INV. 871.03±
INV. 869.03±
B.F.E. 867.00
2'-0" (TYP.)
BASE FLOOD EL. 874.72
DES. FLOOD EL. 873.95
CULVERT 1 LONGITUDINAL SECTION
SCALE: ½" = 1'-0"
PRECAST BOX CULVERT NOTES:
1. THE SECTION IS A PRECAST BOX CULVERT TO BE MONOLITHICALLY CAST OF REINFORCED CONCRETE. THE INSIDE SHALL BE SMOOTH AS TO NOT RESTRICT FLOW.
2. THE INTERNAL DIMENSIONS OF THE BOX CULVERT AT THIS SITE ARE 9'-10" WIDE, 5'-0" HIGH AND A MINIMUM 10" SLAB AND WALL THICKNESS.
3. DESIGN CRITERIA:
3.1. DESIGN SHALL BE IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIAL (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS (AASHTO 9th EDITION) FOR HL-93 LOADING.
3.2. STEEL REINFORCEMENT SHALL BE GRADED CONFORMING TO AASHTO M31.
3.3. MINIMUM 5000 PSI CEMENT CONCRETE STRENGTH @ 28 DAYS.
3.4. CONCRETE COVER FOR REINFORCING STEEL BARS SHALL BE 2 INCHES.
NOTES:
1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. ALL CONCRETE SHALL BE 4000 PSI CONCRETE, 1½ IN, 565 CEMENT CONCRETE.
3. THE FACTORED BEARING PRESSURE = 1.70 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.
FACTORED BEARING RESISTANCE = 6.33 KSF.
FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.
PRECAST CONCRETE BOX CULVERT (BY PRECASTER)
BASE FLOOD EL. 874.72
DES. FLOOD EL. 873.95
4"ø WEEP HOLE 10' O.C. (JUST ABOVE STREAM BED (TYP.)
1 C.Y. CRUSHED STONE BEHIND EACH DRAIN (TYP.)
LIMITS OF BRIDGE EXCAVATION (TYP.)
B.F.E. APPLIES HERE
LIMITS OF DAMP-PROOFING
1'-0" (MIN.)(TYP.)
9'-10" SPAN
3'-0"
5'-0"
12" (MIN.) COMPACTED STRUCTURAL FILL
NATIVE RIVER BED MATERIAL
2'-0" (TYP.)
2'-0" (TYP.)
CULVERT 1 TRANSVERSE SECTION
SCALE: ½" = 1'-0"
REFERENCE NOTES:
1. FOR CULVERT 1 HEADWALL ELEVATIONS, SEE SHEET NO. 165.
2. FOR CULVERT 1 WINGWALL ELEVATIONS, SEE SHEET NO. 166
3. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, AND WINGWALL DETAILS, SEE SHEET NO. 172.
608163_HDT1STRUCTURAL PLAN.DWG Plotted on 26-Jun-2024 8:15 AM

608163_HDT1STRUCTURAL PLAN.DWG Plotted on 26-Jun-2024 8:16 AM

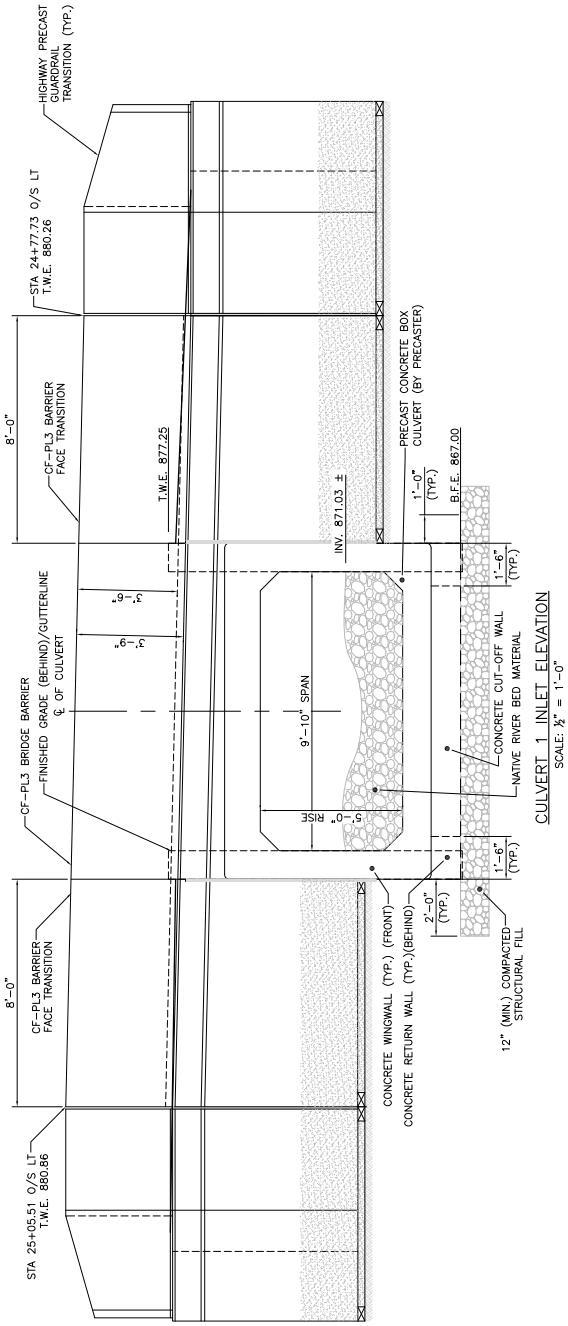
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	165	180
	PROJECT FILE NO.	608163	

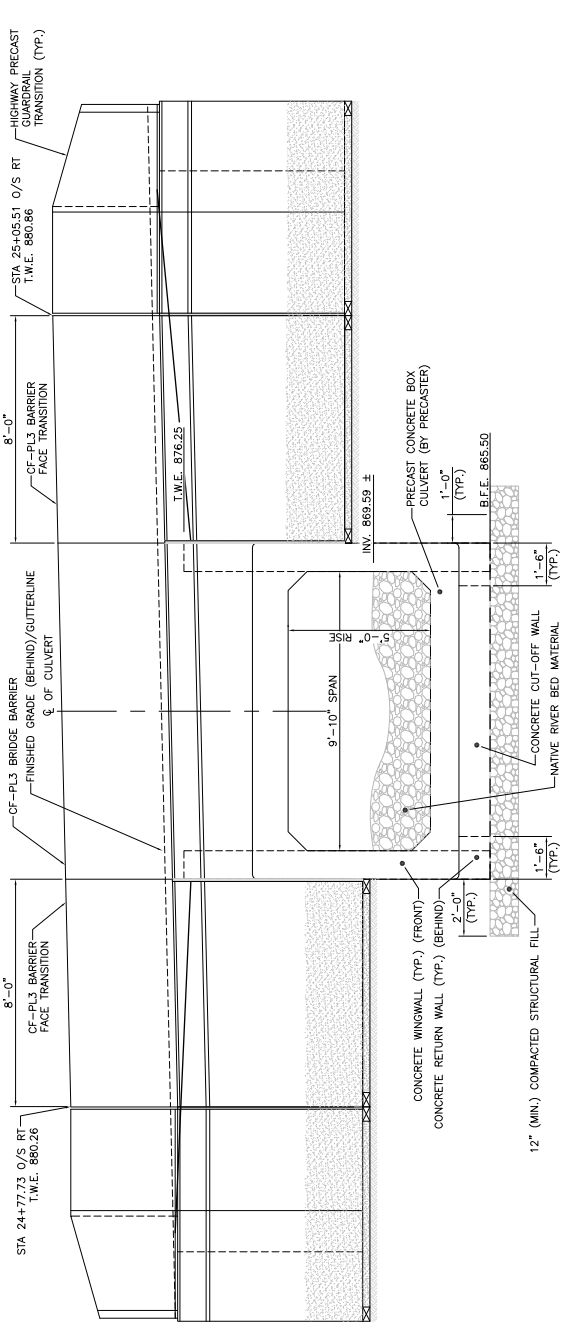
CULVERT 1 HEADWALL ELEVATIONS

REFERENCE NOTES:

1. FOR CULVERT 1 WINGWALL ELEVATIONS, SEE SHEET NO. 166
2. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, AND WINGWALL DETAILS, SEE SHEET NO. 172.



CULVERT 1 INLET ELEVATION
SCALE: ½" = 1'-0"

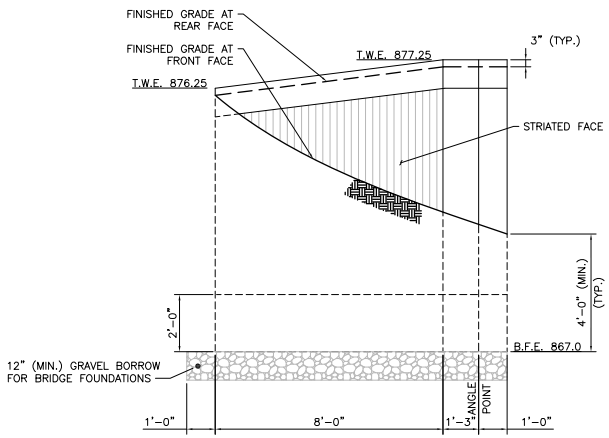


CULVERT 1 OUTLET ELEVATION
SCALE: ½" = 1'-0"

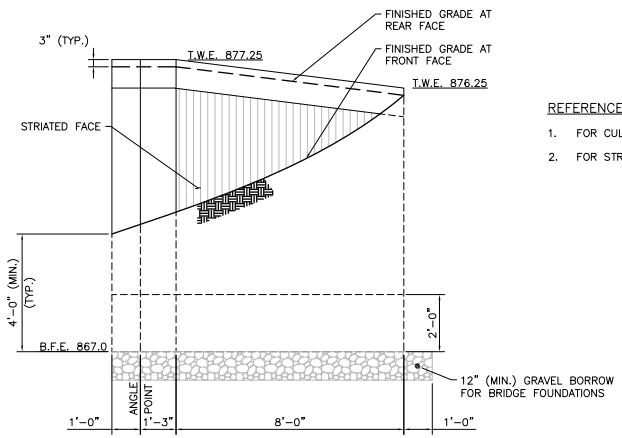
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	168	180
PROJECT FILE NO.	608163		

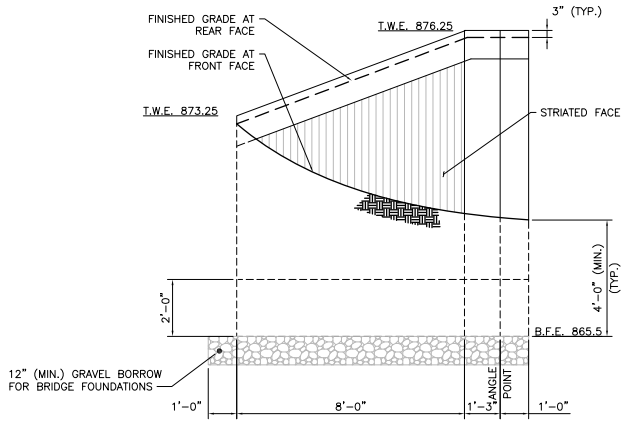
CULVERT 1 WINGWALL ELEVATIONS



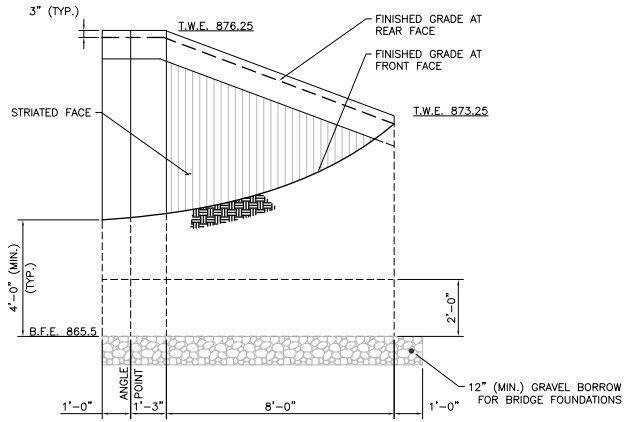
NORTHEAST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



NORTHWEST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



SOUTHWEST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



SOUTHEAST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"

REFERENCE NOTES:

1. FOR CULVERT 1 WINGWALL SECTION, SEE SHEET NO. 164.
2. FOR STRIATION DETAILS, AND WINGWALL DETAILS, SEE SHEET NO. 172.

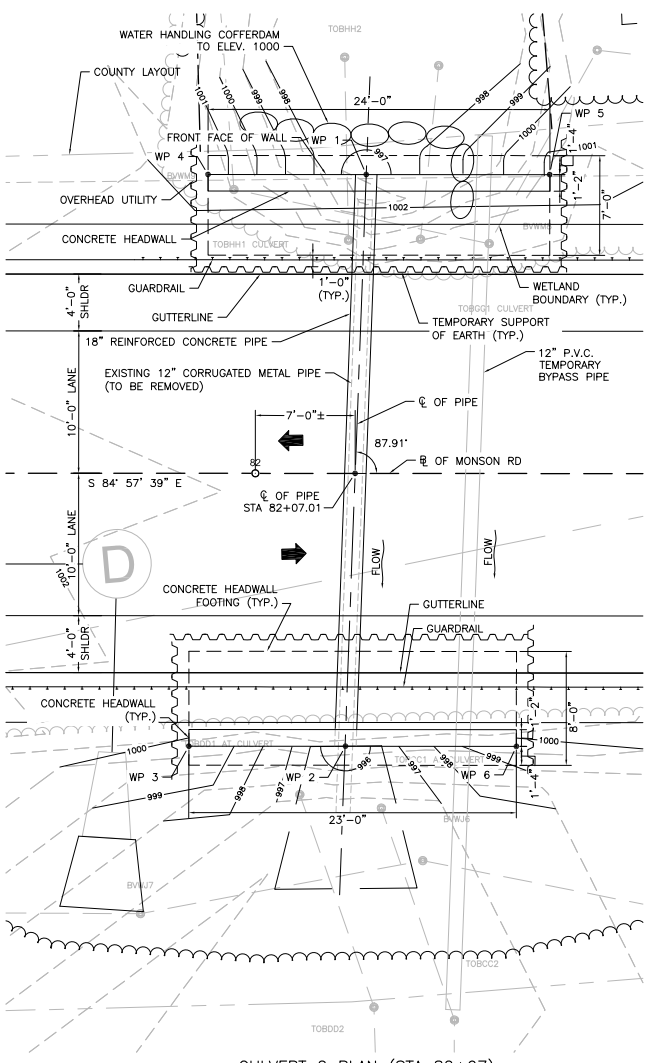
608163_HD11STRUCTURAL PLAN.DWG Plotted on 26-Jun-2024 8:16 AM

A00830-623

Proposal No. 608163-128112

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	167	180
PROJECT FILE NO.	608163		

CULVERT 2 KEY PLAN AND NOTES



CULVERT 2 PLAN (STA 82+07)
SCALE: 1" = 4'

NOTES:

1. THE FACTORED BEARING PRESSURE = 2.22 KSF AT THE INLET HEADWALL AND 2.38 KSF AT THE OUTLET HEADWALL AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 5.66 KSF AT THE INLET HEADWALL AND 5.83 KSF AT THE OUTLET HEADWALL. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 81+25± (LT) SPIKE IN UTILITY POLE: EL. 1005.74

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

4000 PSI, 1½", 565 CEMENT CONCRETE.....HEADWALLS

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING PIPES.
4. INSTALL THE PROPOSED PIPE & HEADWALLS.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE PROPOSED CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
CLASS "A" TRENCH EXCAVATION	C.Y.	209
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	150
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	20
4000 PSI 1½" 565 CEMENT CONCRETE	C.Y.	52
STEEL REINFORCEMENT FOR STRUCTURES - EPOXY COATED	LB.	10010
DAMPPROOFING	S.F.	426
TEMPORARY SUPPORT OF EARTH	L.S.	1

WORKING POINTS		
POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2847313.7204	453680.2286
2	2847273.8336	453675.2733
3	2847274.8008	453664.3163
4	2847314.6939	453669.1581
5	2847312.5891	453693.0567
6	2847272.7828	453687.1995

TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	10.24
DESIGN FLOOD DISCHARGE (C.F.S.)	9
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	0.14
DESIGN FLOOD ELEVATION (FEET, NAVD)	996.14
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	9
BASE FLOOD ELEVATION (FEET, NAVD)	999.20
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	5
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	6.70
DESIGN FLOOD ELEVATION (FEET, NAVD)	998.46

608163_HD11STRUCTURAL PLAN.DWG Plotted on 26-Jun-2024 8:16 AM

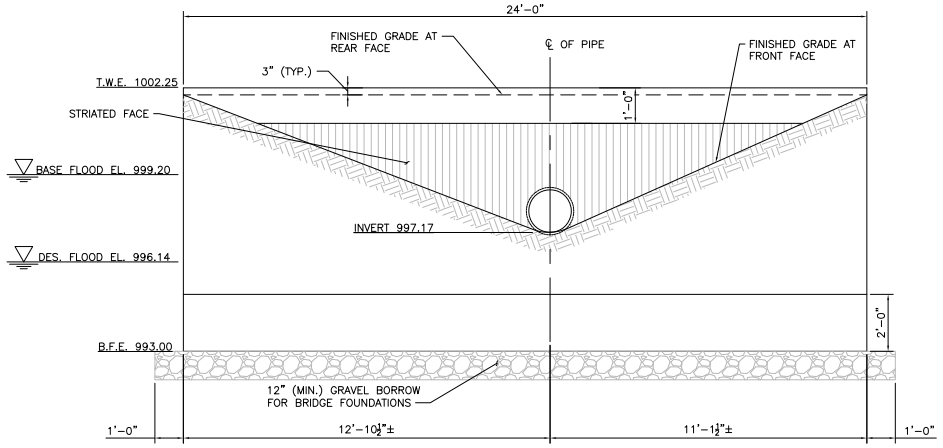
A00830-624

Proposal No. 608163-128112

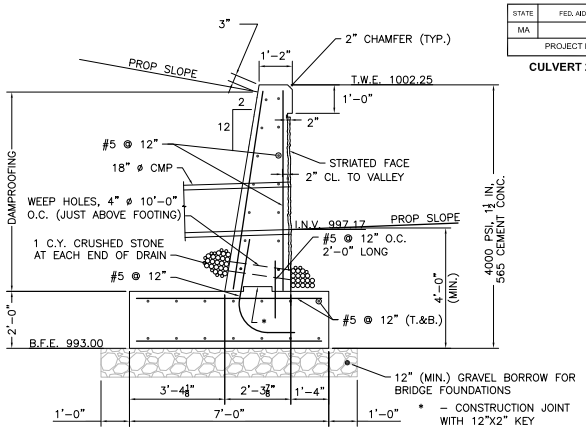
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	168	180
PROJECT FILE NO.	608163		

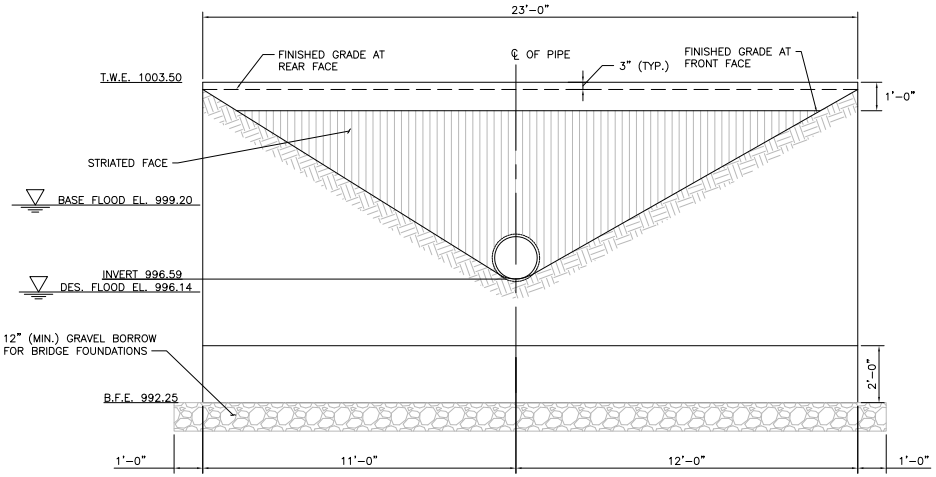
CULVERT 2 WALL DETAILS



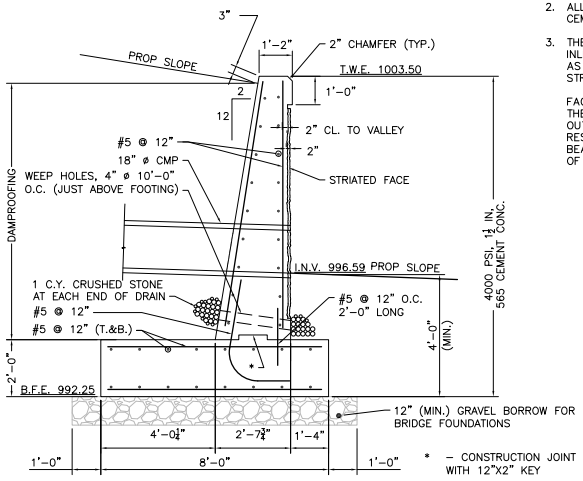
NORTH INLET HEADWALL ELEVATION
SCALE: ½" = 1'-0"



NORTH INLET HEADWALL SECTION
SCALE: ½" = 1'-0"



SOUTH OUTLET HEADWALL ELEVATION
SCALE: ½" = 1'-0"

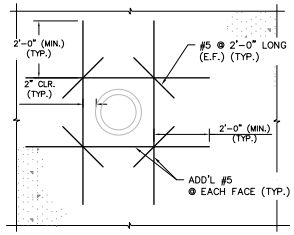


SOUTH OUTLET HEADWALL SECTION
SCALE: ½" = 1'-0"

NOTES:

1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. ALL CONCRETE SHALL BE 4000 PSI CONCRETE, 1 ½ IN, 565 CEMENT CONCRETE.
3. THE FACTORED BEARING PRESSURE = 2.22 KSF AT THE INLET HEADWALL AND 2.38 KSF AT THE OUTLET HEADWALL AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 5.66 KSF AT THE INLET HEADWALL AND 5.83 KSF AT THE OUTLET HEADWALL. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.



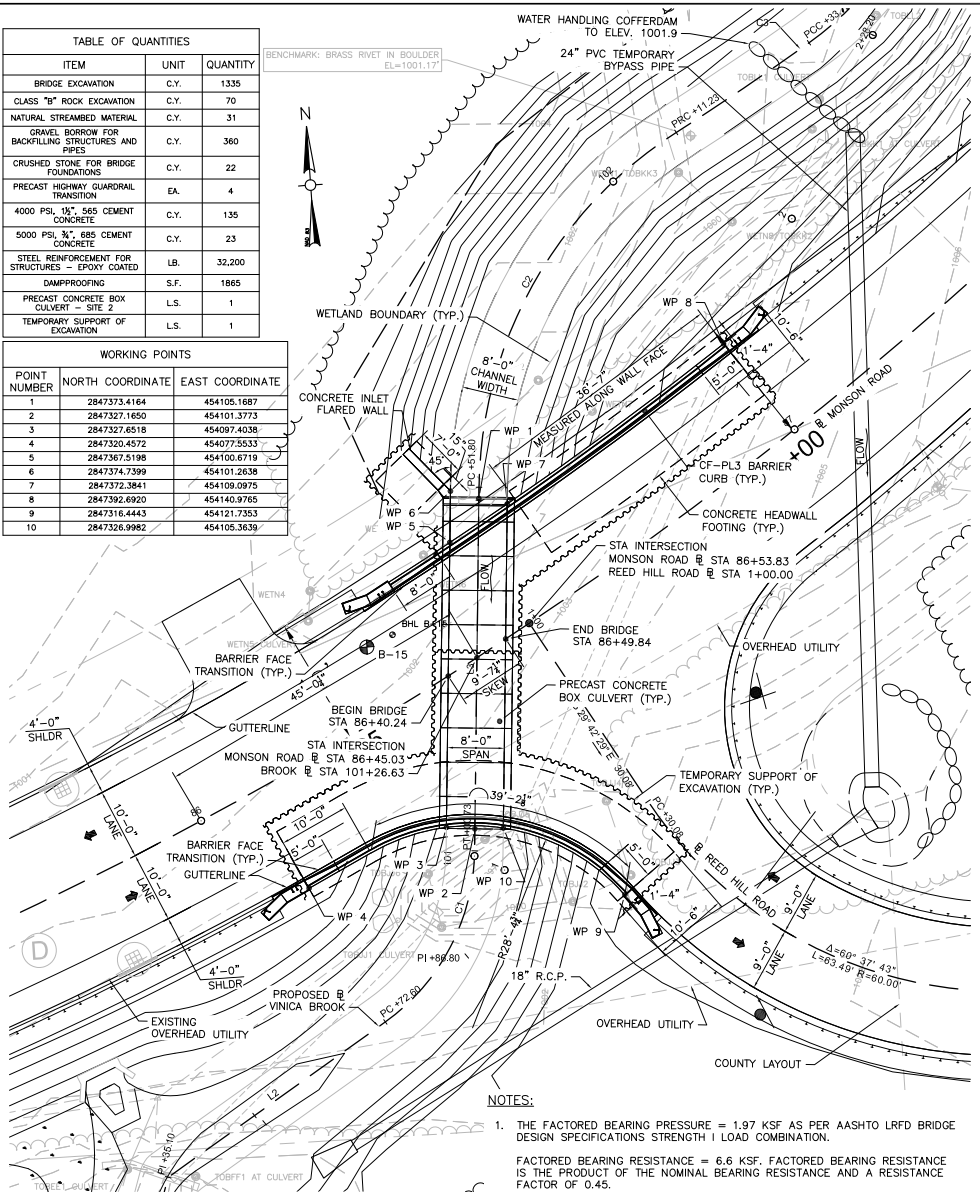
ADDITIONAL REINFORCEMENT AT PIPE
SCALE: ½" = 1'-0"

608163_HD11STRUCTURAL PLAN.DWG Plotted on 26-Jun-2024 8:17 AM

Proposal No. 608163-128112

TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	1335
CLASS "B" ROCK EXCAVATION	C.Y.	70
NATURAL STREAMBED MATERIAL	C.Y.	31
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	360
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	22
PRECAST HIGHWAY GUARDRAIL TRANSITION	EA.	4
4000 PSI, 1½", 565 CEMENT CONCRETE	C.Y.	135
5000 PSI, ¾", 685 CEMENT CONCRETE	C.Y.	23
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	32,200
DAMPPROOFING	S.F.	1865
PRECAST CONCRETE BOX CULVERT – SITE 2	L.S.	1
TEMPORARY SUPPORT OF EXCAVATION	L.S.	1

WORKING POINTS		
POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2847373.4164	454105.1687
2	2847327.1650	454101.3773
3	2847327.6518	454097.4038
4	2847320.4572	454077.5533
5	2847367.5198	454100.6719
6	2847374.7399	454101.2638
7	2847372.3841	454109.0975
8	2847392.6920	454140.9765
9	2847316.4443	454121.7353
10	2847326.9982	454105.3639



CULVERT 3 PLAN (STA 86+45)

SCALE: 1" = 8'

NOTES:

1. THE FACTORED BEARING PRESSURE = 1.97 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 6.6 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 87+10± (RT) SPIKE IN UTILITY POLE: EL. 1007.89 FT

BENCHMARK STA 87+20± (LT) BRASS RIVET: EL. 1001.17 FT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

4000 PSI, 1½", 565 CEMENT CONCRETE.....HEADWALLS

5000 PSI, ¾", 610 CEMENT CONCRETE.....CF-PL3 BARRIER CURB, TRANSITION BARRIER CURB

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	169	180
PROJECT FILE NO.	608163		

CULVERT 3 KEY PLAN AND NOTES

TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	0.33
DESIGN FLOOD DISCHARGE (C.F.S.)	52
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	3.22
DESIGN FLOOD ELEVATION (FEET, NAVD)	998.40
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	73
BASE FLOOD ELEVATION (FEET, NAVD)	998.77
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	18
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	8.91
DESIGN FLOOD ELEVATION (FEET, NAVD)	1001.42

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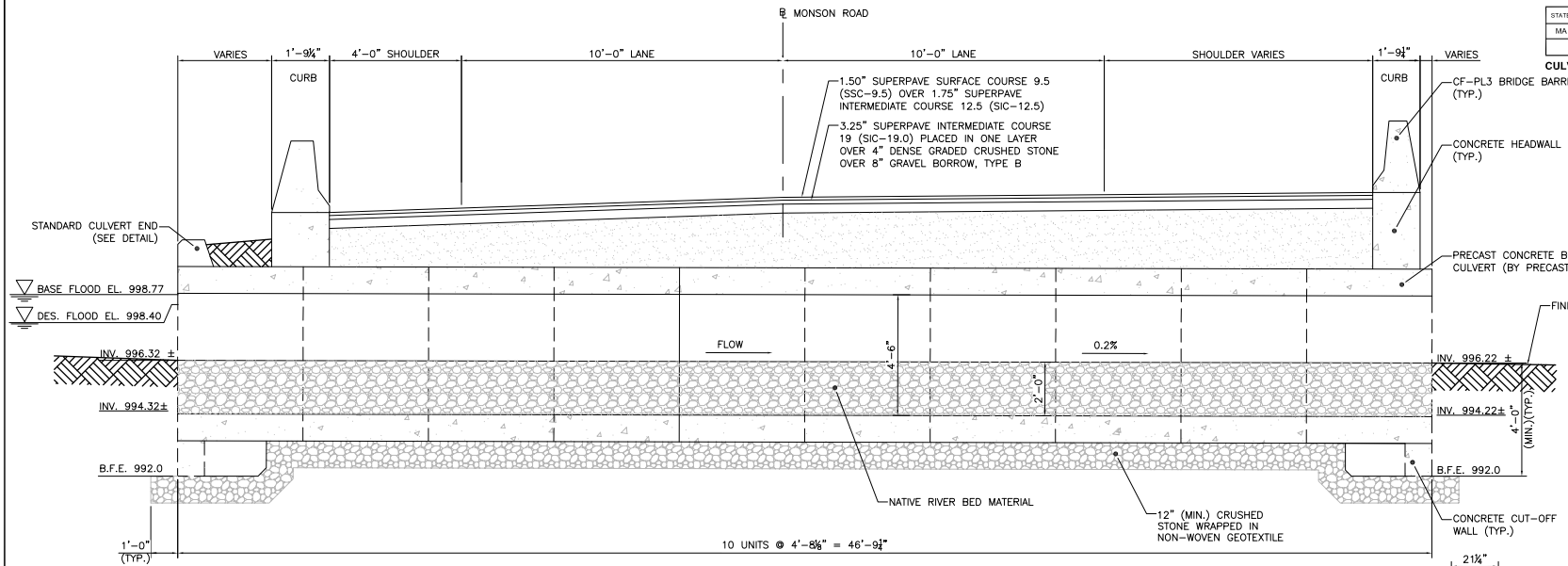
Proposal No. 608163-128112

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	170	180
PROJECT FILE NO.	608163		

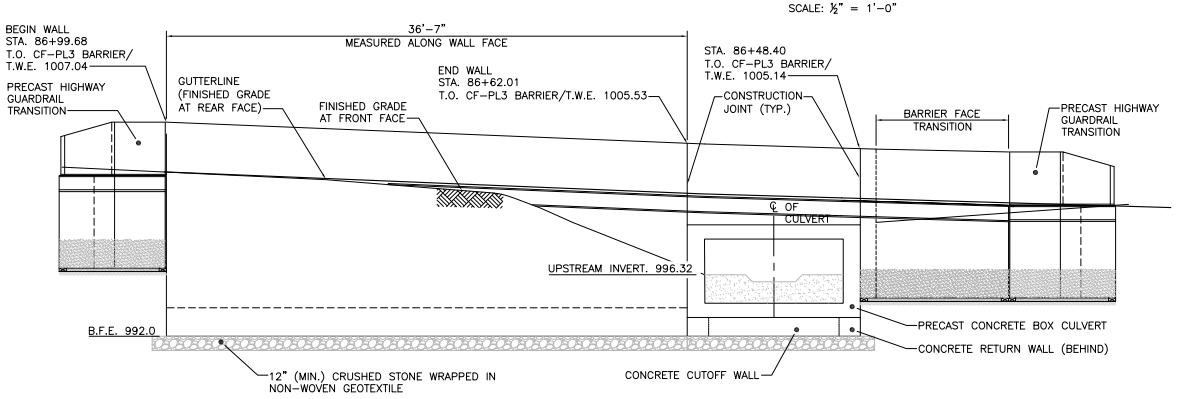
CULVERT 3 SECTION AND DETAILS

608163_HD11\STRUCTURAL PLAN.DWG Plotted on: 26-Jun-2024 8:17 AM



CULVERT LONGITUDINAL SECTION – ALONG STREAM BASELINE

SCALE: ½" = 1'-0"



CULVERT INLET NORTH ELEVATION

SCALE: ¼" = 1'-0"

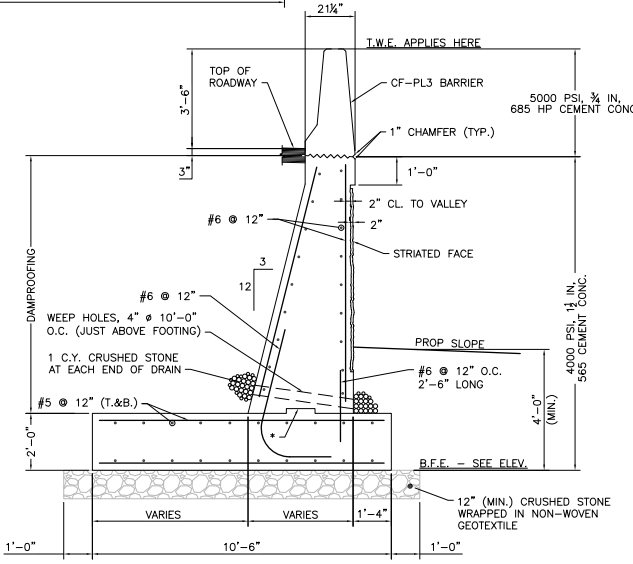
REFERENCE NOTES:

1. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, CONCRETE END WALL DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 172.

NOTES:

1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. ALL CONCRETE SHALL BE 4000 PSI CONCRETE, 1 ½ IN, 565 CEMENT CONCRETE.
3. THE FACTORED BEARING PRESSURE = 1.97 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 6.6 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.



RETAINING WALL SECTION

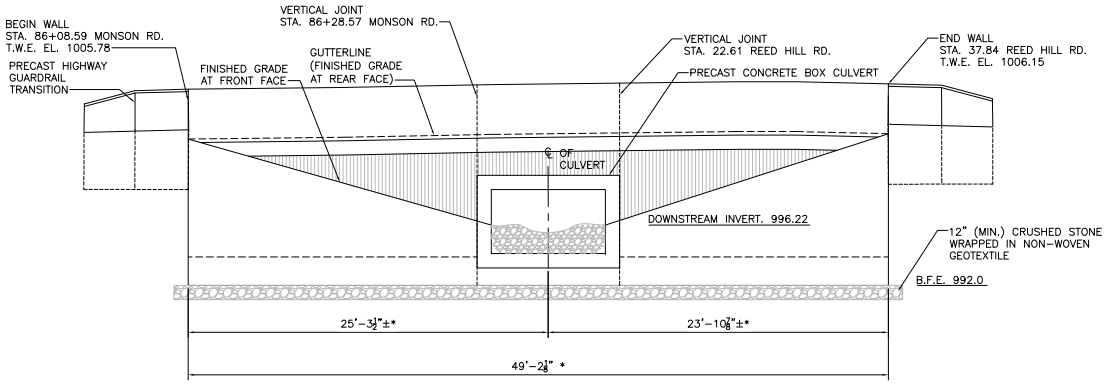
SCALE: ½" = 1'-0"

* – CONSTRUCTION JOINT WITH 12"X2" KEY

Proposal No. 608163-128112

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	171	180
PROJECT FILE NO.	608163		

CULVERT 3 WALL ELEVATION AND DETAILS



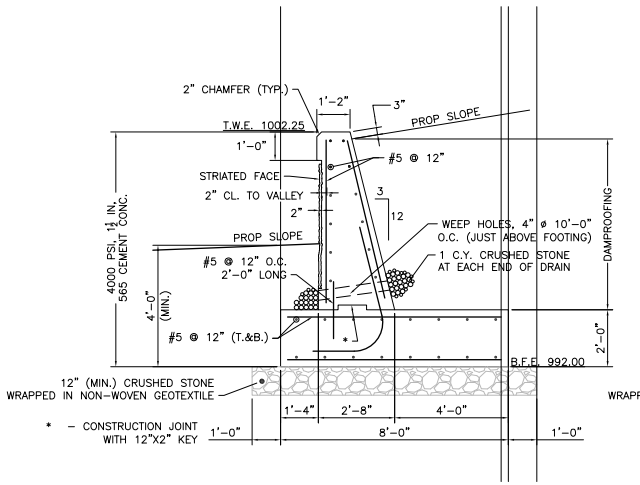
CULVERT 3 OUTLET/SOUTH ELEVATION
SCALE: ¼" = 1'-0"

PRECAST BOX CULVERT NOTES:

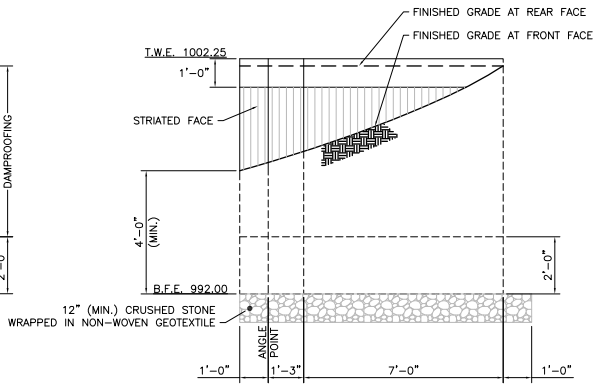
1. THE SECTION IS A PRECAST BOX CULVERT TO BE MONOLITHICALLY CAST OF REINFORCED CONCRETE. THE INSIDE SHALL BE SMOOTH AS TO NOT RESTRICT FLOW.
2. THE INTERNAL DIMENSIONS OF THE BOX CULVERT AT THIS SITE ARE 8'-0" WIDE, 4'-6" HIGH AND A MINIMUM 10" SLAB AND WALL THICKNESS.
3. DESIGN CRITERIA:
   - 3.1. DESIGN SHALL BE IN ACCORDANCE WITH THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIAL (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS (9th EDITION) FOR HL-93 LOADING.
   - 3.2. STEEL REINFORCEMENT SHALL BE GRADED CONFORMING TO AASHTO M31.
   - 3.3. MINIMUM 5000 PSI CEMENT CONCRETE STRENGTH @ 28 DAYS.
   - 3.4. CONCRETE COVER FOR REINFORCING STEEL BARS SHALL BE 2 INCHES.

REFERENCE NOTES:

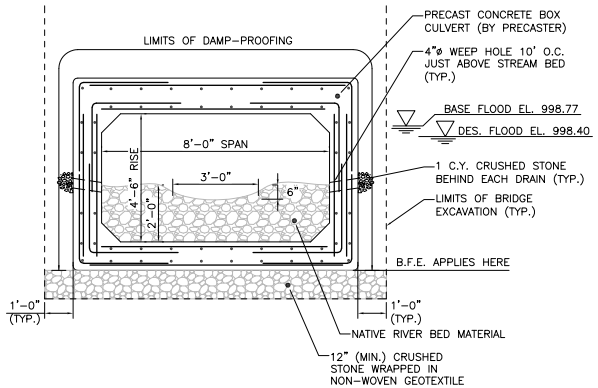
1. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, CONCRETE END WALL DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 172.



CULVERT 3 INLET FLARED WALL - SECTION
SCALE: ½" = 1'-0"



CULVERT 3 INLET FLARED WALL - ELEVATION
SCALE: ½" = 1'-0"



CULVERT 3 TRANSVERSE SECTION
SCALE: ½" = 1'-0"

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A00830-628

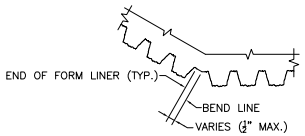
Proposal No. 608163-128112

WALES
MONSON ROAD

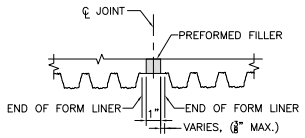
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	172	180
PROJECT FILE NO.	608163		

CULVERT & WALL DETAILS

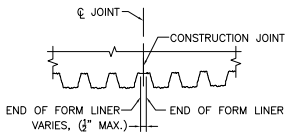
608163_HD11STRUCTURAL PLAN.DWG Plotted on: 26-Jun-2024 8:18 AM



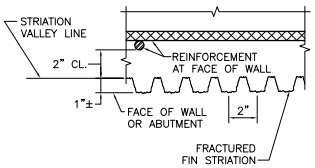
DETAIL AT WALL CORNER
SCALE: 3" = 1'-0"



EXPANSION JOINT
SCALE: 3" = 1'-0"



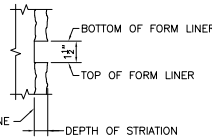
CONSTRUCTION JOINT
SCALE: 3" = 1'-0"

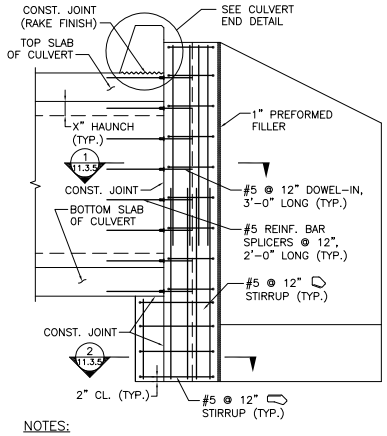


NOTES:

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.

TYPICAL STRIATION DETAIL
SCALE: 3" = 1'-0"

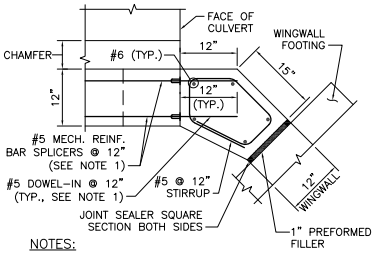




NOTES:

1. THE CONTRACTOR MAY SUBSTITUTE #5 DOWELS, 3'-0" LONG FOR MECHANICAL REINFORCING BAR SPLICERS AND THREADED REBARS.
2. CULVERT REINFORCEMENT IS NOT SHOWN FOR CLARITY.

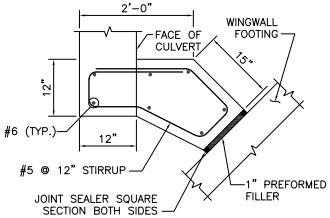
SECTION AT WINGWALL
SCALE: ½" = 1'-0"



NOTES:

1. THE CONTRACTOR MAY SUBSTITUTE #5 DOWELS, 3'-0" LONG, FOR MECHANICAL REINFORCING BAR SPLICERS AND THREADED REBARS.
2. CULVERT REINFORCEMENT IS NOT SHOWN FOR CLARITY.

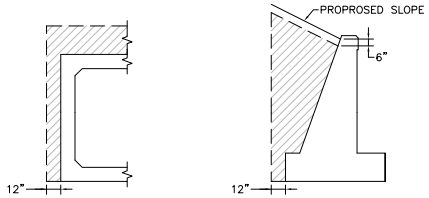
SECTION 1
SCALE: 1" = 1'-0"



NOTE:

CULVERT REINFORCEMENT IS NOT SHOWN FOR CLARITY.

SECTION 2
SCALE: 1" = 1'-0"



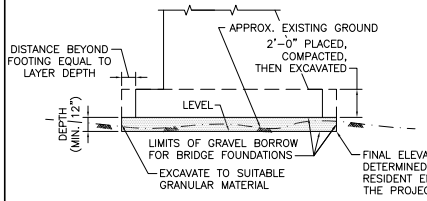
BOX CULVERT (OR FRAME)

HEADWALL

NOTE:

HATCHED AREA INDICATES LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES.

LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES
SCALE: ¼" = 1'-0"

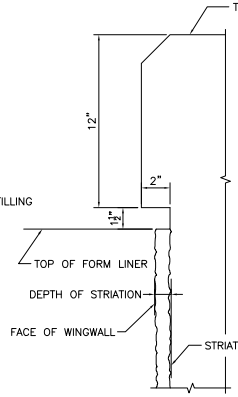


NOTES:

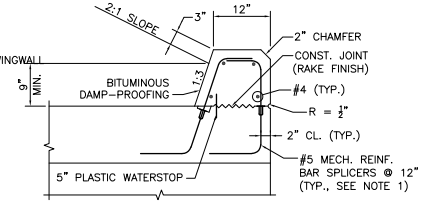
1. SAME TREATMENT IS TO BE USED AT ENDS OF WALLS.

LIMITS OF CRUSHED FOR BRIDGE FOUNDATIONS
NOT TO SCALE

HORIZONTAL PANEL JOINT
SCALE: 3" = 1'-0"



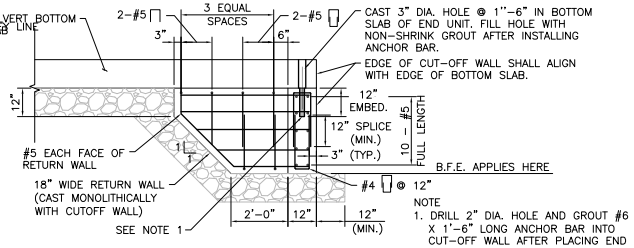
DETAIL AT TOP OF WINGWALL
SCALE: 3" = 1'-0"



NOTES:

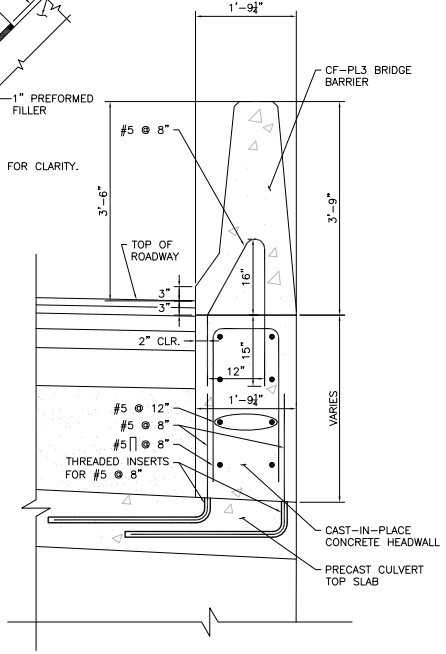
1. THE CONTRACTOR MAY SUBSTITUTE #5 ⌐⌐ DOWELS, FOR MECHANICAL REINFORCING BAR SPLICERS AND THREADED REBARS.
2. CULVERT REINFORCEMENT IS NOT SHOWN FOR CLARITY.

CULVERT END DETAIL
SCALE: 1" = 1'-0"



NOTE
1. DRILL 2" DIA. HOLE AND GROUT #6 X 1'-6" LONG ANCHOR BAR INTO CUT-OFF WALL AFTER PLACING END UNIT. USE NON-SHRINK GROUT. CENTER ANCHOR BAR IN HOLE IN BOTTOM SLAB.

CUT-OFF AND RETURN WALL DETAIL
SCALE: ½" = 1'-0"

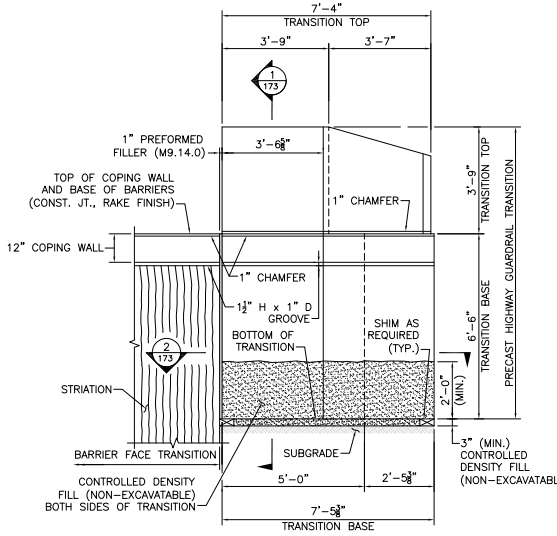


SECTION AT BOX CULVERT HEADWALL
SCALE: ½" = 1'-0"

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	173	180
PROJECT FILE NO.	608163		

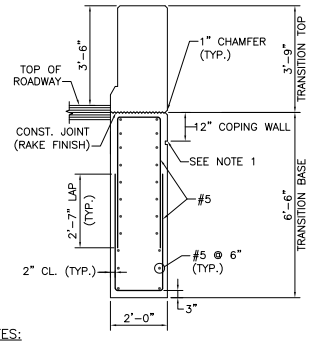
BARRIER CURB DETAILS I

608163_HD11STRUCTURAL PLAN.DWG Plotted on 26-Jun-2024 8:19 AM



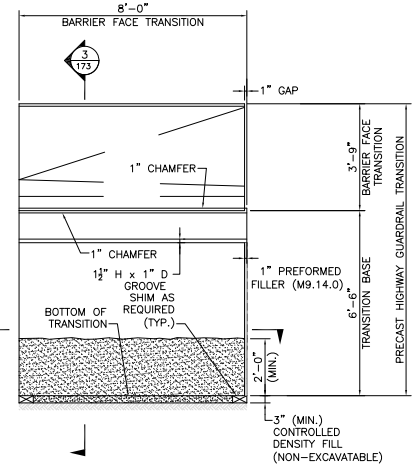
PRECAST GUARDRAIL TRANSITION ELEVATION AT U-WINGWALL

SCALE: ½" = 1'-0"



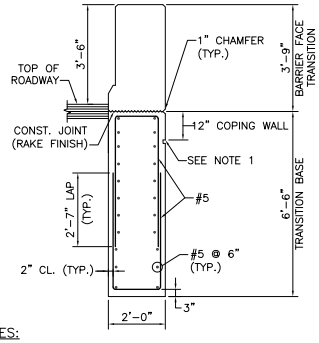
NOTES:

1. 1½" H x 1" D GROOVE. ALIGN WITH GROOVE AT TOP OF STRIATIONS.
2. REINFORCEMENT OF THE TRANSITION TOP IS NOT SHOWN FOR CLARITY.



BARRIER FACE TRANSITION CURB

SCALE: ½" = 1'-0"



NOTES:

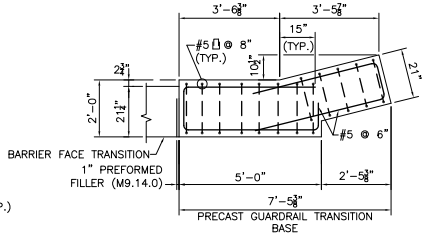
1. 1½" H x 1" D GROOVE. ALIGN WITH GROOVE AT TOP OF STRIATIONS.
2. REINFORCEMENT OF THE TRANSITION TOP IS NOT SHOWN FOR CLARITY.

SECTION 3

SCALE: ½" = 1'-0"

SECTION 1

SCALE: ½" = 1'-0"

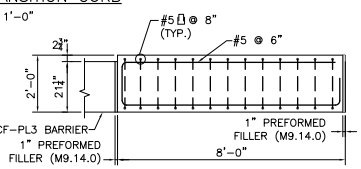


NOTE:

WINGWALL REINFORCEMENT AND STRIATIONS NOT SHOWN FOR CLARITY.

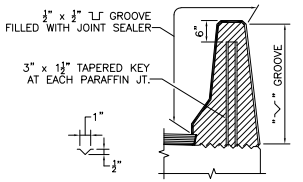
SECTION 2

SCALE: ½" = 1'-0"



SECTION 4

SCALE: ½" = 1'-0"

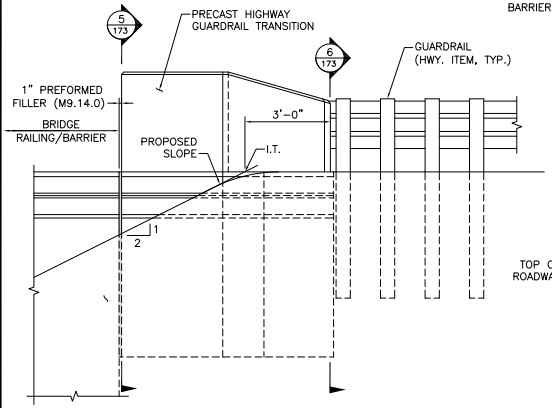


NOTES:

1. ALL CONCRETE ABOVE SLAB SHALL BE POURED IN ALTERNATING SECTIONS WITH NOT LESS THAN 3 DAYS BETWEEN POURS.
2. DO NOT CARRY LONGITUDINAL BARS THROUGH THE PARAFFIN JOINTS. END THE REINFORCEMENT 2" CLEAR OF JOINT.
3. JOINT SHALL BE SQUARE TO FACE OF CURB *(or coping)*.

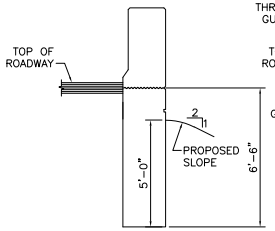
PARAFFIN JOINT DETAILS

SCALE: ¾" = 1'-0"



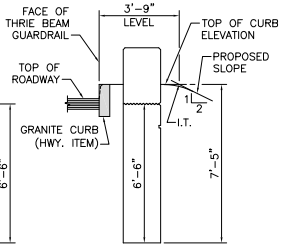
GRADING REQUIREMENTS ELEVATION

SCALE: ½" = 1'-0"



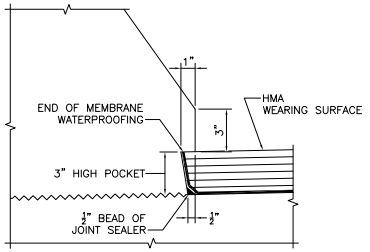
SECTION 5

SCALE: ⅜" = 1'-0"



SECTION 6

SCALE: ⅜" = 1'-0"



NOTE:

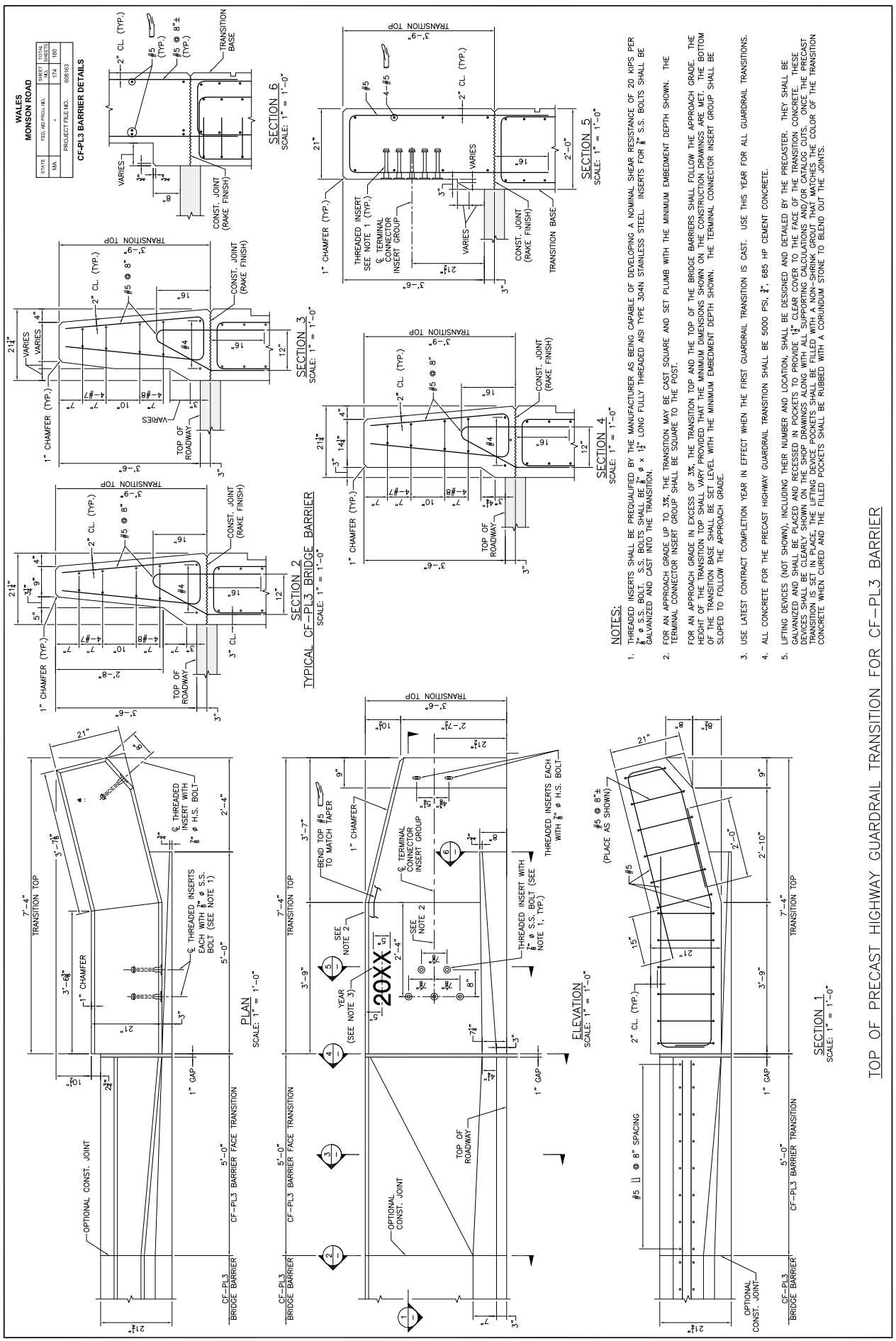
TURN MEMBRANE UP INTO 3" HIGH POCKET.

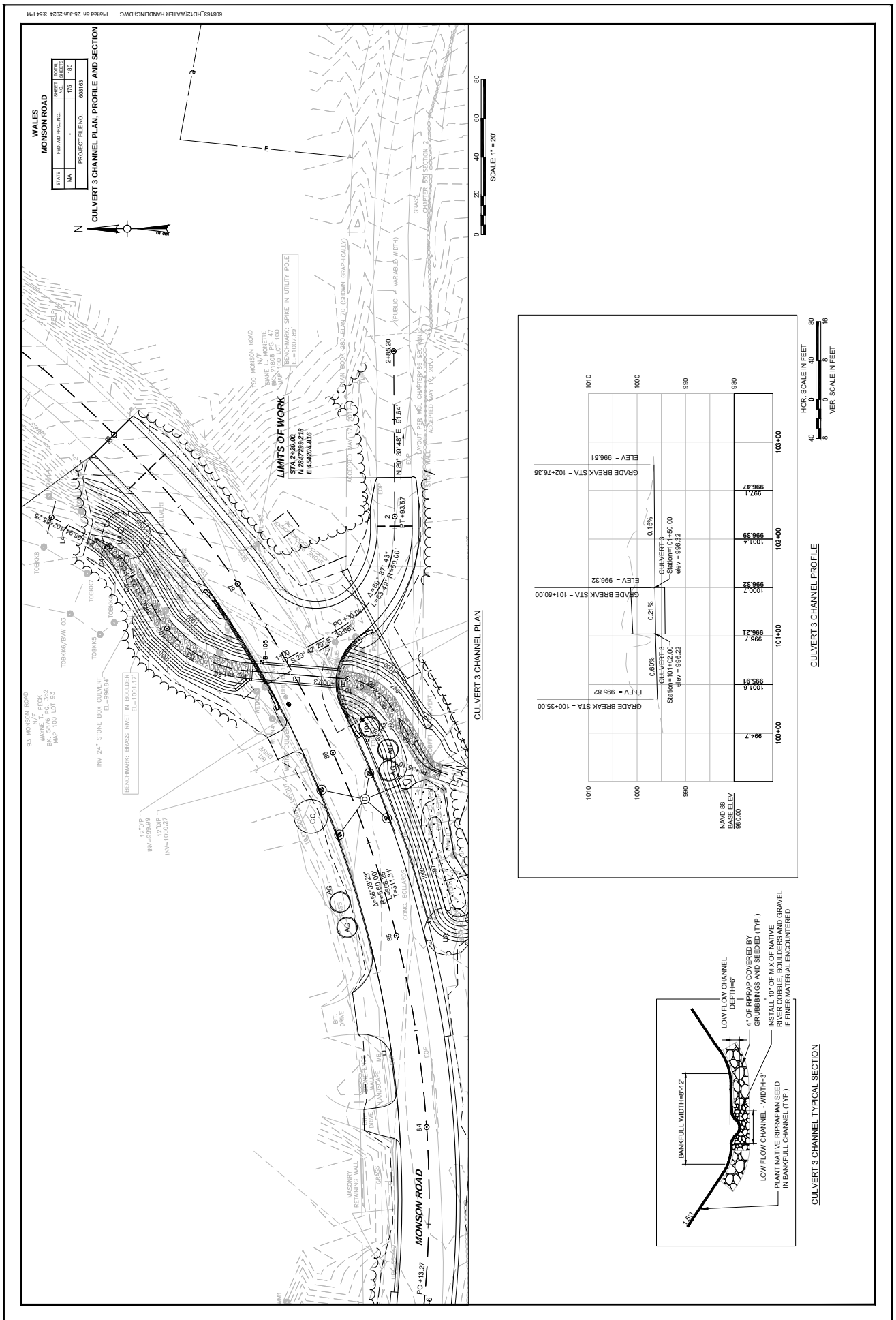
FACE OF SAFETY CURB DETAILS

SCALE: 3" = 1'-0"

A00830-630

Proposal No. 608163-128112

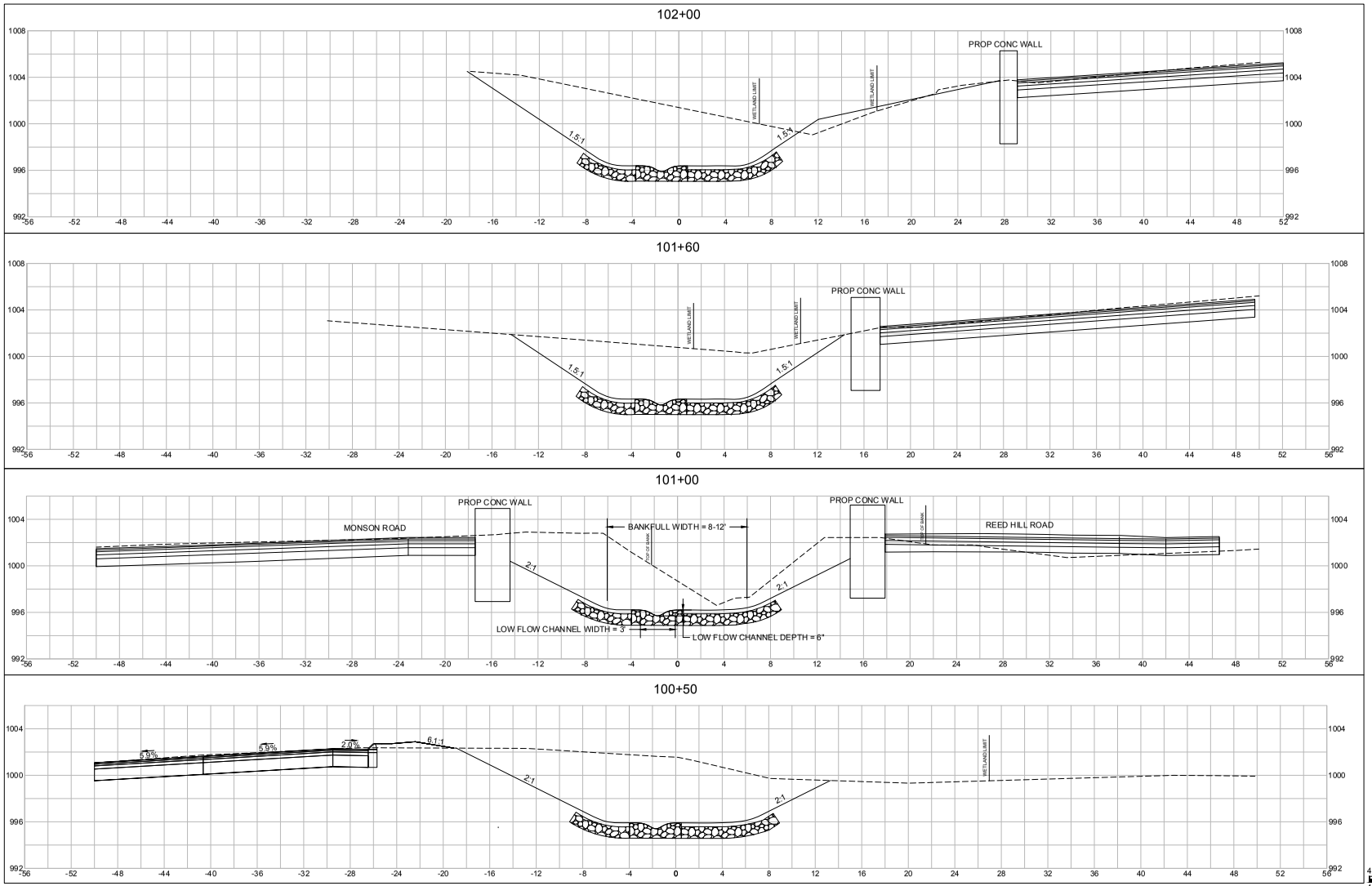

WALES
MONSON ROAD
CF-PL3 BARRIER DETAILS
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
174
TOTAL SHEETS
180
TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION FOR CF-PL3 BARRIER
TYPICAL CF-PL3 BRIDGE BARRIER
SECTION 1
SECTION 2
SECTION 3
SECTION 4
SECTION 5
SECTION 6
PLAN
ELEVATION
NOTES:
1. THREADED INSERTS SHALL BE PREQUALIFIED BY THE MANUFACTURER AS BEING CAPABLE OF DEVELOPING A NOMINAL SHEAR RESISTANCE OF 20 KIPS PER ⅞" ø S.S. BOLT. S.S. BOLTS SHALL BE ⅞" ø x 1½" LONG FULLY THREADED AISI TYPE 304N STAINLESS STEEL. INSERTS FOR ⅞" S.S. BOLTS SHALL BE GALVANIZED AND CAST INTO THE TRANSITION.
2. FOR AN APPROACH GRADE UP TO 3%, THE TRANSITION MAY BE CAST SQUARE AND SET PLUMB WITH THE MINIMUM EMBEDMENT DEPTH SHOWN. THE TERMINAL CONNECTOR INSERT GROUP SHALL BE SQUARE TO THE POST.
FOR AN APPROACH GRADE IN EXCESS OF 3%, THE TRANSITION TOP AND THE TOP OF THE BRIDGE BARRIERS SHALL FOLLOW THE APPROACH GRADE. THE HEIGHT OF THE TRANSITION TOP SHALL VARY PROVIDED THAT THE MINIMUM DIMENSIONS SHOWN ON THE CONSTRUCTION DRAWINGS ARE MET. THE BOTTOM OF THE TRANSITION BASE SHALL BE SET LEVEL WITH THE MINIMUM EMBEDMENT DEPTH SHOWN. THE TERMINAL CONNECTOR INSERT GROUP SHALL BE SLOPED TO FOLLOW THE APPROACH GRADE.
3. USE LATEST CONTRACT COMPLETION YEAR IN EFFECT WHEN THE FIRST GUARDRAIL TRANSITION IS CAST. USE THIS YEAR FOR ALL GUARDRAIL TRANSITIONS.
4. ALL CONCRETE FOR THE PRECAST HIGHWAY GUARDRAIL TRANSITION SHALL BE 5000 PSI, ⅜", 685 HP CEMENT CONCRETE.
5. LIFTING DEVICES (NOT SHOWN), INCLUDING THEIR NUMBER AND LOCATION, SHALL BE DESIGNED AND DETAILED BY THE PRECASTER. THEY SHALL BE GALVANIZED AND SHALL BE PLACED AND RECESSED IN POCKETS TO PROVIDE 1½" CLEAR COVER TO THE FACE OF THE TRANSITION CONCRETE. THESE DEVICES SHALL BE CLEARLY SHOWN ON THE SHOP DRAWINGS ALONG WITH ALL SUPPORTING CALCULATIONS AND/OR CATALOG CUTS. ONCE THE PRECAST TRANSITION IS SET IN PLACE, THE LIFTING DEVICE POCKETS SHALL BE FILLED WITH A NON-SHRINK GROUT THAT MATCHES THE COLOR OF THE TRANSITION CONCRETE WHEN CURED AND THE FILLED POCKETS SHALL BE RUBBED WITH A CORUNDUM STONE TO BLEND OUT THE JOINTS.


608163_HD12(WATER HANDLING).DWG Plotted on 25-Jun-2024 3:54 PM
WALES
MONSON ROAD
STATE
FED. AD PROJ NO.
SHEET NO.
TOTAL SHEETS
MA
-
175
180
PROJECT FILE NO.
608163
CULVERT 3 CHANNEL PLAN, PROFILE AND SECTION
N
SCALE: 1" = 20'
LIMITS OF WORK
STA 2+20.00
N 2847299.213
E 454204.816
MONSON ROAD
CULVERT 3 CHANNEL PLAN
CULVERT 3 CHANNEL PROFILE
HOR. SCALE IN FEET
VER. SCALE IN FEET
NAVD 88
BASE ELEV
980.00
GRADE BREAK STA = 100+35.00
ELEV = 995.82
GRADE BREAK STA = 101+50.00
ELEV = 996.32
GRADE BREAK STA = 102+76.35
ELEV = 996.51
CULVERT 3
Station=101+02.00
elev = 996.22
CULVERT 3
Station=101+50.00
elev = 996.32
CULVERT 3 CHANNEL TYPICAL SECTION
BANKFULL WIDTH=8'-12'
LOW FLOW CHANNEL DEPTH=6"
4" OF RIPRAP COVERED BY GRUBBINGS AND SEEDED (TYP.)
INSTALL 10" OF MIX OF NATIVE RIVER COBBLE, BOULDERS AND GRAVEL IF FINER MATERIAL ENCOUNTERED
LOW FLOW CHANNEL - WIDTH=3'
PLANT NATIVE RIPRAPIAN SEED IN BANKFULL CHANNEL (TYP.)

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	176	180
PROJECT FILE NO.	608163		

CULVERT 3 CHANNEL CROSS SECTIONS



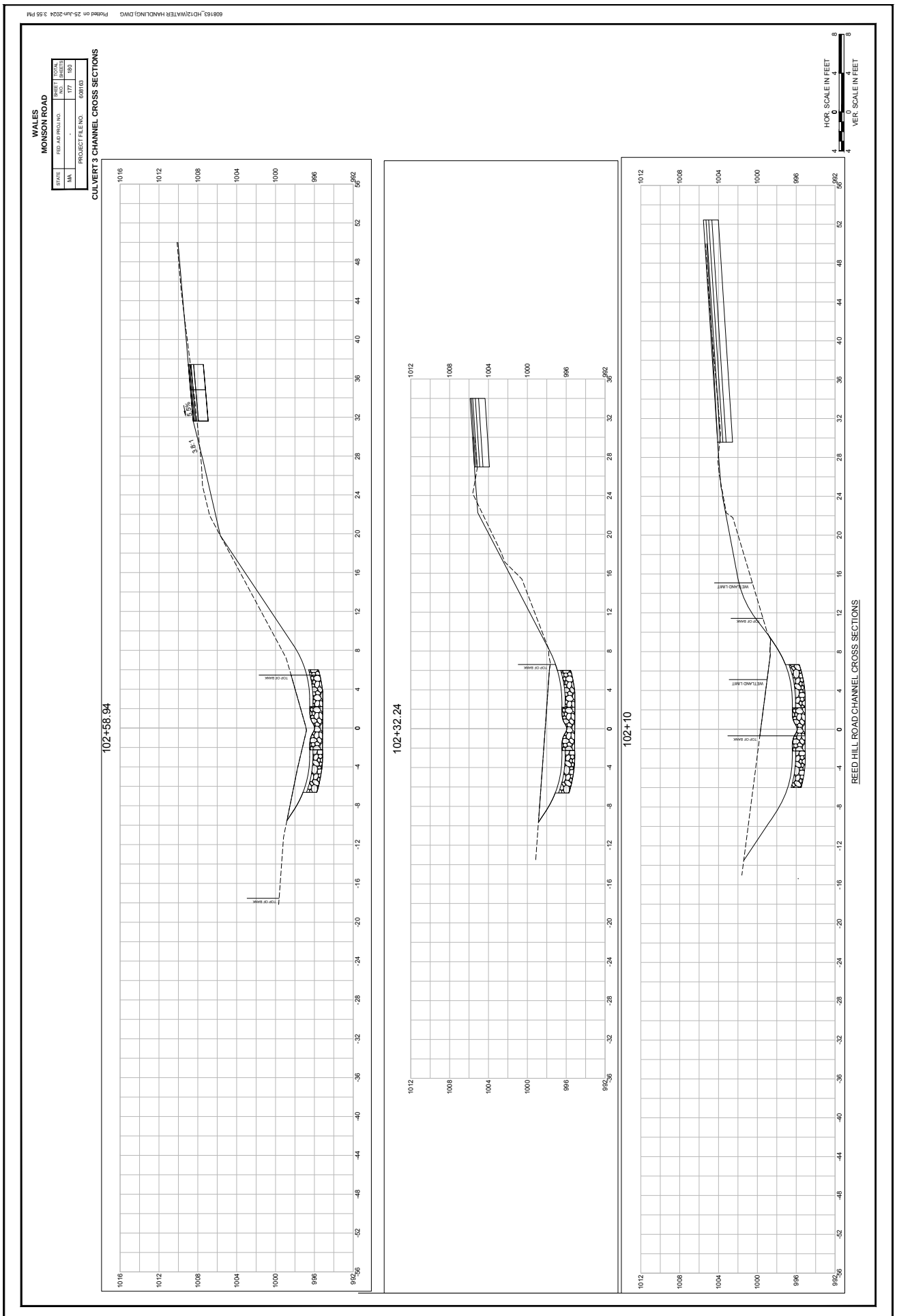
REED HILL ROAD CHANNEL CROSS SECTIONS

HOR. SCALE IN FEET
VER. SCALE IN FEET

608163_HD12\WATER HANDLING\.DWG Plotted on 25-Jun-2024 3:54 PM

A00830 -633

Proposal No. 608163-128112

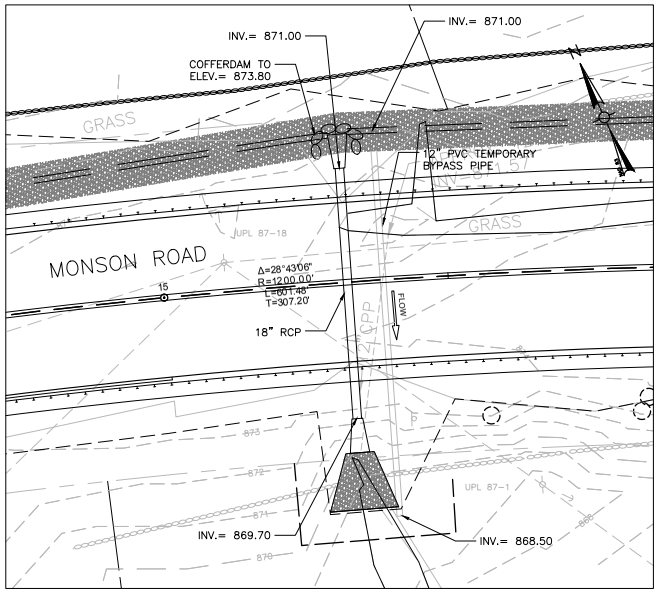

608163_HD12\WATER HANDLING\.DWG Plotted on 25-Jun-2024 3:55 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
PROJECT FILE NO.
608163
SHEET NO.
177
TOTAL SHEETS
180
CULVERT 3 CHANNEL CROSS SECTIONS
102+58.94
102+32.24
102+10
REED HILL ROAD CHANNEL CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
TOP OF BANK
WETLAND LIMIT
3.5:1

WALES
MONSON ROAD

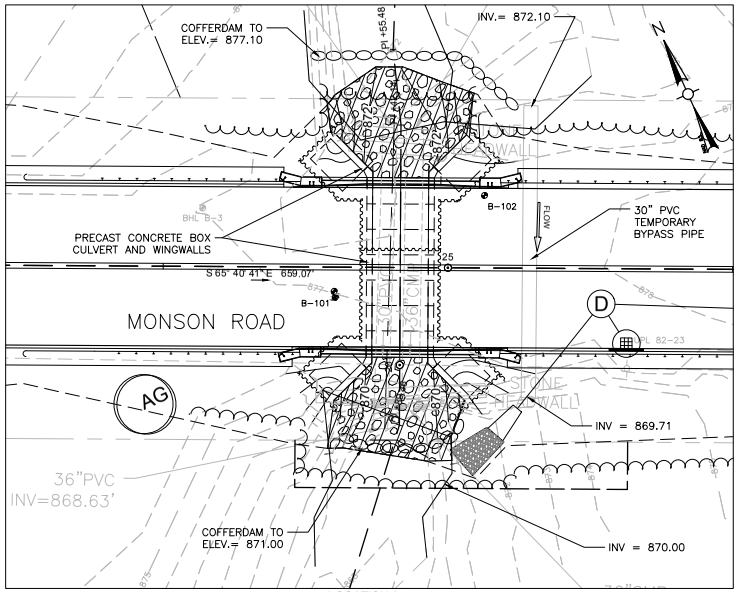
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	178	180
PROJECT FILE NO.	608163		

CONTROL OF WATER PLANS

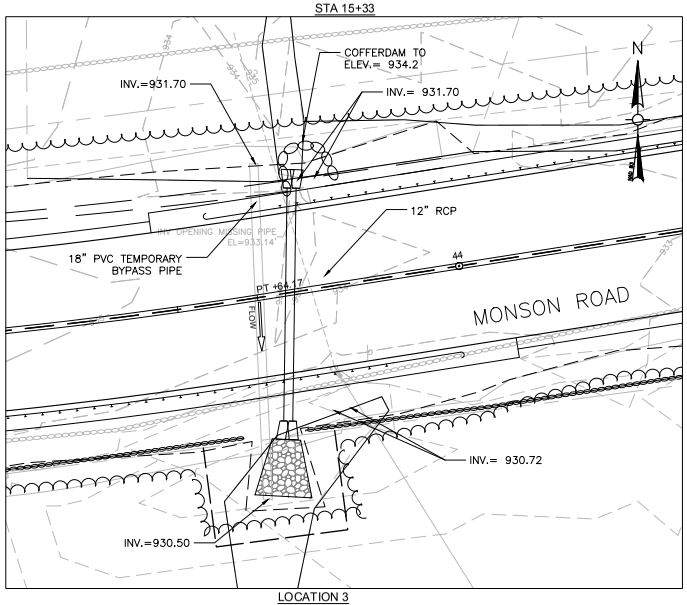
608163_HD12\WATER HANDLING\.DWG Plotted on 25-Jun-2024 3:56 PM



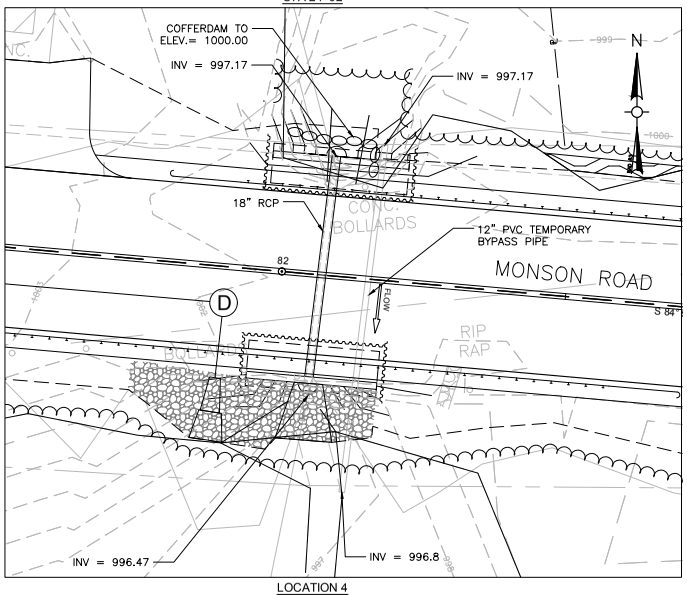
LOCATION 1
STA 15+33



LOCATION 2
STA 24+92



LOCATION 3
STA 43+76



LOCATION 4
STA 82+07

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE FOR CULVERTS:

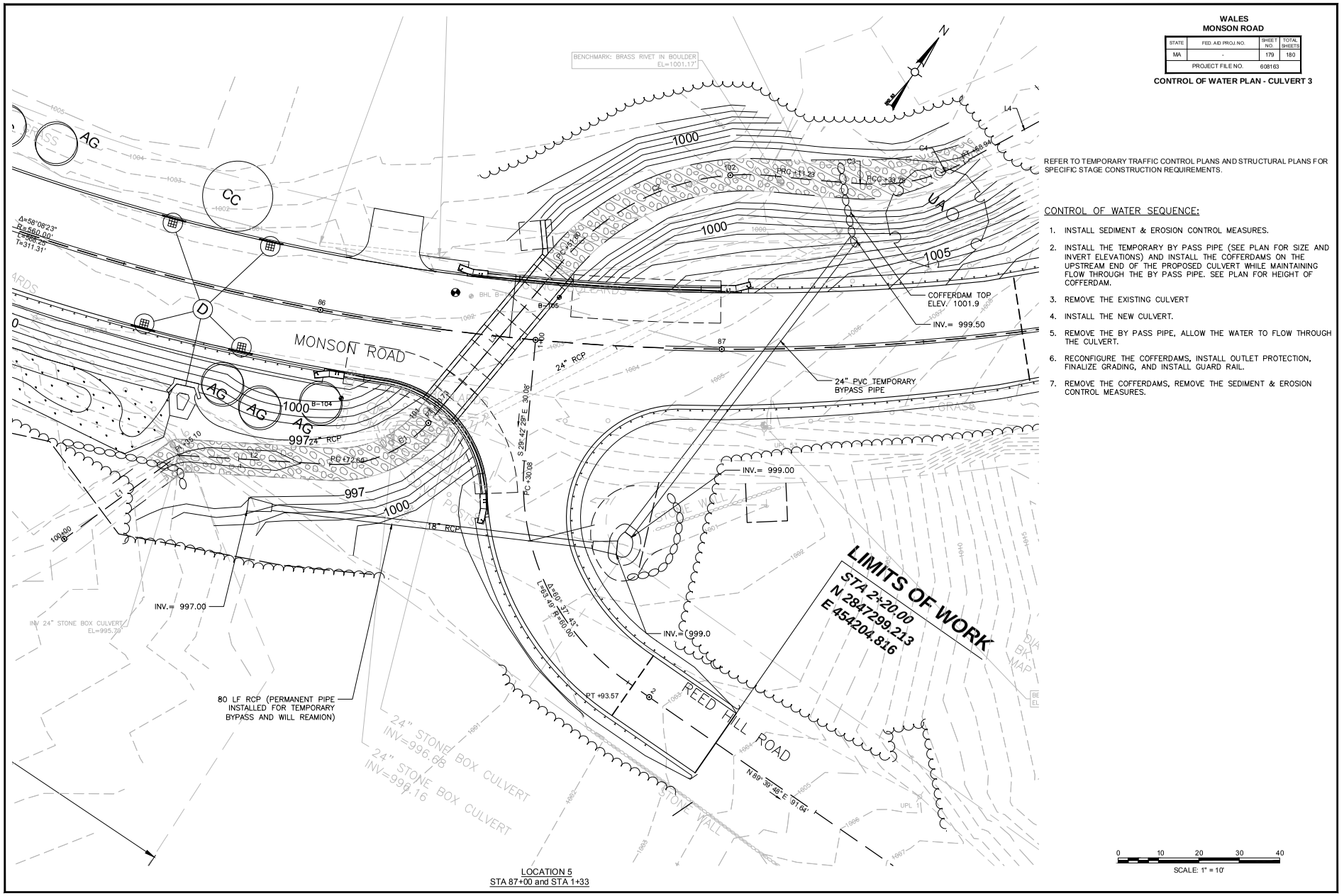
1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE AND INVERT ELEVATIONS) AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE. SEE PLAN FOR HEIGHT OF COFFERDAM.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE FOR CULVERTS AND END WALLS

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE) AND INSTALL THE COFFERDAMS IN THE STREAM ON BOTH ENDS OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND ENDWALLS.
4. INSTALL THE NEW CULVERT.
5. INSTALL THE END WALLS.
6. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT. RECONFIGURE THE COFFERDAMS AROUND THE SIDE THAT WILL BE CONSTRUCTED NEXT.
7. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
8. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

0 10 20 30 40
SCALE: 1" = 10'



LOCATION 5
STA 87+00 and STA 1+33

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	179	180
PROJECT FILE NO.	608163		

CONTROL OF WATER PLAN - CULVERT 3

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE AND INVERT ELEVATIONS) AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE. SEE PLAN FOR HEIGHT OF COFFERDAM.
3. REMOVE THE EXISTING CULVERT
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

608163_HD12\WATER HANDLING\.DWG Plotted on 25-Jun-2024 3:56 PM

A00830 -636

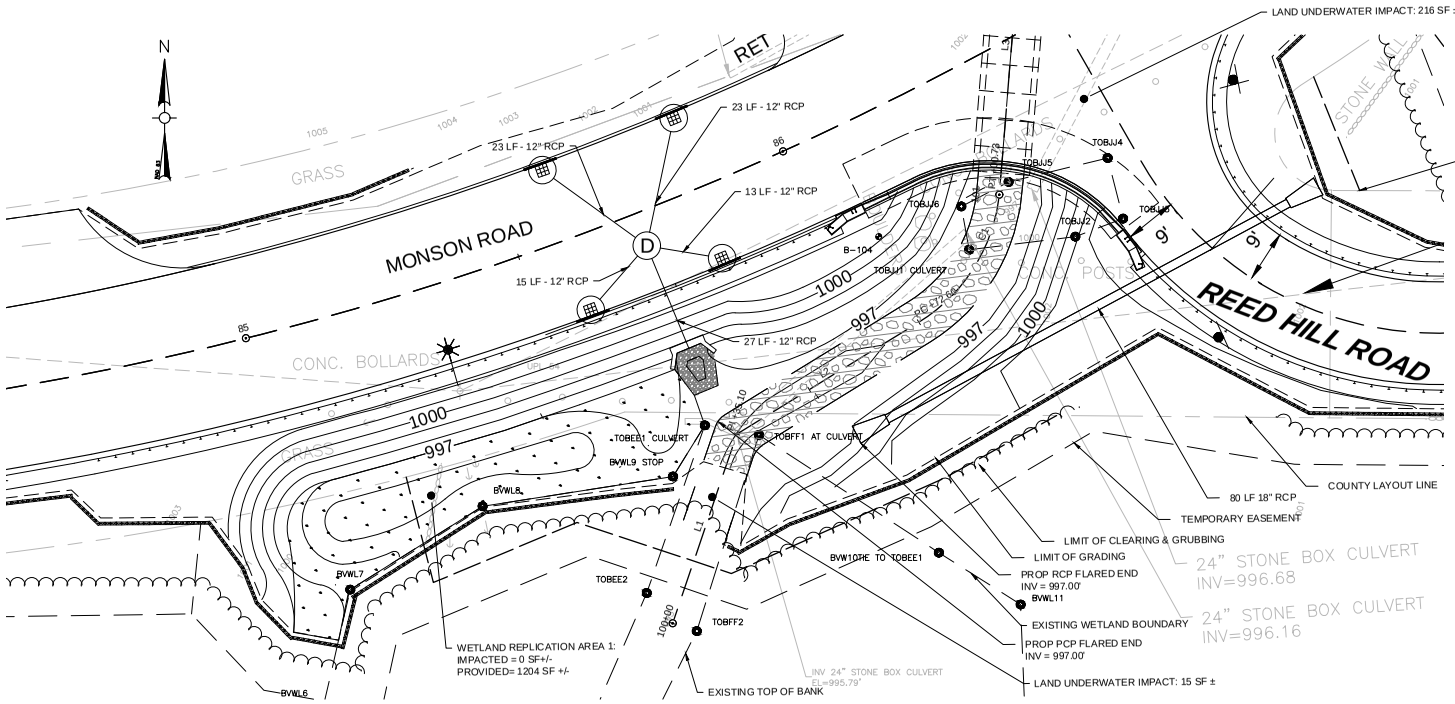
Proposal No. 608163-128112

608163_HD13\WETLAND REPLICATION).DWG Plotted on 25-Jun-2024 4:00 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	180	180
PROJECT FILE NO.	608163		

WETLAND REPLICATION AREA DETAIL



WETLAND REPLICATION AREA 1 GRADING PLAN

0 10 20 30 40
SCALE: 1" = 10'

WETLAND SEED MIX - OBLIGATE MIX

BOTANICAL

GRASS	COMMON NAME	%PLS BY WEIGHT
CAREX VULPINOIDEA	FOX SEDGE	26.50%
CAREX LURIDA	SHALLOW SEDGE	15.00%
SAPERGANIUM EURYCARPUM	GIANT BUR REED ECO PA	10.00%
CAREX LUPULINA	HOP SEDGE	7.00%
CAREX CRINITA	FRINGED SEDGE	6.00%
SCIRPUS CYPERINUS	WOOLGRASS	4.00%
JUNCUS EFFUSUS	SOFT RUSH	3.00%
CAREX COMOSA	BEAREDED SEDGE	3.00%
SCIRPUS ATROVIRENS	GREEN BULRUSH	3.00%
SPARGANIUM AMERICANUM	BURRWEED	2.50%
SCIRPUS VALIDUS	BULRUSH, SOFT-STEM	2.00%
CAREX STRICTA	TUSSOCK SEDGE	1.00%
GLYCERIA CANADENISIS	MANNA GRASS	1.00%
		86.00%
VERBENA HASTATA	BLUE VERVAIN	4.00%
ASTER PUNICEUS	ASTER - SWAMP	2.00%
EUPATORIUM MACULATUM	JOE-PYE WEED	1.50%
EUPATORIUM PERFOLIATUM	BONESET	2.00%
IRIS VERSICOLOR	BLUE FLAG IRIS	2.00%
ALISMA SUBCORDATUM	MUD PLAINTAIN	1.00%
VERONIA NOVEBORACENSIS	NEW YORK IRONWEED	1.00%
BUDENS CERNUA	NODDING BURR MARIGOLD	1.00%
SOLIDAGO PATULA	ROUGHLEAF GOLDENROD	0.50%
MIMULUS RINGENS	MONKEY FLOWER	0.50%
CHELONE GLABRA	WHITE TURTLEHEAD	0.50%
		14.00%
		100.00%

SEED RATING:
SPECIES ECOTYPE SHALL BE AS NATIVE TO NEW ENGLAND REGION AS POSSIBLE. APPLY THIS MIX AT 20 LBS PLS/ACRE.

WETLAND REPLACEMENT AREA 1 NOTES:

1. A WETLAND SCIENTIST SHALL BE PROVIDED ON-SITE TO MONITOR CONSTRUCTION OF THE WETLAND MITIGATION AREA TO ENSURE COMPLIANCE WITH THE MITIGATION PLAN.
2. AT LEAST 12 INCHES OF NATURAL OR MANMADE WETIAND SOIL SHALL BE INSTALLED IN THE WETLAND REPLICATION AREA.
3. ONLY PLANT MATERIALS NATIVE AND INDIGENOUS TO THE REGION SHALL BE USED, SPECIES NOT SPECIFIED IN THE REPLICATION PLAN SHALL NOT BE USED WITHOUT WRITTEN APPROVAL FROM THE REGULATORY AUTHORITIES. PLANT SPECIES ON THE INVASIVE SPECIES PLANT LIST IN THE CORPS MITIGATION INTRODUCTION: PERFORMANCE STANDARDS AND SUPPLEMENTARY INFORMATION DATED 2/21/01 SHALL NOT BE USED IN AND WITHIN 100 FEET OF MITIGATION SITES.
4. A SUPPLY OF DEAD AND DYING WOODY DEBRIS SHALL COVER between 5%-20% OF THE GROUND THROUGHOUT THE MITIGATION SITE AFTER THE COMPLETION OF CONSTRUCTION OF THE MITIGATION SITE. THESE MATERIALS SHOULD NOT INCLUDE INVASIVE SPECIES.
5. TEMPORARY DEVICES AND STRUCTURES TO CONTROL EROSION AND SEDIMENTATION IN AND AROUND MITIGATION SITES SHALL BE DISASSEMBLED AND PROPERLY DISPOSED OF NO LATER THAN NOVEMBER 1 THREE FULL GROWING SEASON AFTER PLANTING. SEDIMENT COLLECTED BY THESE DEVICES SHALL BE REMOVED AND PROPERLY DISPOSED OF IN A MANNER THAT PREVENT ITS EROSION AND TRANSPORT TO A WATERWAY OR WETLAND.

WETLAND REPLICATION AREA 1 PLANTING PLAN

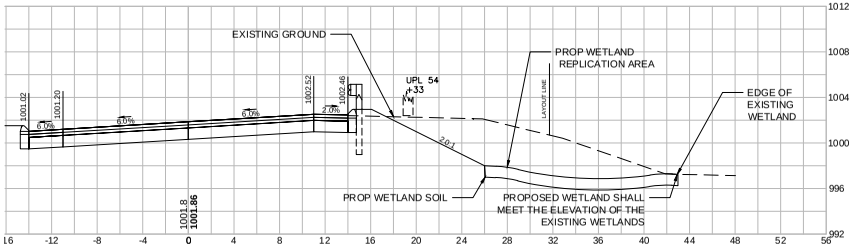
SHRUBS
HIGHBUSH BLUEBERRY (VACCINIUM CORYMBOSUM): 4 PLANTS, SPACED 10 FEET ON CENTER MINIMUM
WINTERBERRY (ILEX VERTICILLATE): 4 PLANTS, SPACED 10 FEET ON CENTER MINIMUM

FERNS
CINNAMON FERN (OSMUNDA CINNAMOMEA): 50 PLANTS, SPACED 2 FEET ON CENTER, PUT IN CLUSTERS OF AT LEAST 5 TOGETHER IN SAME AREA TO PROVIDE A NATURAL PATTERN.
SENSITIVE FERN (ONOCLEA SENSIBILIS): 50 PLANTS, SPACED 2 FEET ON CENTER, PUT IN CLUSTERS OF AT LEAST 5 TOGETHER IN SAME AREA TO PROVIDE A NATURAL PATTERN.

SEED MIX
IN WETLAND REPLICATION AREA: SEE WETLAND SEED - OBLIGATE MIX - THIS SHEET (SAME MIX TO BE USED ON PLAN SHEET 16 FOR WETLAND RESTORATION AREA 1)

FOR ALL AREA OUTSIDE AND ADJACENT TO WETLAND RESTORATION AND/OR REPLICATION AREAS PROVIDE PART SHADE ROADSIDE SEED MIX AS INDICATED ON CONSTRCUTION DETAIL SHEET 84.

85+50



WETLAND REPLICATION AREA CROSS SECTION

Regulatory Division
Transportation & Utility Section

John Grasso
Town of Wales
3 Hollow Road
Wales, MA 01081
Via Email: select@townofwales.net

Courtney Walker
MassDOT – Highway Division
10 Park Plaza
Boston, MA 02166
Via Email: courtney.l.walker@dot.state.ma.us

Dear Mr. Grasso and Ms. Walker:

This letter is in response to the application you submitted to the New England District, Regulatory Division on June 27, 2024 for a Department of the Army permit verification. This project has been assigned the file number NAE-2024-01688. This file number should be referenced in all correspondence with this office.

The proposed work includes the reconstruction of 1.5 miles of Monson Road, including upgrading several stream crossings in Wales, Hampden County, Massachusetts.

We have completed our initial review of the application and have determined that it is incomplete. The following information listed below is necessary to have a complete application. Please provide this information in **one consolidated response within 30 days (August 9, 2024) of the date of this correspondence.** If you do not respond within the 30-day timeframe, the request will be administratively withdrawn. Closure of your file will not preclude you from re-opening the file at a later date, 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. 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, boring logs and cross sections without jurisdictional impacts should be removed from the file.

3. Please renumber the plan set to form a sequential set. Please revise the key sheet after sheets have been reduced to reflect the updated plan set.

4. Please update the plan sets to use different colors and or symbology to differentiate permanent and temporary impacts for wetlands and Waters of the United States (WOTUS).

5. Page 6 of the narrative and sheet number 33 of the plan set describe an intermittent channel labeled “WET N”. If this is a stream with bed, bank, and Ordinary High Water (OHW), “WET N” should be considered WOTUS. If there are impacts to “WET N”, please provide photos, revise the plan sheets and adjust impact calculations accordingly.

6. Detailed cross-section and profile views were provided for STA 24+92, 82+07, and 86+45. Please provide cross section and profile views for the other three stream crossings (STA 15+32, 43+75, and 46+60).

7. Please include OHW elevation within each culvert cross-section and profile view.

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.

If you have any questions concerning this correspondence, please contact Kevin Newton at (978)-318-8044, or by email at kevin.m.newton@usace.army.mil.

Sincerely,

Kevin Newton
Project Manager/Biologist

Enclosures

cc:
Mike Joyce, Weston & Sampson Engineers (via joyce.michael@wseinc.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)

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

August 9, 2024

U.S. Army Corps of Engineers, New England District
Regulatory Division
Attn: Mr. Kevin Newton
696 Virginia Road
Concord, MA 01742

Submitted via email to Kevin.M.Newton@usace.army.mil

Re: Response to Request for Additional Information – Monson Road Transportation Improvements Project, Wales, Massachusetts (Corps File No. NAE-2024-01688)

Dear Mr. Newton:

In response to the comments issued by the U.S. Army Corps of Engineers (USACE) on July 10, 2024 for the Monson Road Transportation Improvements Project Pre-Construction Notification (PCN), submitted by Weston & Sampson on behalf of the Town of Wales, Weston & Sampson is providing a written response to comments.

The USACE's comments on the PCN are provided in italics below, followed by our responses in **bold** font.

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.*

   MassDOT has re-sent the Project Notification Form (PNF) to the BUAR and the THPOs and has included the delivery receipts. Proof of delivery to the BUAR and THPOs is included in Appendix A to this letter.

2. *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, boring logs and cross sections without jurisdictional impacts should be removed from the file.*

   The plan set size and number of pages have been reduced as requested. The revised plan set is included in Appendix C to this response letter.

3. *Please renumber the plan set to form a sequential set. Please revise the key sheet after sheets have been reduced to reflect the updated plan set.*

   The plan sheet numbers have been renumbered sequentially. The revised plan set is included in Appendix C.

4. *Please update the plan sets to use different colors and or symbology to differentiate permanent and temporary impacts for wetlands and Waters of the United States (WOTUS).*

   The plans have been updated to use different colors for the proposed permanent and temporary impacts to WOTUS. The revised plan set is included in Appendix C.

5. *Page 6 of the narrative and sheet number 33 of the plan set describe an intermittent channel labeled "WET N". If this is a stream with bed, bank, and Ordinary High Water (OHW), "WET N" should be considered WOTUS. If there are impacts to "WET N", please provide photos, revise the plan sheets and adjust impact calculations accordingly.*

   The channel is a small, roadside drainage ditch. The Applicant believes that the area does not meet the definition of Waters of the U.S. (WOTUS) pursuant to 33 CFR Part 328 which states, in part, "where a feature satisfies the terms of an exclusion, it is excluded from jurisdiction even where the feature would otherwise be jurisdictional under paragraphs (a)(2) through (5) of this rule…". The list of exclusions includes:

   (3) Ditches (including roadside ditches) excavated wholly in and draining only dry land and that do not carry a relatively permanent flow of water.

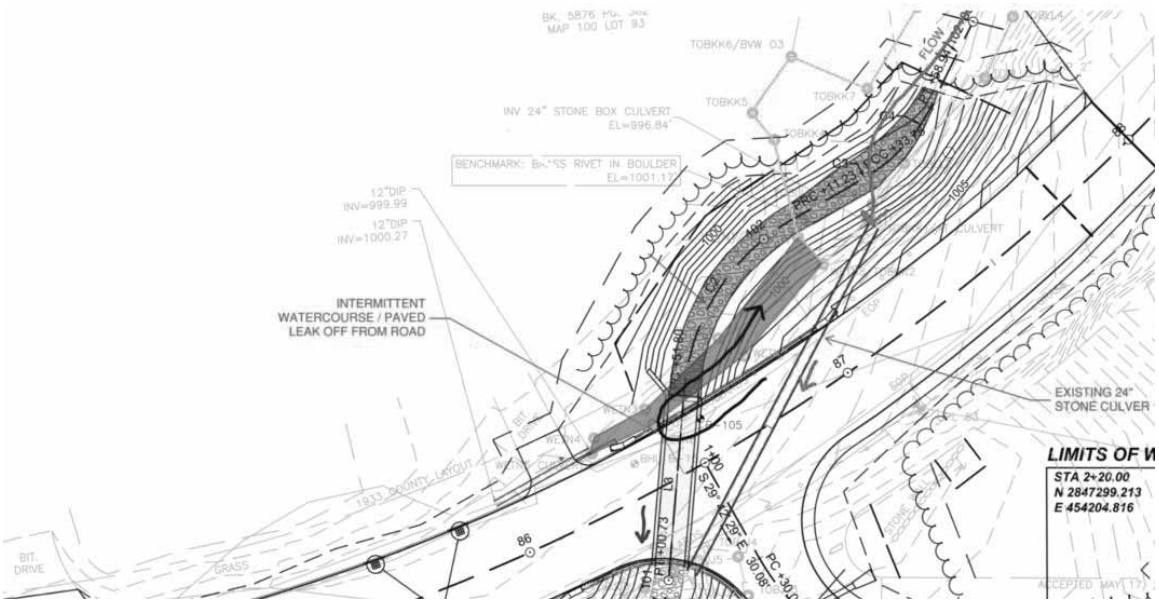
   The drainage channel in question (labeled "WET N" on the plans) is a roadside ditch that collects runoff from Monson Road. The channel meets the above definition as it was excavated in dry land and drains dry land (the roadway). It does not carry a permanent flow of water, and was dry at the time of the delineation.

   This channel was discussed in a meeting with the U.S. Army Corps of Engineers (Mr. Kevin Newton and Mr. Dan Vasconcelos) and MassDEP (Ms. Heidi Davis and Mr. Ryan Hale) on July 23, 2024. As discussed, the drainage ditch in question originates in an upland area, does not contain wetland vegetation or hydric soils, and has no visible Ordinary High Water mark (OHWM). This channel was excavated in an upland area for stormwater drainage purposes and is maintained by the Town as needed.

   Photos of this drainage ditch are included below.

The sediment shown in the photo is deposited sediment from roadway runoff.

The inverts of the 12" pipe under the adjacent driveway shows the direction of flow back toward the pipe and actual watercourse (see image below).



The roadside ditch collects runoff from the road. The observed banks are more due to erosion than actual watercourse patterns. The paved leaked off was cut in by the Town and periodically paved to allow the roadway runoff to drain off the road and toward the watercourse and 24" stone culvert. The invert of the 24" pipe under Monson Road is approximately 4-5' lower than the beginning of the paved leaked off.

Regarding a question from Ms. Heidi Davis during the July 23rd meeting, the existing drainage area contributing to the drainage ditch across from Reed Hill Road is approximately 16,760 SF or 0.38 acres. This area mainly consists of roadway drainage coming down the hill and eventually entering the existing paved leak-off. Approximately 2,200 SF (0.05AC) is pervious area (grass/woods).

6. *Detailed cross-section and profile views were provided for STA 24+92, 82+07, and 86+45. Please provide cross section and profile views for the other three stream crossings (STA 15+32, 43+75, and 46+60).*

   Cross section views of the crossings at STA 15+32, 43+75, and 46+60 have been provided in the revised plan set. As discussed, these shallow, small watercourses do not represent perpendicular stream crossings, and therefore longitudinal profiles have not been provided.

7. *Please include OHW elevation within each culvert cross-section and profile view.*

   The field delineated OHW limits have been shown on the cross sections at the locations where they were field delineated.

Additional Information:

Since the original PCN submittal MassDOT conducted Stream Visual Assessments for the stream crossings at STA 24+92, 43+75, and 86+45. The SVAP forms are included in Appendix B. The overall SVAP score for the stream at STA 24+92 is 5.8 (Fair), the score for the stream at STA 43+75 is 2.6 (Severely Degraded), the score for the north segment of the stream at STA 86+45 is 4.1 (Poor), and the score for the south segment of the stream at STA 86+45 is 4.2 (Poor).

The stream at STA 24+92 received an SVAP rating as “Fair” and contained clear water, dense canopy cover, and its banks were observed to be mostly stable, despite some incision. The stream received low scores for the minimal riparian vegetation and for its barriers to movement (two culverts under the road with an approximately 1-foot drop to the stream channel downstream).

The stream at STA 43+75 was actively incised and the swale and pipe were observed to be severely altering the hydrology of the stream channel. Large sediment flow with many fine sediments were observed within the north segment of the stream channel at STA 86+45. A half buried 24” diameter pipe was also observed at the downstream boundary. The south segment of the stream channel at STA 86+45 had significant hydrologic alteration and almost no riparian area present.

The applicant understands that a Stream Visual Assessment is also required for the crossing at STA 15+32. This SVAP will be provided as a supplemental submittal to the USACE following this submission.

If you have any questions regarding this submittal, please contact me at 978-548-6301.

Very truly yours,

WESTON & SAMPSON ENGINEERS, INC.

Michael Joyce, P.E.
Senior Team Leader - Transportation

cc: Wales Board of Selectmen
Courtney Walker, MassDOT
Melissa Lenker, MassDOT
Kimberly Sloan, MassDOT
Heidi Davis, MassDEP
Tyler Lewis, MassDEP
Ryan Hale, MassDEP

List of Appendices:

Appendix A: Section 106 Correspondence
Appendix B: Stream Visual Assessment Protocol Forms
Appendix C: Updated Permit Drawings
Appendix D: Updated Stormwater Report

Appendix A

Copy of Delivery Receipts for Section 106 Correspondence

Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Gina Fiandaca, Secretary & CEO
Jonathan L. Gulliver, Highway Administrator

massDOT
Massachusetts Department of Transportation
Highway Division

April 28, 2023

RE: WALES –Reconstruction & Improvements on Monson Rd. Project (608163)
Section 106 Review - No Adverse Effect
Section 4(f) Evaluation – Permanent Easements – *de minimis* impact
Section 4(f) Evaluation – Temporary Occupancies – No 4(f) Use

Ms. Brona Simon
State Historic Preservation Officer
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125

CONCURRENCE Brona Simon
5/31/23 BRONA SIMON
STATE HISTORIC
PRESERVATION OFFICER
MASSACHUSETTS
HISTORICAL COMMISSION

RECEIVED
MAY 01 2023
MASS. HIST. COMM
RC.73167

Dear Ms. Simon:

The Massachusetts Department of Transportation, Highway Division (MassDOT) and the Town of Wales propose to expend federal funds to reconstruct a 1.45-miles segment of the Monson Road from the Wales/Monson town line easterly to Reed Hill Road. Monson Road will also be widened, existing culverts will be replaced, and stormwater and drainage improvements will be completed.

According to the MHC-Inventory form, the late-eighteen century **Cyrus Munger House (WAL.36)** is one of the oldest houses constructed in Wales for the Munger family, who were among the earliest recorded settlers in town. Mr. Munger is also reportedly a Revolutionary War Veteran.[1] It is the opinion of MassDOT Cultural Resources Unit (CRU) staff that the property is individually eligible for listing in the NRHP at the local level. MassDOT has reviewed this project under the terms of the 2004 Massachusetts Statewide Programmatic Agreement for Section 106 of the National Historic Preservation Act of 1966, as amended [36 CFR Part 800.3(a)(2)], and has determined that the project will have **No Adverse Effect** on any NR-listed or –eligible properties.

Monson Road Reconstruction & Improvements

Monson Road is currently 22'-wide with no roadway shoulders or bicycle/pedestrian accommodations. This project proposes full-depth reconstruction of Monson Road with a new 28'-wide cross-section, consisting of two 10' travels lanes with 4' shoulders. The new cross-section will improve driver sight-distances and provide bicyclists and pedestrians space as well.

The project will require some minor geometric improvements at selected intersections including the Monson Road/Lynch Road intersection, which is located directly to the east of the **NRE-Cyrus Munger House**. The roadway width at this intersection will be reduced by removing the small traffic island and narrowing the roadway. The freestanding stonewalls that line the edge of the NRE-property will not be affected by the nearby roadway work. The intersection of Monson

[1] *Munger Collection, 1776-1859*, Old Sturbridge Village Research Library, Sturbridge, MA (https://www.osv.org/content/uploads/2019/01/Munger-Collection.pdf)

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

Road/Reed Hill Road, at the easternmost end of the project corridor, will also be realigned to become a T-shaped intersection.

Other work within the project corridor includes replacing culverts and drainage structures and constructing a new closed drainage system. Selected trees and free-standing stone walls will be removed from within the roadway layout to facilitate the project work. Trees close to the roadway work will be protected during construction, and erosion control measures will be installed.

Archaeological Assessment

A review of the MHC's archaeological maps in MACRIS revealed no recorded sites in the vicinity of the Monson Road project area. It is the opinion of the MassDOT Archaeologist that low sensitivity can be ascribed to the project's direct area of potential effect (APE) based on the impacts of past roadway, utility, and drainage construction, unfavorable conditions (slope and wetlands), and roadside development. The project work will be confined to disturbed and unfavorable conditions within and immediately adjacent to the existing roadway layout. The majority of the Monson Road widening (approximately 10 – 20 ft. in width) will occur to the south of the roadway. The widening areas consist of sloped roadway shoulders, drainage swale/wetland areas, landscaped lawns, and dry laid stone/rubble walls. The stonewalls to be removed are currently located within the existing highway layout. The proposed drainage work will occur on existing drainage structures within wetland areas.

Section 4(f) Evaluation –Permanent Utility Easements – *de minimis* impact

This project will require two permanent utility easements from the NR-eligible **Cyrus Munger House (WAL.36)** parcel for overhead wires and the installation of a guy wire. Permanent utility easements are highlighted in yellow on the enclosed ROW plans.

Any permanent utility easement that results in the permanent incorporation of land from a public or private historic site into a transportation facility (e.g., roadway, public sidewalk) is regarded as a transportation use and must be evaluated and approved under Section 4(f) of the Department of Transportation Act of 1966, as amended [23 CFR Part 774].

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 4(f) Evaluation – Temporary Occupancies – No 4(f) use

The project requires temporary occupancies, also known as temporary construction easements, on the NR-eligible **Cyrus Munger House (WAL.36)** parcel. The temporary occupancies are necessary to facilitate grading and installing compost filters. The temporary occupancies are highlighted in green on the right of way plans.

It is MassDOT's opinion that the temporary occupancies on parcel occupied by the NR-eligible Cyrus Munger House will satisfy the five conditions required for a temporary occupancy not to constitute a "use" within the meaning of Section 4(f), pursuant to 23 CFR 774.13(d):

(1) Duration must be temporary, i.e., less than the time needed for construction of the project, and there should be no change in ownership of the land;
(2) Scope of the work must be minor, i.e., both the nature and the magnitude of the changes to the Section 4(f) property are minimal;
(3) There are no anticipated permanent adverse physical impacts, nor will there be interference with the protected activities, features, or attributes of the property, on either a temporary or permanent basis;
(4) The land being used must be fully restored, i.e., the property must be returned to a condition which is at least as good as that which existed prior to the project; and
(5) There must be documented agreement of the official(s) with jurisdiction over the Section 4(f) resource regarding the above conditions.

The SHPO is the official with jurisdiction over historic sites for the purposes of Section 4(f), pursuant to 23 CFR 774.17. Your concurrence with this letter will signify that your office agrees with MassDOT's assessment that the proposed temporary occupancies do not constitute a "use" of a historic site under Section 4(f) and that the conditions listed above have been satisfied, pursuant to Condition 5 above.

Summary of Section 106 Effect Findings

On behalf of MassDOT, Weston & Sampson sent early coordination letters to the Wales Historical Commission (dated October 12, 2018) and a copy of this letter was mailed to the MHC. No response has been received to date from the Commissions.

It is MassDOT's opinion that the proposed Monson Road Reconstruction and Improvements Project will have **No Adverse Effect** on the NRE-**Cyrus Munger House (WAL.36)**. MassDOT solicits your concurrence with our **No Adverse Effect** finding for the project 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 by email at mary.hafferty@state.ma.us.

Sincerely,

Mary Hafferty

Mary Hafferty
Cultural Resources Specialist
Environmental Services

c.c. C. Ostrander, FHWA (w/attachments)

encs: 75% Highway & Right of Way Plans
Maps & Photographs

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, (or designee) Date
Division Administrator
Federal Highway Administration
Massachusetts Division

Hafferty, Mary H. (DOT)

From: Hafferty, Mary H. (DOT)
Sent: Thursday, May 4, 2023 9:32 AM
To: thpo@wampanoagtribe-nsn.gov; tcrm2@wampanoagtribe-nsn.gov
Cc: Harwood, Jameson (DOT)
Subject: Monson Road Reconstruction, Wales (MassDOT #608163)
Attachments: Wales -PNF.pdf; Wales 75% HWY -PNF.pdf; Wales -Maps & Photos.pdf

Dear Ms. Washington,

MassDOT is submitting the enclosed project information to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of the Federal Highway Administration and the 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@state.ma.us.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
***MassDOT* – Highway Division**
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

Hafferty, Mary H. (DOT)

From: Hafferty, Mary H. (DOT)
Sent: Thursday, May 4, 2023 9:33 AM
To: Robinson, David S (EEA)
Cc: Harwood, Jameson (DOT)
Subject: Monson Road Reconstruction, Wales (MassDOT #608163)
Attachments: Wales -PNF.pdf; Wales 75% HWY -PNF.pdf; Wales -PNF Maps.pdf

Dear Mr. Robinson,

MassDOT is submitting the enclosed project information to the Board of Underwater Archaeological Resources to meet the Section 106 consultation requirements of the U. S. 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@state.ma.us.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
MassDOT – Highway Division
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

Hafferty, Mary H. (DOT)

From: Hafferty, Mary H. (DOT)
Sent: Thursday, May 4, 2023 9:33 AM
To: David.Weeden@mwtribe-nsn.gov
Cc: Harwood, Jameson (DOT)
Subject: Monson Road Reconstruction, Wales (MassDOT #608163)
Attachments: Wales -PNF.pdf; Wales 75% HWY -PNF.pdf; Wales -PNF Maps.pdf

Dear Mr. Weeden,

MassDOT is submitting the enclosed project information to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of the Federal Highway Administration and the 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@state.ma.us.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
***MassDOT* – Highway Division**
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

Hafferty, Mary H. (DOT)

From: Hafferty, Mary H. (DOT)
Sent: Thursday, May 4, 2023 9:33 AM
To: tashtesook@aol.com
Cc: Harwood, Jameson (DOT)
Subject: Monson Road Reconstruction, Wales (MassDOT #608163)
Attachments: Wales -PNF.pdf; Wales 75% HWY -PNF.pdf; Wales -PNF Maps.pdf

Dear Mr. Brown,

MassDOT is submitting the enclosed project information to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of the Federal Highway Administration and the 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@state.ma.us.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
MassDOT – Highway Division
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A
MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: Reconstruction of Monson Road (#608163)

Location /Address: Monson Road from Wales Town Line Easterly to Reed Hill Road

City/Town: Wales

Project Proponent

Name: Massachusetts Department of Transportation

Address: 10 Park Plaza

City/Town/Zip/Telephone: Boston, MA 02116

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name	**Type of License or funding (specify)**
FHWA	Federal funding
Army Corps of Engineers	Sections 401 & 404 Permits

Project Description (narrative):

The Massachusetts Department of Transportation, Highway Division (MassDOT) and the Town of Wales propose to expend federal funds to reconstruct a 1.45-miles segment of the Monson Road from the Wales/Monson town line easterly to Reed Hill Road. Monson Road will also be widened, existing culverts will be replaced, and stormwater and drainage improvements will be completed.

Monson Road is currently 22'-wide with no roadway shoulders or bicycle/pedestrian accommodations. This project proposes full-depth reconstruction of Monson Road with a new 28'-wide cross-section, consisting of two 10' travels lanes with 4' shoulders. The new cross-section will improve driver sight-distances and provide bicyclists and pedestrians space as well.

The project will require some minor geometric improvements at selected intersections including the Monson Road/Lynch Road intersection, which is located directly to the east of the NR-eligible Cyrus Munger House. The roadway width at this intersection will be reduced by removing the small traffic island and narrowing the roadway. The freestanding stonewalls that line the edge of the NRE-property will not be affected by the nearby roadway work. The intersection of Monson Road/Reed Hill Road, at the easternmost end of the project corridor, will also be realigned to become a T-shaped intersection.

Other work within the project corridor includes replacing culverts and drainage structures and constructing a new closed drainage system. Selected trees and free-standing stone walls will be removed from within the roadway layout to facilitate the project work. Trees close to the roadway work will be protected during construction, and erosion control measures will be installed.

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A (continued)

A Section 404 General Permit from the U. S. Army Corps of Engineers is required for culvert replacements and drainage improvements.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

n/a

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.

n/a

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

n/a

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.

According to the MHC-Inventory form, the late-eighteen century Cyrus Munger House (WAL.36) is one of the oldest houses constructed in Wales for the Munger family, who were among the earliest recorded settlers in town. Records from the Old Sturbridge Village Research Library also indicate that Mr. Munger is also a Revolutionary War Veteran. It is the opinion of MassDOT Cultural Resources Unit (CRU) staff that the property is individually eligible for listing in the NRHP at the local level.

Archaeological Assessment

A review of the MHC's archaeological maps in MACRIS revealed no recorded sites in the vicinity of the Monson Road project area. It is the opinion of the MassDOT Archaeologist that low sensitivity can be ascribed to the project's direct area of potential effect (APE) based on the impacts of past roadway, utility, and drainage construction, unfavorable conditions (slope and wetlands), and roadside development. The project work will be confined to disturbed and unfavorable conditions within and immediately adjacent to the existing roadway layout. The majority of the Monson Road widening (approximately 10 – 20 ft. in width) will occur to the south of the roadway. The widening areas consist of sloped roadway shoulders, drainage swale/wetland areas, landscaped lawns, and dry laid stone/rubble walls. The stonewalls to be removed are currently located within the existing highway layout. The proposed drainage work will occur on existing drainage structures within wetland areas.

What is the total acreage of the project area?

			Productive Resources:		
Woodland		acres			
Wetland		acres	Agriculture		acres
Floodplain		acres	Forestry		acres
Open Space		acres	Mining/Extraction		acres
Developed		acres	Total Project Acreage		acres

What is the acreage of the proposed new construction? _____ acres

What is the present land use of the project area?

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A (continued)

The project corridor mainly runs through forested areas with sporadic areas of residential housing and agricultural land.

Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of person submitting this form: MHH **Date:** 5/4/2023

Name: Mary Hafferty, Cultural Resources Specialist MassDOT

Address: 10 Park Plaza, Room 4260

City/Town/Zip: Boston, MA 02717

Telephone: 857-368-8799

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

CC:

Hafferty, Mary H. (DOT)

From:	Hafferty, Mary H. (DOT)
Sent:	Thursday, July 11, 2024 9:15 AM
To:	Robinson, David S (EEA)
Cc:	Harwood, Jameson (DOT)
Subject:	FW: Monson Road Reconstruction, Wales (MassDOT #608163)
Attachments:	Wales -PNF.pdf; Wales 75% HWY -PNF.pdf; Wales -PNF Maps.pdf

Tracking:

Recipient	Delivery
Robinson, David S (EEA)	Delivered: 7/11/2024 9:16 AM
Harwood, Jameson (DOT)	Delivered: 7/11/2024 9:16 AM

Dear Mr. Robinson,

MassDOT is resubmitting the attached PNF documents from May 4, 2023, to comply with the Army Corps' updated policy to include delivery receipts with our permit applications. Please note that the project's scope has not changed since the original submittal. Please let me know if you have any questions or concerns.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
MassDOT – Highway Division
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

From: Hafferty, Mary H. (DOT)
Sent: Thursday, May 4, 2023 9:33 AM
To: Robinson, David S (EEA) <David.S.Robinson@mass.gov>
Cc: Harwood, Jameson (DOT) <Jameson.Harwood@dot.state.ma.us>
Subject: Monson Road Reconstruction, Wales (MassDOT #608163)

Dear Mr. Robinson,

MassDOT is submitting the enclosed project information to the Board of Underwater Archaeological Resources to meet the Section 106 consultation requirements of the U. S. 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@state.ma.us.

Best regards,

Mary

Mary Hafferty
Cultural Resources Specialist
MassDOT – Highway Division
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

From:	Microsoft Outlook
To:	Robinson, David S (EEA)
Subject:	Delivered: FW: Monson Road Reconstruction, Wales (MassDOT #608163)
Date:	Thursday, July 11, 2024 9:15:44 AM
Attachments:	FW Monson Road Reconstruction Wales (MassDOT #608163).msg

Your message has been delivered to the following recipients:
Robinson, David S (EEA) (David.S.Robinson@mass.gov) <mailto:David.S.Robinson@mass.gov>
Subject: FW: Monson Road Reconstruction, Wales (MassDOT #608163)

From: Hafferty, Mary H. (DOT)
To: thpo@wampanoagtribe-nsn.gov
Cc: Harwood, Jameson (DOT)
Subject: FW: Monson Road Reconstruction, Wales (MassDOT #608163)
Date: Thursday, July 11, 2024 9:15:00 AM
Attachments: Wales -PNF.pdf
Wales 75% HWY -PNF.pdf
Wales -Maps & Photos.pdf

Dear Ms. Washington,

MassDOT is resubmitting the attached PNF documents from May 4, 2023, to comply with the Army Corps' updated policy to include delivery receipts with our permit applications. Please note that the project's scope has not changed since the original submittal. Please let me know if you have any questions or concerns.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
MassDOT – Highway Division
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

From: Hafferty, Mary H. (DOT)
Sent: Thursday, May 4, 2023 9:32 AM
To: thpo@wampanoagtribe-nsn.gov; tcrm2@wampanoagtribe-nsn.gov
Cc: Harwood, Jameson (DOT) <Jameson.Harwood@dot.state.ma.us>
Subject: Monson Road Reconstruction, Wales (MassDOT #608163)

Dear Ms. Washington,

MassDOT is submitting the enclosed project information to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of the Federal Highway Administration and the 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@state.ma.us.

Best regards,

Mary

Mary Hafferty
Cultural Resources Specialist
MassDOT – Highway Division
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

From:	Microsoft Outlook
To:	thpo@wampanoagtribe-nsn.gov
Subject:	Relayed: FW: Monson Road Reconstruction, Wales (MassDOT #608163)
Date:	Thursday, July 11, 2024 9:16:03 AM
Attachments:	FW Monson Road Reconstruction Wales (MassDOT #608163).msg

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:
thpo@wampanoagtribe-nsn.gov (thpo@wampanoagtribe-nsn.gov) <mailto:thpo@wampanoagtribe-nsn.gov>
Subject: FW: Monson Road Reconstruction, Wales (MassDOT #608163)

From: Hafferty, Mary H. (DOT)
To: David.Weeden@mwtribe-nsn.gov
Cc: Harwood, Jameson (DOT)
Subject: FW: Monson Road Reconstruction, Wales (MassDOT #608163)
Date: Thursday, July 11, 2024 9:14:00 AM
Attachments: Wales -PNF.pdf
Wales 75% HWY -PNF.pdf
Wales -PNF Maps.pdf

Dear Mr. Weeden,

MassDOT is resubmitting the attached PNF documents from May 4, 2023, to comply with the Army Corps' updated policy to include delivery receipts with our permit applications. Please note that the project's scope has not changed since the original submittal. Please let me know if you have any questions or concerns.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
MassDOT – Highway Division
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

From: Hafferty, Mary H. (DOT)
Sent: Thursday, May 4, 2023 9:33 AM
To: David.Weeden@mwtribe-nsn.gov
Cc: Harwood, Jameson (DOT) <Jameson.Harwood@dot.state.ma.us>
Subject: Monson Road Reconstruction, Wales (MassDOT #608163)

Dear Mr. Weeden,

MassDOT is submitting the enclosed project information to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of the Federal Highway Administration and the 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@state.ma.us.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
MassDOT – Highway Division
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

From:	Microsoft Outlook
To:	David.Weeden@mwtribe-nsn.gov
Subject:	Relayed: FW: Monson Road Reconstruction, Wales (MassDOT #608163)
Date:	Thursday, July 11, 2024 9:14:38 AM
Attachments:	FW Monson Road Reconstruction Wales (MassDOT #608163).msg

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:
David.Weeden@mwtribe-nsn.gov (David.Weeden@mwtribe-nsn.gov) <mailto:David.Weeden@mwtribe-nsn.gov>
Subject: FW: Monson Road Reconstruction, Wales (MassDOT #608163)

From: Hafferty, Mary H. (DOT)
To: tashtesook@aol.com; markandrews0563@outlook.com
Cc: Harwood, Jameson (DOT)
Subject: FW: Monson Road Reconstruction, Wales (MassDOT #608163)
Date: Thursday, July 11, 2024 9:14:00 AM
Attachments: Wales -PNF.pdf
Wales 75% HWY -PNF.pdf
Wales -PNF Maps.pdf

Dear Mr. Brown,

MassDOT is resubmitting the attached PNF documents from May 4, 2023, to comply with the Army Corps' updated policy to include delivery receipts with our permit applications. Please note that the project's scope has not changed since the original submittal. Please let me know if you have any questions or concerns.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
MassDOT – Highway Division
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

From: Hafferty, Mary H. (DOT)
Sent: Thursday, May 4, 2023 9:33 AM
To: tashtesook@aol.com
Cc: Harwood, Jameson (DOT) <Jameson.Harwood@dot.state.ma.us>
Subject: Monson Road Reconstruction, Wales (MassDOT #608163)

Dear Mr. Brown,

MassDOT is submitting the enclosed project information to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of the Federal Highway Administration and the 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@state.ma.us.

Best regards,
Mary

Mary Hafferty
Cultural Resources Specialist
MassDOT – Highway Division
10 Park Plaza – Room 7360
Boston, MA 02116
781-801-0057 (cell)

From:	Microsoft Outlook
To:	tashtesook@aol.com; markandrews0563@outlook.com
Subject:	Relayed: FW: Monson Road Reconstruction, Wales (MassDOT #608163)
Date:	Thursday, July 11, 2024 9:15:07 AM
Attachments:	FW Monson Road Reconstruction Wales (MassDOT #608163).msg

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:
tashtesook@aol.com (Tashtesook@aol.com) <mailto:Tashtesook@aol.com>
markandrews0563@outlook.com (markandrews0563@outlook.com) <mailto:markandrews0563@outlook.com>
Subject: FW: Monson Road Reconstruction, Wales (MassDOT #608163)

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A
MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name:	Reconstruction of Monson Road (#608163)
Location /Address:	Monson Road from Wales Town Line Easterly to Reed Hill Road
City/Town:	Wales

Project Proponent

Name:	Massachusetts Department of Transportation
Address:	10 Park Plaza
City/Town/Zip/Telephone:	Boston, MA 02116

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name	**Type of License or funding (specify)**
FHWA	Federal funding
Army Corps of Engineers	Sections 401 & 404 Permits

Project Description (narrative):

The Massachusetts Department of Transportation, Highway Division (MassDOT) and the Town of Wales propose to expend federal funds to reconstruct a 1.45-miles segment of the Monson Road from the Wales/Monson town line easterly to Reed Hill Road. Monson Road will also be widened, existing culverts will be replaced, and stormwater and drainage improvements will be completed.

Monson Road is currently 22'-wide with no roadway shoulders or bicycle/pedestrian accommodations. This project proposes full-depth reconstruction of Monson Road with a new 28'-wide cross-section, consisting of two 10' travels lanes with 4' shoulders. The new cross-section will improve driver sight-distances and provide bicyclists and pedestrians space as well.

The project will require some minor geometric improvements at selected intersections including the Monson Road/Lynch Road intersection, which is located directly to the east of the NR-eligible Cyrus Munger House. The roadway width at this intersection will be reduced by removing the small traffic island and narrowing the roadway. The freestanding stonewalls that line the edge of the NRE-property will not be affected by the nearby roadway work. The intersection of Monson Road/Reed Hill Road, at the easternmost end of the project corridor, will also be realigned to become a T-shaped intersection.

Other work within the project corridor includes replacing culverts and drainage structures and constructing a new closed drainage system. Selected trees and free-standing stone walls will be removed from within the roadway layout to facilitate the project work. Trees close to the roadway work will be protected during construction, and erosion control measures will be installed.

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A (continued)

A Section 404 General Permit from the U. S. Army Corps of Engineers is required for culvert replacements and drainage improvements.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

n/a

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.

n/a

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

n/a

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.

According to the MHC-Inventory form, the late-eighteen century Cyrus Munger House (WAL.36) is one of the oldest houses constructed in Wales for the Munger family, who were among the earliest recorded settlers in town. Records from the Old Sturbridge Village Research Library also indicate that Mr. Munger is also a Revolutionary War Veteran. It is the opinion of MassDOT Cultural Resources Unit (CRU) staff that the property is individually eligible for listing in the NRHP at the local level.

Archaeological Assessment

A review of the MHC's archaeological maps in MACRIS revealed no recorded sites in the vicinity of the Monson Road project area. It is the opinion of the MassDOT Archaeologist that low sensitivity can be ascribed to the project's direct area of potential effect (APE) based on the impacts of past roadway, utility, and drainage construction, unfavorable conditions (slope and wetlands), and roadside development. The project work will be confined to disturbed and unfavorable conditions within and immediately adjacent to the existing roadway layout. The majority of the Monson Road widening (approximately 10 – 20 ft. in width) will occur to the south of the roadway. The widening areas consist of sloped roadway shoulders, drainage swale/wetland areas, landscaped lawns, and dry laid stone/rubble walls. The stonewalls to be removed are currently located within the existing highway layout. The proposed drainage work will occur on existing drainage structures within wetland areas.

What is the total acreage of the project area?

			Productive Resources:		
Woodland		acres			
Wetland		acres	Agriculture		acres
Floodplain		acres	Forestry		acres
Open Space		acres	Mining/Extraction		acres
Developed		acres	Total Project Acreage		acres

What is the acreage of the proposed new construction? _____ acres

What is the present land use of the project area?

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A (continued)

The project corridor mainly runs through forested areas with sporadic areas of residential housing and agricultural land.

Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of person submitting this form: MHH **Date:** 5/4/2023

Name: Mary Hafferty, Cultural Resources Specialist MassDOT

Address: 10 Park Plaza, Room 4260

City/Town/Zip: Boston, MA 02717

Telephone: 857-368-8799

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

CC:

Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Gina Fiandaca, Secretary & CEO
Jonathan L. Gulliver, Highway Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

April 28, 2023

RE: WALES –Reconstruction & Improvements on Monson Rd. Project (608163)
Section 106 Review - No Adverse Effect
Section 4(f) Evaluation – Permanent Easements – *de minimis* impact
Section 4(f) Evaluation – Temporary Occupancies – No 4(f) Use

Ms. Brona Simon
State Historic Preservation Officer
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125

CONCURRENCE: Brona Simon 5/31/23
BRONA SIMON
STATE HISTORIC
PRESERVATION OFFICER
MASSACHUSETTS
HISTORICAL COMMISSION

RECEIVED
MAY 01 2023
MASS. HIST. COMM
RC.73167

Dear Ms. Simon:

The Massachusetts Department of Transportation, Highway Division (MassDOT) and the Town of Wales propose to expend federal funds to reconstruct a 1.45-miles segment of the Monson Road from the Wales/Monson town line easterly to Reed Hill Road. Monson Road will also be widened, existing culverts will be replaced, and stormwater and drainage improvements will be completed.

According to the MHC-Inventory form, the late-eighteen century **Cyrus Munger House (WAL.36)** is one of the oldest houses constructed in Wales for the Munger family, who were among the earliest recorded settlers in town. Mr. Munger is also reportedly a Revolutionary War Veteran.[1] It is the opinion of MassDOT Cultural Resources Unit (CRU) staff that the property is individually eligible for listing in the NRHP at the local level. MassDOT has reviewed this project under the terms of the 2004 Massachusetts Statewide Programmatic Agreement for Section 106 of the National Historic Preservation Act of 1966, as amended [36 CFR Part 800.3(a)(2)], and has determined that the project will have **No Adverse Effect** on any NR-listed or –eligible properties.

Monson Road Reconstruction & Improvements

Monson Road is currently 22'-wide with no roadway shoulders or bicycle/pedestrian accommodations. This project proposes full-depth reconstruction of Monson Road with a new 28'-wide cross-section, consisting of two 10' travels lanes with 4' shoulders. The new cross-section will improve driver sight-distances and provide bicyclists and pedestrians space as well.

The project will require some minor geometric improvements at selected intersections including the Monson Road/Lynch Road intersection, which is located directly to the east of the **NRE-Cyrus Munger House**. The roadway width at this intersection will be reduced by removing the small traffic island and narrowing the roadway. The freestanding stonewalls that line the edge of the NRE-property will not be affected by the nearby roadway work. The intersection of Monson

[1] *Munger Collection, 1776-1859*, Old Sturbridge Village Research Library, Sturbridge, MA (https://www.osv.org/content/uploads/2019/01/Munger-Collection.pdf)

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

Road/Reed Hill Road, at the easternmost end of the project corridor, will also be realigned to become a T-shaped intersection.

Other work within the project corridor includes replacing culverts and drainage structures and constructing a new closed drainage system. Selected trees and free-standing stone walls will be removed from within the roadway layout to facilitate the project work. Trees close to the roadway work will be protected during construction, and erosion control measures will be installed.

Archaeological Assessment

A review of the MHC's archaeological maps in MACRIS revealed no recorded sites in the vicinity of the Monson Road project area. It is the opinion of the MassDOT Archaeologist that low sensitivity can be ascribed to the project's direct area of potential effect (APE) based on the impacts of past roadway, utility, and drainage construction, unfavorable conditions (slope and wetlands), and roadside development. The project work will be confined to disturbed and unfavorable conditions within and immediately adjacent to the existing roadway layout. The majority of the Monson Road widening (approximately 10 – 20 ft. in width) will occur to the south of the roadway. The widening areas consist of sloped roadway shoulders, drainage swale/wetland areas, landscaped lawns, and dry laid stone/rubble walls. The stonewalls to be removed are currently located within the existing highway layout. The proposed drainage work will occur on existing drainage structures within wetland areas.

Section 4(f) Evaluation –Permanent Utility Easements – *de minimis* impact

This project will require two permanent utility easements from the NR-eligible **Cyrus Munger House (WAL.36)** parcel for overhead wires and the installation of a guy wire. Permanent utility easements are highlighted in yellow on the enclosed ROW plans.

Any permanent utility easement that results in the permanent incorporation of land from a public or private historic site into a transportation facility (e.g., roadway, public sidewalk) is regarded as a transportation use and must be evaluated and approved under Section 4(f) of the Department of Transportation Act of 1966, as amended [23 CFR Part 774].

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 4(f) Evaluation – Temporary Occupancies – No 4(f) use

The project requires temporary occupancies, also known as temporary construction easements, on the NR-eligible **Cyrus Munger House (WAL.36)** parcel. The temporary occupancies are necessary to facilitate grading and installing compost filters. The temporary occupancies are highlighted in green on the right of way plans.

It is MassDOT's opinion that the temporary occupancies on parcel occupied by the NR-eligible Cyrus Munger House will satisfy the five conditions required for a temporary occupancy not to constitute a "use" within the meaning of Section 4(f), pursuant to 23 CFR 774.13(d):

(1) Duration must be temporary, i.e., less than the time needed for construction of the project, and there should be no change in ownership of the land;
(2) Scope of the work must be minor, i.e., both the nature and the magnitude of the changes to the Section 4(f) property are minimal;
(3) There are no anticipated permanent adverse physical impacts, nor will there be interference with the protected activities, features, or attributes of the property, on either a temporary or permanent basis;
(4) The land being used must be fully restored, i.e., the property must be returned to a condition which is at least as good as that which existed prior to the project; and
(5) There must be documented agreement of the official(s) with jurisdiction over the Section 4(f) resource regarding the above conditions.

The SHPO is the official with jurisdiction over historic sites for the purposes of Section 4(f), pursuant to 23 CFR 774.17. Your concurrence with this letter will signify that your office agrees with MassDOT's assessment that the proposed temporary occupancies do not constitute a "use" of a historic site under Section 4(f) and that the conditions listed above have been satisfied, pursuant to Condition 5 above.

Summary of Section 106 Effect Findings

On behalf of MassDOT, Weston & Sampson sent early coordination letters to the Wales Historical Commission (dated October 12, 2018) and a copy of this letter was mailed to the MHC. No response has been received to date from the Commissions.

It is MassDOT's opinion that the proposed Monson Road Reconstruction and Improvements Project will have **No Adverse Effect** on the NRE-**Cyrus Munger House (WAL.36)**. MassDOT solicits your concurrence with our **No Adverse Effect** finding for the project 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 by email at mary.hafferty@state.ma.us.

Sincerely,

Mary Hafferty

Mary Hafferty
Cultural Resources Specialist
Environmental Services

c.c. C. Ostrander, FHWA (w/attachments)

encs: 75% Highway & Right of Way Plans
Maps & Photographs

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.

CASSANDRA CHASE OSTRANDER Digitally signed by CASSANDRA CHASE OSTRANDER
Date: 2023.07.14 07:55:53 -04'00'

Joi Singh, (or designee) Date
Division Administrator
Federal Highway Administration
Massachusetts Division

Appendix B

Stream Visual Assessment Protocol Forms

Exhibit 1: Stream Visual Assessment Protocol 2

Data Forms

Date: 6/26/24 Page 1 of 4
Site ID: Station 24 + 92 Near Garden Center
Data recorder: D. White

Owner's name* MassDOT

Contact info* MassDOT (*property owner or POC for access)

Evaluator's name(s) K. Hickey, D. White (include all personnel on site during assessment)

Stream name Unnamed

Tributary Vinica Brook

to Assessment or Site Type Highway storm water drainage (include purpose or goal of assessment as needed)

Preliminary Assessment (GIS/Office data collection)

A. Watershed Description (fill in from preliminary data sheets, or refer to preliminary data location)

Ecoregion or MLRA Lower Worcester Plateau HUC: 010802040306 Drainage area (acres or mi^2) 570 acres

Watershed management structures: (#): dams _____ water controls 2 irrigation diversions ____

Miles of contiguous riparian cover/mile of entire stream in watershed upstream (estimated) 1 mile

Land use within watershed (%): cropland _____ hay land _____ grazing/pasture _____ forest 90

urban _____ industrial _____ other (specify) 10

Agronomic practices in uplands include: N/A

Confined animal feeding operations (#) N/A Conservation (acres) _____ industrial(acres) _____

Number of stream miles on property 150 ft Number of upstream total stream miles 1 mile

Stream hydrology: _____ intermittent; months of year wetted: _____

X perennial; months of year at baseflow: Unknown

_____ impounded / controlled; distance upstream or downstream _____

B. Stream/Reach Description:

Stream Gage Name or Location/Discharge: NA / _____ ft^3/s

Reach location (UTM or Lat./Long.) 42.067991 / -72.269322

Applicable Reference Stream: N/A Reference Stream Location: _____ / _____

Information Sources or other notes:
MassGIS

SVAP2 Field Assessment

Photo #/ID 1 to 4
Total # 4 Download √ by
Photographer(s) K. Hickey
Camera ID iPhone

Date: 6/28/24 Page 2 of 4
Site ID: Station 24 + 92 Near Garden Center
Data recorder: D.White

Preliminary Field Data

Start Time / Water Temp: 8:20 / N/A SVAP2 End Time / Water Temp: 13:30 / N/A

Weather conditions today 74 degrees F, 10% cloud cover, no precipitation
(ambient temp.\ % cloud cover \ precip.)

Weather conditions over past 2 to 5 days: no rain, avg temp 80 degrees F
(No. of days precip, amount of precip., average daytime temp.)

Schumm stage IV other channel type / classification scheme ____ / ____

Riparian Cover Type(s):
Actual %: Tree 60 % Shrub 10 % Herbaceous 30 % Bare 10 %
Relative %: Tree 70 % Shrub 10 % Herbaceous 10 % Bare 10 %

Bank Profile (√ one): Stratified ____ or Homogenous X ; Cohesive soil ____ or Non-cohesive soil ____

Gradient (√ one): Low (0-2%) ____ Moderate (>2<4%) X High (>4%) ____

Regional curve used N/A - small drainage area Expected bankfull width N/A

Bankfull channel width 20ft (ft , m) Reach length 150ft (ft , m) Flood plain width 120 ft , m

Avg. riparian zone width 15 ft (ft , m) Method used visual Floodplain wetlands 0 acres or ft^2 / reach

Dominant substrate (% or √): boulder 20 cobble 30 gravel 20 sand 20 fines/silt/clay 10
(> 250 mm) (60-250mm) (2-60 mm) (2-.06 mm) (< .06 mm)

6. Canopy cover #	6. Canopy cover%	10. Pool depth	10. Riffle depth	15. Riffle Embed %	12. & 13. Habitat Features **B**oth, **F**ish, **I**nverts	12. Fish count	13. Invert. count	14. Aquatic Invert name/type	14. Group I,II,III
NA	65%	2 ft	NA	NA	**B** Large wood	NA	NA	NA	NA
					B Small wood				
					B Overhang. Veg.				
					B Root mats				
					B Undercut banks				
					B Cobble riffles				
					B Macrophyte beds				
					F Deep pools				
					F Other pools (shallow, scour, plunge, pocket)				
					I Any pools				
					F >20" boulders				
					F 10-20" boulder clusters				
					I >20" boulders in riffles				
					I 10-20" Boulder clusters in riffles				
					F Off-channel				
					B Other locally important				

Element Scores

Date: 6/26/24 Page 3 of 4
Site ID: Station 24 + 92 Near Garden Center
Data recorder: D. White

Element	Notes	Score
1. Channel Condition	- While incision is evident, the channel is mostly stable and has cobble and boulders to maintain channel structure under higher flow conditions.	7
2. Hydrologic Alteration	-Multiple controlling devices installed preventing natural flow of stream. One foot drop from pipe under Monson Road	3
3. Bank Condition	-bank mostly stable with some incision	7
4. Riparian Area Quantity	- Riparian zone width is 5 to 25 ft, with an average of ~ 15 ft on each side (30 ft total). No vegetation gaps evident.	2
5. Riparian Area Quality	-Right bank had minimal riparian vegetation. The left bank side had several expected species of riparian habitat.	5
6. Canopy Cover	-heavily vegetated	7
7. Water Appearance	Clear with no sheen	9
8. Nutrient Enrichment	- Clear with no odor	9
9. Manure or Human Waste	N/A	N/A
10. Pools	Pool downstream of Monson Road measured at 2.5 ft. Another pool present upstream of roadway.	6
11. Barriers to Movement	-two culverts under the road with a 1' drop to the stream channel downstream	1
12. Fish Habitat Complexity	A variety of characteristics of fish habitat were observed	7
13. Aquatic Invertebrate Habitat	A variety of characteristics of fish habitat were observed	7
14. Aquatic Invertebrate Community	N/A	N/A
15. Riffle Embeddedness	N/A	N/A
16. Salinity	N/A	N/A
A. Sum of all elements scored		70
B. Number of elements scored		12

Overall score: A/B 5.8

1 to 2.9 Severely Degraded
3 to 4.9 Poor
5 to 6.9 Fair
7 to 8.9 Good
9 to 10 Excellent

1 to 2.9 Severely Degraded (list elements)
4, 11

3 to 4.9 Poor (list elements)
2

9 to 10 Excellent (list elements)
7, 8

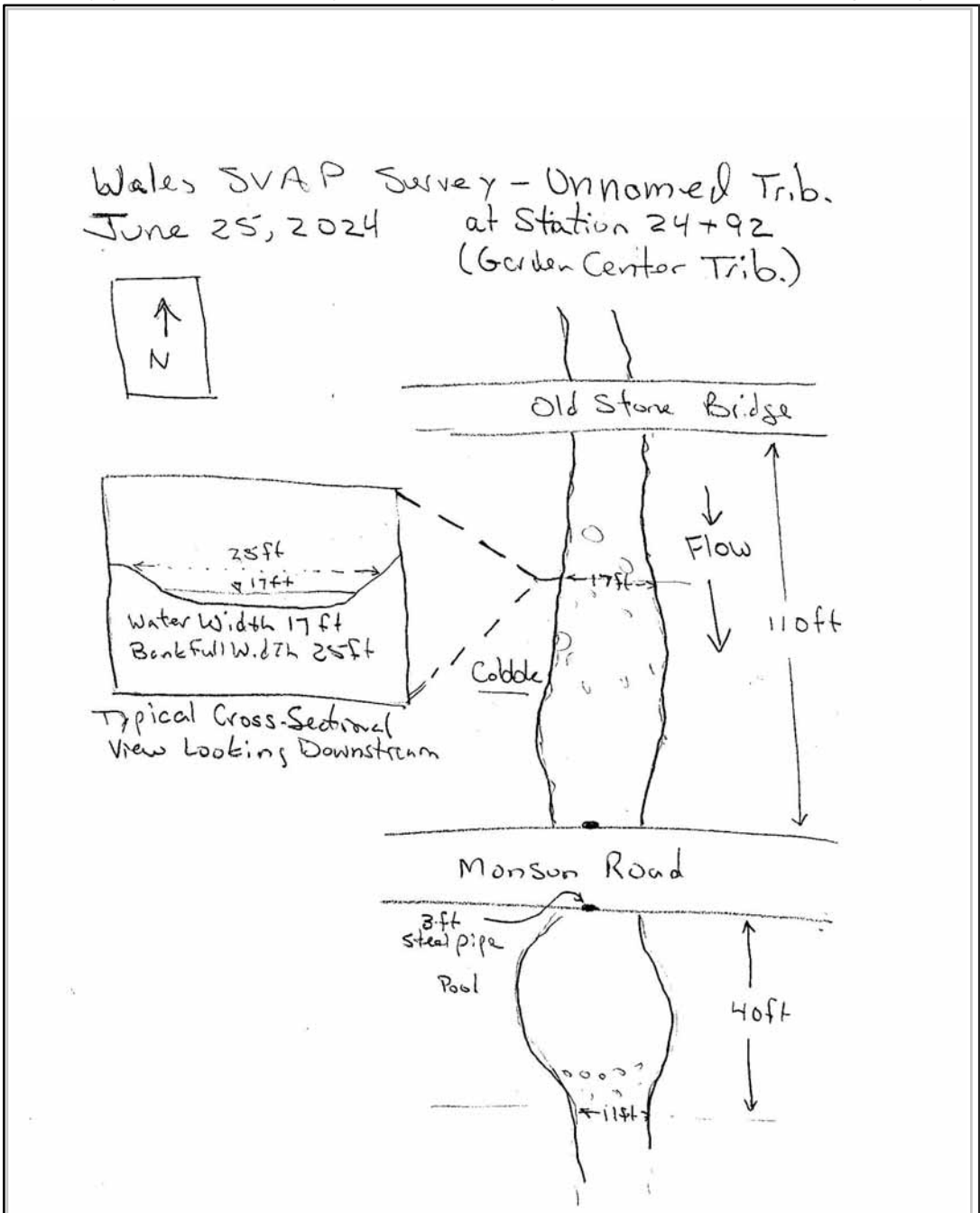
Suspected causes of SVAP2 scores less than 5 (does not meet quality criteria for stream species)

Monson Road culvert and associated vertical drop creating a significant barrier to movement. Also there is a lack of riparian area due to steep banks ending in uplands resulting a low score.

Recommendations for further assessment or actions:

C. Site Map – Include and label: Legend (define abbreviations), flow direction, orientation & scale, reach top/bottom, landmarks, large wood, boulders, bank/channel work, infrastructure, barriers, vegetation, sampling locations.
** Note Riparian Vegetation Left Bank and Right Bank separately for entire reach
** Quantity (Natural community, width compared to bankfull width and active floodplain, % vegetation gaps)
** Quality (Natural & diverse %, age structure, invasive species %, concentrated flows, species present)

Date: 6/25/24 Page 4 of 4
Site ID: Station 24 + 92 Near Garden Center
Data recorder D. White



VEGETATION LIST

Jewelweed (Impatiens)
Skunk Cabbage (Symplocarpus)
Red maple (Acer rubrum)
American Elm (Ulmus)
Virg. Creeper (Vitaceae)
Oriental Bittersweet (Celastrus)

LEGEND:

Provide additional notes related to each element scored on back of site diagram, if needed.

Photo 1 - A north facing view of the outlet under Monson Road. This outlet is 3-feet in diameter with the water dropping 1 foot out of the outlet to reconnect with the stream.

Photo 2 - A representative south facing view of the stream, south of Monson Road.

Photo 3 - A representative north facing view of the stream, taken north of Monson Road.

Photo 4 - A south facing view of the stream which flows through a 3-foot diameter inlet and crosses under Monson Road.

Exhibit 1: Stream Visual Assessment Protocol 2 Data Forms

Date: 6/26/2024 Page 1 of 4
Site ID: Station 43 + 75 Monson Rd. Swale
Data recorder: D.White

Owner's name* MassDOT

Contact info* MassDOT (*property owner or POC for access)

Evaluator's name(s) K. Hickey, D. White (include all personnel on site during assessment)

Stream name unnamed Tributary to Vinica Brook

Assessment or Site Type Highway storm water drainage
(include purpose or goal of assessment as needed)

Preliminary Assessment (GIS/Office data collection)

A. Watershed Description (fill in from preliminary data sheets, or refer to preliminary data location)

Ecoregion or MLRA Lower Worcester Plateau HUC: 010802040306 Drainage area (acres or mi^2) 96 acres

Watershed management structures: (#): dams _____ water controls 1 irrigation diversions ____

Miles of contiguous riparian cover/mile of entire stream in watershed upstream (estimated) .5 miles

Land use within watershed (%): cropland _____ hay land _____ grazing/pasture _____ forest 95

urban _____ industrial _____ other (specify) _____

Agronomic practices in uplands include: N/A

Confined animal feeding operations (#) N/A Conservation (acres) _____ industrial(acres) _____

Number of stream miles on property 250 ft Number of upstream total stream miles .5

Stream hydrology: x intermittent; months of year wetted: unknown

_____ perennial; months of year at baseflow: _____

_____ impounded / controlled; distance upstream or downstream _____

B. Stream/Reach Description:

Stream Gage Name or Location/Discharge: N/A / _____ ft^3/s

Reach location (UTM or Lat./Long.) 42.058942 / -72.259603

Applicable Reference Stream: N/A Reference Stream Location: _____ / _____

Information Sources or other notes:
MassGIS

SVAP2 Field Assessment

Photo #/ID 1 to 4
Total # 4 Download √ by
Photographer(s) K. Hickey
Camera ID iPhone

Date: 6/28/24 Page 2 of 4
Site ID: Station 43 + 75 Monson Road Swale
Data recorder: D.White

Preliminary Field Data

Start Time / Water Temp: 8:20 / N/A SVAP2 End Time / Water Temp: 13:30 / N/A

Weather conditions today 74 degrees F, 10% cloud cover
(ambient temp.\ % cloud cover \ precip.)

Weather conditions over past 2 to 5 days: no rain, avg temp 80 degrees F
(No. of days precip, amount of precip., average daytime temp.)

Schumm stage I other channel type / classification scheme ____ / ____

Riparian Cover Type(s):
Actual %: Tree 5 % Shrub 35 % Herbaceous 90 % Bare 5 %
Relative %: Tree 5 % Shrub 10 % Herbaceous 80 % Bare 5 %

Bank Profile (√ one): Stratified ____ or Homogenous ____ ; Cohesive soil ____ or Non-cohesive soil X

Gradient (√ one): Low (0-2%) X Moderate (>2<4%) ____ High (>4%) ____

Regional curve used N/A - small drainage area Expected bankfull width N/A

Bankfull channel width 4ft (ft , m) Reach length 268ft (ft , m) Flood plain width NA ft , m

Avg. riparian zone width 3 ft (ft , m) Method used visual Floodplain wetlands 0 acres or ft^2 / reach

Dominant substrate (% or √): boulder ____ cobble ____ gravel ____ sand 50 fines/silt/clay 50
(> 250 mm) (60-250mm) (2-60 mm) (2-.06 mm) (< .06 mm)

6. Canopy cover #	6. Canopy cover%	10. Pool depth	10. Riffle depth	15. Riffle Embed %	12. & 13. Habitat Features **B**oth, **F**ish, **I**nverts	12. Fish count	13. Invert. count	14. Aquatic Invert name/type	14. Group I,II,III
NA	10%	NA	NA	NA	**B** Large wood	NA	NA	NA	NA
					B Small wood				
					B Overhang. Veg.				
					B Root mats				
					B Undercut banks				
					B Cobble riffles				
					B Macrophyte beds				
					F Deep pools				
					F Other pools (shallow, scour, plunge, pocket)				
					I Any pools				
					F >20" boulders				
					F 10-20" boulder clusters				
					I >20" boulders in riffles				
					I 10-20" Boulder clusters in riffles				
					F Off-channel				
					B Other locally important				

Element Scores

Date: 6/26/24 Page 3 of 4
Site ID: Station 43 + 75 Monson Rd. Swale
Data recorder: D. White

Element	Notes	Score
1. Channel Condition	-Actively incised and roadway constraint	2
2. Hydrologic Alteration	- Swale and pipe severely alter stream	1
3. Bank Condition	- Relatively stable	3
4. Riparian Area Quantity	- Riparian area decreases as you progress downstream	1
5. Riparian Area Quality	- Diverse array of plants and almost 100 percent cover	6
6. Canopy Cover	-0-20%	1
7. Water Appearance	-Clear flowing water	4
8. Nutrient Enrichment	- None	8
9. Manure or Human Waste	- N/A	N/A
10. Pools	- N/A	N/A
11. Barriers to Movement	- 18" pipe	1
12. Fish Habitat Complexity	- Straight channel. Overhead cover during growing season from herbaceous vegetation	1
13. Aquatic Invertebrate Habitat	- Overhanging Vegetation present.	1
14. Aquatic Invertebrate Community	- N/A	N/A
15. Riffle Embeddedness	- N/A	N/A
16. Salinity	- N/A	N/A
A. Sum of all elements scored		29
B. Number of elements scored		11

Overall score: A/B 2.6

~~1 to 2.9 Severely Degraded~~
3 to 4.9 Poor
5 to 6.9 Fair
7 to 8.9 Good
9 to 10 Excellent

1 to 2.9 Severely Degraded (list elements)
1, 2, 4, 6 11, 12, 13

3 to 4.9 Poor (list elements)
3, 7

9 to 10 Excellent (list elements)

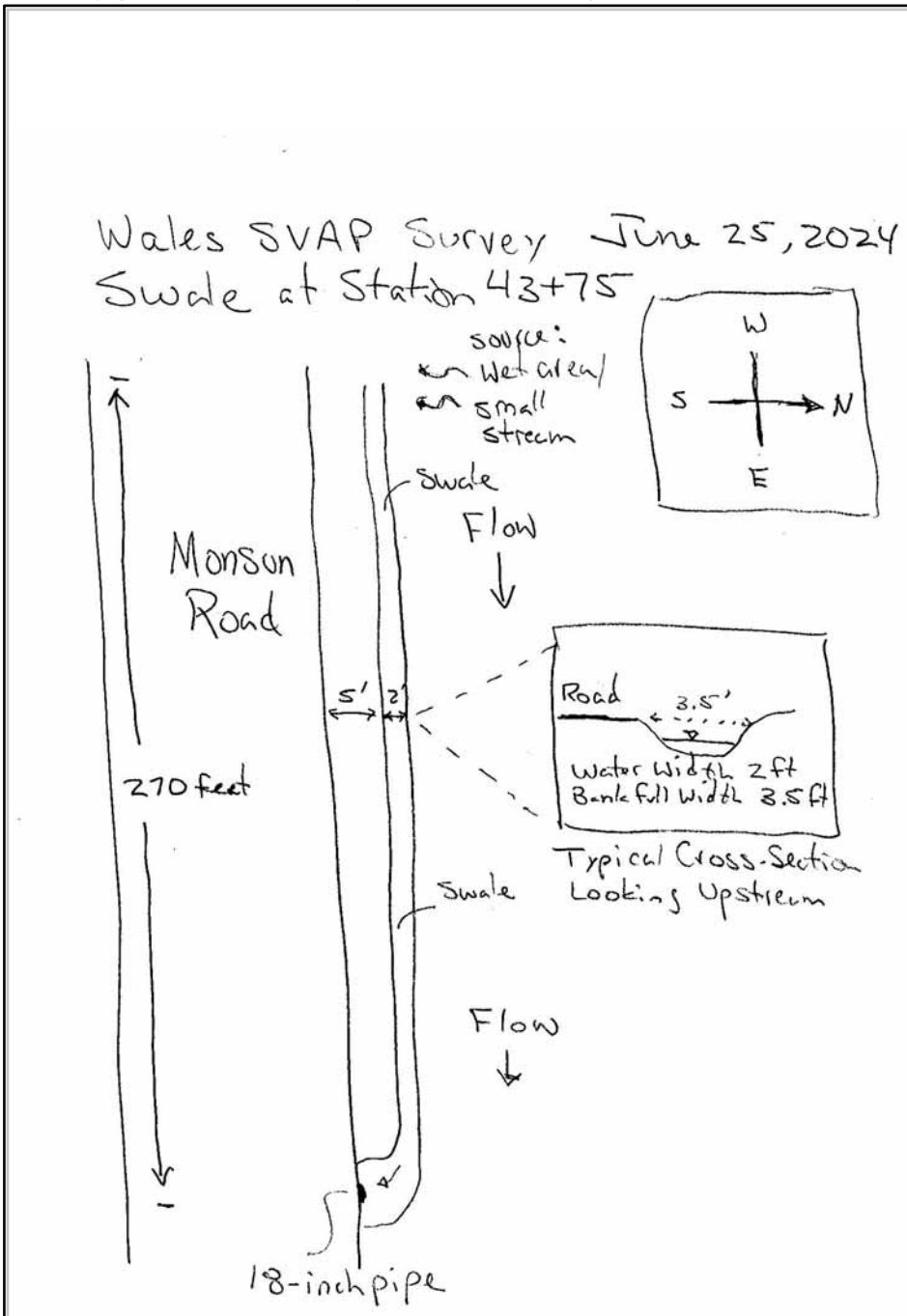
Suspected causes of SVAP2 scores less than 5 (does not meet quality criteria for stream species)

Straight channelized stream segment along roadway and downstream conduit impair stream.

Recommendations for further assessment or actions:

C. Site Map – Include and label: Legend (define abbreviations), flow direction, orientation & scale, reach top/bottom, landmarks, large wood, boulders, bank/channel work, infrastructure, barriers, vegetation, sampling locations.
** Note Riparian Vegetation Left Bank and Right Bank separately for entire reach
** Quantity (Natural community, width compared to bankfull width and active floodplain, % vegetation gaps)
** Quality (Natural & diverse %, age structure, invasive species %, concentrated flows, species present)

Date: 6/26/2024 Page 4 of 4
Site ID: Station 43 + 75 Monson Road
Data recorder D. White



VEGETATION LIST

red maple (Acer rubrum)

Jewelweed (Impatiens)
Skunk Cabbage (Symplocarpus)
Sensitive Fern (Onoclea)
Reed Canary Grass (Phalaris)
Soft Rush (Juncus)
Halberd-leaf tearthumb (Persicaria)
Deer tongue (Panicum)
Swamp dewberry (Rubus)

LEGEND:

Provide additional notes related to each element scored on back of site diagram, if needed.

Photo 1 - An eastern view of the stream segment taken from the western boundary.

Photo 2 - A representative photo of the western end of the stream segment

Photo 3 - A representative photo of the eastern side of the stream segment. Unstable banks and washout from the roadway were observed.

Photo 4 - A western facing view of the eastern boundary of the stream segment. The stream passes through an inlet that travels under Monson Road.

Exhibit 1: Stream Visual Assessment Protocol 2 Data Forms

Date: 6/26/24 Page 1 of 4
Site ID: Station 86 - 87 Reed Hill Road North
Data recorder: D. White

Owner's name* MassDOT

Contact info* MassDOT (*property owner or POC for access)

Evaluator's name(s) K. Hickey, D.White (include all personnel on site during assessment)

Stream name unnamed Tributary to Vinica Pond

Assessment or Site Type Highway storm water drainage (include purpose or goal of assessment as needed)

Preliminary Assessment (GIS/Office data collection)

A. Watershed Description (fill in from preliminary data sheets, or refer to preliminary data location)

Ecoregion or MLRA Lower Worcester Plateau HUC: 010802040306 Drainage area (acres or mi^2) 230 acres

Watershed management structures: (#): dams _____ water controls 1 irrigation diversions ____

Miles of contiguous riparian cover/mile of entire stream in watershed upstream (estimated) 1,800 ft.

Land use within watershed (%): cropland _____ hay land _____ grazing/pasture _____ forest 80

urban _____ industrial _____ other (specify) 20 Residential

Agronomic practices in uplands include: N/A

Confined animal feeding operations (#) N/A Conservation (acres) _____ industrial(acres) _____

Number of stream miles on property 200 ft Number of upstream total stream miles 1000ft

Stream hydrology: x intermittent; months of year wetted: unknown

_____ perennial; months of year at baseflow: _____

_____ impounded / controlled; distance upstream or downstream _____

B. Stream/Reach Description:

Stream Gage Name or Location/Discharge: N/A / _____ ft^3/s

Reach location (UTM or Lat./Long.) 42.059643 / -72.244839

Applicable Reference Stream: N/A Reference Stream Location: _____ / _____

Information Sources or other notes:
MassGIS

SVAP2 Field Assessment

Photo #/ID 1 to 4
Total # 4 Download √ by
Photographer(s) K. Hickey
Camera ID iPhone

Date: 6/26/24 Page 2 of 4
Site ID: Station 86+00 - 87.00 Reed Hill Road North
Data recorder: D.White

Preliminary Field Data

Start Time / Water Temp: 8:20 / N/A SVAP2 End Time / Water Temp: 13:30 / N/A

Weather conditions today 74 degrees F, 10% cloud cover
(ambient temp.\ % cloud cover \ precip.)

Weather conditions over past 2 to 5 days: no rain, avg temp 80 degrees F
(No. of days precip, amount of precip., average daytime temp.)

Schumm stage III other channel type / classification scheme ____ / ____

Riparian Cover Type(s):
Actual %: Tree 25 % Shrub 10 % Herbaceous 7 % Bare 50 %
Relative %: Tree 50 % Shrub 5 % Herbaceous 15 % Bare 50 %

Bank Profile (√ one): Stratified ____ or Homogenous ____ ; Cohesive soil ____ or Non-cohesive soil x

Gradient (√ one): Low (0-2%) ____ Moderate (>2<4%) x High (>4%) ____

Regional curve used N/A - small drainage area Expected bankfull width N/A

Bankfull channel width 21ft (ft , m) Reach length 100ft (ft , m) Flood plain width 80 ft , m

Avg. riparian zone width 9 ft (ft , m) Method used visual Floodplain wetlands 0 acres or ft^2 / reach

Dominant substrate (% or √): boulder ____ cobble 30 gravel ____ sand ____ fines/silt/clay 70
(> 250 mm) (60-250mm) (2-60 mm) (2-.06 mm) (< .06 mm)

6. Canopy cover #	6. Canopy cover%	10. Pool depth	10. Riffle depth	15. Riffle Embed %	12. & 13. Habitat Features **B**oth, **F**ish, **I**nverts	12. Fish count	13. Invert. count	14. Aquatic Invert name/type	14. Group I,II,III
NA	50%	NA	NA	NA	**B** Large wood	NA	NA	NA	NA
					B Small wood				
					B Overhang. Veg.				
					B Root mats				
					B Undercut banks				
					B Cobble riffles				
					B Macrophyte beds				
					F Deep pools				
					F Other pools (shallow, scour, plunge, pocket)				
					I Any pools				
					F >20" boulders				
					F 10-20" boulder clusters				
					I >20" boulders in riffles				
					I 10-20" Boulder clusters in riffles				
					F Off-channel				
					B Other locally important				

Element Scores

Date: 6/26/24 Page 3 of 4
Site ID: Station 86+00 - 87.00 Reed Hill Road North
Data recorder: D.White

Element	Notes	Score
1. Channel Condition	-Relatively stable. Minor incision present	5
2. Hydrologic Alteration	-Storm pipe at lower boundary of stream	2
3. Bank Condition	-bank moderately stable	5
4. Riparian Area Quantity	-Much more riparian area present along the right bank	3
5. Riparian Area Quality	- Species were observed that are typically indicative of a riparian area. Large sediment flow was also observed	2
6. Canopy Cover	-Moderately vegetated	5
7. Water Appearance	-water was flowing clear. With the amount of fines it is presumed water would be turbid after a storm	6
8. Nutrient Enrichment	organic material observed clinging to cobble in the streambed and in adjacent wetlands	7
9. Manure or Human Waste	N/A	N/A
10. Pools	-N/A	N/A
11. Barriers to Movement	-Half buried 24" diameter pipe on the downstream boundary.	1
12. Fish Habitat Complexity	-Fish habitat was observed with several contributing factors.	4
13. Aquatic Invertebrate Habitat	-Invertebrate habitat was observed.	5
14. Aquatic Invertebrate Community	N/A	N/A
15. Riffle Embeddedness	N/A	N/A
16. Salinity	N/A	N/A
A. Sum of all elements scored		45
B. Number of elements scored		11

Overall score: A/B 4.1

1 to 2.9 Severely Degraded
3 to 4.9 Poor
5 to 6.9 Fair
7 to 8.9 Good
9 to 10 Excellent

1 to 2.9 Severely Degraded (list elements)
2, 4, 11

3 to 4.9 Poor (list elements)
4

9 to 10 Excellent (list elements)

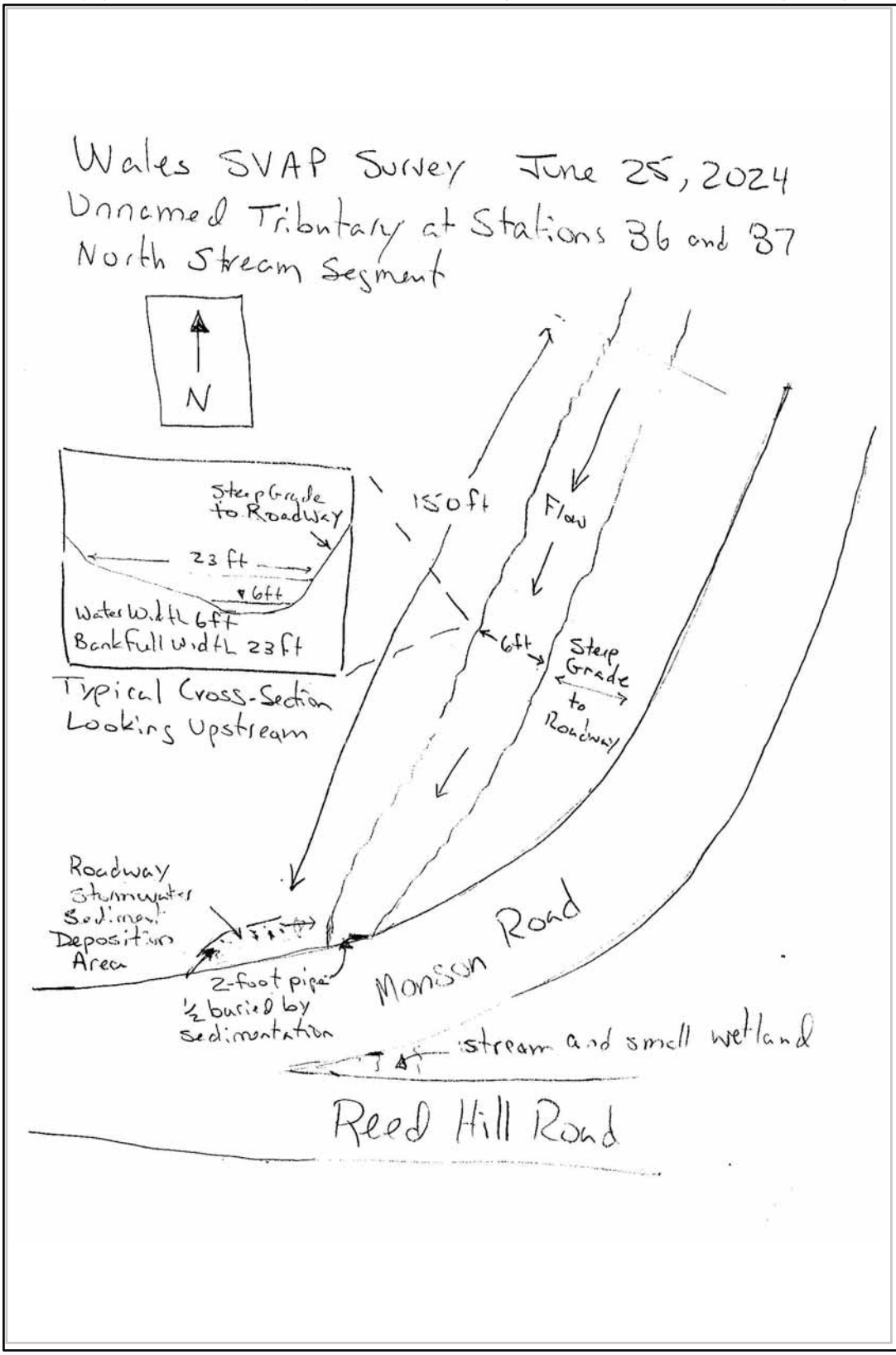
Suspected causes of SVAP2 scores less than 5 (does not meet quality criteria for stream species)

Roadway conduit and large roadway sediment load impair stream. Small riparian area along with large sediment deposits damaging riparian quality and large barriers to movement resulted in a low score.

Recommendations for further assessment or actions:

C. Site Map – Include and label: Legend (define abbreviations), flow direction, orientation & scale, reach top/bottom, landmarks, large wood, boulders, bank/channel work, infrastructure, barriers, vegetation, sampling locations.
** Note Riparian Vegetation Left Bank and Right Bank separately for entire reach
** Quantity (Natural community, width compared to bankfull width and active floodplain, % vegetation gaps)
** Quality (Natural & diverse %, age structure, invasive species %, concentrated flows, species present)

Date: 6/26/2024 Page 4 of 4
Site ID: Station 86+00 - 87.00 Reed Hill Road North Data recorder D. White



VEGETATION LIST

red maple (Acer rubrum)
Jewelweed (Impatiens)
Skunk Cabbage (Symplocarpus)
Sensitive Fern (Onoclea)
Crowsfoot (Caltha)
Reed Canary Grass (Phalaris)
Red Oak (Quercus)
Cinnamon Fern (Osmunda)

LEGEND:

Provide additional notes related to each element scored on back of site diagram, if needed.

Photo 1 - A south facing view of the stream segment taken from the northern boundary

Photo 2 - A south facing view of the stream segment and inlet which leads under Monson Road. The inlet was measured at 2 feet in diameter.

Photo 3 - A wide view of the sediment washing into the stream segment at downstream boundary along roadway.

Photo 4 - A closer perspective on the sediment washing into the stream.

Exhibit 1: Stream Visual Assessment Protocol 2 Data Forms

Date: 6/26/24 Page 1 of 4
Site ID: Station 86+00 - 87.00 Reed Hill Road South
Data recorder: D. White

Owner's name* MassDOT

Contact info* MassDOT (*property owner or POC for access)

Evaluator's name(s) K. Hickey, D.White (include all personnel on site during assessment)

Stream name unnamed Tributary to Vinica Pond

Assessment or Site Type Highway storm water drainage
(include purpose or goal of assessment as needed)

Preliminary Assessment (GIS/Office data collection)

A. Watershed Description (fill in from preliminary data sheets, or refer to preliminary data location)

Ecoregion or MLRA Lower Worcester Plateau HUC: 010802040306 Drainage area (acres or mi^2) 230 acres

Watershed management structures: (#): dams _____ water controls 1 irrigation diversions ____

Miles of contiguous riparian cover/mile of entire stream in watershed upstream (estimated) 1,800 ft.

Land use within watershed (%): cropland _____ hay land _____ grazing/pasture _____ forest 80

urban _____ industrial _____ other (specify) 20 Residential

Agronomic practices in uplands include: N/A

Confined animal feeding operations (#) N/A Conservation (acres) _____ industrial(acres) _____

Number of stream miles on property 200 ft Number of upstream total stream miles 1000ft

Stream hydrology: x intermittent; months of year wetted: unknown

_____ perennial; months of year at baseflow: _____

_____ impounded / controlled; distance upstream or downstream _____

B. Stream/Reach Description:

Stream Gage Name or Location/Discharge: N/A / _____ ft^3/s

Reach location (UTM or Lat./Long.) 42.05759 / -72.24500

Applicable Reference Stream: N/A Reference Stream Location: _____ / _____

Information Sources or other notes:
MassGIS

SVAP2 Field Assessment

Photo #/ID 1 to
Total # 4 Download √ by
Photographer(s) K. Hickey
Camera ID iPhone

Date: 6/26/24 Page 2 of 4
Site ID: Station 86+00 - 87.00 Reed Hill Road South
Data recorder: D.White

Preliminary Field Data

Start Time / Water Temp: 8:20 / N/A SVAP2 End Time / Water Temp: 13:30 / N/A

Weather conditions today 74 degrees F, 10% cloud cover
(ambient temp.\ % cloud cover \ precip.)

Weather conditions over past 2 to 5 days: no rain, avg temp 80 degrees F
(No. of days precip, amount of precip., average daytime temp.)

Schumm stage I other channel type / classification scheme /

Riparian Cover Type(s):
Actual %: Tree 60 % Shrub 20 % Herbaceous 25 % Bare 35 %
Relative %: Tree 40 % Shrub 5 % Herbaceous 20 % Bare 35 %

Bank Profile (√ one): Stratified ____ or Homogenous ____ ; Cohesive soil ____ or Non-cohesive soil X

Gradient (√ one): Low (0-2%) ____ Moderate (>2<4%) X High (>4%) ____

Regional curve used N/A - small drainage area Expected bankfull width N/A

Bankfull channel width 13ft (ft , m) Reach length 100ft (ft , m) Flood plain width NA ft , m

Avg. riparian zone width 6.5 ft (ft , m) Method used visual Floodplain wetlands 200 acres or ft^2 / reach

Dominant substrate (% or √): boulder 10 cobble 30 gravel 30 sand ____ fines/silt/clay 30
(> 250 mm) (60-250mm) (2-60 mm) (2-.06 mm) (< .06 mm)

6. Canopy cover #	6. Canopy cover%	10. Pool depth	10. Riffle depth	15. Riffle Embed %	12. & 13. Habitat Features **B**oth, **F**ish, **I**nverts	12. Fish count	13. Invert. count	14. Aquatic Invert name/type	14. Group I,II,III
NA	65%	NA	NA	NA	**B** Large wood	NA	NA	NA	NA
					B Small wood				
					B Overhang. Veg.				
					B Root mats				
					B Undercut banks				
					B Cobble riffles				
					B Macrophyte beds				
					F Deep pools				
					F Other pools (shallow, scour, plunge, pocket)				
					I Any pools				
					F >20" boulders				
					F 10-20" boulder clusters				
					I >20" boulders in riffles				
					I 10-20" Boulder clusters in riffles				
					F Off-channel				
					B Other locally important				

Element Scores

Date: 6/26/24 Page 3 of 4
Site ID: Station 86+00 - 87.00 Reed Hill Road South
Data recorder: D.White

Element	Notes	Score
1. Channel Condition	-Relatively stable. Signs of infrequent incision	6
2. Hydrologic Alteration	-Storm pipe at upper boundary of stream	2
3. Bank Condition	-bank moderately stable	5
4. Riparian Area Quantity	Almost no riparian area present	2
5. Riparian Area Quality	-small pocket of vegetation expected in riparian area	2
6. Canopy Cover	-heavily vegetated	8
7. Water Appearance	-water was flowing clear	6
8. Nutrient Enrichment	organic material observed clinging to cobble in the streambed	5
9. Manure or Human Waste	N/A	N/A
10. Pools	-N/A	N/A
11. Barriers to Movement	24" diameter pipe on the upstream boundary.	1
12. Fish Habitat Complexity	-Fish habitat was observed with several contributing factors.	4
13. Aquatic Invertebrate Habitat	-Invertebrate habitat was observed.	5
14. Aquatic Invertebrate Community	N/A	N/A
15. Riffle Embeddedness	N/A	N/A
16. Salinity	N/A	N/A
A. Sum of all elements scored		46
B. Number of elements scored		11

Overall score: A/B 4.2

1 to 2.9 Severely Degraded
3 to 4.9 Poor
5 to 6.9 Fair
7 to 8.9 Good
9 to 10 Excellent

1 to 2.9 Severely Degraded (list elements)
2, 11

3 to 4.9 Poor (list elements)

9 to 10 Excellent (list elements)

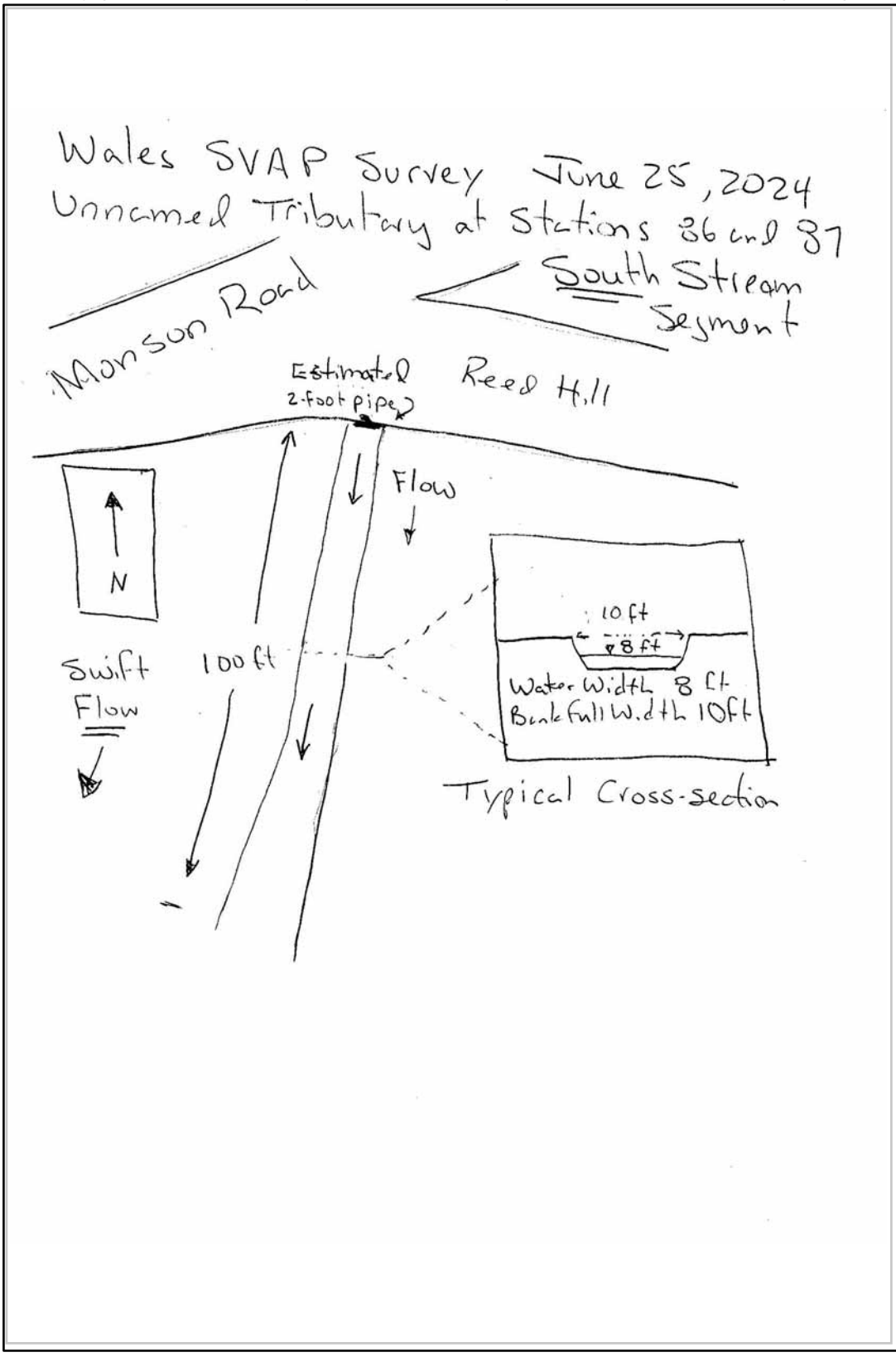
Suspected causes of SVAP2 scores less than 5 (does not meet quality criteria for stream species)

Large barrier to movement and channelized flow with low riparian qualities.

Recommendations for further assessment or actions:

C. Site Map – Include and label: Legend (define abbreviations), flow direction, orientation & scale, reach top/bottom, landmarks, large wood, boulders, bank/channel work, infrastructure, barriers, vegetation, sampling locations.
** Note Riparian Vegetation Left Bank and Right Bank separately for entire reach
** Quantity (Natural community, width compared to bankfull width and active floodplain, % vegetation gaps)
** Quality (Natural & diverse %, age structure, invasive species %, concentrated flows, species present)

Date 6/26/2024 Page 4 of 4
Site ID: Station 86+00 - 87.00 Reed Hill Road South
Data recorder D. White



VEGETATION LIST

Red maple (Acer rubrum)
Jewelweed (Impatiens)
Skunk Cabbage (Symplocarpus)
Sensitive Fern (Onoclea)
Crowsfoot (Caltha)
Golden Rod (Solidago)

LEGEND:

Provide additional notes related to each element scored on back of site diagram, if needed.

Photo 1 - An upstream boundary facing north. The outlet was measured at 2 feet in diameter

Photo 2 - A south facing view of the stream segment taken from the north boundary.

Photo 3 - A representative photo of the stream segment.

Photo 4 - A view of the southern boundary of this stream segment.

Appendix C

Updated 404 WQC Permit Drawings

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

PLAN AND PROFILE OF

MONSON ROAD IMPROVEMENTS

IN THE TOWN OF

WALES

HAMPDEN COUNTY

100% SUBMITTAL

404 ENVIRONMENTAL PERMIT PLAN SET

WALES
MONSON ROAD

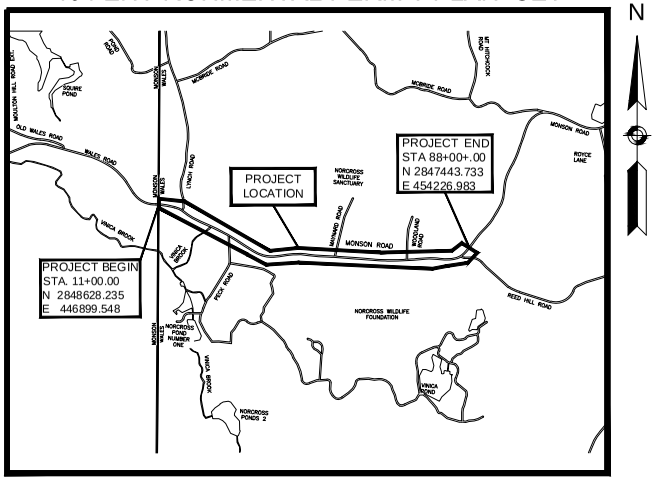
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-		
PROJECT FILE NO.	608163		

TITLE SHEET & INDEX

THESE PLANS ARE SUPPLEMENTED BY THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DATED 2024, 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	KEY PLAN
3	LEGEND, ABBREVIATIONS & GENERAL NOTES
4	TYPICAL SECTIONS
5-12	CONSTRUCTION PLANS
13-18	PROFILES
19-26	CROSS SECTIONS
27-35	STRUCTURAL PLANS
36	CULVERT 3 CHANNEL PLAN, PROFILE AND SECTION
37-38	CULVERT 3 CHANNEL CROSS SECTIONS
39-40	TEMPORARY WATER HANDLING PLAN
41	WETLAND REPLICATION AREA DETAIL



DESIGN DESIGNATION - MONSON ROAD

DESIGN SPEED	40 MPH
ADT (2017)	660
ADT (2025)	760
K	11%
D	52%
T (PEAK HOUR)	3.0%
T (AVERAGE DAY)	3.0%
DHV	85
DDHV	45
FUNCTIONAL CLASSIFICATION	RURAL MAJOR COLLECTOR

LENGTH OF PROJECT = 7700.00 FEET = 1.458 MILES

August 2024

COMMONWEALTH OF MASSACHUSETTS
SCOTT R. BRUSO
STRUCTURAL
No. 48061
REGISTERED PROFESSIONAL ENGINEER

2024.08.09 12:45:27-04'00'

Weston & Sampson
712 Brook Street, Suite 103
Rocky Hill, CT 06067
860.513.1473
www.westonandsampson.com

DATE	DESCRIPTION	REV #

MassDOT Massachusetts Department of Transportation Highway Division

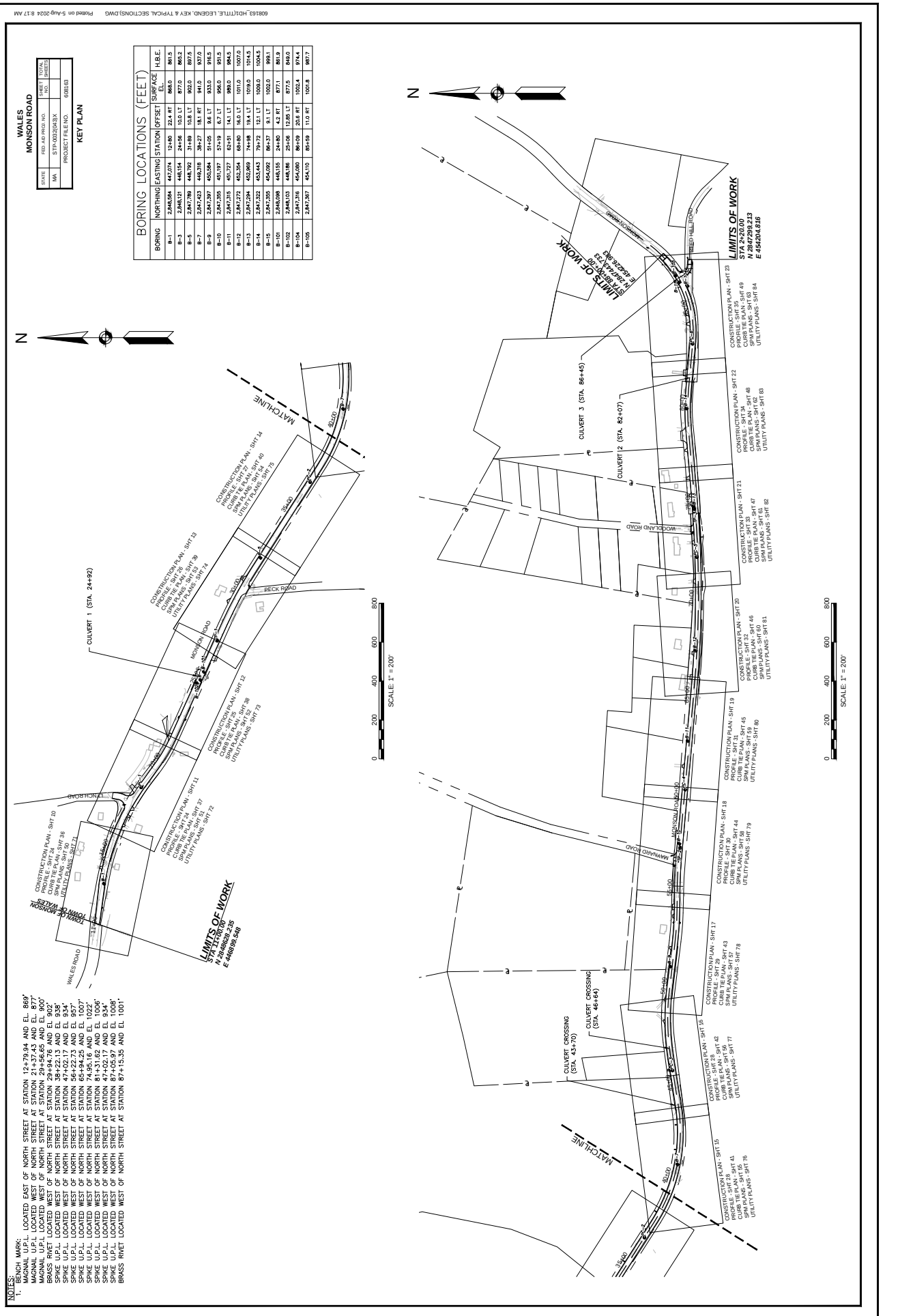
APPROVED

CHIEF ENGINEER _____ DATE _____

608163_HDI(TITLE, LEGEND, KEY & TYPICAL SECTIONS)404.DWG Plotted on 9-Aug-2024 5:04 PM

A00830 -703

Proposal No. 608163-128112


608163_HDLTITLE, LEGEND, KEY & TYPICAL SECTIONS.DWG Plotted on 5-Aug-2024 8:17 AM
WALES
MONSON ROAD
KEY PLAN
STATE | FED. AID PROJ. NO. | SHEET NO. | TOTAL SHEETS
MA | STP-0032(043)X | 1 | 90
PROJECT FILE NO. 608163
BORING LOCATIONS (FEET)
BORING | NORTHING | EASTING | STATION | OFFSET | SURFACE EL. | H.B.E.
B-1 | 2,848,584 | 447,074 | 12+80 | 22.4 RT | 868.0 | 861.5
B-3 | 2,848,121 | 448,154 | 24+56 | 10.0 LT | 877.0 | 865.2
B-5 | 2,847,780 | 448,792 | 31+69 | 10.8 LT | 902.0 | 897.5
B-7 | 2,847,423 | 449,318 | 38+27 | 18.1 RT | 941.0 | 937.0
B-9 | 2,847,397 | 450,584 | 51+05 | 9.6 LT | 933.0 | 916.5
B-10 | 2,847,355 | 451,197 | 57+19 | 6.7 LT | 956.0 | 951.5
B-11 | 2,847,315 | 451,727 | 62+51 | 14.1 LT | 989.0 | 984.5
B-12 | 2,847,272 | 452,354 | 68+80 | 16.0 LT | 1011.0 | 1007.0
B-13 | 2,847,294 | 453,969 | 74+48 | 19.4 LT | 1018.0 | 1014.5
B-14 | 2,847,322 | 453,443 | 79+72 | 12.1 LT | 1008.0 | 1004.5
B-15 | 2,847,355 | 454,092 | 86+37 | 6.1 LT | 1002.0 | 998.1
B-101 | 2,848,099 | 448,135 | 24+85 | 4.2 RT | 877.1 | 861.9
B-102 | 2,848,103 | 448,186 | 25+06 | 12.85 LT | 877.5 | 64.60
B-104 | 2,847,316 | 454,089 | 86+39 | 20.6 RT | 1002.4 | 974.4
B-105 | 2,847,307 | 454,110 | 85+59 | 11.0 RT | 1001.8 | 987.7
NOTES:
1. BENCH MARK:
MAGNAL U.P.L. LOCATED EAST OF NORTH STREET AT STATION 12+79.94 AND EL. 869'
MAGNAL U.P.L LOCATED WEST OF NORTH STREET AT STATION 21+37.43 AND EL. 877'
MAGNAL U.P.L LOCATED WEST OF NORTH STREET AT STATION 29+56.65 AND EL 900'
BRASS RIVET LOCATED WEST OF NORTH STREET AT STATION 29+94.76 AND EL 902'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 38+22.13 AND EL 938'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 47+02.17 AND EL 934'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 56+22.73 AND EL 957'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 65+94.25 AND EL 1007'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 74.95.16 AND EL 1022'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 81+31.62 AND EL 1006'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 87+05.97 AND EL 934
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 87+05.97 AND EL 1008'
BRASS RIVET LOCATED WEST OF NORTH STREET AT STATION 87+15.35 AND EL 1001'
N
SCALE: 1" = 200'
0 200 400 600 800
CULVERT 1 (STA. 24+92)
CULVERT 2 (STA. 82+07)
CULVERT 3 (STA. 86+45)
CULVERT CROSSING (STA. 43+70)
CULVERT CROSSING (STA. 46+64)
RECK ROAD
MONSON ROAD
WOODLAND ROAD
MAPLE HILL ROAD
MAPLE HILL ROAD
MONSON ROAD
MONSON ROAD
WALES ROAD
TOWN OF MONSON
TOWN OF WALES
MATCHLINE
MATCHLINE
LIMITS OF WORK
STA 0+00.00
N 2848626.295
E 446198.568
LIMITS OF WORK
STA 2+20.00
N 2847299.213
E 454204.816
LIMITS OF WORK
STA 89+44.72
N 2847626.943
E 454426.723
CONSTRUCTION PLAN - SHT 10
PROFILE - SHT 24
CURB TIE PLAN - SHT 36
SPM PLANS - SHT 70
UTILITY PLANS - SHT 21
CONSTRUCTION PLAN - SHT 11
PROFILE - SHT 24
CURB TIE PLAN - SHT 37
SPM PLANS - SHT 71
UTILITY PLANS - SHT 72
CONSTRUCTION PLAN - SHT 12
PROFILE - SHT 25
CURB TIE PLAN - SHT 38
SPM PLANS - SHT 72
UTILITY PLANS - SHT 73
CONSTRUCTION PLAN - SHT 13
PROFILE - SHT 26
CURB TIE PLAN - SHT 39
SPM PLANS - SHT 73
UTILITY PLANS - SHT 74
CONSTRUCTION PLAN - SHT 14
PROFILE - SHT 27
CURB TIE PLAN - SHT 40
SPM PLANS - SHT 74
UTILITY PLANS - SHT 75
CONSTRUCTION PLAN - SHT 15
PROFILE - SHT 28
CURB TIE PLAN - SHT 41
SPM PLANS - SHT 75
UTILITY PLANS - SHT 76
CONSTRUCTION PLAN - SHT 16
PROFILE - SHT 28
CURB TIE PLAN - SHT 42
SPM PLANS - SHT 76
UTILITY PLANS - SHT 77
CONSTRUCTION PLAN - SHT 17
PROFILE - SHT 29
CURB TIE PLAN - SHT 43
SPM PLANS - SHT 57
UTILITY PLANS - SHT 78
CONSTRUCTION PLAN - SHT 18
PROFILE - SHT 29
CURB TIE PLAN - SHT 44
SPM PLANS - SHT 58
UTILITY PLANS - SHT 79
CONSTRUCTION PLAN - SHT 19
PROFILE - SHT 30
CURB TIE PLAN - SHT 45
SPM PLANS - SHT 59
UTILITY PLANS - SHT 80
CONSTRUCTION PLAN - SHT 20
PROFILE - SHT 31
CURB TIE PLAN - SHT 46
SPM PLANS - SHT 60
UTILITY PLANS - SHT 81
CONSTRUCTION PLAN - SHT 21
PROFILE - SHT 33
CURB TIE PLAN - SHT 47
SPM PLANS - SHT 61
UTILITY PLANS - SHT 82
CONSTRUCTION PLAN - SHT 22
PROFILE - SHT 34
CURB TIE PLAN - SHT 48
SPM PLANS - SHT 62
UTILITY PLANS - SHT 83
CONSTRUCTION PLAN - SHT 23
PROFILE - SHT 35
CURB TIE PLAN - SHT 49
SPM PLANS - SHT 63
UTILITY PLANS - SHT 84

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
	CBCI	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
		CABLE MANHOLE
		DRAINAGE MANHOLE
		ELECTRIC MANHOLE
		GAS MANHOLE
		MISC MANHOLE
		SEWER MANHOLE
		TELEPHONE MANHOLE
		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
		SWAMP / MARSH
WG	WG	WATER GATE
PM	PM	PARKING METER
		OVERHEAD CABLE/WIRE
		CURBING
100 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
x	x	CHAIN LINK OR METAL FENCE
		WOOD FENCE
		EROSION AND SEDIMENT CONTROL BARRIER
		TREE LINE
		LIMITS OF CLEARING AND GRUBBING
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		EDGE OF PAVEMENT
		LIMIT OF MICROMILLING AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT WETLAND BUFFER
		200 FT RIVERFRONT AREA BUFFER
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT
		SIGN AND POST
		SIGN AND DOUBLE POST

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
CBCI-DB	DOUBLE GRATE CATCH BASIN W/ 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
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
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
LB	LEACH BASIN

ABBREVIATIONS (cont.)

GENERAL

LP	LIGHT POLE
LT	LEFT
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NIC	NOT IN CONTRACT
NO.	NUMBER
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
PSB	PLANTABLE 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 WATER WAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCCE	REINFORCED CONCRETE CULVERT END
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	STA
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SW	SIDEWALK
SWTU	STORMWATER TREATMENT UNIT
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
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

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
	SL	12"-WIDE STOP LINE
	SWL	6"-WIDE SOLID WHITE LINE
	DBYL	DOUBLE YELLOW LINE (2 - 6"-WIDE YELLOW LINES)

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

LEGEND, ABBREVIATIONS & GENERAL NOTES

GENERAL NOTES:

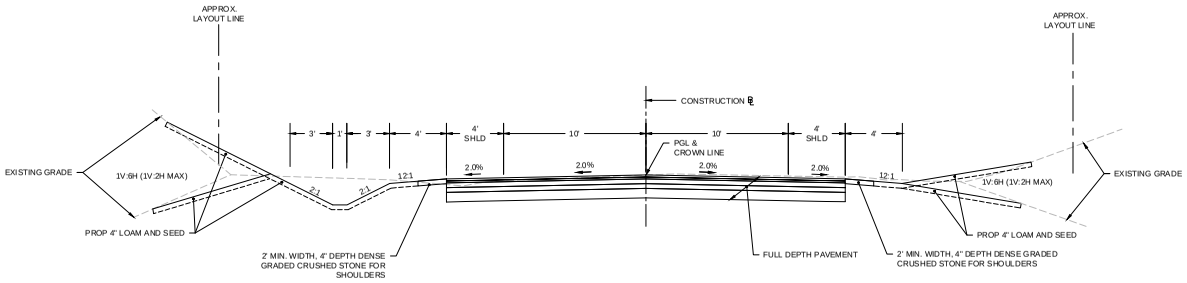
1. TOPOGRAPHICAL INFORMATION BASED ON AN ON THE GROUND SURVEY PERFORMED BY CHAPPELL ENGINEERING ON DECEMBER 2017 AND SUPPLEMENTED BY CHAPPELL ENGINEERING IN OCTOBER 2023. WETLAND FLAGGING WAS PERFORMED BY WESTON & SAMPSON IN NOVEMBER 2020 AND REFLAGGED IN SEPTEMBER OF 2023.
2. THE HORIZONTAL COORDINATES ARE BASED ON NAD 83, THE VERTICAL DATUM IS NAVD 88.
3. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. THE CONTRACTOR SHALL DIG TEST PITS WITH THE LOCATIONS BEING APPROVED BY THE ENGINEER PRIOR TO COMMENCEMENT OF WORK TO EXACTLY LOCATE EXISTING UTILITIES.
4. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
5. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY OWNER. ANY ALTERATIONS SHALL BE INCIDENTAL TO THE PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY SUPPORT OF ALL UTILITIES TO REMAIN IN PLACE AND SHALL DESCRIBE IN WRITING, TO THE SATISFACTION OF THE ENGINEER, HIS METHOD OF TEMPORARY SUPPORT.
6. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
7. THE TERM "PROPOSED (PROP)" INDICATES WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET (R&R)".
8. ALL EXISTING STATE, COUNTY AND TOWN LOCATION LINES AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATION ARE NOT GUARANTEED.
9. ALL EXCESS MATERIAL FROM ROADWAY RECONSTRUCTION OR THE EXCAVATION PROCESS SHALL BE REUSED ON SITE OR REMOVED FROM THE SITE AND DISPOSED OF IN A LEGAL AND PROPER MANNER.
10. THE CONTRACTOR SHALL CALL DIGSAFE AT 1-888-344-7233 AT LEAST 72 HOURS, SATURDAYS, AND HOLIDAYS EXCLUDED, PRIOR TO EXCAVATING AT ANY LOCATION. A COPY OF THE DIGSAFE PROJECT REFERENCE NUMBER(S) SHALL BE GIVEN TO THE TOWN PRIOR TO EXCAVATION.
11. JOINTS BETWEEN HOT MIX ASPHALT TRENCH PAVEMENT AND SAWCUT EXISTING PAVEMENT SHALL BE SEALED WITH BITUMEN AND BACKSANDED.
12. IF DEEMED NECESSARY DUE TO THE WORK, THE CONTRACTOR SHALL COORDINATE WITH THE TOWN OF WALES HIGHWAY DEPARTMENT, THE WALES FIRE DEPARTMENT, AND THE ENGINEER FOR APPROVAL OF SHUTTING DOWN ANY EXISTING WATER MAINS AND SHALL ALSO OBTAIN APPROVAL FOR DISRUPTING ANY EXISTING SEWER FLOWS.
13. THE CONTRACTOR SHALL BE AWARE THAT ONLY TOWN PERSONNEL ARE ALLOWED TO OPERATE WATER GATES AND HYDRANTS. ANY REQUESTS TO OPERATE THE GATES SHALL BE COORDINATED THROUGH THE ENGINEER.
14. THE CONTRACTOR SHALL COORDINATE ANY WORK FOR THE PROJECT WITH ALL ADJACENT/CONCURRENT PROJECTS AND CONTRACTORS.
15. THE CONTRACTOR SHALL INSTALL PRIOR TO COMMENCEMENT OF WORK, MAINTAIN, AND REMOVE AT THE END OF THE PROJECT INLET SEDIMENT CONTROL BAGS IN ALL CATCH BASINS, WITHIN OR ADJACENT TO THE PROJECT LIMITS. THE CONTRACTOR SHALL ALSO MAINTAIN SILT FENCE AND COMPOST FILTER TUBES AS SHOWN ON THE PLANS THROUGHOUT THE DURATION OF THE PROJECT AND REMOVE AT THE END.
16. ANY GRASS AREAS DISTURBED BY THE WORK SHALL BE RESTORED WITH LOAM AND SEED.
17. ANY LANDSCAPED AREAS DISTURBED BY THE WORK SHALL BE RESTORED TO EXISTING CONDITIONS WITH EXISTING OR NEW GROUND COVER MATERIALS AS DIRECTED BY THE ENGINEER. ANY PLANTS, SHRUBS, OR FLOWERS DISTURBED BY THE WORK SHALL BE RESET TO EXISTING CONDITIONS OR REPLACED WITH NEW PLANTS, SHRUBS, OR FLOWERS AS DIRECTED BY THE ENGINEER. ALL WORK TO RESTORE LANDSCAPE AREAS, NEW GROUND COVER MATERIALS, NEW PLANTS, NEW SHRUBS, OR NEW FLOWERS REQUIRED BY THE ENGINEER SHALL BE INCIDENTAL TO THE PROJECT.
18. CONTRACTOR TO COORDINATE WITH UTILITY POLE OWNERS IN AREAS WHERE UNDERGROUND UTILITY WORK IS WITHIN CLOSE PROXIMITY AND POSSIBLE UTILITY POLE SHORING IS REQUIRED WHILE INSTALLING PROPOSED UTILITIES.
19. RAISE AND ADJUST FRAMES AND GRATES, FRAMES AND COVERS AND GATE BOXES PRIOR TO PAVEMENT OVERLAY, IF REQUIRED.
20. CONTRACTOR IS RESPONSIBLE FOR REPLACING ANY PROPERTY PINS THAT ARE DAMAGED OR DESTROYED DURING CONSTRUCTION, TO THEIR LOCATION JUST PRIOR TO CONSTRUCTION.
21. ALL TRAFFIC SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS OTHERWISE NOTED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
22. CONTRACTOR TO ESTABLISH TEMPORARY BENCHMARKS EVERY 1000 FEET BASED ON THE PERMANENT BENCHMARKS LOCATED AT STA 29+85.04, 24.73 LEFT AND STA 87+27.18, 41.17 LEFT OR AS REQUIRED BY THE ENGINEER.
23. CONTRACTOR TO PROVIDE ADDITIONAL TRAVERSE POINTS AND TRAVERSE LINES IN THE VICINITY OF EXISTING TRAVERSE POINTS WHERE THE EXISTING TRAVERSE POINT IS LOCATED IN "SOFT GROUND" OR AS REQUIRED BY THE ENGINEER.
24. ALL EXISTING STONE WALLS PROPOSED FOR RELOCATION SHALL NOT BE REMOVED FROM THE IMMEDIATE AREA SHOWN ON THE PLANS.

608163_HDU(TITLE, LEGEND, KEY & TYPICAL SECTIONS).DWG Plotted on 5-Aug-2024 8:17 AM

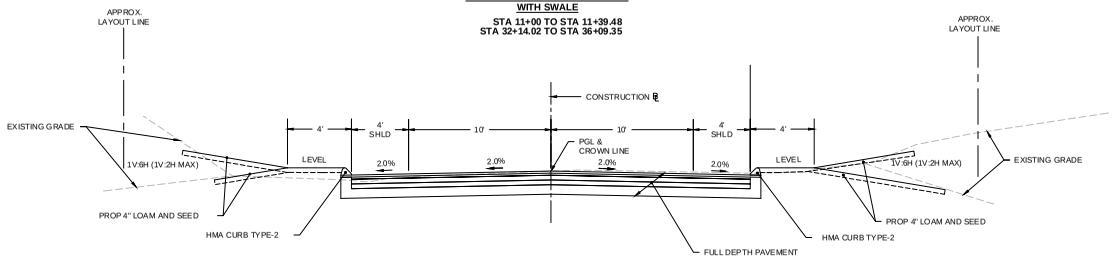
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

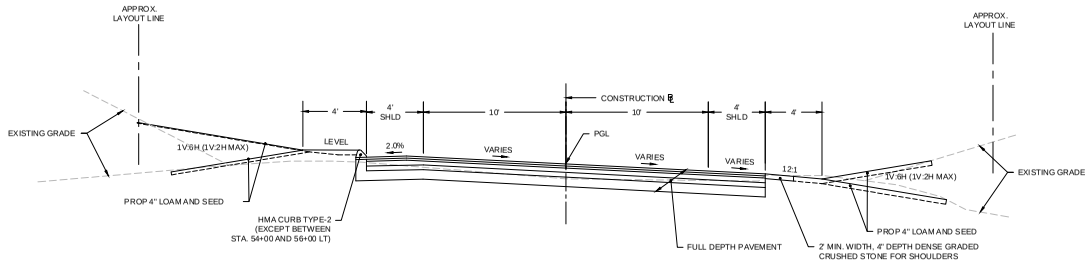
TYPICAL SECTIONS



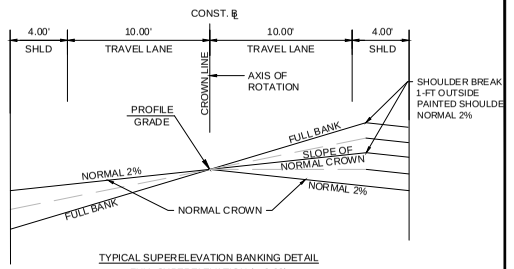
MONSON ROAD TYPICAL SECTION
WITH SWALE
STA 11+00 TO STA 11+39.48
STA 32+14.02 TO STA 36+09.35



MONSON ROAD TYPICAL SECTION
WITH CURBING
STA 22+70.43 TO STA 26+98.72
STA 57+46.79 TO STA 64+41.04
STA 75+70.50 TO STA 77+39.51



MONSON ROAD TYPICAL SECTION
FULL SUPERELEVATION AND TRANSITIONS
STA 11+39.48 TO STA 22+70.43
STA 26+98.72 TO STA 32+14.02
STA 36+09.35 TO STA 57+46.79
STA 64+41.04 TO STA 75+70.50
STA 77+39.51 TO STA 88+00



TYPICAL SUPERELEVATION BANKING DETAIL
FULL SUPERELEVATION (e=0.06)
N.T.S.

PAVEMENT NOTES

PROPOSED PAVEMENT MILLING AND OVERLAY:

1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 1.50" PAVEMENT MILLING

PROPOSED FULL DEPTH PAVEMENT:

SURFACE COURSE:	1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5).
BASE COURSE:	3.25" SUPERPAVE INTERMEDIATE COURSE 19 (SIC-19.0) PLACED IN ONE LAYER.
SUBBASE:	4" DENSE GRADED CRUSHED STONE OVER 8" GRAVEL BORROW, TYPE B.
	BITUMEN FOR TACK COAT (RS-1) TO BE APPLIED AT A RATE OF 0.07 TO 0.09 GAL/SY OVER MILLED SURFACES AND 0.06 TO 0.08 GAL/SY ON BASE AND INTERMEDIATE PAVEMENT COURSES.

PROPOSED HOT MIX ASPHALT DRIVEWAY :

SURFACE COURSE:	1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 2.50" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5)
FOUNDATION:	8" GRAVEL BORROW, TYPE B

PROPOSED GRAVEL DRIVEWAY:

8" GRAVEL BORROW, TYPE B

PROPOSED CEMENT CONCRETE WALK

4" CEMENT CONCRETE OVER
8" GRAVEL BORROW, TYPE B

608163_HDI(TITLE, LEGEND, KEY & TYPICAL SECTIONS).DWG Plotted on 5-Aug-2024 8:17 AM

A00830 -706

Proposal No. 608163-128112

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

CONSTRUCTION PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	QTY (MASTER TOTAL)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	13	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	0	27	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	1	13	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	2	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

HIGHWAY GUARD DETAILS
STA 14+65 TO STA 14+78 LT TANGENT END TREATMENT TL-3
STA 14+78 TO STA 16+88 LT (TL-3)
STA 14+50 TO STA 14+63 RT TANGENT END TREATMENT TL-3
STA 14+63 TO STA 16+02 RT (TL-3)

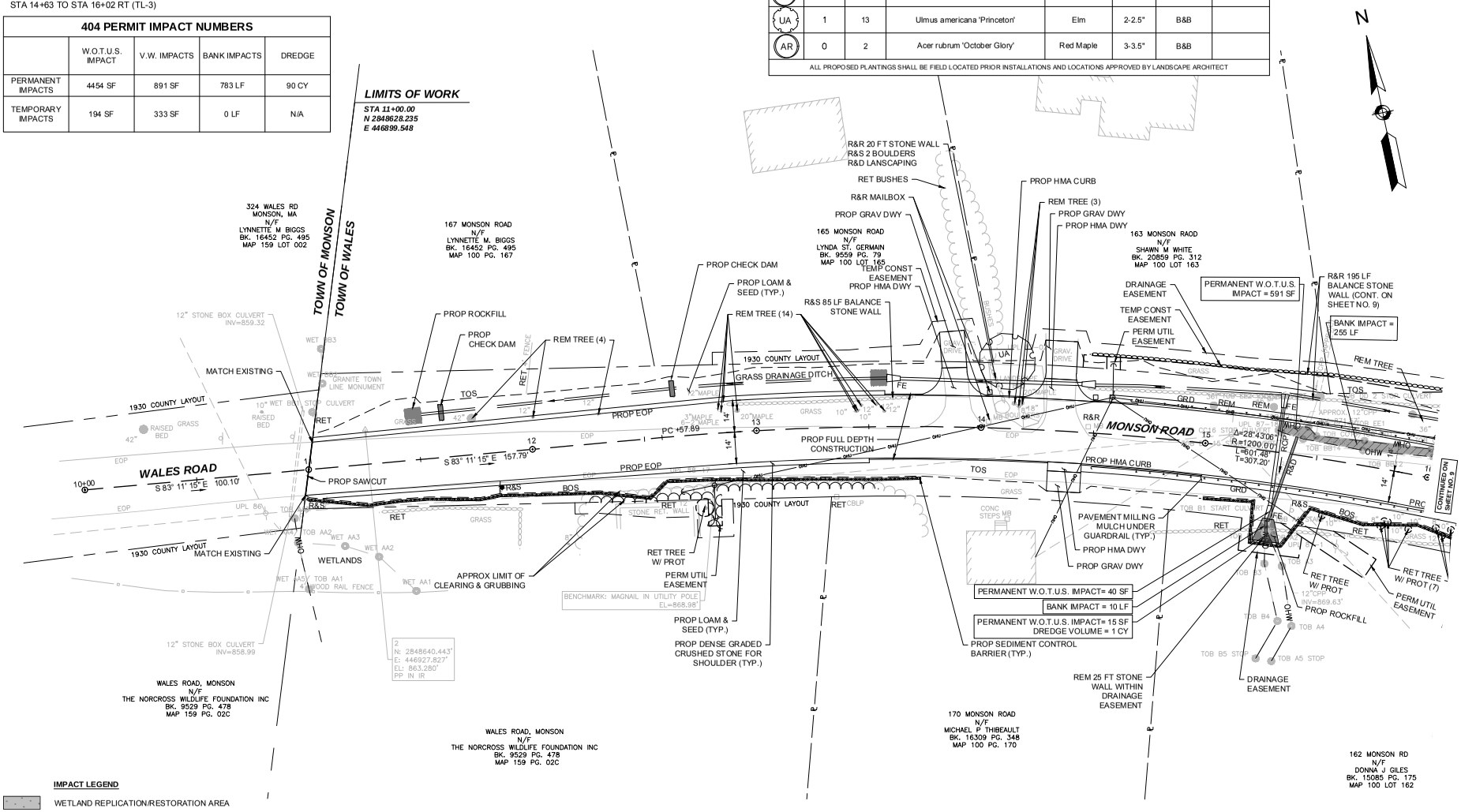
TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
NONE

DRAINAGE DETAILS
SEE UTILITY PLANS

404 PERMIT IMPACT NUMBERS

	W.O.T.U.S. IMPACT	V.W. IMPACTS	BANK IMPACTS	DREDGE
PERMANENT IMPACTS	4454 SF	891 SF	783 LF	90 CY
TEMPORARY IMPACTS	194 SF	333 SF	0 LF	N/A



IMPACT LEGEND

WETLAND REPLICATION/RESTORATION AREA

— OHW — ORDINARY HIGH WATER

W.O.T.U.S.=WATERS OF THE UNITED STATES
PERMANENT
TEMPORARY

V.W.=VEGETATED WETLANDS
PERMANENT
TEMPORARY

FOR PROFILE SEE SHEET NO. 22

608163_HD3(CONSTRUCTION PLANS)404.DWG Plotted on 9-Aug-2024 4:02 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CONSTRUCTION PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	3	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	0	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	4	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

HIGHWAY GUARD DETAILS

STA 14+78 TO STA 16+88 LT (TL-3)
STA 16+88 TO STA 17+00 LT TANGENT END TREATMENT TL-3
STA 14+63 TO STA 16+02 RT (TL-3)
STA 16+02 TO STA 16+14 RT TANGENT END TREATMENT TL-3
STA 20+25 TO STA 20+37 RT TANGENT END TREATMENT TL-3
STA 20+37 TO STA 23+10 RT (TL-3)

TRAFFIC SIGNAL CONDUIT

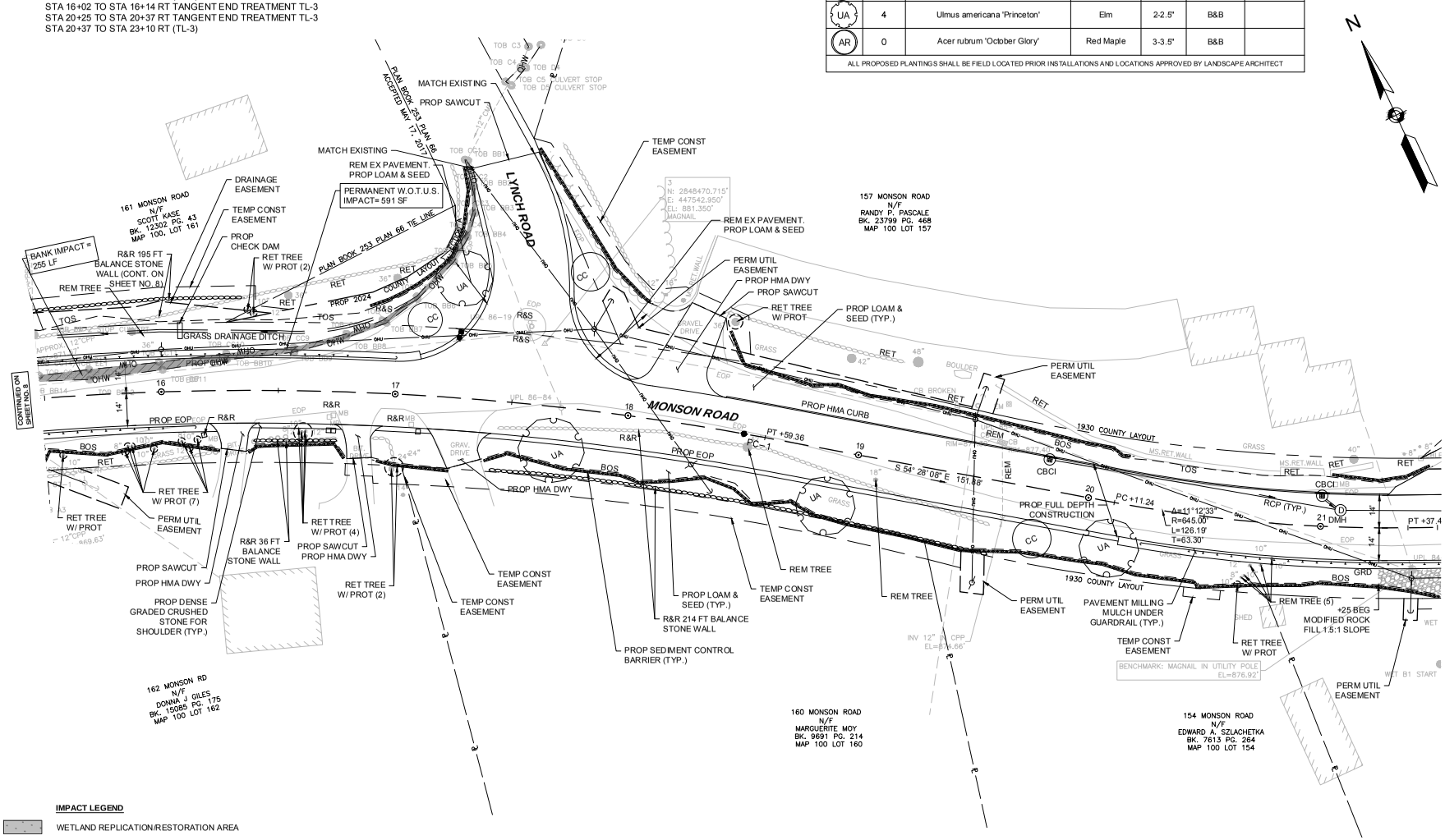
NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

SEE UTILITY PLANS



IMPACT LEGEND

WETLAND REPLICATION/RESTORATION AREA

— OHW — ORDINARY HIGH WATER

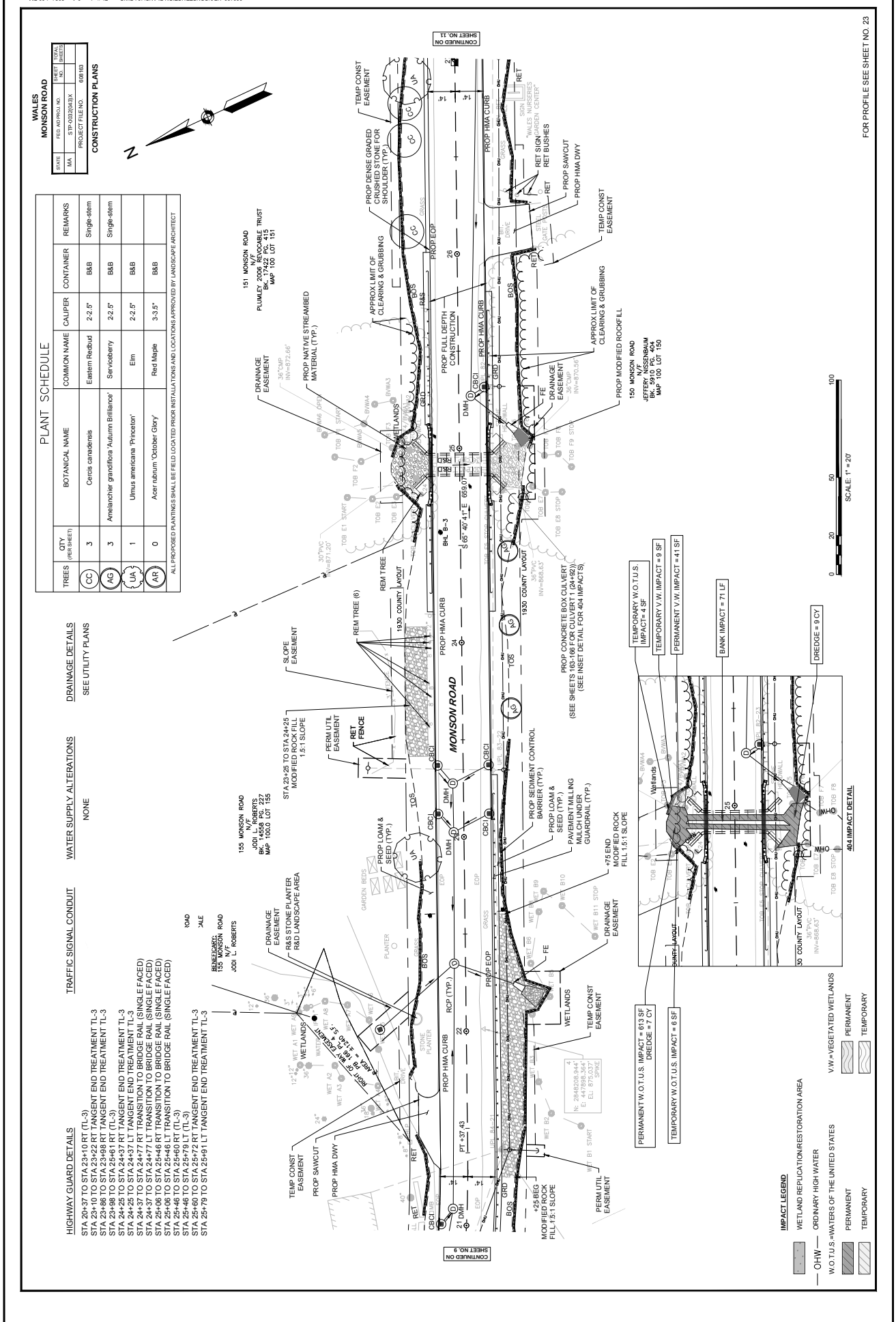
W.O.T.U.S.=WATERS OF THE UNITED STATES
- PERMANENT
- TEMPORARY

V.W.=VEGETATED WETLANDS
- PERMANENT
- TEMPORARY

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 22

608163_HD3(CONSTRUCTION PLANS)404.DWG Plotted on 9-Aug-2024 4:02 PM


WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
CONSTRUCTION PLANS
PLANT SCHEDULE
TREES
QTY (PER SHEET)
BOTANICAL NAME
COMMON NAME
CALIPER
CONTAINER
REMARKS
CC
3
Cercis canadensis
Eastern Redbud
2-2.5"
B&B
Single-stem
AG
3
Amelanchier grandiflora 'Autumn Brilliance'
Serviceberry
2-2.5"
B&B
Single-stem
UA
1
Ulmus americana 'Princeton'
Elm
2-2.5"
B&B
AR
0
Acer rubrum 'October Glory'
Red Maple
3-3.5"
B&B
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 20+37 TO STA 23+10 RT (TL-3)
STA 23+10 TO STA 23+22 RT TANGENT END TREATMENT TL-3
STA 23+86 TO STA 23+98 RT TANGENT END TREATMENT TL-3
STA 23+98 TO STA 25+61 RT (TL-3)
STA 24+25 TO STA 24+37 RT TANGENT END TREATMENT TL-3
STA 24+25 TO STA 24+37 LT TANGENT END TREATMENT TL-3
STA 24+37 TO STA 24+77 RT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 24+37 TO STA 24+77 LT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+06 TO STA 25+46 RT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+06 TO STA 25+46 LT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+46 TO STA 25+60 RT (TL-3)
STA 25+46 TO STA 25+79 LT (TL-3)
STA 25+60 TO STA 25+72 RT TANGENT END TREATMENT TL-3
STA 25+79 TO STA 25+91 LT TANGENT END TREATMENT TL-3
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
SEE UTILITY PLANS
DRAINAGE DETAILS
CONTINUED ON SHEET NO. 9
CONTINUED ON SHEET NO. 11
FOR PROFILE SEE SHEET NO. 23
MONSON ROAD
SCALE: 1" = 20
404 IMPACT DETAIL
IMPACT LEGEND
WETLAND REPLICATION/RESTORATION AREA
ORDINARY HIGH WATER
W.O.T.U.S.=WATERS OF THE UNITED STATES
V.W.=VEGETATED WETLANDS
PERMANENT
TEMPORARY
PERMANENT W.O.T.U.S. IMPACT = 613 SF
DREDGE = 7 CY
TEMPORARY W.O.T.U.S. IMPACT = 6 SF
TEMPORARY W.O.T.U.S. IMPACT = 4 SF
TEMPORARY V.W. IMPACT = 9 SF
PERMANENT V.W. IMPACT = 41 SF
BANK IMPACT = 71 LF
DREDGE = 9 CY
151 MONSON ROAD N/F PLUMLEY 2006 REVOCABLE TRUST BK: 7422 PG: 415 MAP 100 LOT 151
150 MONSON ROAD N/F JEFFERY WISSENBAUM BK: 5910 PG: 404 MAP 100 LOT 150
155 MONSON ROAD N/F JODI L. ROBERTS BK: 14558 PG: 227 MAP 100.0 LOT 155
BENEFICIARY: 155 MONSON ROAD JODI L. ROBERTS
ROAD
JALE

HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS
STA 42+75 TO STA 42+87 RT TANGENT END TREATMENT TL-3 STA 42+87 TO STA 43+86 RT (TL-3)	NONE	NONE	SEE UTILITY PLANS

PLANT SCHEDULE

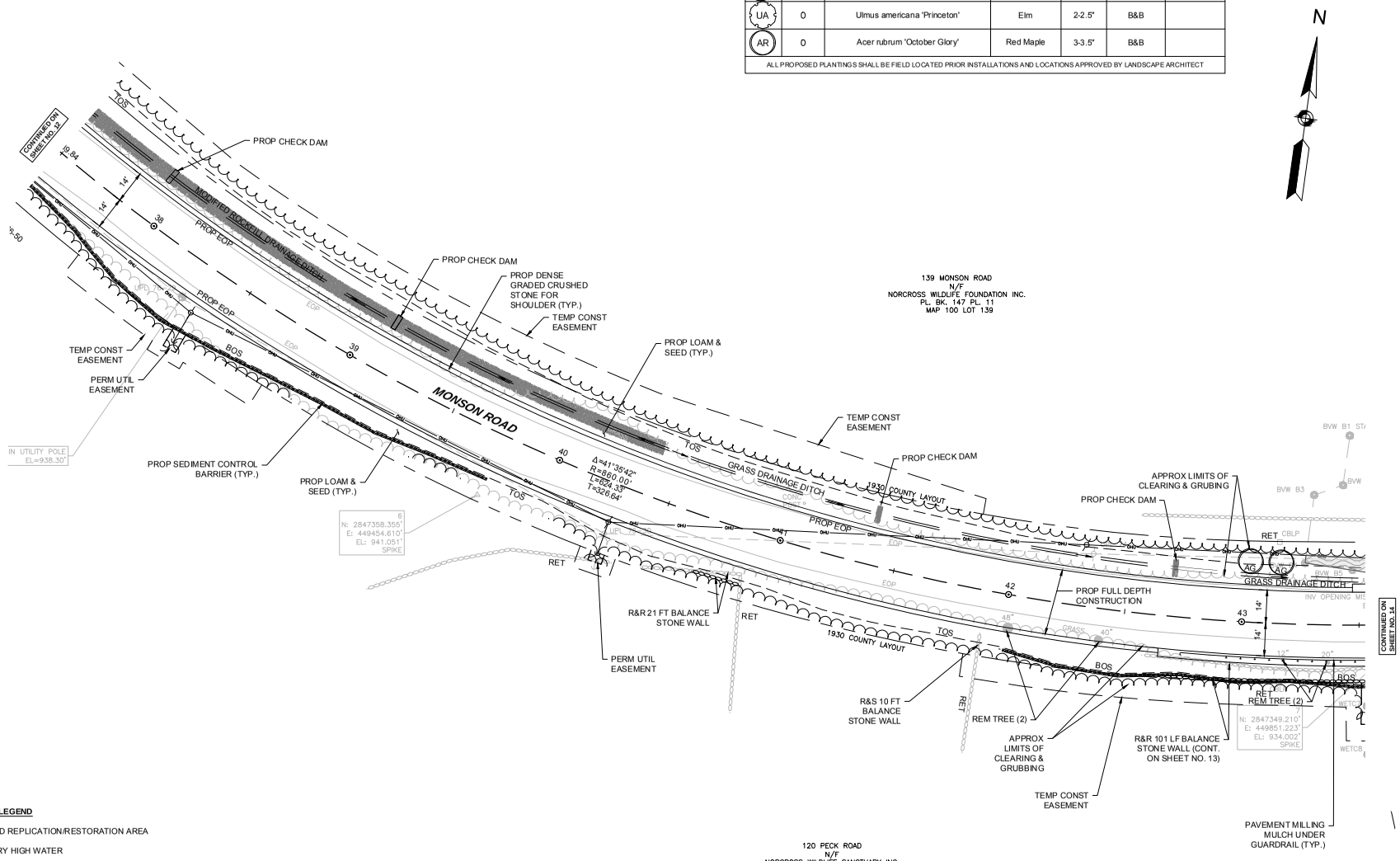
TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	2	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	0	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CONSTRUCTION PLANS



IMPACT LEGEND

- WETLAND REPLICATION/RESTORATION AREA
- OHW — ORDINARY HIGH WATER
- W.O.T.U.S.=WATERS OF THE UNITED STATES
  - PERMANENT
  - TEMPORARY
- V.W.=VEGETATED WETLANDS
  - PERMANENT
  - TEMPORARY

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 26

608163_HD3(CONSTRUCTION PLANS)404.DWG Plotted on 9-Aug-2024 4:03 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

CONSTRUCTION PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	6	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	0	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

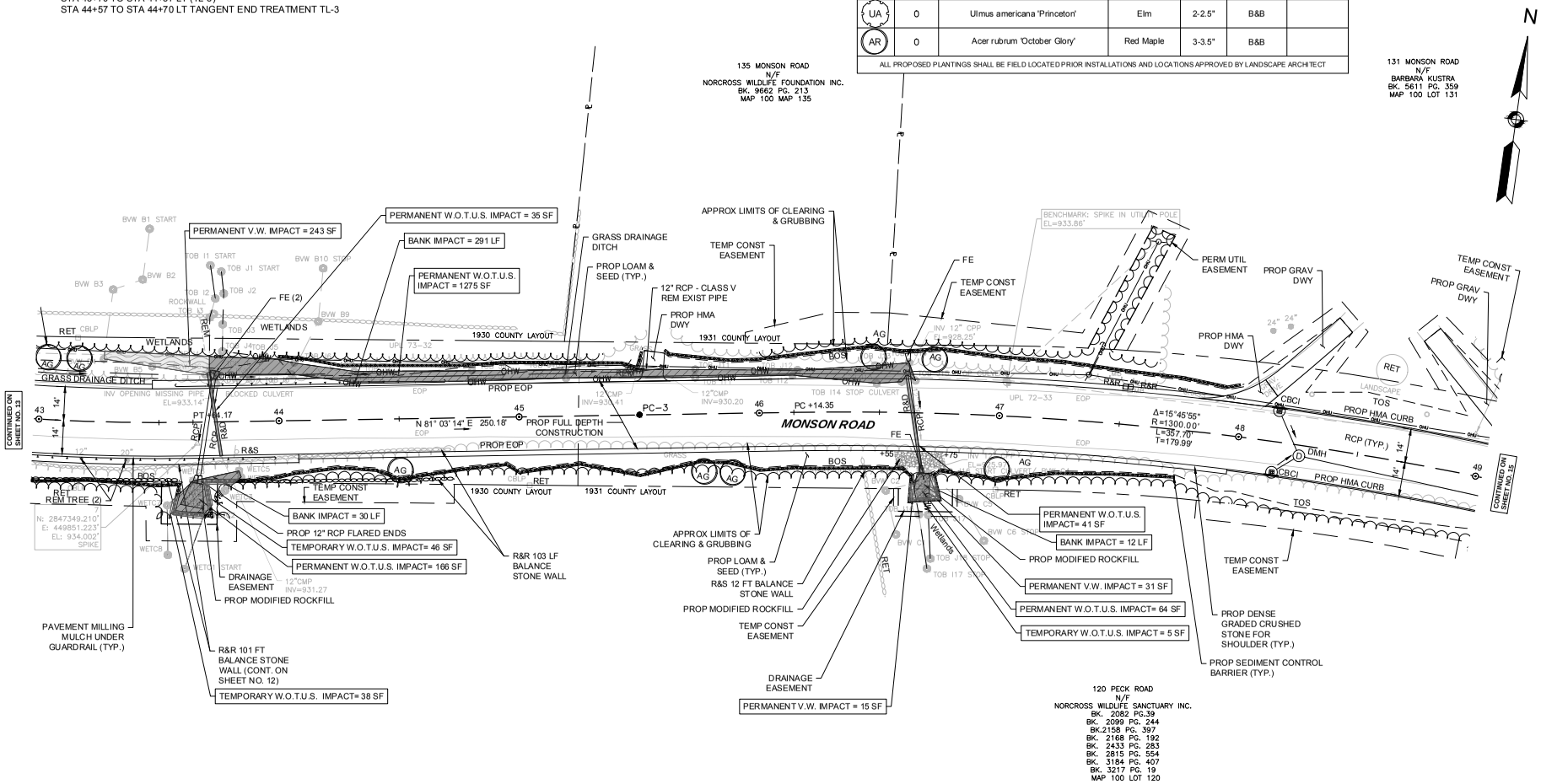
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

HIGHWAY GUARD DETAILS
STA 42+87 TO STA 43+86 RT (TL-3)
STA 43+86 TO STA 43+98 RT TANGENT END TREATMENT TL-3
STA 43+57 TO STA 43+70 LT TANGENT END TREATMENT TL-3
STA 43+70 TO STA 44+57 LT (TL-3)
STA 44+57 TO STA 44+70 LT TANGENT END TREATMENT TL-3

TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
NONE

DRAINAGE DETAILS
SEE UTILITY PLANS



IMPACT LEGEND

WETLAND REPLICATION/RESTORATION AREA

— OHW — ORDINARY HIGH WATER

W.O.T.U.S.=WATERS OF THE UNITED STATES
- PERMANENT
- TEMPORARY

V.W.=VEGETATED WETLANDS
- PERMANENT
- TEMPORARY

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 26

608163_HD3(CONSTRUCTION PLANS)H04.DWG Plotted on 9-Aug-2024 4:03 PM

HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS
NONE	NONE	NONE	SEE UTILITY PLANS

PLANT SCHEDULE

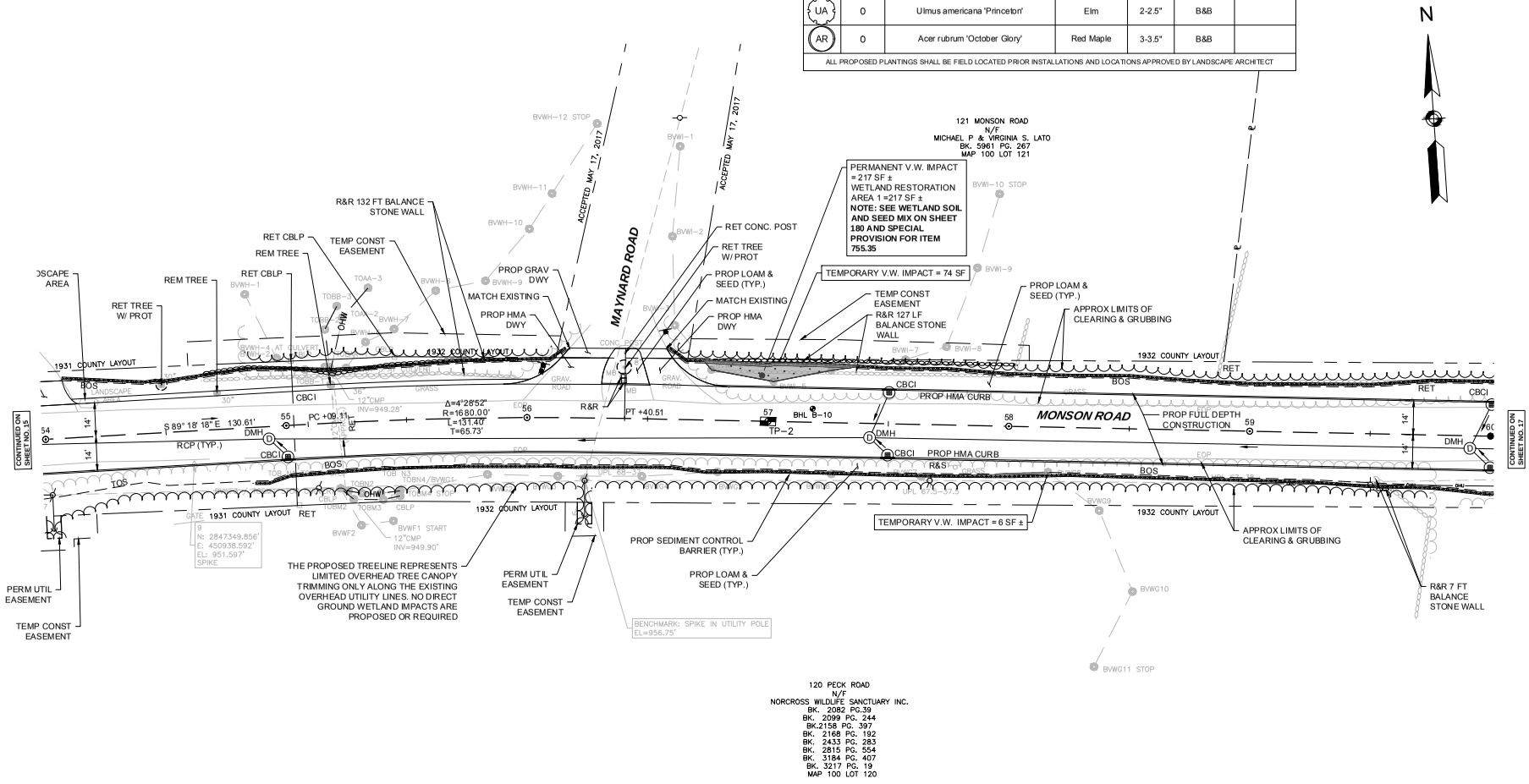
TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	0	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	0	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CONSTRUCTION PLANS



IMPACT LEGEND

- WETLAND REPLICATION/RESTORATION AREA
- — OHW — ORDINARY HIGH WATER

W.O.T.U.S.=WATERS OF THE UNITED STATES
- PERMANENT
- TEMPORARY

V.W.=VEGETATED WETLANDS
- PERMANENT
- TEMPORARY

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 28

608163_HD3(CONSTRUCTION PLANS)H04.DWG Plotted on 9-Aug-2024 4:03 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CONSTRUCTION PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	2	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	4	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	0	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

HIGHWAY GUARD DETAILS

STA 80+08 TO STA 80+21 RT TANGENT END TREATMENT TL-3
STA 80+21 TO STA 82+59 RT (TL-3)
STA 81+79 TO STA 81+92 LT TANGENT END TREATMENT TL-3
STA 81+92 TO STA 82+92 LT (TL-3)

TRAFFIC SIGNAL CONDUIT

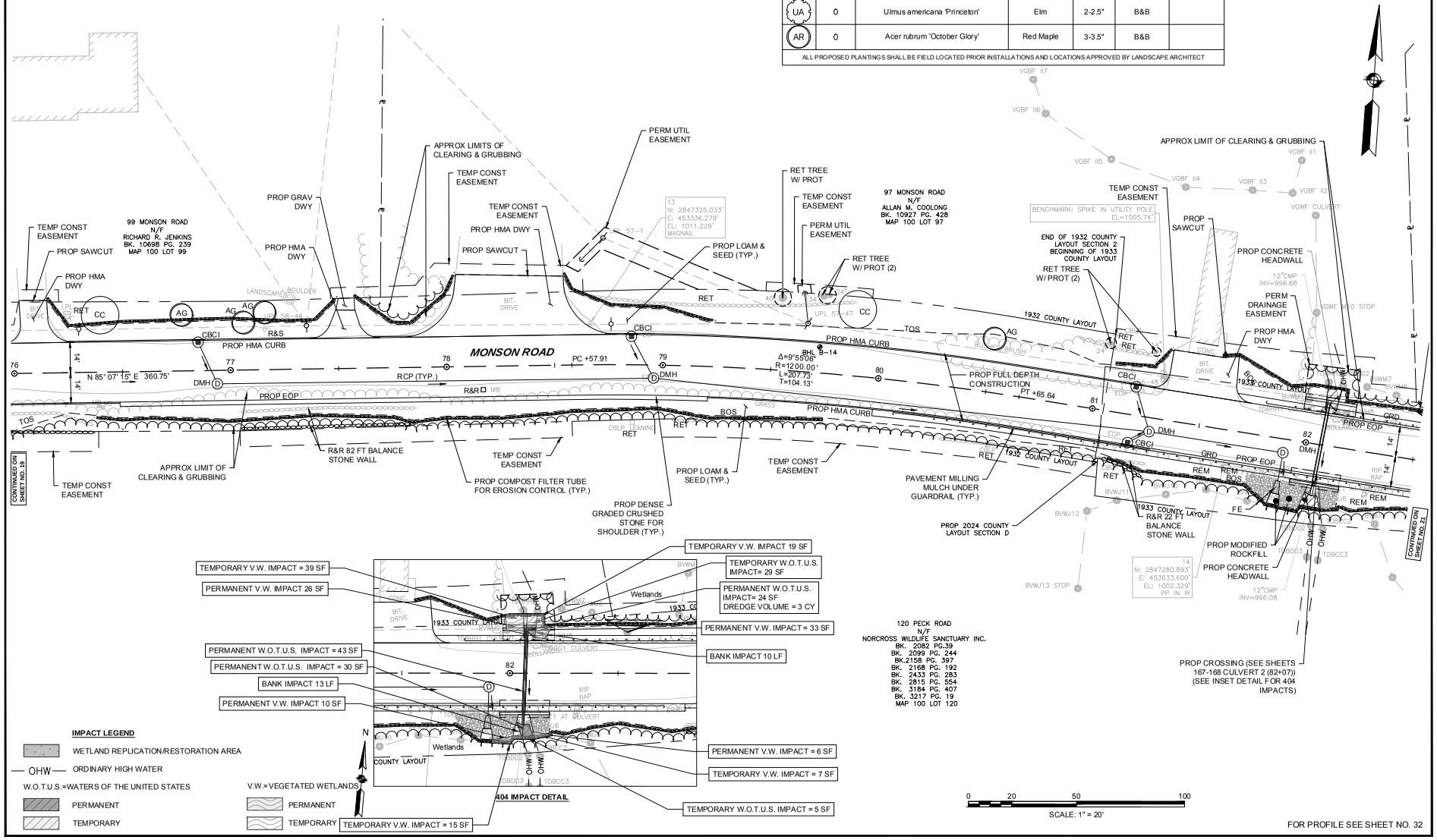
NONE

WATER SUPPLY ALTERATIONS

NONE

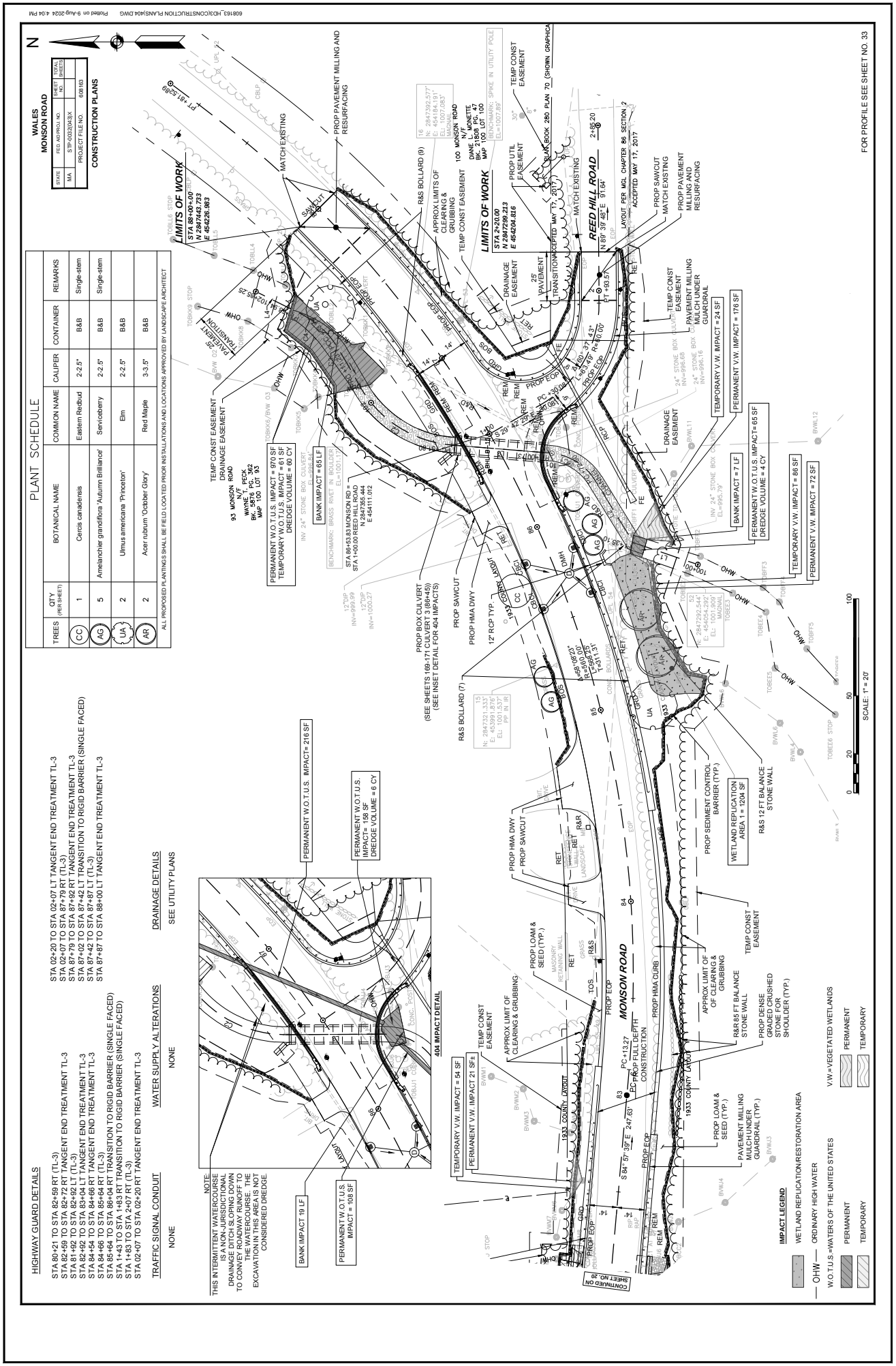
DRAINAGE DETAILS

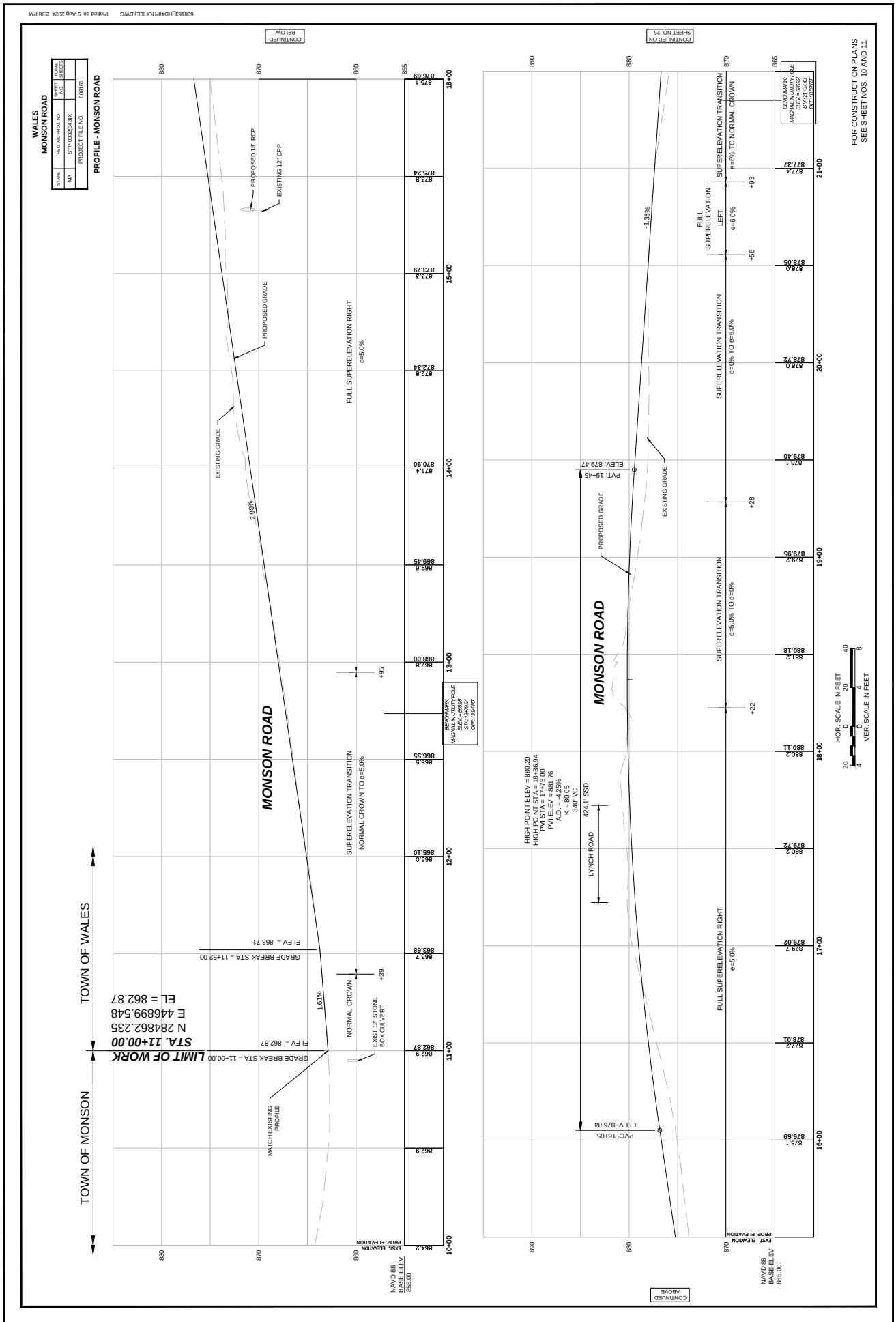
SEE UTILITY PLANS



FOR PROFILE SEE SHEET NO. 32

608163_HD3(CONSTRUCTION PLANS)404.DWG Plotted on 9-Aug-2024 4:04 PM


WALES
MONSON ROAD
CONSTRUCTION PLANS
PROJECT FILE NO. 608163
FED. AID PROJ. NO. STP-0032(043)X
PLANT SCHEDULE
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 80+21 TO STA 82+59 RT (TL-3)
STA 82+59 TO STA 82+72 RT TANGENT END TREATMENT TL-3
STA 81+92 TO STA 82+92 LT (TL-3)
STA 82+92 TO STA 83+44 RT TANGENT END TREATMENT TL-3
STA 82+42 TO STA 83+44 RT (TL-3)
STA 84+66 TO STA 85+64 RT (TL-3)
STA 85+64 TO STA 86+04 RT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 11+43 TO STA 11+83 RT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 11+83 TO STA 2+07 RT (TL-3)
STA 02+07 TO STA 02+20 RT TANGENT END TREATMENT TL-3
STA 02+20 TO STA 02+07 LT TANGENT END TREATMENT TL-3
STA 02+07 TO STA 87+79 RT (TL-3)
STA 87+79 TO STA 87+92 RT TANGENT END TREATMENT TL-3
STA 87+02 TO STA 87+42 LT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 87+42 TO STA 87+87 LT (TL-3)
STA 87+87 TO STA 88+00 LT TANGENT END TREATMENT TL-3
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
NOTE:
THIS INTERMITTENT WATERCOURSE IS A NON-JURISDICTIONAL DRAINAGE DITCH SLOPING DOWN TO CONVEY ROADWAY RUNOFF TO THE WATERCOURSE. THE EXCAVATION IN THIS AREA IS NOT CONSIDERED DREDGE.
404 IMPACT DETAIL
BANK IMPACT 19 LF
PERMANENT W.O.T.U.S. IMPACT = 106 SF
PERMANENT W.O.T.U.S. IMPACT= 216 SF
PERMANENT W.O.T.U.S. IMPACT= 158 SF DREDGE VOLUME = 6 CY
IMPACT LEGEND
WETLAND REPLICATION/RESTORATION AREA
ORDINARY HIGH WATER
W.O.T.U.S.=WATERS OF THE UNITED STATES
V.W.=VEGETATED WETLANDS
PERMANENT
TEMPORARY
MONSON ROAD
LIMITS OF WORK
REED HILL ROAD
SCALE: 1" = 20'
FOR PROFILE SEE SHEET NO. 33
CONTINUED ON SHEET NO. 20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WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
STP-0032(043)X
PROJECT FILE NO.
608163
PROFILE - MONSON ROAD
CONTINUED BELOW
CONTINUED ON SHEET NO. 25
CONTINUED ABOVE
FOR CONSTRUCTION PLANS
SEE SHEET NOS. 10 AND 11
TOWN OF WALES
TOWN OF MONSON
LIMIT OF WORK
STA. 11+00.00
N 284862.235
E 446899.548
EL = 862.87
MONSON ROAD
PROPOSED 18" RCP
EXISTING 12" CPP
PROPOSED GRADE
EXISTING GRADE
FULL SUPERELEVATION RIGHT
e=5.0%
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=5.0%
NORMAL CROWN
EXIST 12" STONE BOX CULVERT
MATCH EXISTING PROFILE
GRADE BREAK STA = 11+00.00
ELEV = 862.87
GRADE BREAK STA = 11+52.00
ELEV = 863.71
2.90%
1.61%
BENCHMARK: MAGNAL IN UTILITY POLE
ELEV = 866.98'
STA: 12+79.94
OFF: 13.54'RT
HIGH POINT ELEV = 880.20
HIGH POINT STA = 18+36.94
PVI STA = 17+75.00
PVI ELEV = 881.76
A.D. = -4.25%
K = 80.05
340' VC
424.1' SSD
LYNCH ROAD
PVC: 16+05
ELEV: 876.84
PVT: 19+45
ELEV: 879.47
-1.35%
FULL SUPERELEVATION LEFT
e=6.0%
SUPERELEVATION TRANSITION
e=6% TO NORMAL CROWN
e=0% TO e=6.0%
e=5.0% TO e=0%
BENCHMARK: MAGNAL IN UTILITY POLE
ELEV = 876.92'
STA: 21+37.43
OFF: 18.52'RT
HOR. SCALE IN FEET
VER. SCALE IN FEET
NAVD 88 BASE ELEV 855.00
NAVD 88 BASE ELEV 865.00
EXIST. ELEVATION
PROP. ELEVATION

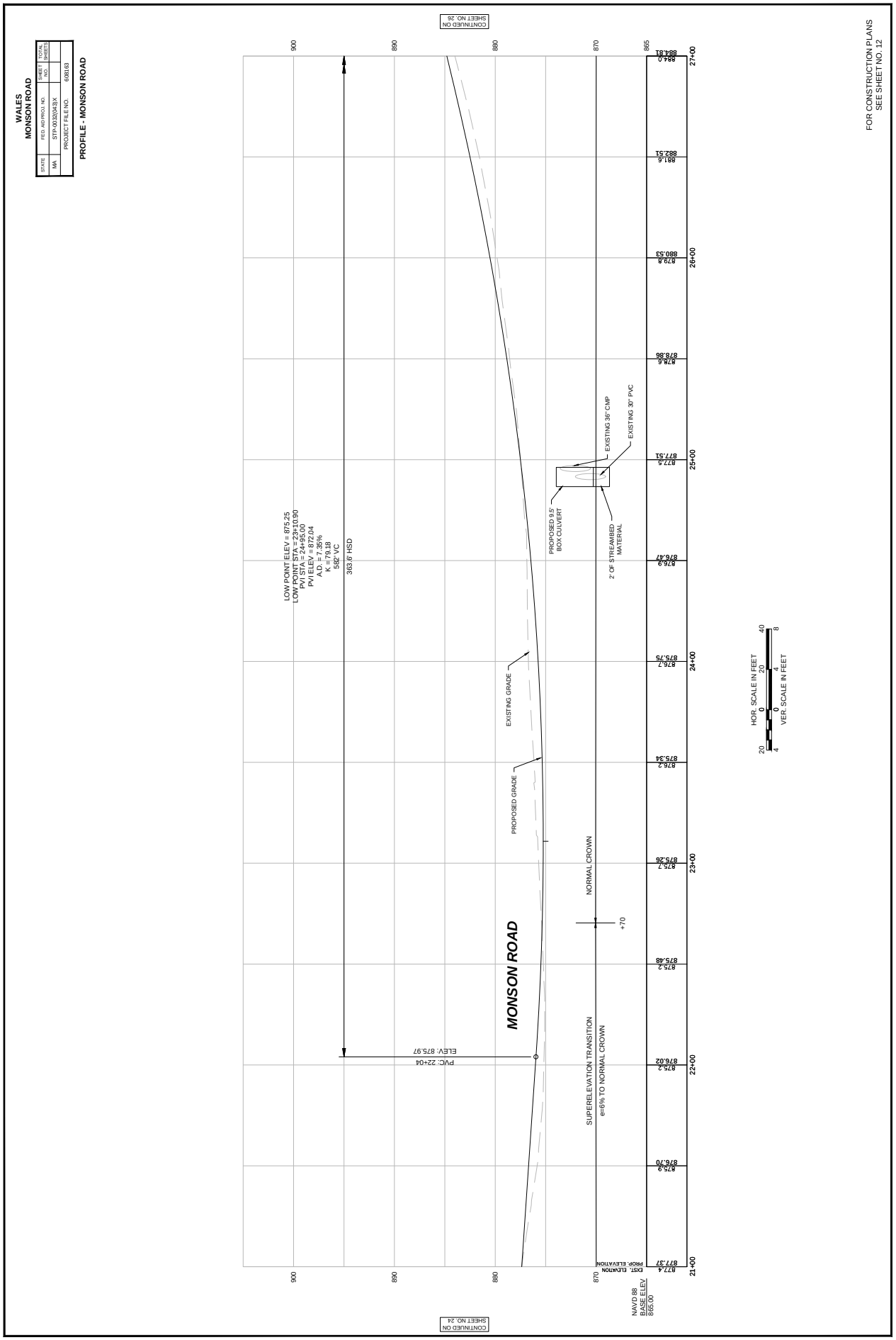
608163_HDA\PROFILE).DWG Plotted on 9-Aug-2024 2:38 PM

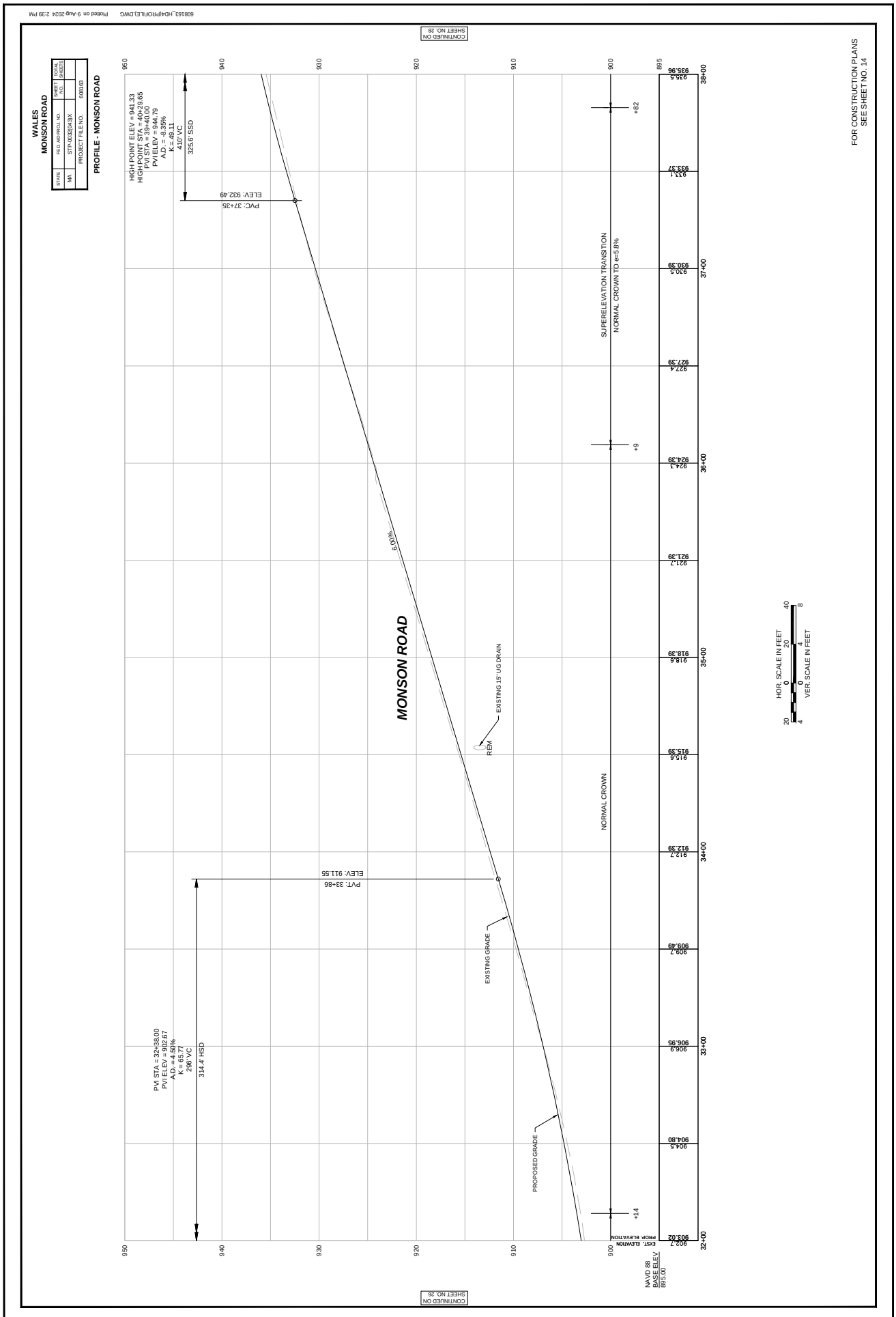
WALES
MONSON ROAD

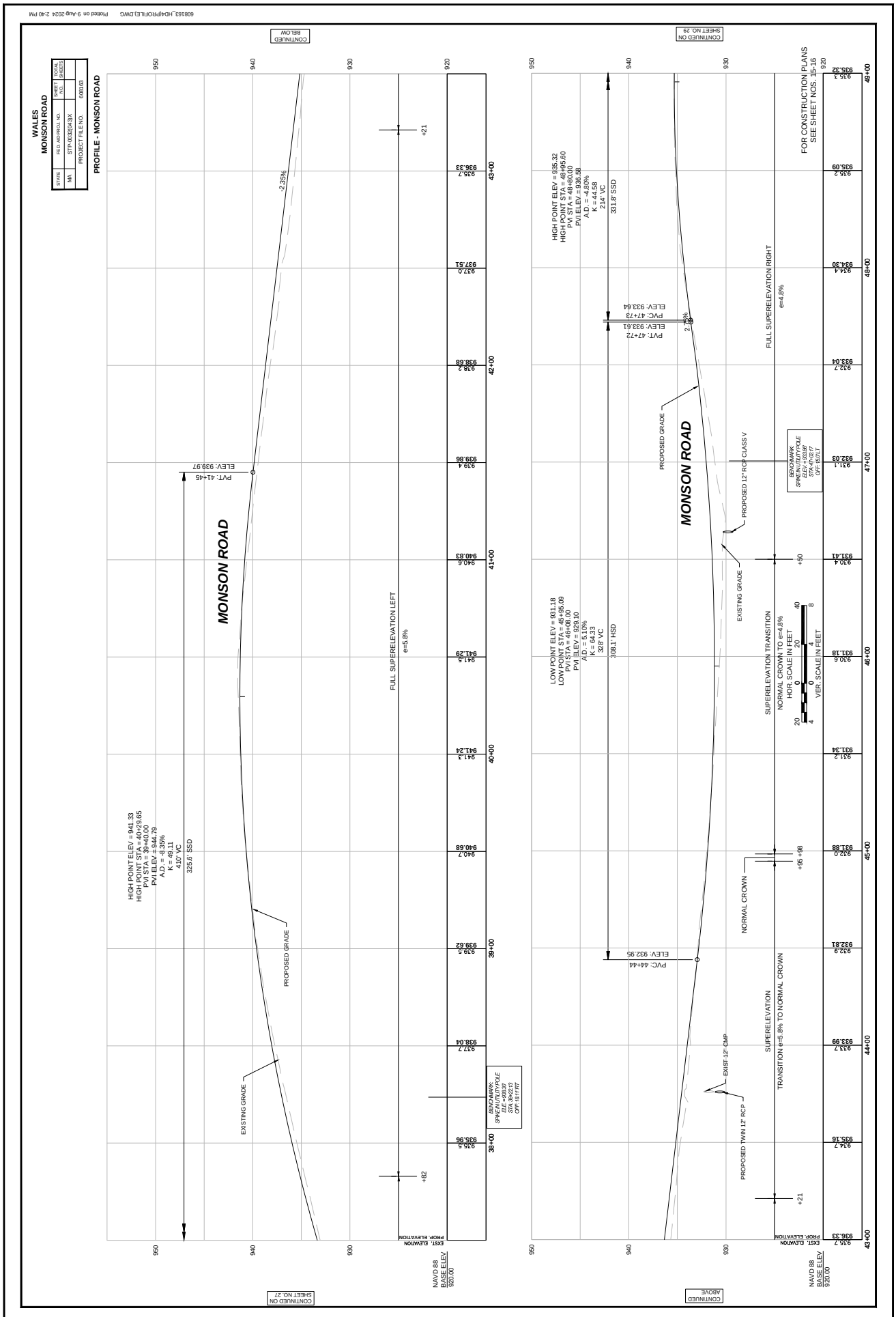
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

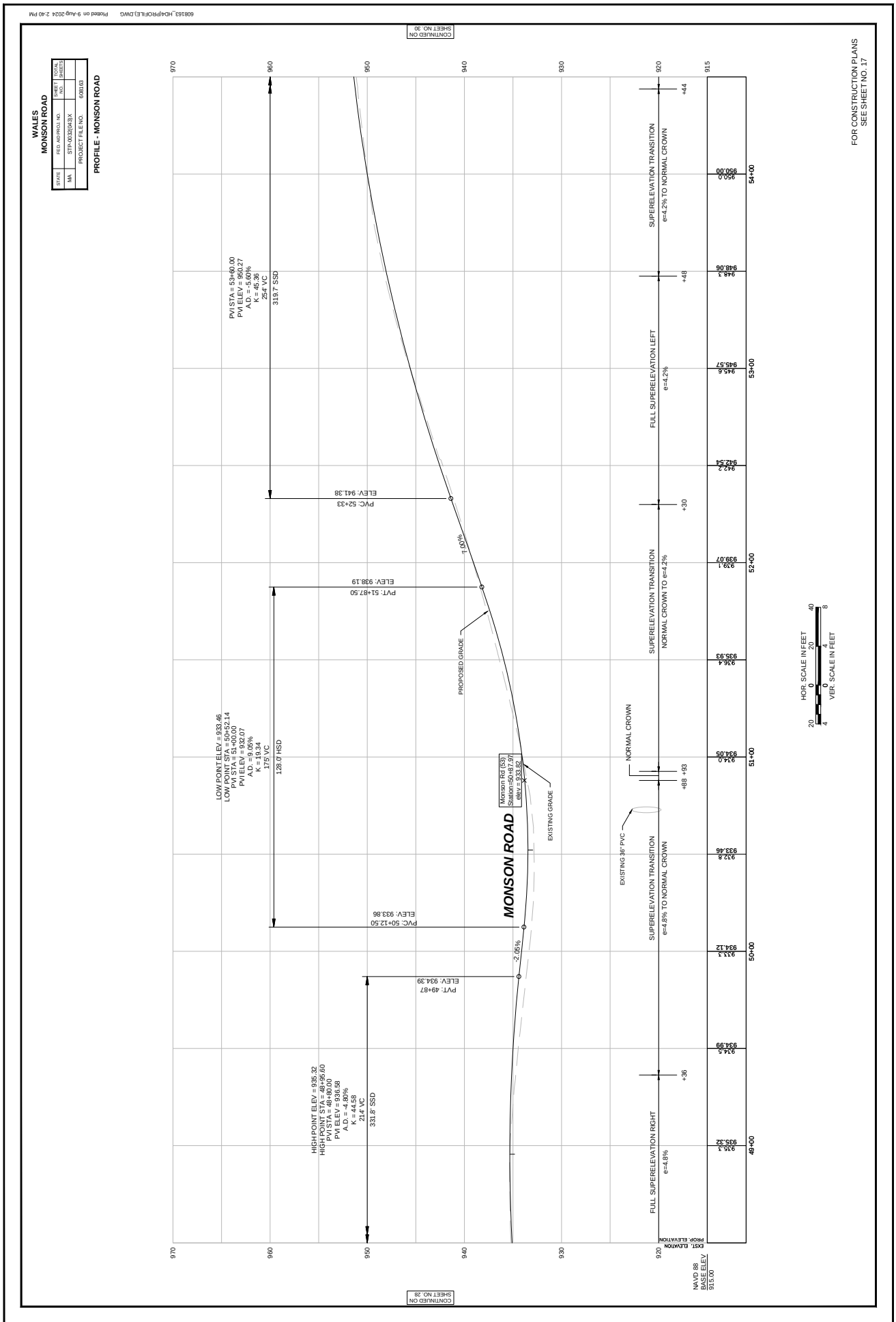
PROFILE - MONSON ROAD

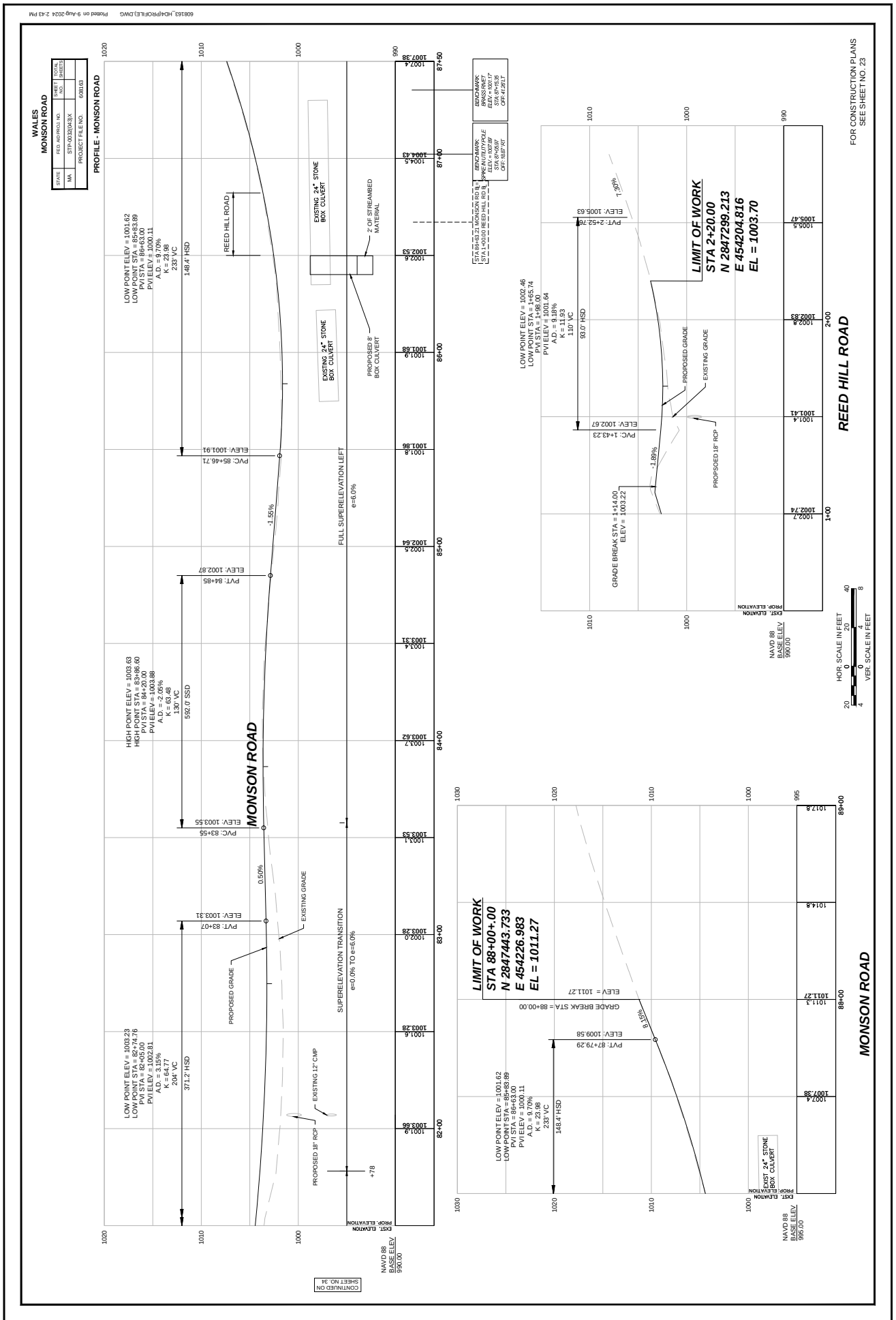
FOR CONSTRUCTION PLANS
SEE SHEET NO. 12

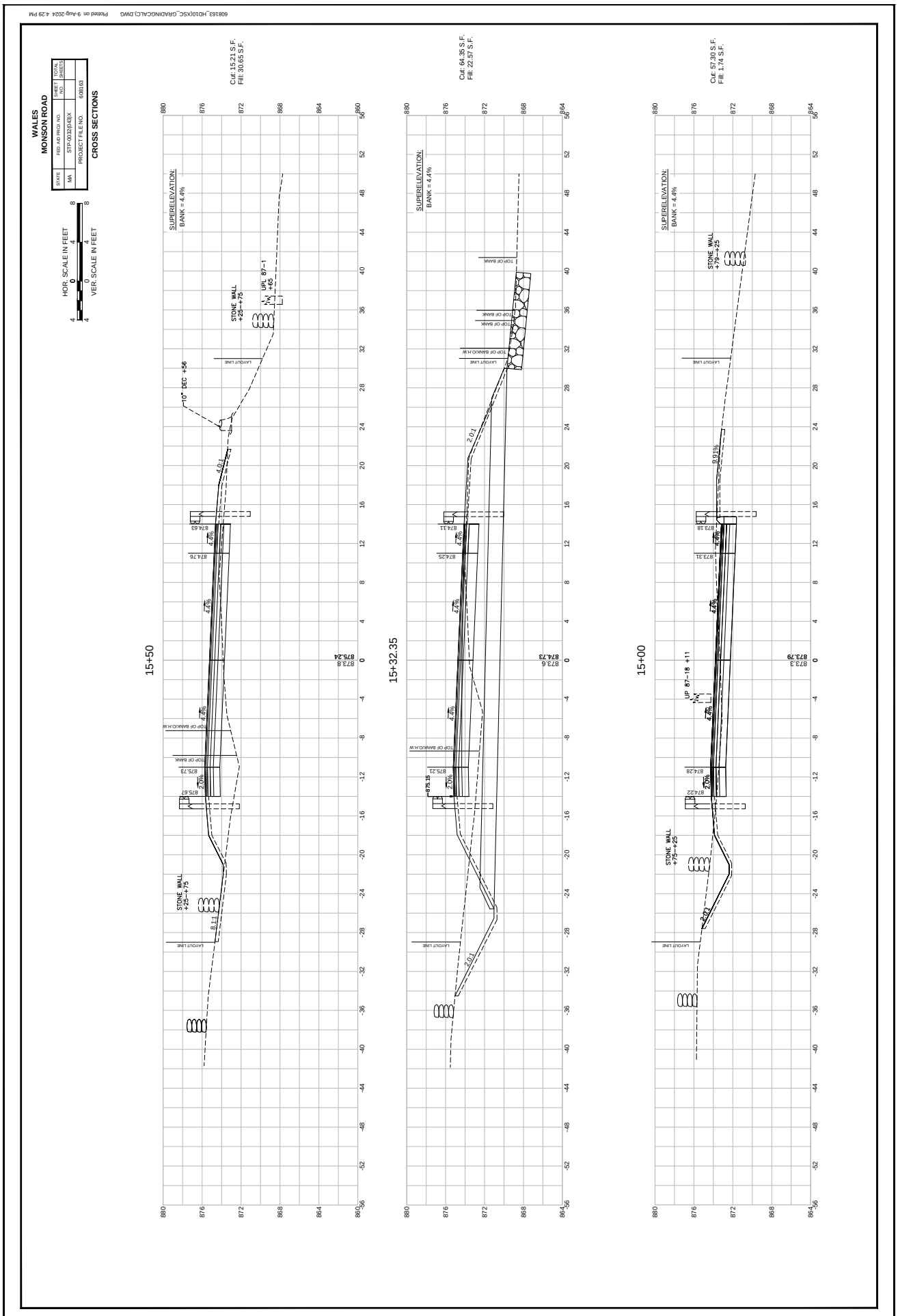



608163_HDA\PROFILE).DWG Plotted on 9-Aug-2024 2:39 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
PROFILE - MONSON ROAD
FOR CONSTRUCTION PLANS
SEE SHEET NO. 14
CONTINUED ON SHEET NO. 28
CONTINUED ON SHEET NO. 28
MONSON ROAD
HIGH POINT ELEV = 941.33
HIGH POINT STA = 40+29.65
PVI STA = 39+40.00
PVI ELEV = 944.79
A.D. = -8.39%
K = 49.11
410' VC
325.6' SSD
PVC: 37+35
ELEV: 932.49
PVI STA = 32+38.00
PVI ELEV = 902.67
A.D. = 4.50%
K = 65.77
296' VC
314.4' HSD
PVT: 33+86
ELEV: 911.55
6.00%
REM
EXISTING 15" UG DRAIN
EXISTING GRADE
PROPOSED GRADE
NORMAL CROWN
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=5.8%
+82
+9
+14
EXIST. ELEVATION
PROP. ELEVATION
935.96
933.37
930.39
927.39
924.39
921.39
918.39
915.39
912.39
909.49
906.95
904.80
903.02
902.7
938.5
933.1
930.5
927.4
924.1
921.7
918.6
915.6
912.7
909.7
906.9
904.5
903.7
38+00
37+00
36+00
35+00
34+00
33+00
32+00
950
940
930
920
910
900
895
(NAVD 88)
BASE ELEV.
895.00
HOR. SCALE IN FEET
0
20
40
VER. SCALE IN FEET
0
4
8


WALES
MONSON ROAD
PROFILE - MONSON ROAD
MONSON ROAD
HIGH POINT ELEV = 941.33
HIGH POINT STA = 40+29.65
PVI STA = 39+40.00
PVI ELEV = 944.79
A.D. = -8.35%
K = 49.11
410' VC
325.6' SSD
PVT: 41+45
ELEV: 939.97
-2.35%
FULL SUPERELEVATION LEFT
e=5.8%
PROPOSED GRADE
EXISTING GRADE
BENCHMARK:
SPIKE IN UTILITY POLE
ELE = 938.37
STA: 38+22.13
OFF: 18.11' RT
CONTINUED BELOW
CONTINUED ON SHEET NO. 27
NAVD 88
BASE ELEV
920.00
EXST. ELEVATION
PROP. ELEVATION
HIGH POINT ELEV = 935.32
HIGH POINT STA = 48+95.60
PVI STA = 48+80.00
PVI ELEV = 936.58
A.D. = -4.80%
K = 44.58
214' VC
331.8' SSD
PVT: 47+72
ELEV: 933.61
PVC: 47+73
ELEV: 933.64
LOW POINT ELEV = 931.18
LOW POINT STA = 45+95.09
PVI STA = 46+08.00
PVI ELEV = 929.10
A.D. = 5.10%
K = 64.33
328' VC
308.1' HSD
PVC: 44+44
ELEV: 932.95
FULL SUPERELEVATION RIGHT
e=4.8%
PROPOSED 12" RCP CLASS V
EXISTING GRADE
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=4.8%
HOR. SCALE IN FEET
VER. SCALE IN FEET
NORMAL CROWN
SUPERELEVATION
TRANSITION e=5.8% TO NORMAL CROWN
EXIST. 12" CMP
PROPOSED TWIN 12" RCP
FOR CONSTRUCTION PLANS
SEE SHEET NOS. 15-16
CONTINUED ON SHEET NO. 29
CONTINUED ABOVE


608163_HDA\PROFILE).DWG Plotted on 9-Aug-2024 2:40 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
PROFILE - MONSON ROAD
FOR CONSTRUCTION PLANS
SEE SHEET NO. 17
CONTINUED ON SHEET NO. 30
CONTINUED ON SHEET NO. 28
MONSON ROAD
PROPOSED GRADE
EXISTING GRADE
EXISTING 36" PVC
NORMAL CROWN
Monson Rd (59)
Station=50+97.97
elev = 933.82
LOW POINT ELEV = 933.46
LOW POINT STA = 50+52.14
PVI STA = 50+00.00
PVI ELEV = 932.07
A.D. = 9.05%
K = 19.34
175' VC
128.0' HSD
HIGH POINT ELEV = 936.32
HIGH POINT STA = 49+95.60
PVI STA = 49+80.00
PVI ELEV = 936.58
A.D. = 4.80%
K = 44.58
214' VC
331.8' SSD
PVC: 50+12.50
ELEV: 933.86
PVT: 49+87
ELEV: 934.39
-2.05%
PVI STA = 53+60.00
PVI ELEV = 950.27
A.D. = -5.60%
K = 46.36
254' VC
319.7' SSD
PVC: 52+33
ELEV: 941.38
-1.00%
PVT: 51+87.50
ELEV: 938.19
SUPERELEVATION TRANSITION
e=4.2% TO NORMAL CROWN
FULL SUPERELEVATION LEFT
e=4.2%
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=4.2%
SUPERELEVATION TRANSITION
e=4.8% TO NORMAL CROWN
FULL SUPERELEVATION RIGHT
e=4.8%
+44
+48
+30
+88
+93
+36
54+00
53+00
52+00
51+00
50+00
49+00
950.0
948.06
945.57
942.54
939.07
935.93
934.05
933.46
934.12
934.99
935.32
EXIST. ELEVATION
PROP. ELEVATION
NAVD 88
BASE ELEV
915.00
HOR. SCALE IN FEET
VER. SCALE IN FEET


WALES
MONSON ROAD
PROFILE - MONSON ROAD
STATE
NA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
MONSON ROAD
REED HILL ROAD
LOW POINT ELEV = 1001.62
LOW POINT STA = 85+83.89
PVI STA = 86+63.00
PVI ELEV = 1000.11
A.D. = 2.15%
K = 23.98
233' VC
148.4' HSD
REED HILL ROAD
EXISTING 24" STONE BOX CULVERT
2' OF STREAMBED MATERIAL
PROPOSED 8' BOX CULVERT
BENCHMARK
BENCHMARK #1
ELEV = 1001.62
STA 87+05.97
OFF-189' RT
BENCHMARK
BENCHMARK #2
ELEV = 1007.58
STA 87+05.97
OFF-189' RT
STA 89+63.21 MONSON RD ℄
STA 1+00.00 REED HILL RD ℄
PVC: 85+46.71
ELEV: 1001.91
-1.55%
PVT: 84+85
ELEV: 1002.87
HIGH POINT ELEV = 1003.63
HIGH POINT STA = 83+86.60
PVI STA = 84+20.00
PVI ELEV = 1003.88
A.D. = -2.05%
K = 28.48
130' VC
592.0' SSD
PVC: 83+55
ELEV: 1003.55
FULL SUPERELEVATION LEFT
e=6.0%
0.50%
PVT: 83+07
ELEV: 1003.31
EXISTING GRADE
PROPOSED GRADE
SUPERELEVATION TRANSITION
e=0.0% TO e=6.0%
LOW POINT ELEV = 1003.23
LOW POINT STA = 82+74.76
PVI STA = 82+05.00
PVI ELEV = 1002.81
A.D. = 3.15%
K = 64.77
204' VC
371.2' HSD
PROPOSED 18" RCP
EXISTING 12" CMP
+78
EXIST. ELEVATION
PROP. ELEVATION
NAVD 88
BASE ELEV
990.00
CONTINUED ON SHEET NO. 34
LOW POINT ELEV = 1002.46
LOW POINT STA = 1+45.74
PVI STA = 1+98.00
PVI ELEV = 1001.64
A.D. = 9.18%
K = 11.93
110' VC
93.0' HSD
PVT: 2+52.76
ELEV: 1005.63
7.39%
LIMIT OF WORK
STA 2+20.00
N 2847299.213
E 454204.816
EL = 1003.70
PROPOSED GRADE
EXISTING GRADE
PROPSOED 18" RCP
-1.89%
PVC: 1+43.23
ELEV: 1002.67
GRADE BREAK STA = 1+14.00
ELEV = 1003.22
LIMIT OF WORK
STA 88+00+.00
N 2847443.733
E 454226.983
EL = 1011.27
GRADE BREAK STA = 88+00.00
ELEV = 1011.27
8.15%
PVT: 87+79.29
ELEV: 1009.58
EXIST 24" STONE BOX CULVERT
HOR. SCALE IN FEET
VER. SCALE IN FEET
FOR CONSTRUCTION PLANS
SEE SHEET NO. 23


608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 4:29 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0132(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
15+50
Cut: 15.21 S.F.
Fill: 30.65 S.F.
SUPERELEVATION:
BANK = 4.4%
STONE WALL
+25—+75
UPL 87—1
+65
10° DEC +56
LAYOUT LINE
TOP OF BANK
TOP OF BANK/O.H.W
STONE WALL
+25—+75
15+32.35
Cut: 64.35 S.F.
Fill: 22.57 S.F.
SUPERELEVATION:
BANK = 4.4%
TOP OF BANK
TOP OF BANK/O.H.W
LAYOUT LINE
15+00
Cut: 57.30 S.F.
Fill: 1.74 S.F.
SUPERELEVATION:
BANK = 4.4%
STONE WALL
+79—+25
UP 87—18
+11
STONE WALL
+75—+25

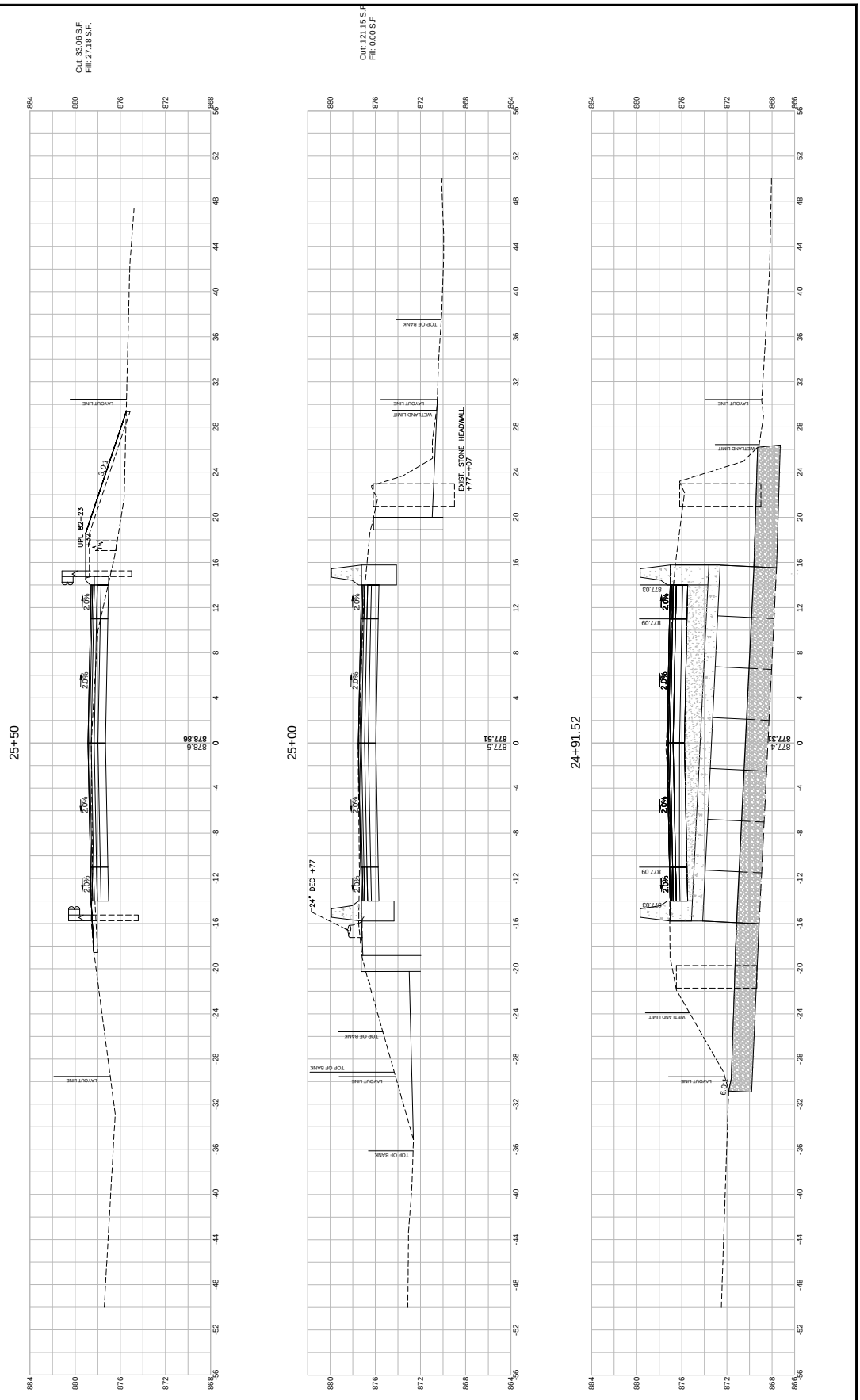
608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 3:57 PM

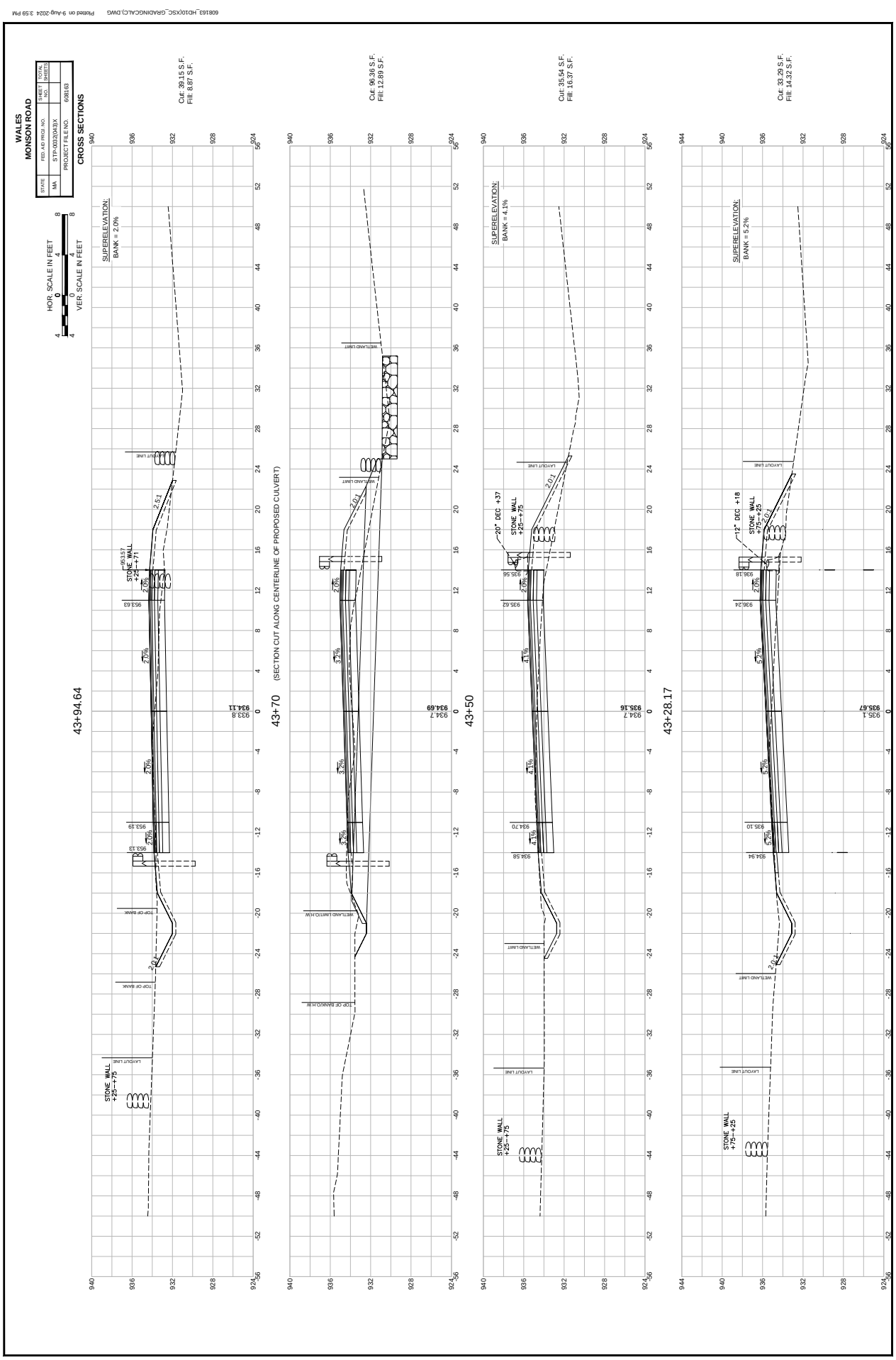
WALES
MONSON ROAD

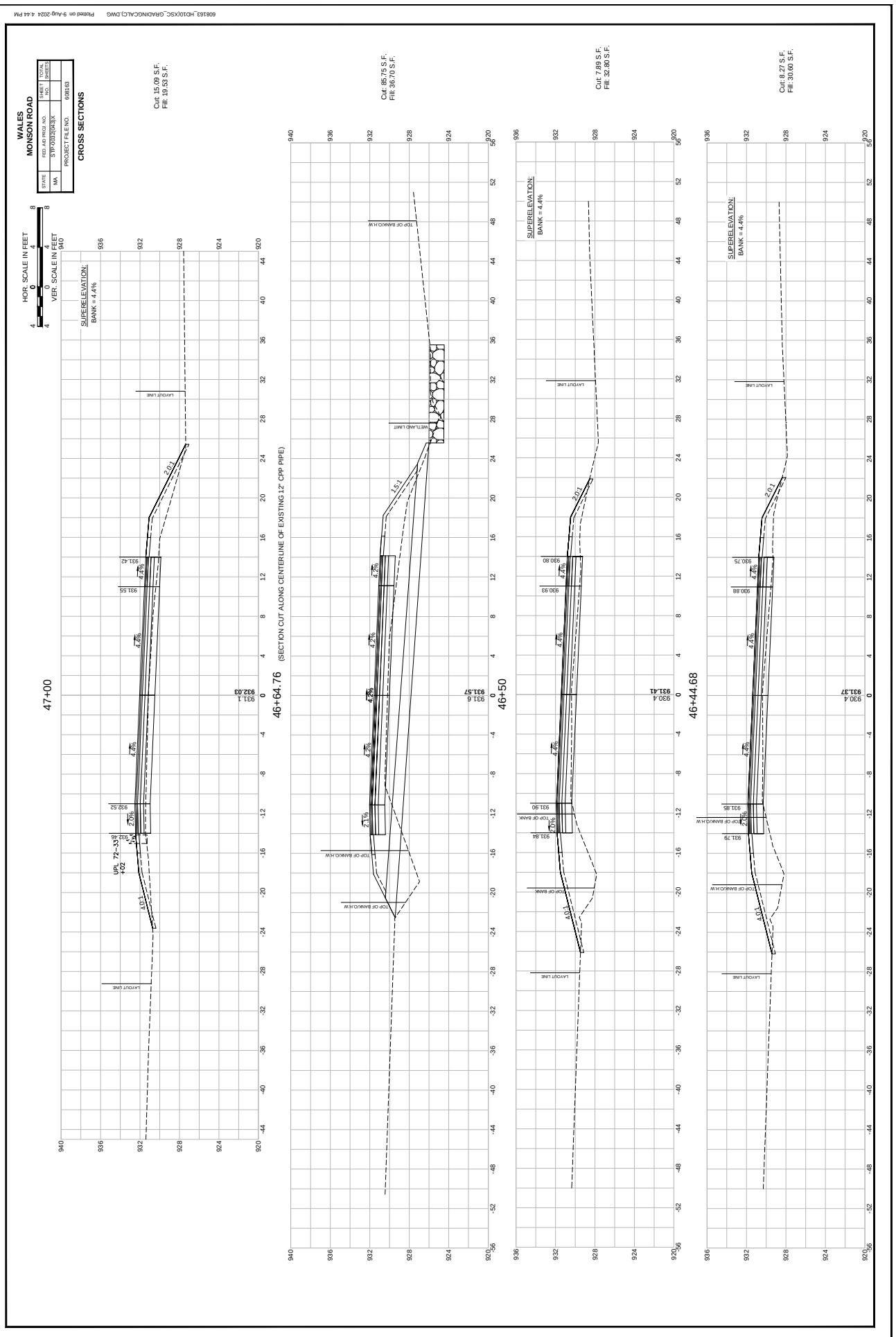
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

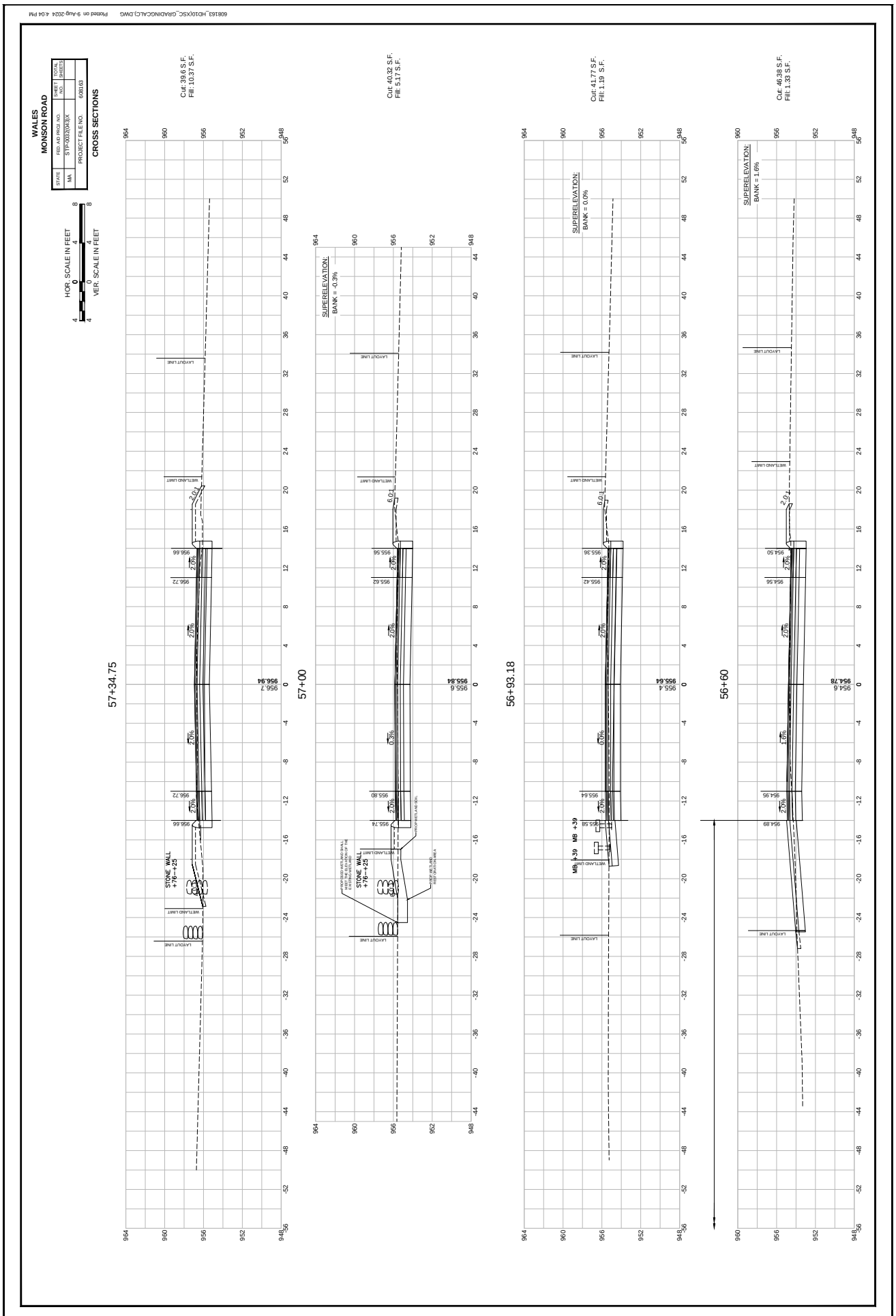
CROSS SECTIONS

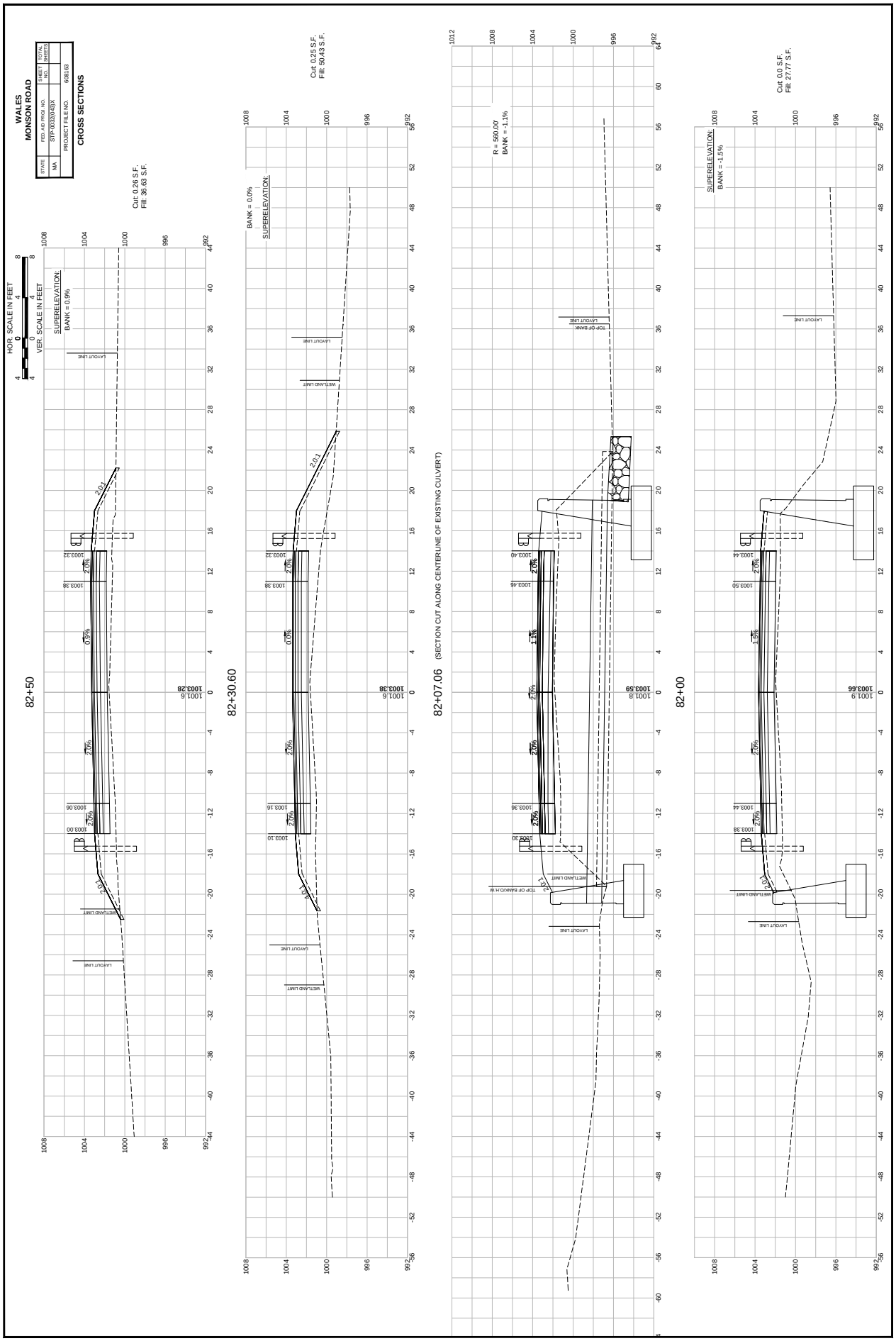
HOR. SCALE IN FEET
4 0 4 8
VER. SCALE IN FEET
4 0 4 8




608163_HD10(XSC_GRADINGCALC).DWG Plotted on 9-Aug-2024 3:59 PM
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
STP-0032(043)X
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 39.15 S.F.
Fill: 8.87 S.F.
Cut: 96.36 S.F.
Fill: 12.89 S.F.
Cut: 35.54 S.F.
Fill: 16.37 S.F.
Cut: 33.29 S.F.
Fill: 14.32 S.F.
SUPERELEVATION:
BANK = 2.0%
BANK = 4.1%
BANK = 5.2%
43+94.64
43+70
(SECTION CUT ALONG CENTERLINE OF PROPOSED CULVERT)
43+50
43+28.17
STONE WALL
+25-+75
+75-+25
20" DEC +37
12" DEC +18
LAYOUT LINE
TOP OF BANK
WETLAND LIMIT
WETLAND LIMIT/O.H.W.
TOP OF BANK/O.H.W.


608163_HD10(XSC_GRADINGCALC).DWG Plotted on 9-Aug-2024 4:44 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
SHEET NO.
TOTAL SHEETS
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 15.09 S.F.
Fill: 19.53 S.F.
Cut: 85.75 S.F.
Fill: 36.70 S.F.
Cut: 7.89 S.F.
Fill: 32.80 S.F.
Cut: 8.27 S.F.
Fill: 30.60 S.F.
SUPERELEVATION:
BANK = 4.4%
47+00
46+64.76
(SECTION CUT ALONG CENTERLINE OF EXISTING 12" CPP PIPE)
46+50
46+44.68
UPL 72-33
+02
LAYOUT LINE
TOP OF BANK/O.H.W
WETLAND LIMIT
931.1
932.03
931.6
931.57
930.4
931.41
930.4
931.37


608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 4:04 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0003(004)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 39.6 S.F.
Fill: 10.37 S.F.
Cut: 40.32 S.F.
Fill: 5.17 S.F.
Cut: 41.77 S.F.
Fill: 1.19 S.F.
Cut: 46.38 S.F.
Fill: 1.33 S.F.
SUPERELEVATION:
BANK = -0.3%
SUPERELEVATION:
BANK = 0.0%
SUPERELEVATION:
BANK = 1.6%
LAYOUT LINE
WETLAND LIMIT
STONE WALL
+76 – +25
MB +39
57+34.75
57+00
56+93.18
56+60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WALES
MONSON ROAD
CROSS SECTIONS
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
HOR. SCALE IN FEET
VER. SCALE IN FEET
82+50
Cut: 0.26 S.F.
Fill: 36.63 S.F.
SUPERELEVATION:
BANK = 0.0%
82+30.60
Cut: 0.25 S.F.
Fill: 50.43 S.F.
82+07.06
(SECTION CUT ALONG CENTERLINE OF EXISTING CULVERT)
R = 560.00'
BANK = -1.1%
82+00
Cut: 0.0 S.F.
Fill: 27.77 S.F.
SUPERELEVATION:
BANK = -1.5%
LAYOUT LINE
WETLAND LIMIT
TOP OF BANK
TOP OF BANK/O.H.W

608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 4:15 PM

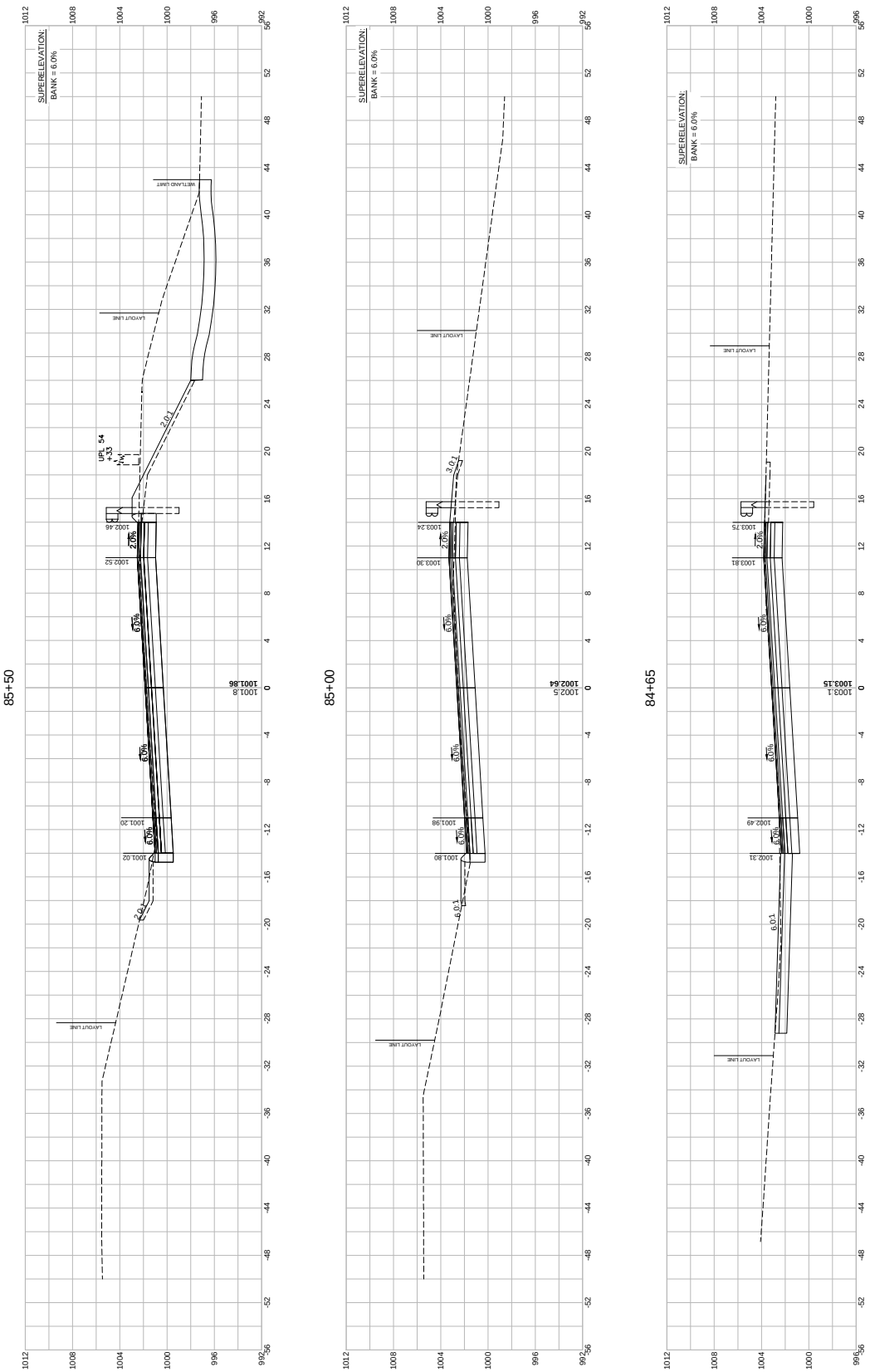
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	S-TP-0032(043)X	4	
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
8 4 0 4 8

VER. SCALE IN FEET
4 0 4 8



608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 4:27 PM

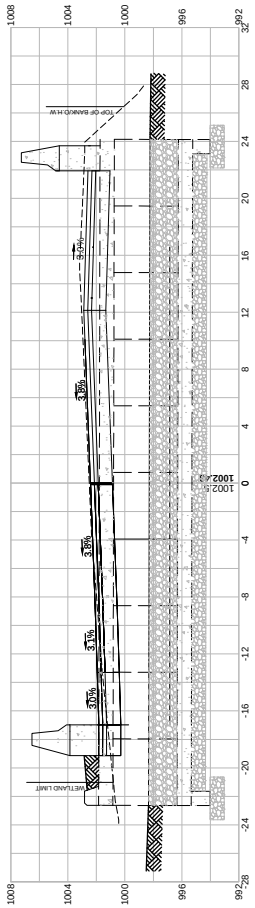
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8

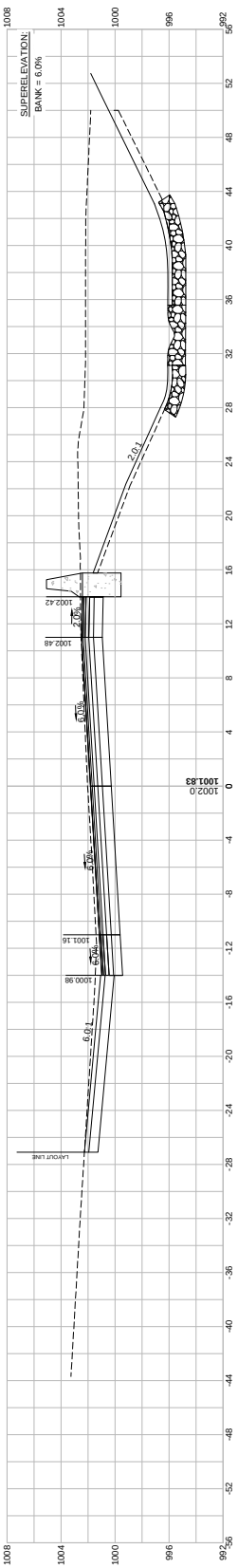
86+45.09 (SECTION CUT ALONG CENTERLINE OF EXISTING CULVERT)



86+15

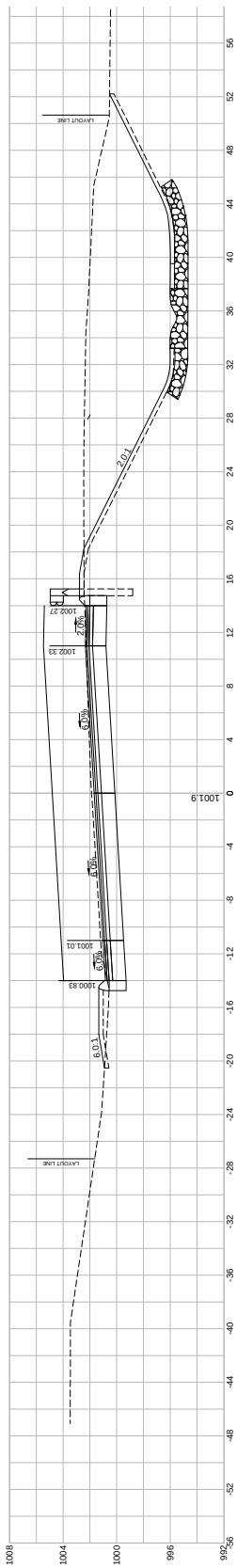
SUPERELEVATION:
BANK = 6.0%

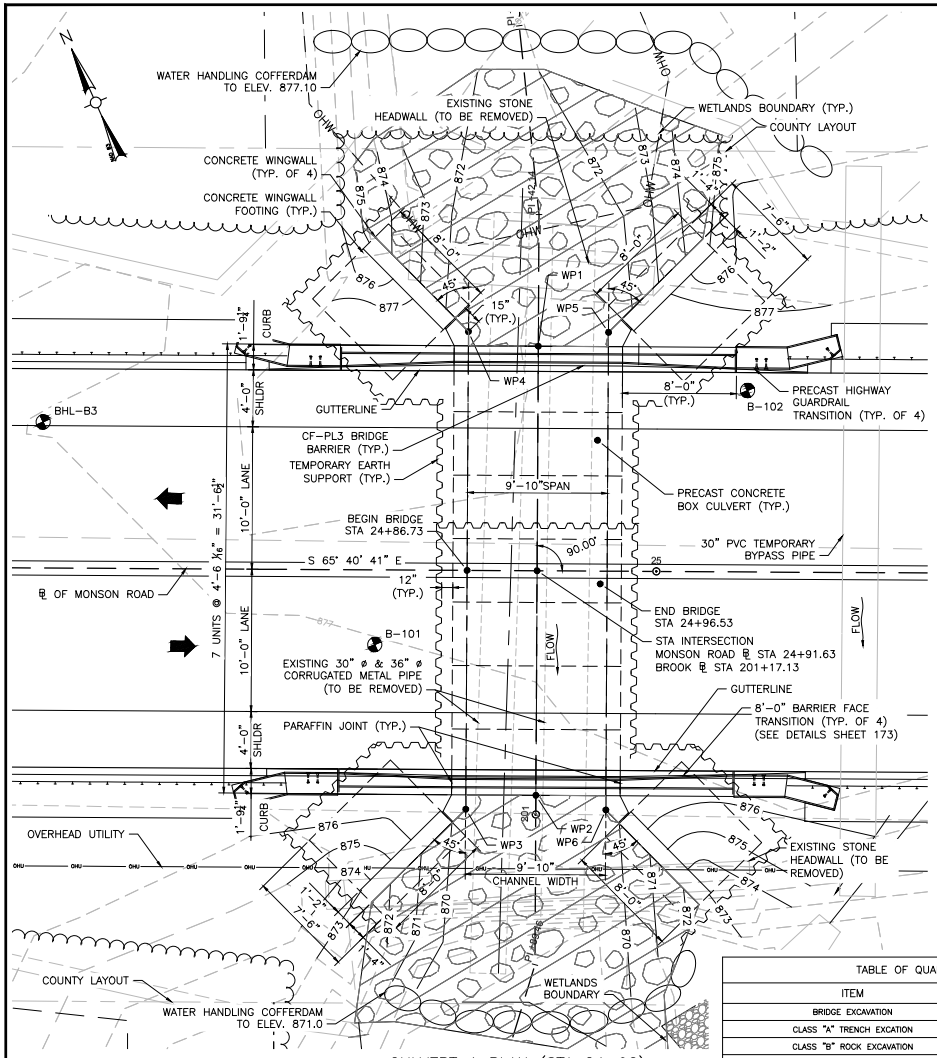
Cut: 238.87 S.F.
Fill: 0.0 S.F.



86+00

Cut: 202.10 S.F.
Fill: 4.42 S.F.





CULVERT 1 PLAN (STA 24+92)
SCALE: 1" = 4'

WORKING POINTS		
POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2848111.9174	448173.3849
2	2848083.1730	448160.3979
3	2848084.2791	448155.5221
4	2848114.8452	448169.3343
5	2848110.8082	448178.2683
6	2848080.2408	448164.4559

NOTES:

1. THE FACTORED BEARING PRESSURE = 2.06 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 5.04 KSF.
   FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS 9TH EDITION, 2020, FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 21+38± (RT) MAGNAIL IN UTILITY POLE: EL. 876.92 FT

BENCHMARK STA 29+60± (RT) MAGNAIL IN UTILITY POLE: EL. 900.23 FT

BENCHMARK STA 29+90± (LT) MAGNAIL BRASS RIVET: EL. 901.72 FT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

5000 PSI, ¾", 685 HP CEMENT CONCRETE.....CF-PL3 BARRIER CURB, TRANSITION BARRIER CURB

5000 PSI, 1½", 660 CEMENT CONCRETE.....WINGWALLS

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	443
CLASS "A" TRENCH EXCATION	C.Y.	69
CLASS "B" ROCK EXCAVATION	C.Y.	30
NATURAL STREAMBED MATERIAL	C.Y.	26
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	300
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	18
PRECAST GUARDRAIL HIGHWAY TRANSITION	EA.	4
5000 PSI, ¾", 685 HP CEMENT CONCRETE	C.Y.	27
5000 PSI, 1½", 660 CEMENT CONCRETE	C.Y.	27
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	17050
DAMPPROOFING	S.F.	1244
PRECAST CONCRETE BOX CULVERT – SITE 1	L.S.	1
TEMPORARY SUPPORT OF EARTH	L.S.	1
CONTROL OF WATER – STRUCTURE NO. 1	L.S.	1

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 1 KEY PLAN AND NOTES

TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	0.903
DESIGN FLOOD DISCHARGE (C.F.S.)	123
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	6.32
DESIGN FLOOD ELEVATION (FEET, NAVD)	873.95
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	174
BASE FLOOD ELEVATION (FEET, NAVD)	874.72
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	43
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	7.72
DESIGN FLOOD ELEVATION (FEET, NAVD)	876.1

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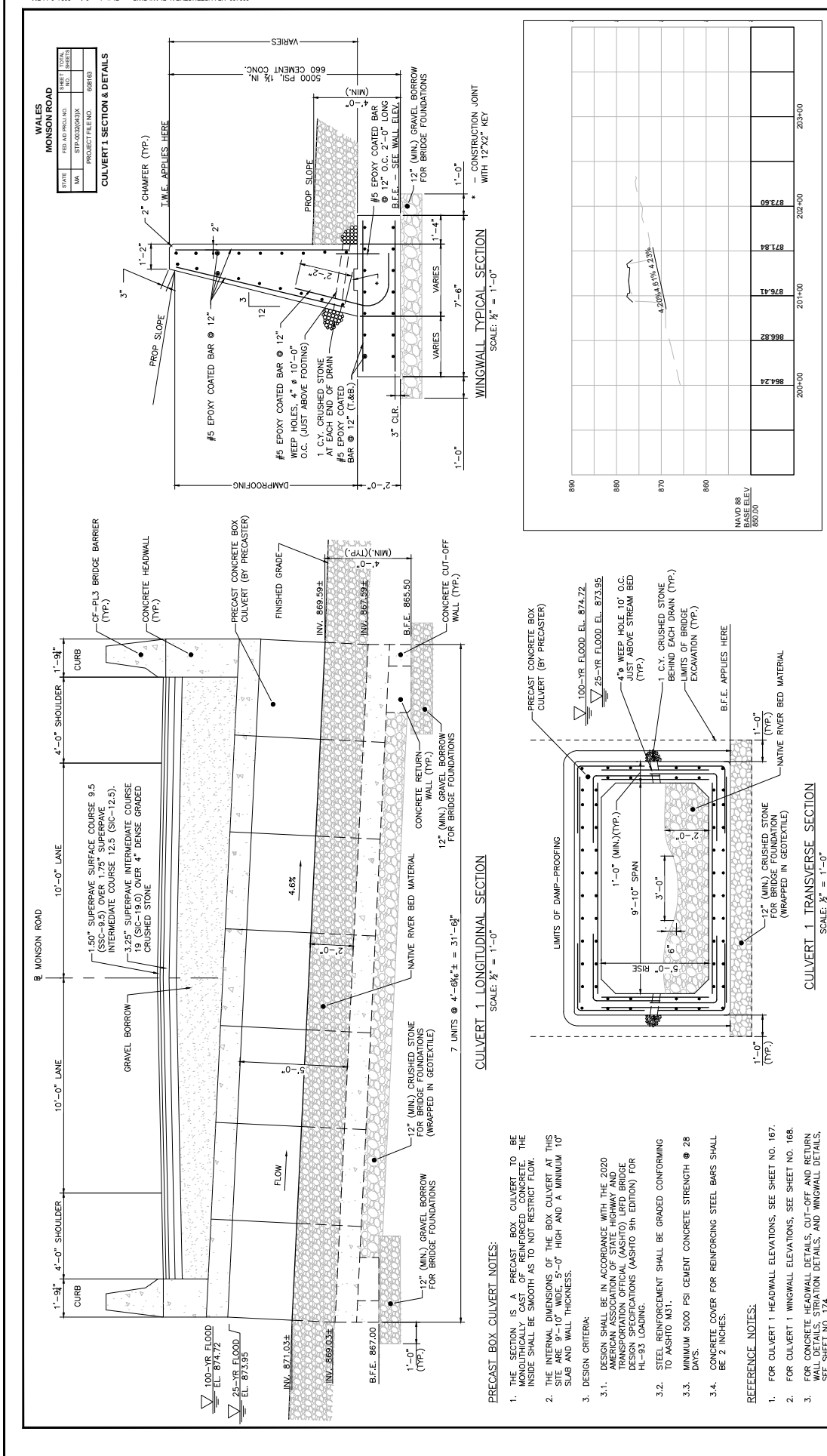
Proposal No. 608163-128112


WALES
MONSON ROAD
CULVERT 1 SECTION & DETAILS
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
NA
STP-0032(043)X
PROJECT FILE NO.
608163
℄ MONSON ROAD
10'-0" LANE
4'-0" SHOULDER
1'-9½"
CURB
1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5).
3.25" SUPERPAVE INTERMEDIATE COURSE 19 (SIC-19.0) OVER 4" DENSE GRADED CRUSHED STONE
GRAVEL BORROW
CF-PL3 BRIDGE BARRIER (TYP.)
CONCRETE HEADWALL (TYP.)
PRECAST CONCRETE BOX CULVERT (BY PRECASTER)
FINISHED GRADE
INV. 869.59±
INV. 867.59±
4'-0" (MIN.)(TYP.)
B.F.E. 865.50
CONCRETE CUT-OFF WALL (TYP.)
CONCRETE RETURN WALL (TYP.)
12" (MIN.) GRAVEL BORROW FOR BRIDGE FOUNDATIONS
NATIVE RIVER BED MATERIAL
7 UNITS @ 4'-6⅛" ± = 31'-6¾" ±
4.6%
FLOW
6'-0"
12" (MIN.) CRUSHED STONE FOR BRIDGE FOUNDATIONS (WRAPPED IN GEOTEXTILE)
12" (MIN.) GRAVEL BORROW FOR BRIDGE FOUNDATIONS
INV. 871.03±
INV. 869.03±
B.F.E. 867.00
1'-0" (TYP.)
100-YR FLOOD EL. 874.72
25-YR FLOOD EL. 873.95
CULVERT 1 LONGITUDINAL SECTION
SCALE: ½" = 1'-0"
PRECAST BOX CULVERT NOTES:
1. THE SECTION IS A PRECAST BOX CULVERT TO BE MONOLITHICALLY CAST OF REINFORCED CONCRETE. THE INSIDE SHALL BE SMOOTH AS TO NOT RESTRICT FLOW.
2. THE INTERNAL DIMENSIONS OF THE BOX CULVERT AT THIS SITE ARE 9'-10" WIDE, 5'-0" HIGH AND A MINIMUM 10" SLAB AND WALL THICKNESS.
3. DESIGN CRITERIA:
3.1. DESIGN SHALL BE IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIAL (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS (AASHTO 9th EDITION) FOR HL-93 LOADING.
3.2. STEEL REINFORCEMENT SHALL BE GRADED CONFORMING TO AASHTO M31.
3.3. MINIMUM 5000 PSI CEMENT CONCRETE STRENGTH @ 28 DAYS.
3.4. CONCRETE COVER FOR REINFORCING STEEL BARS SHALL BE 2 INCHES.
REFERENCE NOTES:
1. FOR CULVERT 1 HEADWALL ELEVATIONS, SEE SHEET NO. 167.
2. FOR CULVERT 1 WINGWALL ELEVATIONS, SEE SHEET NO. 168.
3. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, AND WINGWALL DETAILS, SEE SHEET NO. 174.
PRECAST CONCRETE BOX CULVERT (BY PRECASTER)
100-YR FLOOD EL. 874.72
25-YR FLOOD EL. 873.95
4"ø WEEP HOLE 10' O.C. (JUST ABOVE STREAM BED (TYP.)
1 C.Y. CRUSHED STONE BEHIND EACH DRAIN (TYP.)
LIMITS OF BRIDGE EXCAVATION (TYP.)
B.F.E. APPLIES HERE
LIMITS OF DAMP-PROOFING
1'-0" (MIN.)(TYP.)
9'-10" SPAN
3'-0"
5'-0" RISE
6"
12" (MIN.) CRUSHED STONE FOR BRIDGE FOUNDATION (WRAPPED IN GEOTEXTILE)
NATIVE RIVER BED MATERIAL
1'-0" (TYP.)
CULVERT 1 TRANSVERSE SECTION
SCALE: ½" = 1'-0"
NOTES:
1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 2.06 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.
FACTORED BEARING RESISTANCE = 5.04 KSF.
FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.
VARIES
5000 PSI, 1½ IN. #60 CEMENT CONC.
(MIN.)
PROP SLOPE
#5 EPOXY COATED BAR @ 12" O.C. 2'-0" LONG B.F.E. – SEE WALL ELEV.
12" (MIN.) GRAVEL BORROW FOR BRIDGE FOUNDATIONS
1'-0"
* – CONSTRUCTION JOINT WITH 12"X2" KEY
2" CHAMFER (TYP.)
I.W.F. APPLIES HERE
1'-2"
2"
3"
#5 EPOXY COATED BAR @ 12"
3
12
#5 EPOXY COATED BAR @ 12" (T.&B.)
1 C.Y. CRUSHED STONE AT EACH END OF DRAIN
#5 EPOXY COATED BAR @ 12" (T.&B.)
WEEP HOLES, 4" ø 10'-0" O.C. (JUST ABOVE FOOTING)
3" CLR.
1'-4"
VARIES
7'-6"
2'-0"
DAMPROOFING
WINGWALL TYPICAL SECTION
SCALE: ½" = 1'-0"
4.09%
61%
42.3%
890
880
870
860
NAVD 88 BASE ELEV 850.00
864.24
866.82
876.41
871.84
873.60
200+00
201+00
202+00
203+00

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WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
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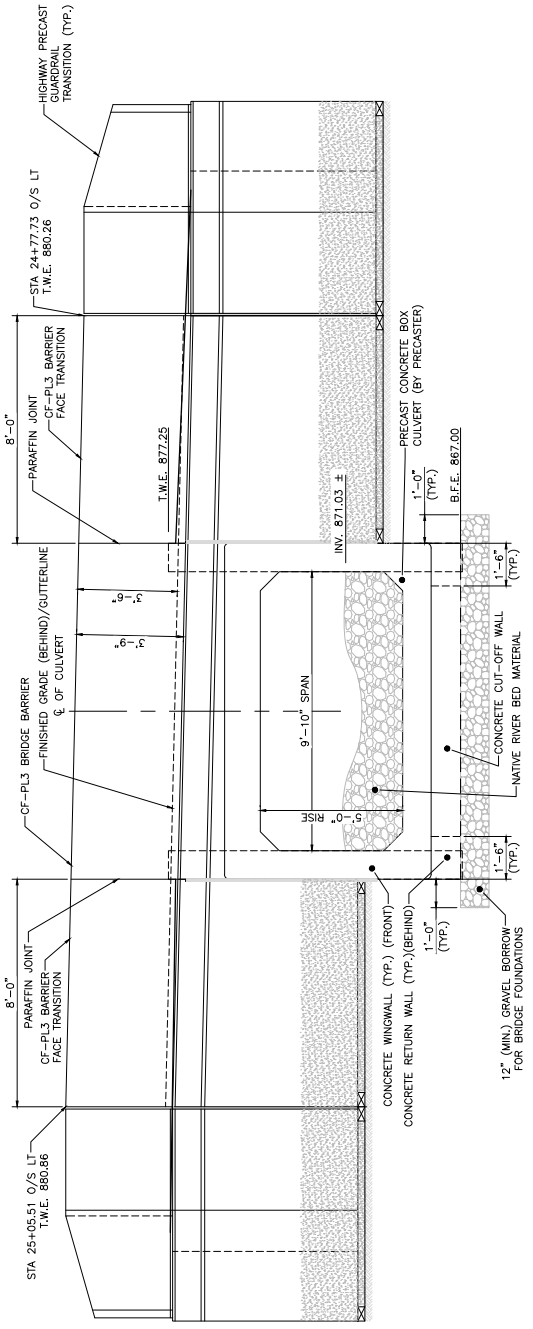
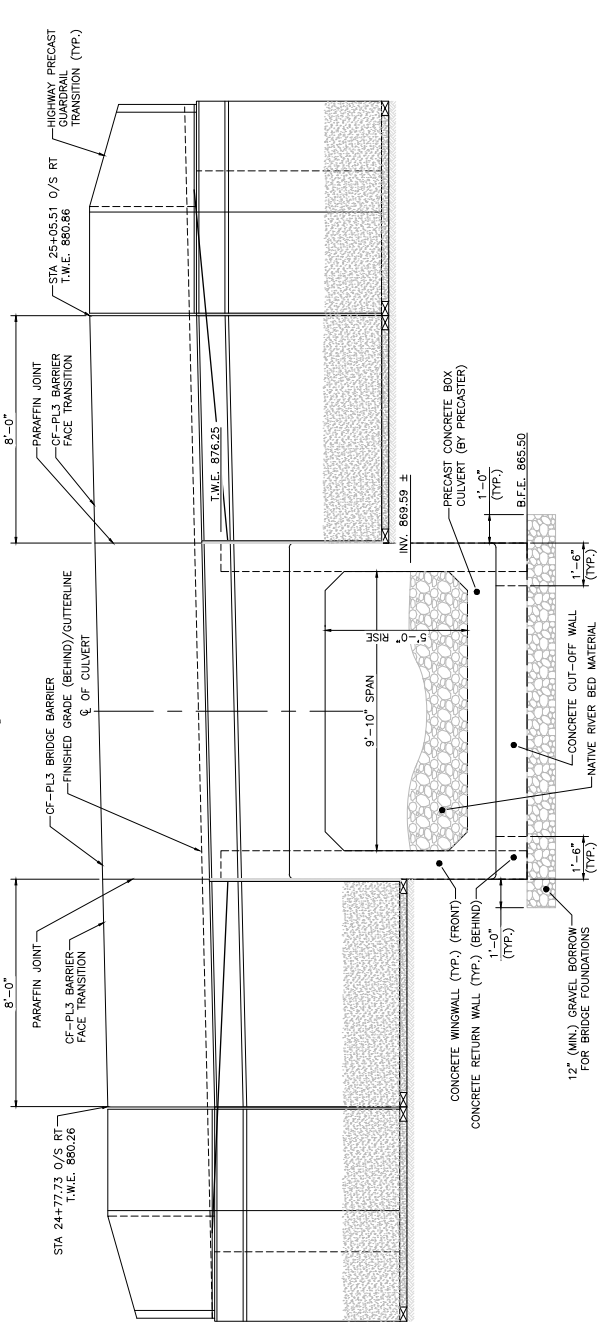
CULVERT 1 HEADWALL ELEVATIONS

REFERENCE NOTES:

1. FOR CULVERT 1 WINGWALL ELEVATIONS, SEE SHEET NO. 168
2. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, PARAFFIN JOINT DETAILS AND WINGWALL DETAILS, SEE SHEET NO. 174.



CULVERT 1 INLET ELEVATION
SCALE: ½" = 1'-0"



CULVERT 1 OUTLET ELEVATION
SCALE: ½" = 1'-0"

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 1 WINGWALL ELEVATIONS

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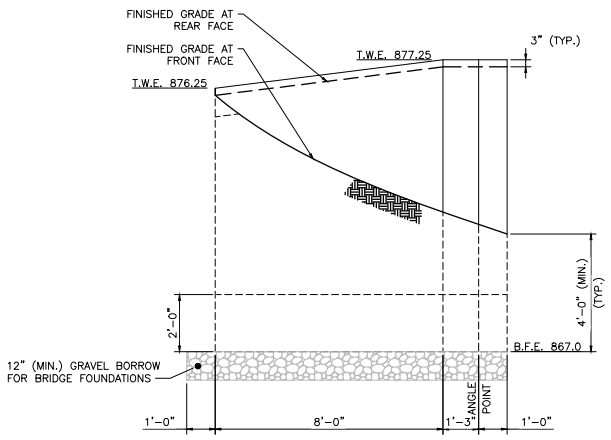
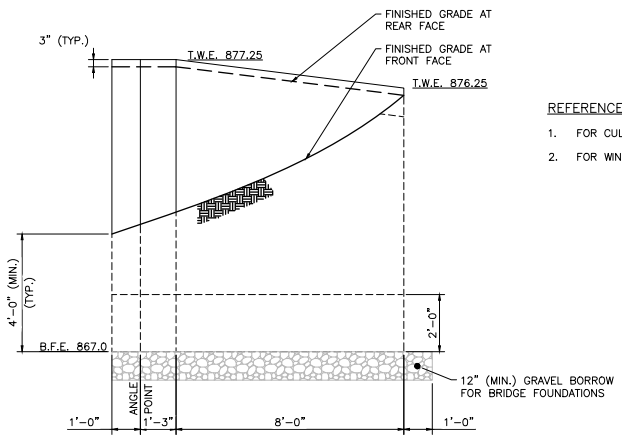
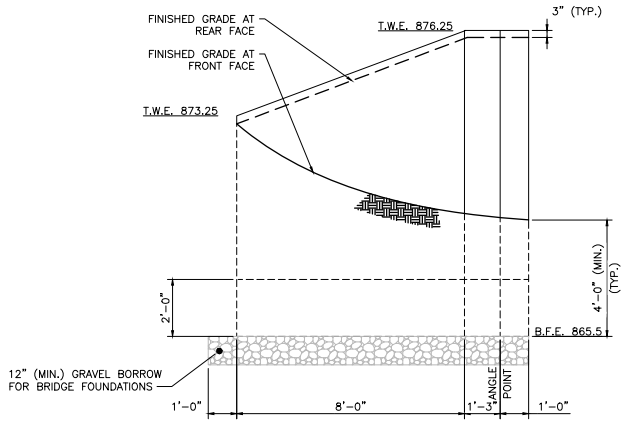


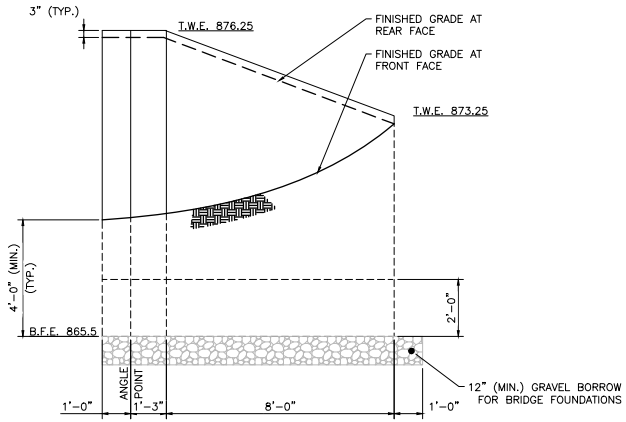
NORTHEAST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



NORTHWEST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



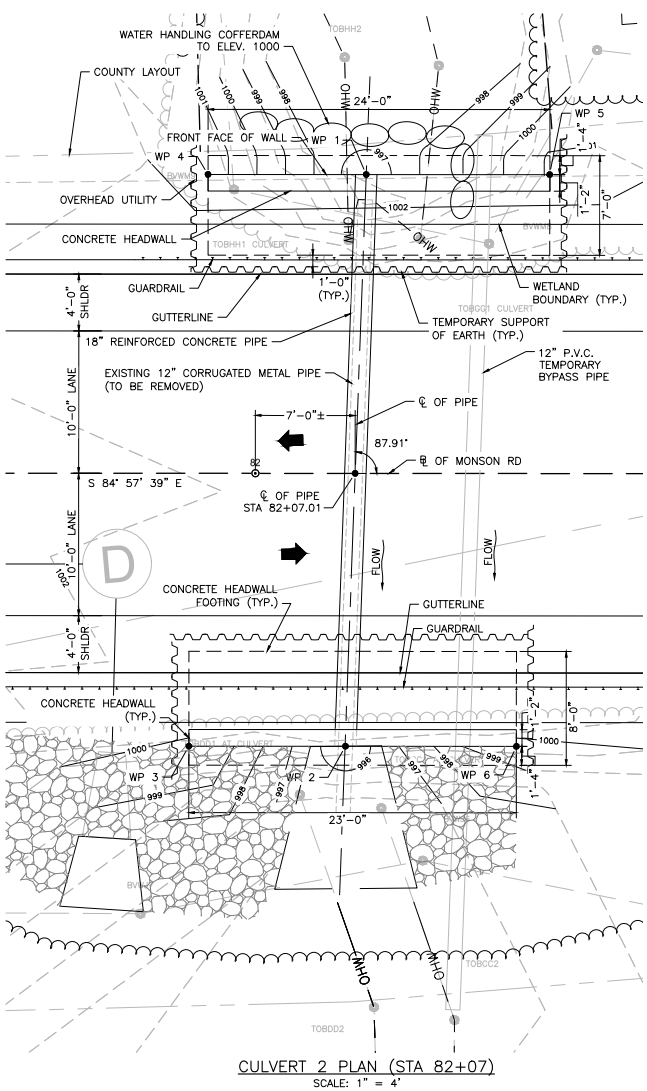
SOUTHWEST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



SOUTHEAST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"

REFERENCE NOTES:

1. FOR CULVERT 1 WINGWALL SECTION, SEE SHEET NO. 166.
2. FOR WINGWALL DETAILS, SEE SHEET NO. 174.



CULVERT 2 PLAN (STA 82+07)

SCALE: 1" = 4'

NOTES:

1. THE FACTORED BEARING PRESSURE = 2.18 KSF AT THE INLET HEADWALL AND 2.64 KSF AT THE OUTLET HEADWALL AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 5.35 KSF AT THE INLET HEADWALL AND 5.52 KSF AT THE OUTLET HEADWALL. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 81+25± (LT) SPIKE IN UTILITY POLE: EL. 1005.74

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

5000 PSI, 1½", 660 CEMENT CONCRETE.....HEADWALLS

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING PIPES.
4. INSTALL THE PROPOSED PIPE & HEADWALLS.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE PROPOSED CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

TABLE OF QUANTITIES

ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	167
CLASS "A" TRENCH EXCAVATION	C.Y.	11
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	150
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	20
5000 PSI 1½" 660 CEMENT CONCRETE	C.Y.	52
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	10010
DAMPPROOFING	S.F.	426
TEMPORARY SUPPORT OF EARTH	L.S.	1
CONTROL OF WATER – STRUCTURE NO. 2	L.S.	1

WORKING POINTS

POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2847313.7204	453680.2286
2	2847273.8336	453675.2733
3	2847274.8008	453664.3163
4	2847314.6939	453669.1581
5	2847312.5891	453693.0567
6	2847272.7828	453687.1995

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 2 KEY PLAN AND NOTES

TRAFFIC DATA

	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA

DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA

DRAINAGE AREA (SQ. MILES)	10.24
DESIGN FLOOD DISCHARGE (C.F.S.)	9
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	0.14
DESIGN FLOOD ELEVATION (FEET, NAVD)	996.14
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	9
BASE FLOOD ELEVATION (FEET, NAVD)	999.20
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA

DESIGN FLOOD DISCHARGE (C.F.S.)	5
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	6.70
DESIGN FLOOD ELEVATION (FEET, NAVD)	998.46

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WALES
MONSON ROAD

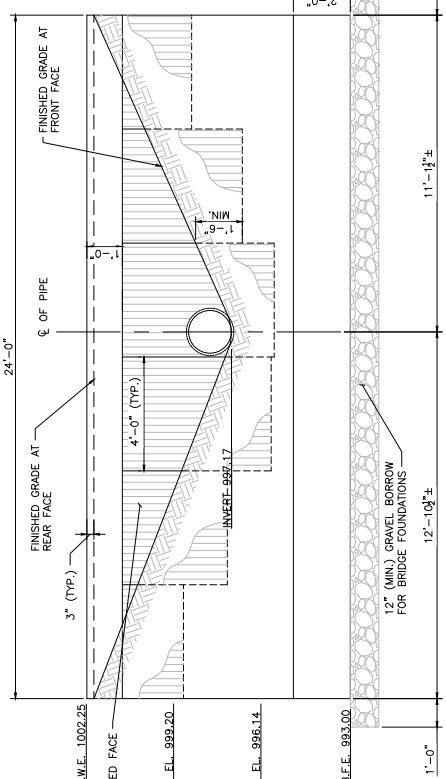
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

CULVERT 2 WALL DETAILS

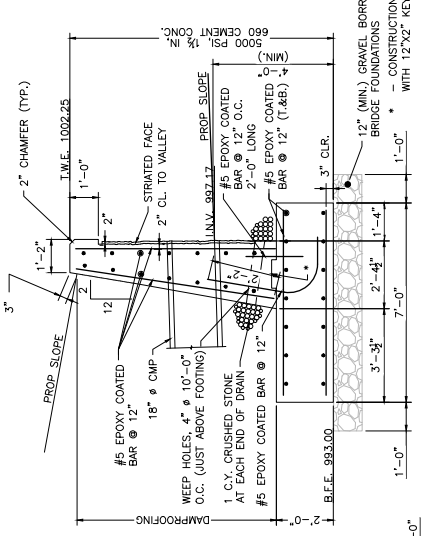
NOTES:

1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 2.18 KSF AT THE INLET HEADWALL AND 2.44 KSF AT THE OUTLET HEADWALL AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

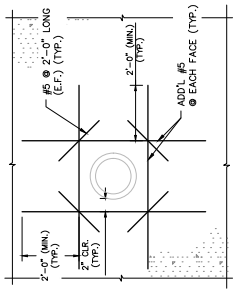
FACTORED BEARING RESISTANCE = 5.35 KSF AT THE INLET HEADWALL AND 5.52 KSF AT THE OUTLET HEADWALL. THE PROVIDED FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.



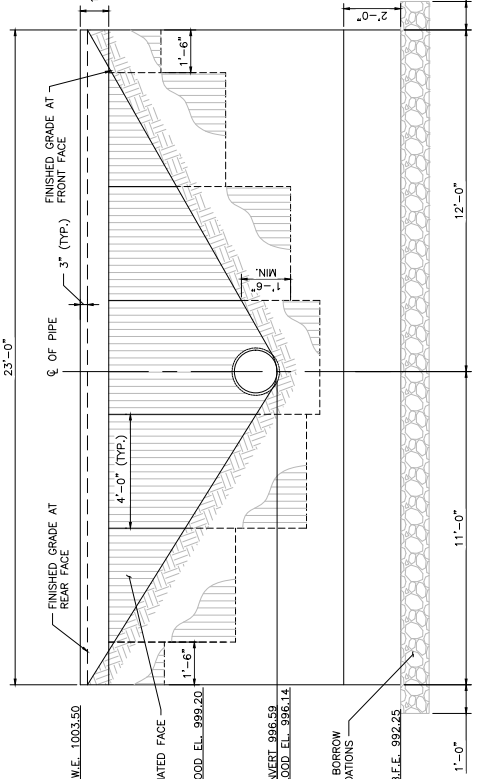
NORTH INLET HEADWALL ELEVATION
SCALE: ½" = 1'-0"



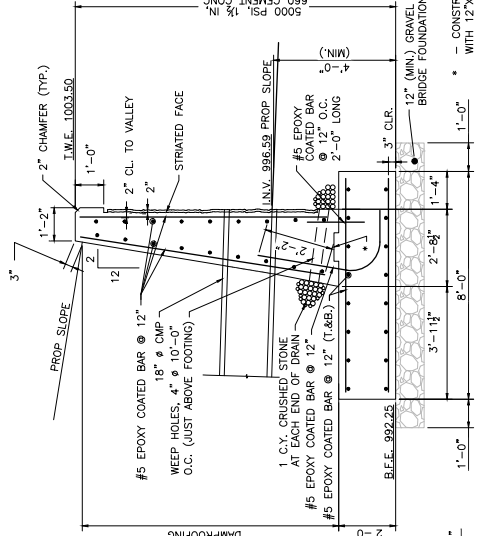
NORTH INLET HEADWALL SECTION
SCALE: ½" = 1'-0"



ADDITIONAL REINFORCEMENT AT PIPE
SCALE: ½" = 1'-0"



SOUTH OUTLET HEADWALL ELEVATION
SCALE: ½" = 1'-0"



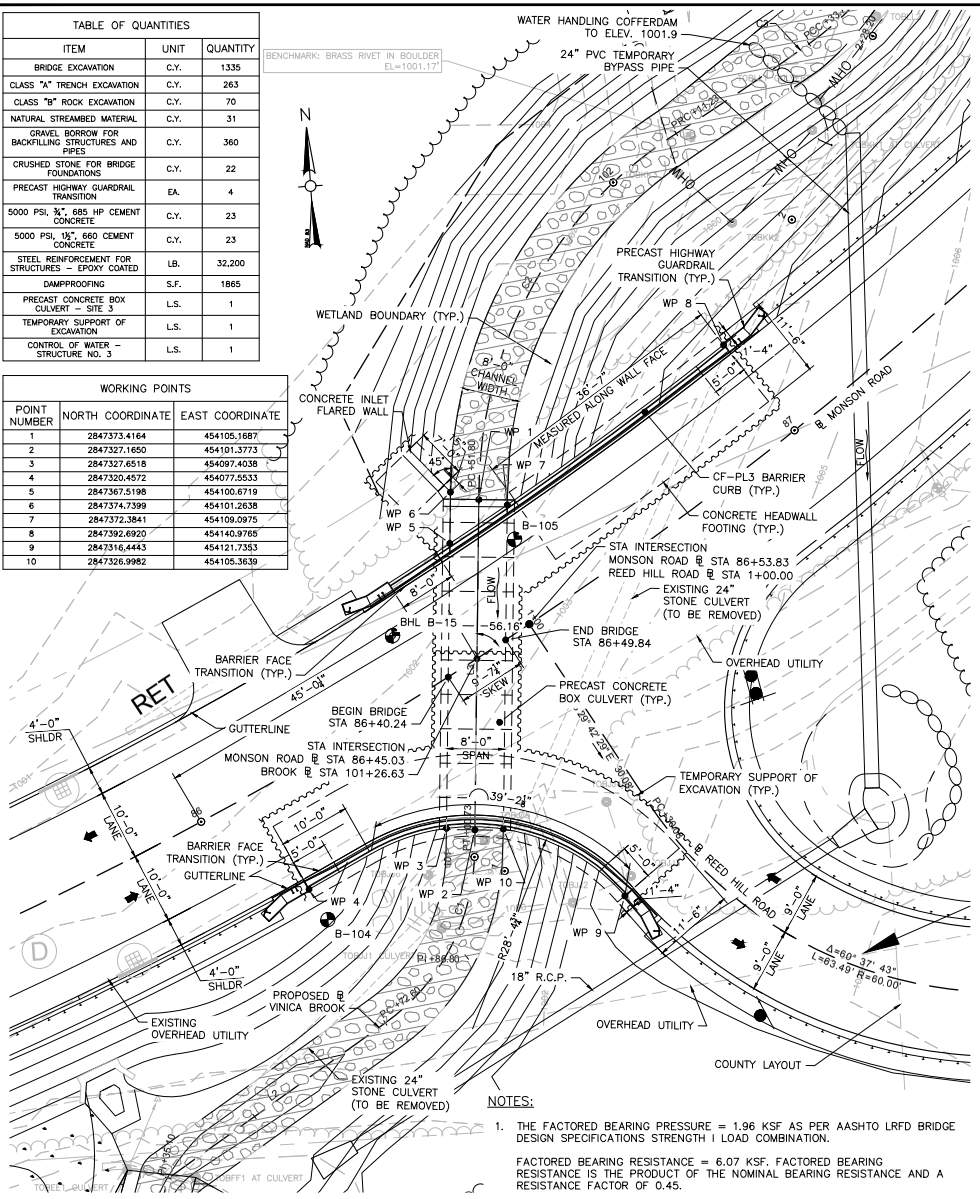
SOUTH OUTLET HEADWALL SECTION
SCALE: ½" = 1'-0"

REFERENCE NOTES:

1. FOR STRIATION DETAILS, SEE SHEET NO. 174.

TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	1335
CLASS "A" TRENCH EXCAVATION	C.Y.	263
CLASS "B" ROCK EXCAVATION	C.Y.	70
NATURAL STREAMBED MATERIAL	C.Y.	31
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	360
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	22
PRECAST HIGHWAY GUARDRAIL TRANSITION	EA.	4
5000 PSI, ¾", 685 HP CEMENT CONCRETE	C.Y.	23
5000 PSI, 1½", 660 CEMENT CONCRETE	C.Y.	23
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	32,200
DAMPPROOFING	S.F.	1865
PRECAST CONCRETE BOX CULVERT – SITE 3	L.S.	1
TEMPORARY SUPPORT OF EXCAVATION	L.S.	1
CONTROL OF WATER – STRUCTURE NO. 3	L.S.	1

WORKING POINTS		
POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2847373.4164	454105.1687
2	2847327.1650	454101.3773
3	2847327.6518	454097.4038
4	2847320.4572	454077.5533
5	2847367.5198	454100.6719
6	2847374.7399	454101.2638
7	2847372.3841	454109.0975
8	2847392.6920	454140.9765
9	2847316.4443	454121.7353
10	2847326.9982	454105.3639



CULVERT 3 PLAN (STA 86+45)

SCALE: 1" = 8'

NOTES:

1. THE FACTORED BEARING PRESSURE = 1.96 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 6.07 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 87+10± (RT) SPIKE IN UTILITY POLE: EL. 1007.89 FT

BENCHMARK STA 87+20± (LT) BRASS RIVET: EL. 1001.17 FT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

5000 PSI, ¾", 685 HP CEMENT CONCRETE.....CF-PL3 BARRIER CURB AND TRANSITION BARRIER CURB

5000 PSI, 1½", 660 CEMENT CONCRETE.....HEADWALLS

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 3 KEY PLAN AND NOTES

TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	0.33
DESIGN FLOOD DISCHARGE (C.F.S.)	52
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	3.22
DESIGN FLOOD ELEVATION (FEET, NAVD)	998.40
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	73
BASE FLOOD ELEVATION (FEET, NAVD)	998.77
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	18
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	8.91
DESIGN FLOOD ELEVATION (FEET, NAVD)	1001.42

608163_HD11(STRUCTURAL PLAN).DWG Plotted on 9-Aug-2024 3:19 PM

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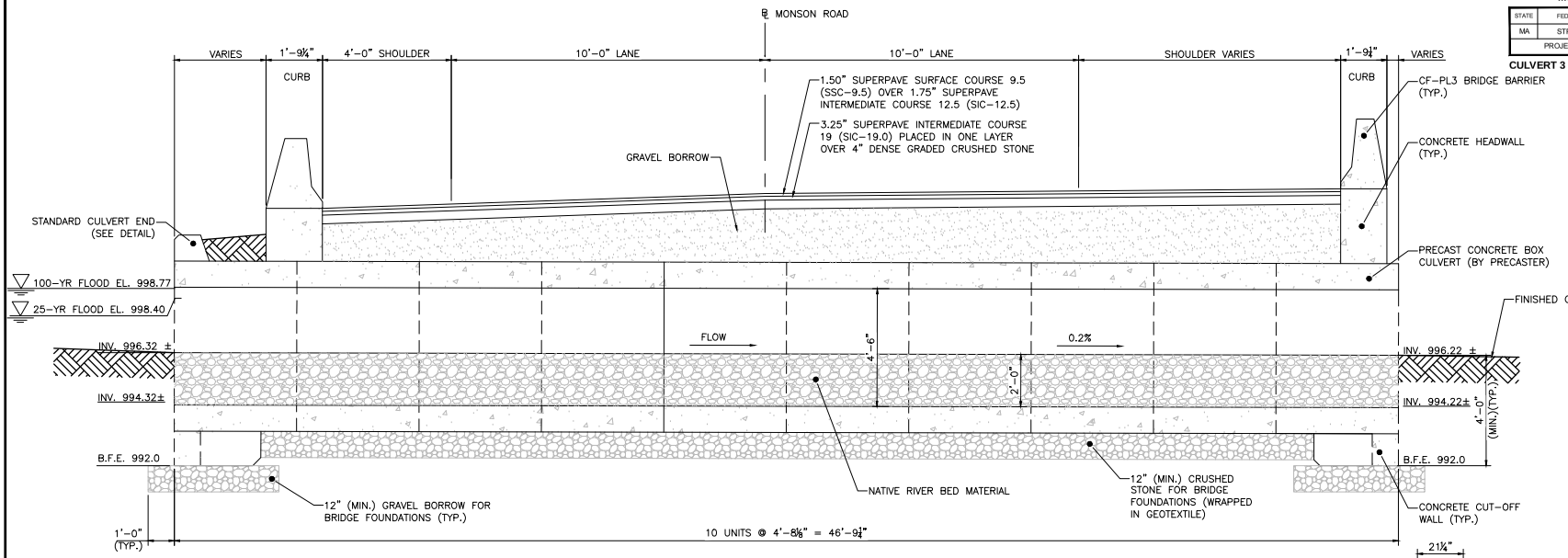
Proposal No. 608163-128112

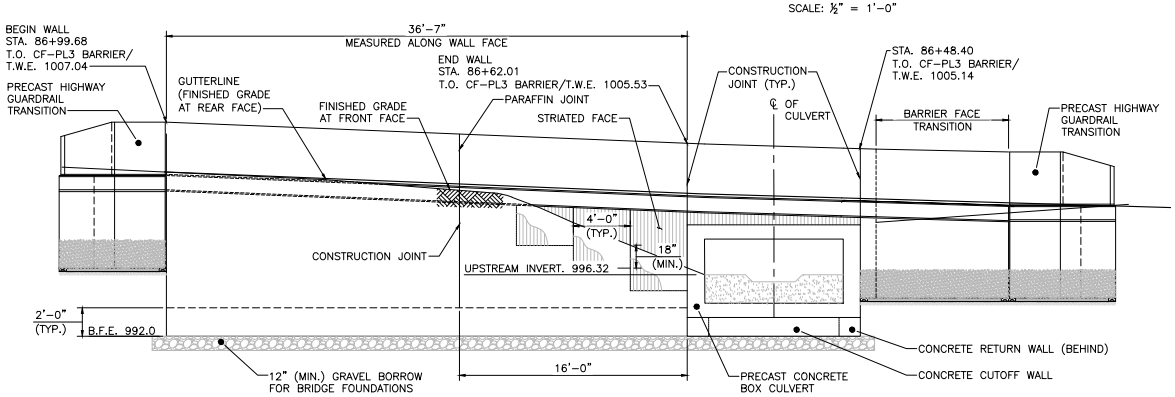
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

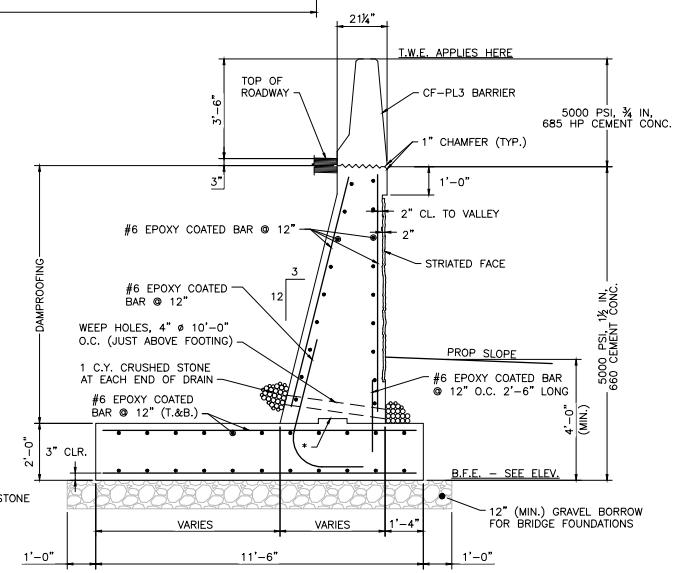
CULVERT 3 SECTION AND DETAILS



CULVERT 3 LONGITUDINAL SECTION – ALONG STREAM BASELINE
SCALE: ½" = 1'-0"



CULVERT 3 INLET NORTH ELEVATION
SCALE: ¼" = 1'-0"



* – CONSTRUCTION JOINT WITH 12"X2" KEY

RETAINING WALL SECTION
SCALE: ½" = 1'-0"

NOTES:

1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 1.96 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 6.07 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

REFERENCE NOTES:

1. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, CONCRETE END WALL DETAIL, PARAFFIN JOINT DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 174.

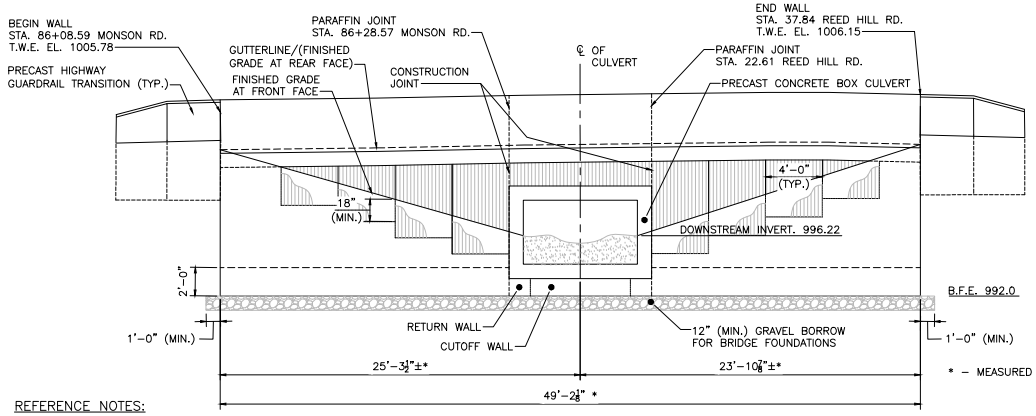
608163_HD11(STRUCTURAL PLAN).DWG Plotted on 9-Aug-2024 3:21 PM

608163_HD11\STRUCTURAL PLAN.DWG Plotted on 9-Aug-2024 3:24 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 3 WALL ELEVATION AND DETAILS



* – MEASURED ALONG WALL FACE

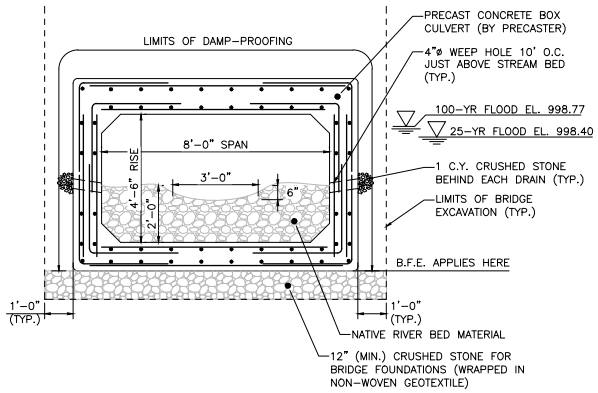
CULVERT 3 OUTLET/SOUTH ELEVATION
SCALE: ¼" = 1'-0"

PRECAST BOX CULVERT NOTES:

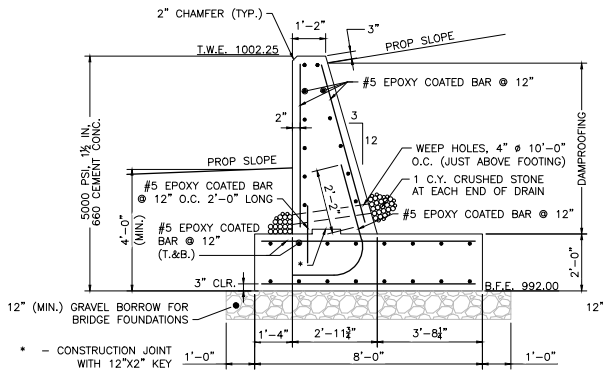
1. THE SECTION IS A PRECAST BOX CULVERT TO BE MONOLITHICALLY CAST OF REINFORCED CONCRETE. THE INSIDE SHALL BE SMOOTH AS TO NOT RESTRICT FLOW.
2. THE INTERNAL DIMENSIONS OF THE BOX CULVERT AT THIS SITE ARE 8'-0" WIDE, 4'-6" HIGH AND A MINIMUM 10" SLAB AND WALL THICKNESS.
3. DESIGN CRITERIA:
   - 3.1. DESIGN SHALL BE IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIAL (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS (9th EDITION) FOR HL-93 LOADING.
   - 3.2. STEEL REINFORCEMENT SHALL BE GRADED CONFORMING TO AASHTO M31.
   - 3.3. MINIMUM 5000 PSI CEMENT CONCRETE STRENGTH @ 28 DAYS.
   - 3.4. CONCRETE COVER FOR REINFORCING STEEL BARS SHALL BE 2 INCHES.

REFERENCE NOTES:

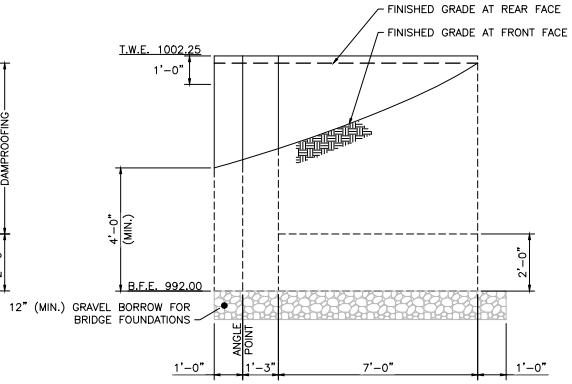
1. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, CONCRETE END WALL DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 172.



CULVERT 3 TRANSVERSE SECTION
SCALE: ½" = 1'-0"



CULVERT 3 INLET FLARED WALL – SECTION
SCALE: ½" = 1'-0"



CULVERT 3 INLET FLARED WALL – ELEVATION
SCALE: ½" = 1'-0"

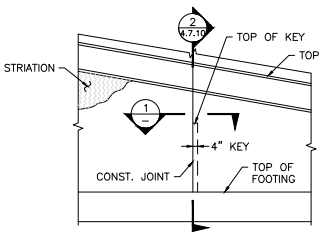
NOTES:

1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 1.90 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

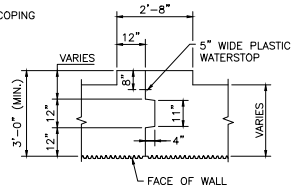
   FACTORED BEARING RESISTANCE = 5.27 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

REFERENCE NOTES:

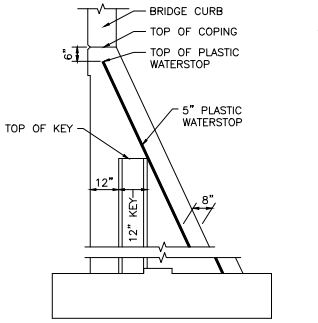
1. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, CONCRETE END WALL DETAIL, PARAFFIN JOINT DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 174.



WALL ELEVATION AT CONSTRUCTION JOINT
SCALE: ½" = 1'-0"

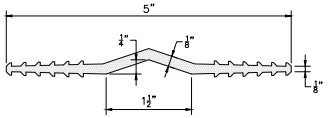


SECTION 1
SCALE: ½" = 1'-0"



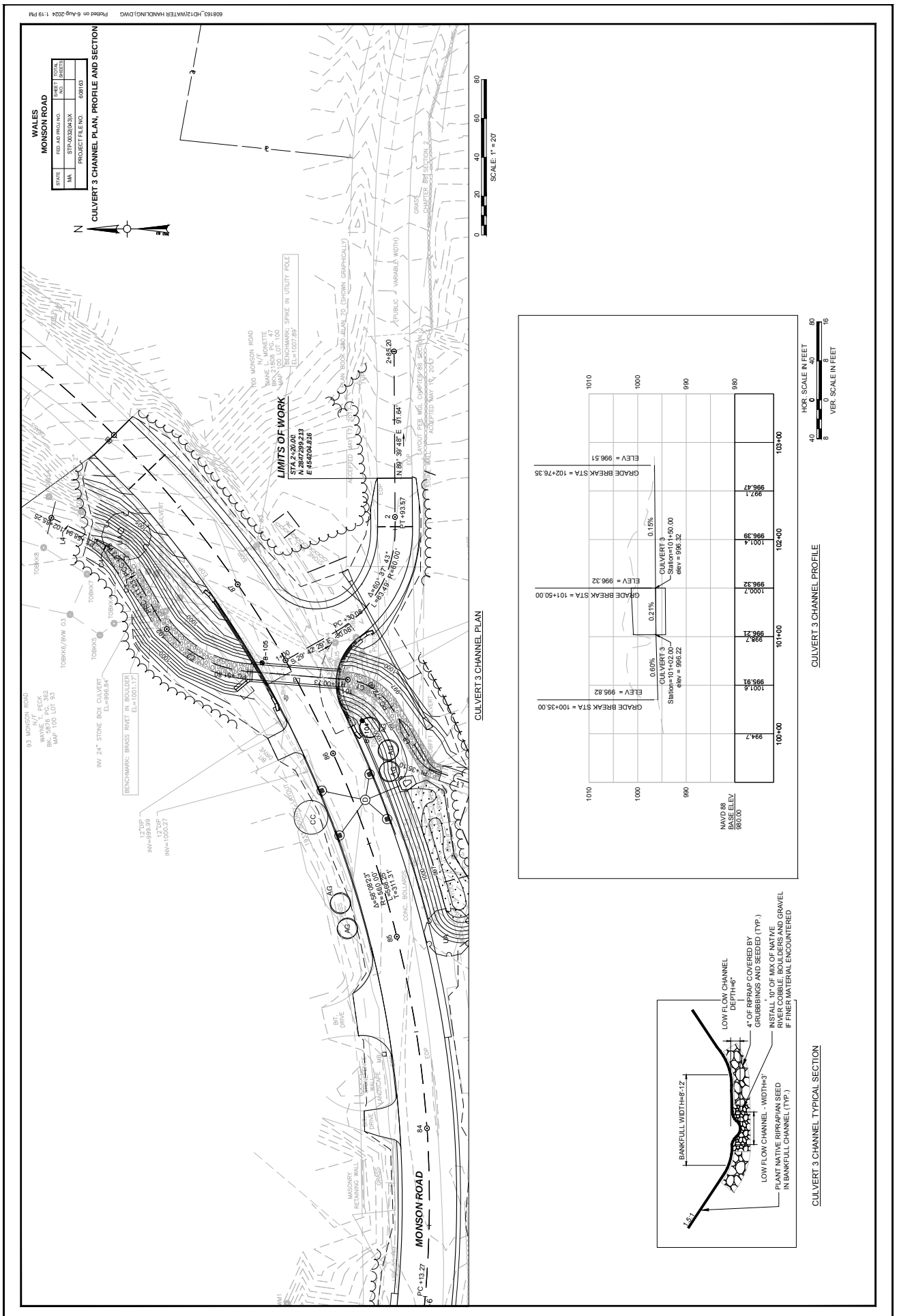
NOTE:
REINFORCEMENT SHALL BE CONTINUOUS THROUGH CONSTRUCTION JOINTS.

SECTION 2
SCALE: ½" = 1'-0"



5" WATERSTOP
FULL SIZE

Proposal No. 608163-128112


WALES
MONSON ROAD
CULVERT 3 CHANNEL PLAN, PROFILE AND SECTION
STATE
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
SCALE: 1" = 20'
LIMITS OF WORK
STA 1+26.00
N 2847299.213
E 454204.816
MONSON ROAD
CULVERT 3 CHANNEL PLAN
CULVERT 3 CHANNEL PROFILE
CULVERT 3 CHANNEL TYPICAL SECTION
BANKFULL WIDTH=8'-12'
LOW FLOW CHANNEL DEPTH=6"
4" OF RIPRAP COVERED BY GRUBBINGS AND SEEDED (TYP.)
INSTALL 10" OF MIX OF NATIVE RIVER COBBLE, BOULDERS AND GRAVEL IF FINER MATERIAL ENCOUNTERED
LOW FLOW CHANNEL WIDTH=3'
PLANT NATIVE RIPRAPIAN SEED IN BANKFULL CHANNEL (TYP.)
1.5:1
GRADE BREAK STA = 100+35.00
ELEV = 995.82
GRADE BREAK STA = 101+50.00
ELEV = 996.32
GRADE BREAK STA = 102+76.35
ELEV = 996.51
CULVERT 3
Station=101+02.00
elev = 996.22
CULVERT 3
Station=101+50.00
elev = 996.32
0.60%
0.21%
0.15%
NAVD 88
BASE ELEV.
980.00
HOR. SCALE IN FEET
VER. SCALE IN FEET

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
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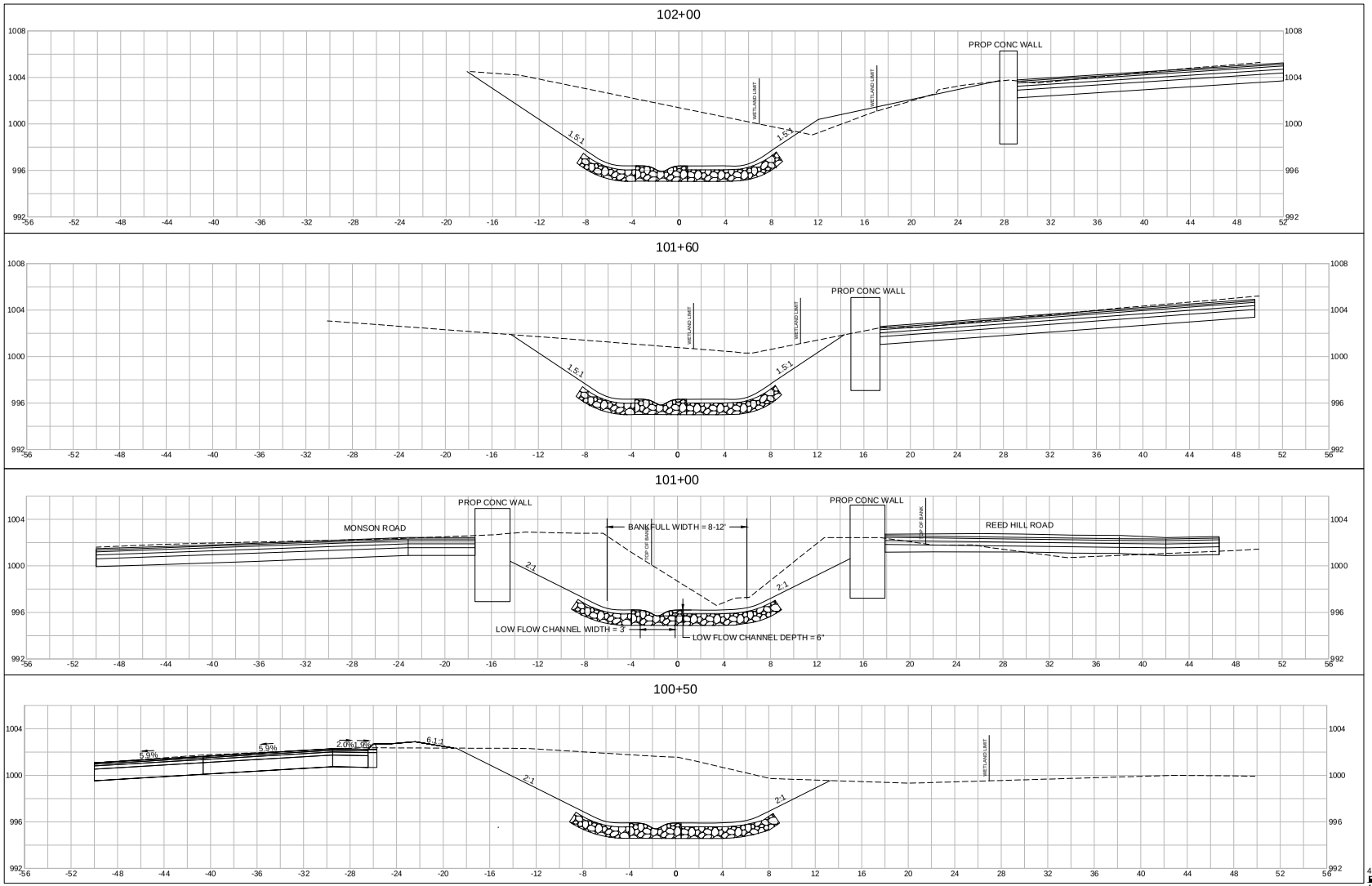
PROJECT FILE NO.	608163		

CULVERT 3 CHANNEL CROSS SECTIONS

608163_HD12\WATER HANDLING\.DWG Plotted on 5-Aug-2024 11:49 AM



REED HILL ROAD CHANNEL CROSS SECTIONS

HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

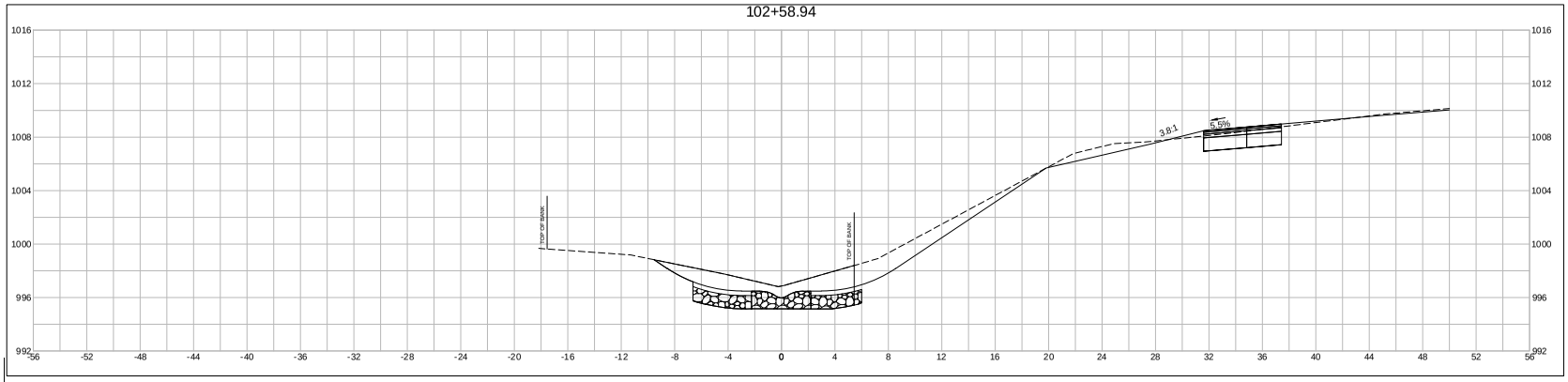
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

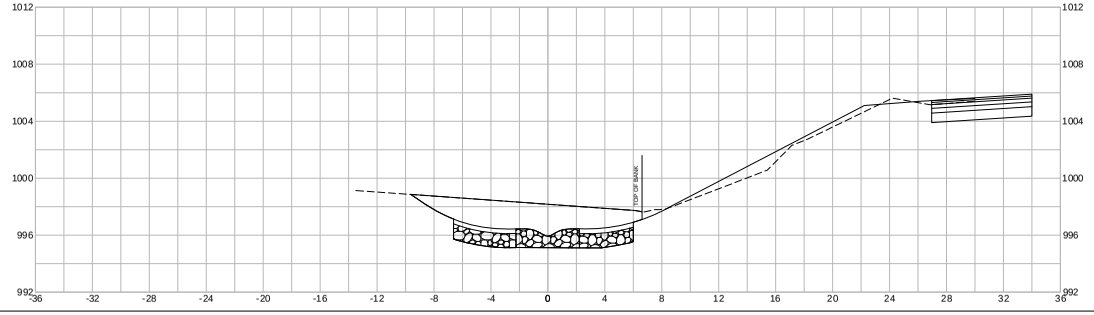
CULVERT 3 CHANNEL CROSS SECTIONS

608163_HD12\WATER HANDLING\.DWG Plotted on 5-Aug-2024 11:50 AM

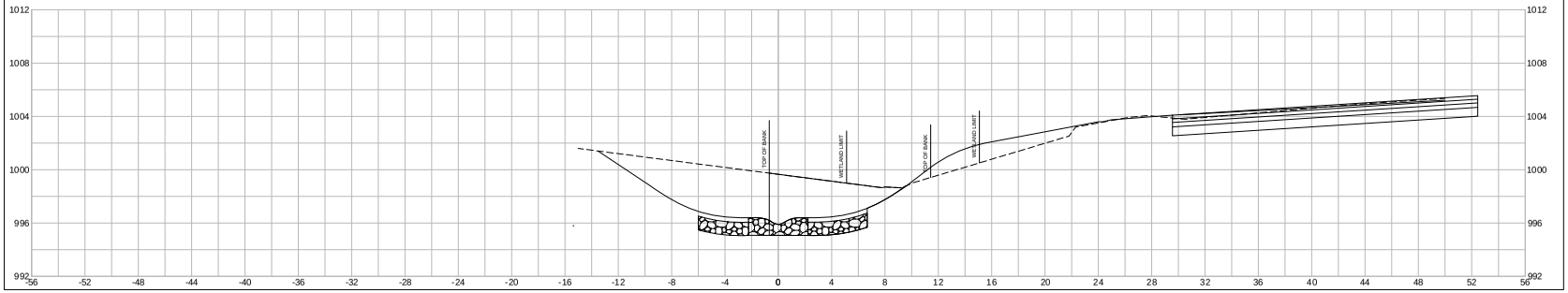
102+58.94



102+32.24



102+10



REED HILL ROAD CHANNEL CROSS SECTIONS

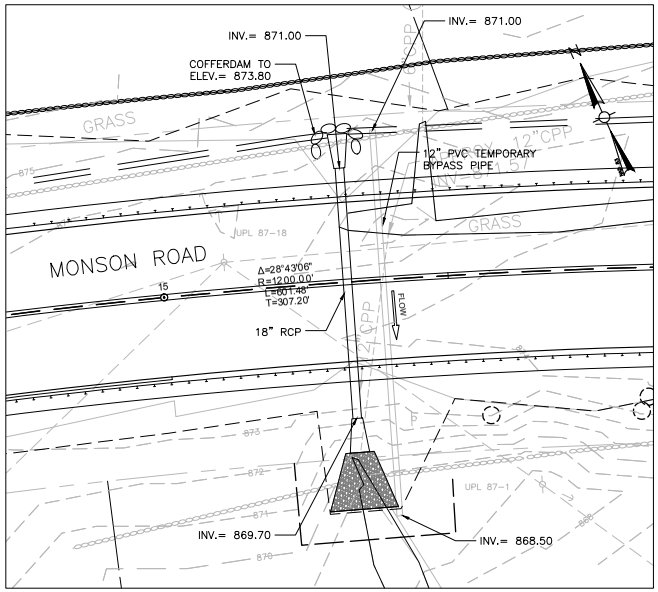
HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

WALES
MONSON ROAD

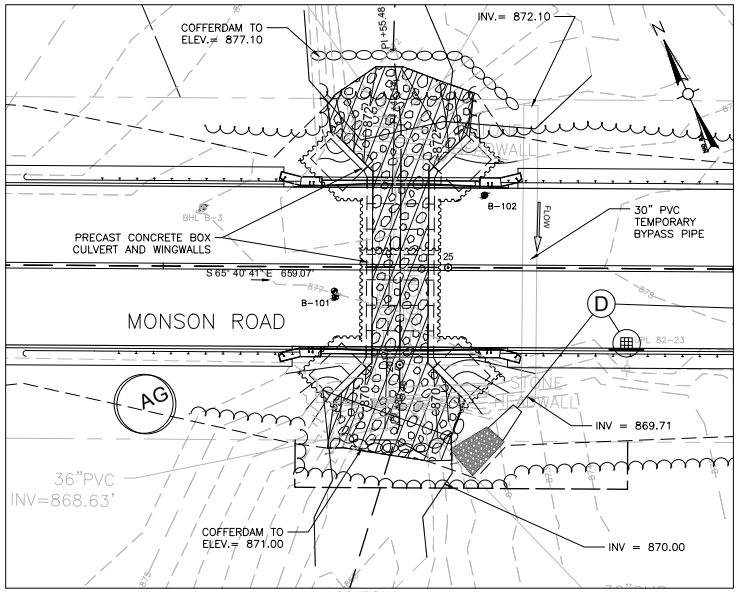
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CONTROL OF WATER PLANS

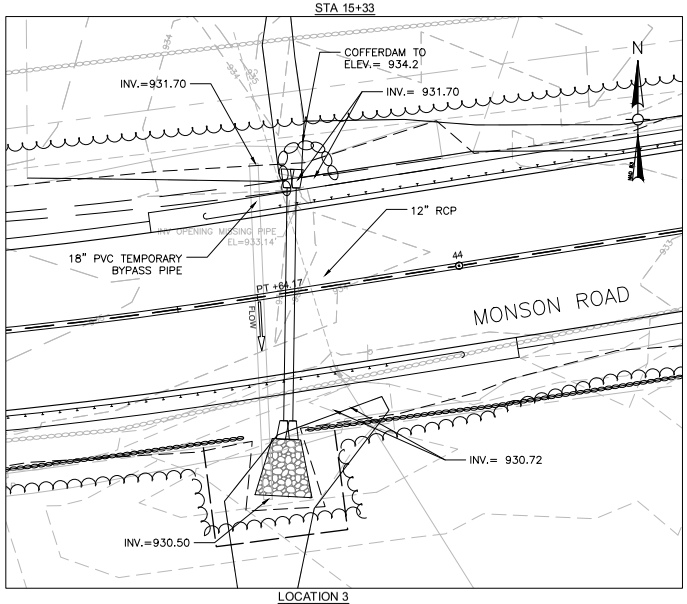
608163_HD12\WATER HANDLING\.DWG Plotted on 5-Aug-2024 11:52 AM



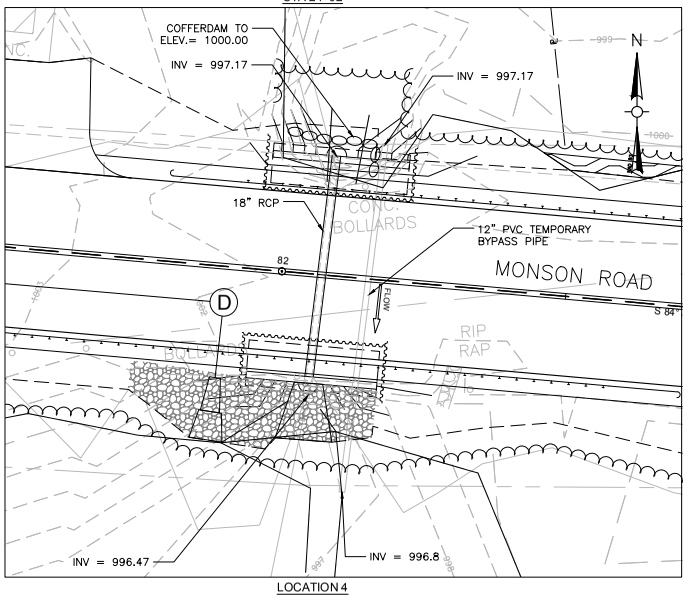
LOCATION 1
STA 15+33



LOCATION 2
STA 24+92



LOCATION 3
STA 43+76



LOCATION 4
STA 82+07

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE FOR CULVERTS:

PLANS AND CALCULATIONS FOR ALL SANDBAGGING, DIKES,OPTIONAL SHEETING AND OTHER WATER CONTROL MEASURES SHALL BE DEVELOPED BY THE CONTRACTOR. THESE PLANS AND CALCULATIONS SHALL BE PREPARED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS AND SHALL BE SUBMITTED FOR APPROVAL OF THE ENGINEER PRIOR TO THE START OF CONSTRCUTION.

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE AND INVERT ELEVATIONS) AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE. SEE PLAN FOR HEIGHT OF COFFERDAM.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE FOR CULVERTS AND END WALLS

PLANS AND CALCULATIONS FOR ALL SANDBAGGING, DIKES,OPTIONAL SHEETING AND OTHER WATER CONTROL MEASURES SHALL BE DEVELOPED BY THE CONTRACTOR. THESE PLANS AND CALCULATIONS SHALL BE PREPARED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS AND SHALL BE SUBMITTED FOR APPROVAL OF THE ENGINEER PRIOR TO THE START OF CONSTRCUTION.

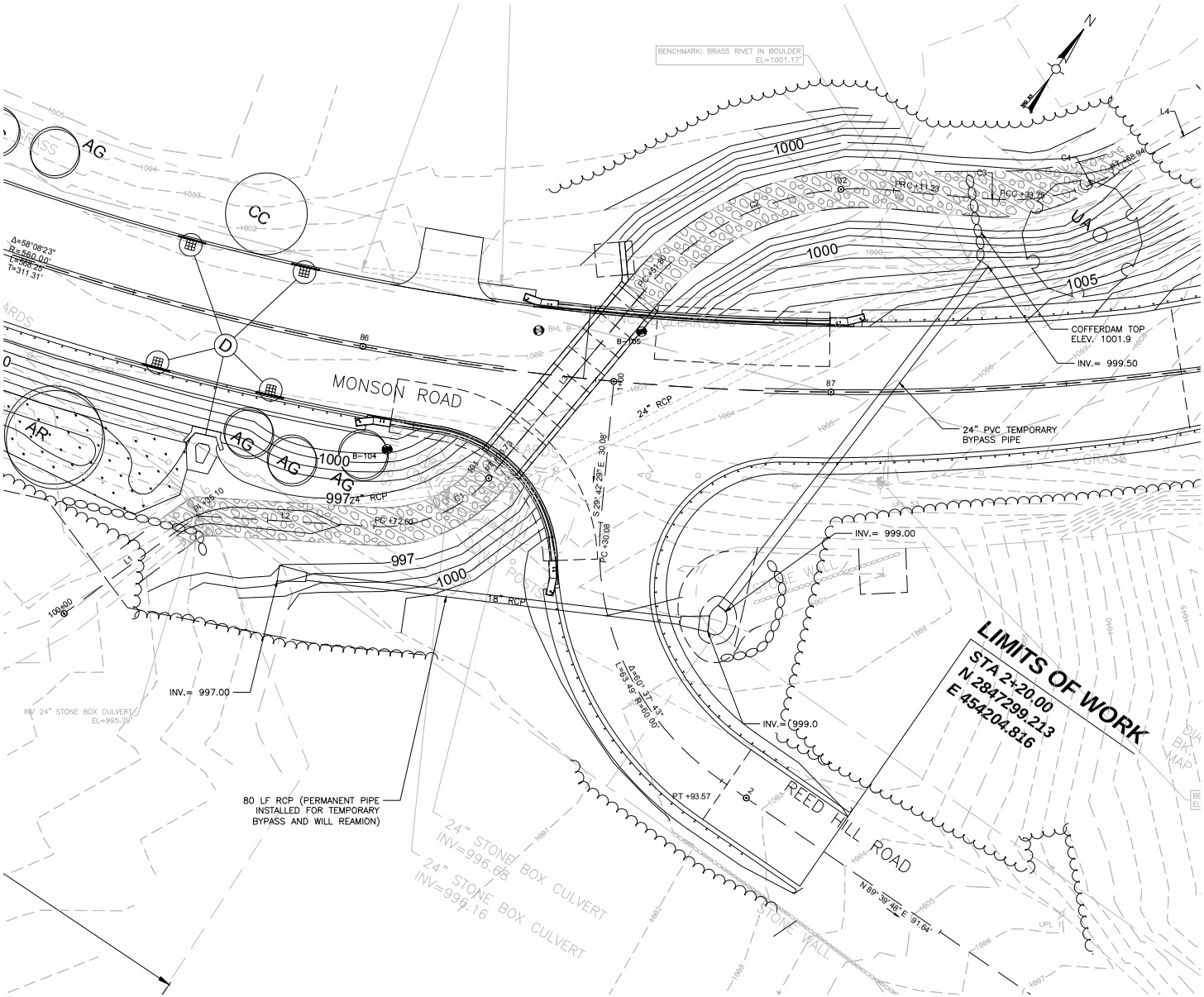
1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE) AND INSTALL THE COFFERDAMS IN THE STREAM ON BOTH ENDS OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND ENDWALLS.
4. INSTALL THE NEW CULVERT.
5. INSTALL THE END WALLS.
6. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT. RECONFIGURE THE COFFERDAMS AROUND THE SIDE THAT WILL BE CONSTRUCTED NEXT.
7. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
8. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

0 10 20 30 40
SCALE: 1" = 10'

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

CONTROL OF WATER PLAN - CULVERT 3



LOCATION 5
STA 87+00 and STA 1+33

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE AND INVERT ELEVATIONS) AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE. SEE PLAN FOR HEIGHT OF COFFERDAM.
3. REMOVE THE EXISTING CULVERT
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

0 10 20 30 40
SCALE: 1" = 10'

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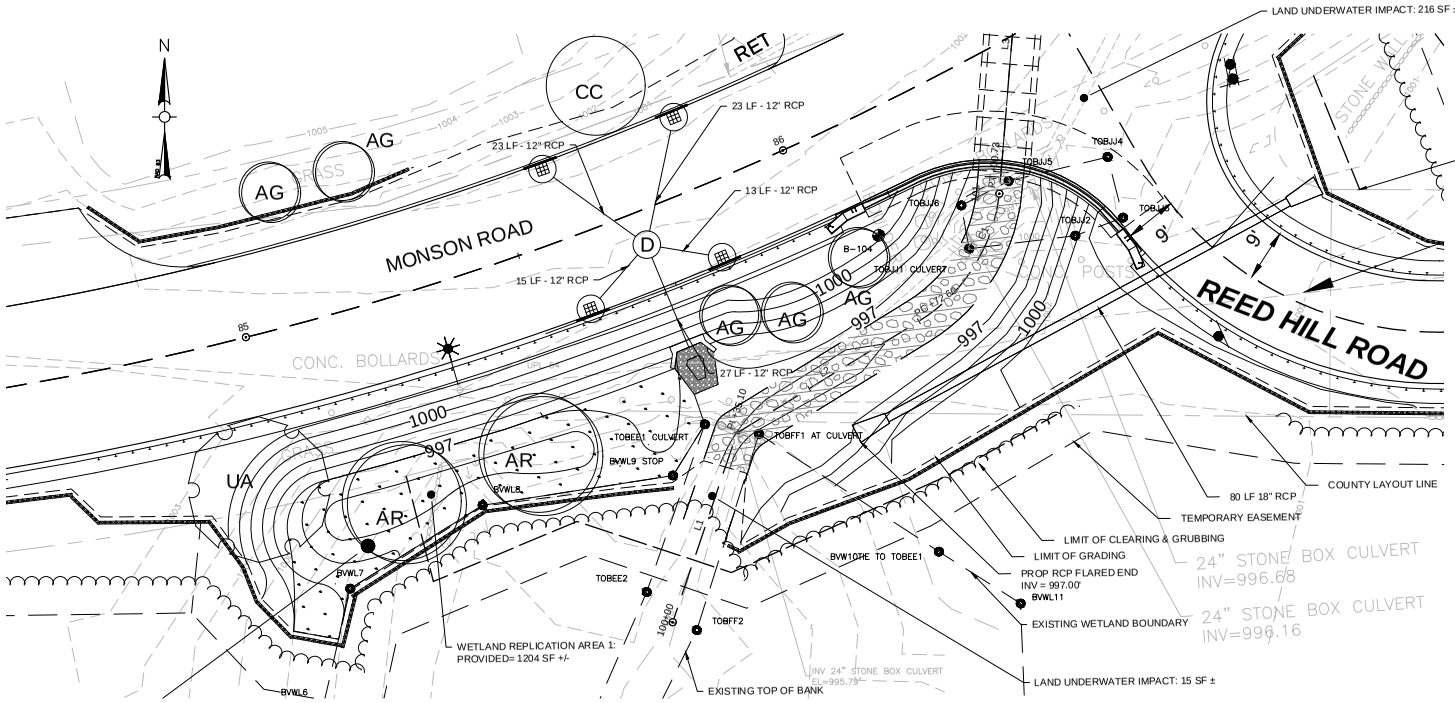
608163_HD13\WETLAND REPLICATION).DWG Plotted on 9-Aug-2024 3:42 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

WETLAND REPLICATION AREA DETAIL



WETLAND REPLICATION AREA 1 GRADING PLAN

0 10 20 30 40

SCALE: 1" = 10'

WETLAND SEED MIX - OBLIGATE MIX

BOTANICAL

GRASS	COMMON NAME	%PLS BY WEIGHT
CAREX VULPINOIDEA	FOX SEDGE	26.50%
CAREX LURIDA	SHALLOW SEDGE	15.00%
SAPERGANIUM EURYCARPUM	GIANT BUR REED ECO PA	10.00%
CAREX LUPULINA	HOP SEDGE	7.00%
CAREX CRINITA	FRINGED SEDGE	6.00%
SCIRPUS CYPERINUS	WOOLGRASS	4.00%
JUNCUS EFFUSUS	SOFT RUSH	3.00%
CAREX COMOSA	BEAREDED SEDGE	3.00%
SCIRPUS ATROVIRENS	GREEN BULRUSH	3.00%
SPARGANIUM AMERICANUM	BURRWEED	2.50%
SCIRPUS VALIDUS	BULRUSH, SOFT-STEM	2.00%
CAREX STRICTA	TUSSOCK SEDGE	1.00%
GLYCERIA CANADENISIS	MANNA GRASS	1.00%
		86.00%
VERBENA HASTATA	BLUE VERVAIN	4.00%
ASTER PUNICEUS	ASTER - SWAMP	2.00%
EUPATORIUM MACULATUM	JOE-PYE WEED	1.50%
EUPATORIUM PERFOLIATUM	BONESET	2.00%
IRIS VERSICOLOR	BLUE FLAG IRIS	2.00%
ALISMA SUBCORDATUM	MUD PLAINTAIN	1.00%
VERONIA NOVEBORACENSIS	NEW YORK IRONWEED	1.00%
BUDENS CERNUA	NODDING BURR MARIGOLD	1.00%
SOLIDAGO PATULA	ROUGHLEAF GOLDENROD	0.50%
MIMULUS RINGENS	MONKEY FLOWER	0.50%
CHELONE GLABRA	WHITE TURTLEHEAD	0.50%
		14.00%
		100.00%

SEED RATING:
SPECIES ECOTYPE SHALL BE AS NATIVE TO NEW ENGLAND REGION AS POSSIBLE. APPLY THIS MIX AT 20 LBS PLS/ACRE.

WETLAND REPLACEMENT AREA 1 NOTES:

1. A WETLAND SCIENTIST SHALL BE PROVIDED ON-SITE TO MONITOR CONSTRUCTION OF THE WETLAND MITIGATION AREA TO ENSURE COMPLIANCE WITH THE MITIGATION PLAN.
2. AT LEAST 12 INCHES OF NATURAL OR MANMADE WETIAND SOIL SHALL BE INSTALLED IN THE WETLAND REPLICATION AREA.
3. ONLY PLANT MATERIALS NATIVE AND INDIGENOUS TO THE REGION SHALL BE USED. SPECIES NOT SPECIFIED IN THE REPLICATION PLAN SHALL NOT BE USED WITHOUT WRITTEN APPROVAL FROM THE REGULATORY AUTHORITIES. PLANT SPECIES ON THE INVASIVE SPECIES PLANT LIST IN THE CORPS MITIGATION INTRODUCTION: PERFORMANCE STANDARDS AND SUPPLEMENTARY INFORMATION DATED 2/21/01 SHALL NOT BE USED IN AND WITHIN 100 FEET OF MITIGATION SITES.
4. A SUPPLY OF DEAD AND DYING WOODY DEBRIS SHALL COVER between 5%-20% OF THE GROUND THROUGHOUT THE MITIGATION SITE AFTER THE COMPLETION OF CONSTRUCTION OF THE MITIGATION SITE. THESE MATERIALS SHOULD NOT INCLUDE INVASIVE SPECIES.
5. TEMPORARY DEVICES AND STRUCTURES TO CONTROL EROSION AND SEDIMENTATION IN AND AROUND MITIGATION SITES SHALL BE DISASSEMBLED AND PROPERLY DISPOSED OF NO LATER THAN NOVEMBER 1 THREE FULL GROWING SEASON AFTER PLANTING. SEDIMENT COLLECTED BY THESE DEVICES SHALL BE REMOVED AND PROPERLY DISPOSED OF IN A MANNER THAT PREVENT ITS EROSION AND TRANSPORT TO A WATERWAY OR WETLAND.

WETLAND REPLICATION AREA 1 PLANTING PLAN

SHRUBS
HIGHBUSH BLUEBERRY (VACCINIUM CORYMBOSUM): 4 PLANTS, SPACED 10 FEET ON CENTER MINIMUM
WINTERBERRY (ILEX VERTICILLATE): 4 PLANTS, SPACED 10 FEET ON CENTER MINIMUM

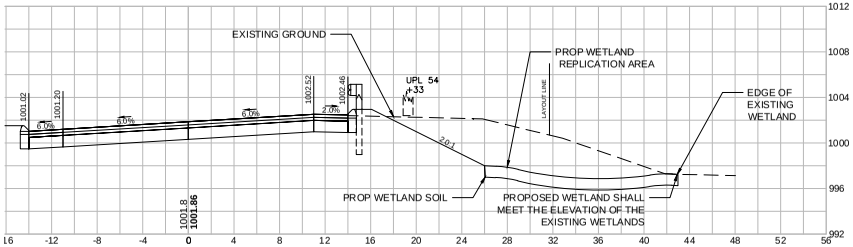
FERNS
CINNAMON FERN (OSMUNDA CINNAMOMEA): 50 PLANTS, SPACED 2 FEET ON CENTER, PUT IN CLUSTERS OF AT LEAST 5 TOGETHER IN SAME AREA TO PROVIDE A NATURAL PATTERN.
SENSITIVE FERN (ONOCLEA SENSIBILIS): 50 PLANTS, SPACED 2 FEET ON CENTER, PUT IN CLUSTERS OF AT LEAST 5 TOGETHER IN SAME AREA TO PROVIDE A NATURAL PATTERN.

SEED MIX
IN WETLAND REPLICATION AREA: SEE WETLAND SEED - OBLIGATE MIX - THIS SHEET (SAME MIX TO BE USED ON PLAN SHEET 16 FOR WETLAND RESTORATION AREA 1)

FOR ALL AREA OUTSIDE AND ADJACENT TO WETLAND RESTORATION AND/OR REPLICATION AREAS PROVIDE PART SHADE ROADSIDE SEED MIX AS INDICATED ON CONSTRUCTION DETAIL SHEET 84.

TREES
OCTOBER GLORY (ACER RUBRUM): 2 TREES SPACED 25 FEET ON CENTER, WITH A 3 INCH TO 3.5 INCH CALIPER, TO PROVIDE A NATURAL PATTERN.
PRINCTON (ULMUS AMERICANA): 1 TREE WITH A 2 INCH TO 2.5 INCH CALIPER.

85+50



WETLAND REPLICATION AREA CROSS SECTION

Appendix D

Updated Stormwater Report

Weston & Sampson

westonandsampson.com

WESTON & SAMPSON ENGINEERS, INC.
712 Brook Street, Suite 103
Rocky Hill, CT 06067
tel: 860.513.1473

REPORT

August 2024

TOWN OF
Wales
MASSACHUSETTS

STORMWATER MANAGEMENT REPORT
Monson Road Reconstruction
Project File No.608163

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Attachment C ..... Drainage Report

Attachment D ..... Operation and Maintenance Plan

Attachment E …….. Erosion and Sedimentation Control Plan and Pollution Prevention Plan

1.0 INTRODUCTION

This Stormwater Management Report has been developed on behalf of the Town of Wales, MA for the Monson Road Transportation Improvement Project (TIP). Monson Road is a two-lane, Rural Major Collector. The project is located along Monson Road beginning at the Wales/Monson town line and traveling east about 1.5 miles to Reed Hill Road. See Attachment A for a Locus Map of the Project Location. This project consists of full depth reconstruction of Monson Road within the project limits and widening the road from 22' to 28' (10' wide lanes and 4' wide shoulders). Minor horizontal and vertical alignment changes are proposed to meet the current design standards and improve sight lines. Superelevation is also proposed along horizontal curves.

Currently the existing site has an open "country" drainage system consisting of stormwater runoff that sheets off the road into undefined swales and wetlands. Cross culverts convey a mix of stormwater runoff from the road and streamflow from overland areas. Roadside sediment deposits block some of the water from sheeting off the road, which causes water to flood the road and damage the road structure. There are also minimal water quality measures. There are nine culvert crossings that convey streams and roadside ditch water under Monson Road. These water courses eventually discharge into Vinica Brook. The existing culverts are undersized, and overtopping of the roadway occurs during large storms.

The proposed project includes grass and modified rockfill lined swales in addition to closed drainage systems and curbing. Six of the existing culverts will be modified as described in Section 4.0. These drainage improvements will alleviate flooding and improve water quality within the project site. The project site is considered to be categorized as a redevelopment project according to the definition within volume 2, chapter 3 of the Massachusetts Stormwater Handbook. The project involves maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving.

The drainage requirements are summarized in the Stormwater Checklist found in Attachment B.

2.0 DESIGN METHODOLOGIES

The survey performed for this project has been used in conjunction with the Mass GIS LIDAR Data to delineate drainage area limits for this project. The watershed area for each structure (both existing and proposed) was finalized based on a detailed field investigation.

The Massachusetts Highway Department Project Development & Design Guide - Chapter 8 (Drainage and Erosion Control) has been used as a guideline for the roadway drainage design. Rational Method is used for determining runoff peak flows and design spreads of the road drainage system for a 10-year frequency design storm. The storm drainage systems were evaluated and designed using *Hydraflow Storm Sewers Extension for AutoCAD Civil 3D 2023*. An IDF curve for the project site was derived to depict the current precipitation intensities as summarized in the NOAA Atlas 14 Precipitation Data.

A proposed drainage area spreadsheet was composed to compute total areas and C-values for each catch basin. The runoff coefficients used are 0.9 for paved areas, 0.3 for grassy areas and 0.2 for unimproved areas (woods). A minimum time of concentration of 5 minutes was used for paved areas.

The hydraulic flow capacity of each drainage system was determined through gutter flow, storm sewer design, and hydraulic grade line analyses. The results of these calculations are presented using the Hydraflow Storm Sewers Program (see Attachment C for Drainage Report).

The culverts that cross Monson Road are designed for a 25-year frequency design storm because Monson Road is a Rural Major Collector. The existing and proposed culverts were analyzed and designed using HY-8 Culvert Hydraulic Analysis Program version 7.50. The HY-8 Reports are included in the Drainage Report in Attachment C.

3.0 EXISTING DRAINAGE CONDITIONS

The existing drainage at Monson Road includes stormwater sheeting into undefined drainage swales and streamflow to culvert crossings. There are no existing closed drainage systems within the project area. The total impervious area of the existing roadway within the project limits is 4.2 acres and the total pervious area consisting mainly of lawn, brush and lightly wooded areas is 4.9 acres. Sediment deposits cause the stormwater to flood the road, which causes the pavement to unravel. Nine culvert crossings convey brooks (unnamed except for the crossing at 50+72 which is locally known as either Dunham or Schoolhouse Brook) under Monson Road from north to south, and there is one culvert crossing at Sta. 55+20 which conveys a perched wet area from south to north. The eight north to south crossings are located at Sta 15+32, Sta. 24+92, Sta. 43+75, Sta. 46+60, Sta. 50+72, Sta 82+07, Sta 86+00, and Sta. 87+00. These brooks eventually discharge into Vinica Brook. The culverts also convey stormwater discharge from the northern drainage swales to the southern side of Monson Road. The existing culverts were modeled with HY-8. The models show that stormwater overtops the road for most of the culverts during a 25-year design storm. See Attachment C for Drainage Report and HY-8 output.

4.0 PROPOSED DRAINAGE CONDITIONS

The proposed roadway improvements include roadway widening, roadway curbing, and super elevating sections of the roadway, which results in significant drainage revisions. Piped roadway drainage systems consisting of catch basins and manholes are proposed to meet the MassDOT drainage design standards and improve the existing drainage conditions. The proposed impervious area within the project limits is 5.1 acres and the total pervious area consisting mainly of lawn, brush and lightly wooded areas is 4.0 acres. 0.88 acres of the proposed pavement is new impervious area. The watershed areas remain consistent with the existing drainage patterns as only slight modifications to the existing vertical and horizontal alignments is proposed. Based on site investigations, historical records, and GIS data, the proposed drainage areas were determined which can be found in the Drainage Report in Attachment C.

Drainage swales are proposed in sections where there is no curbing. The swales will have a bottom width of 1 FT and side slopes of 2:1. Four swales will have grass linings, and two swales will have modified rockfill linings. See Attachment C for the Drainage Report that describes each swale and contains swale design calculations. The swales were designed to withstand the shear stress from a 10-year design frequency storm.

Seven closed storm sewer systems are proposed along Monson Road. See Attachment C for the Drainage Report that describes each system and contains Hydraflow Storm Sewer Reports. These

systems shall outfall near the existing cross culverts or proposed drainage swales. Modified rockfill aprons are proposed at outlets that do not directly discharge into the outlet protection for the culverts.

The nine drainage crossing locations will remain the same, but six of the culverts will be replaced with upgraded sizes and/or improved materials, one culvert will be removed, and two culverts will be retained. See Attachment C for the Drainage Report which contains the proposed culvert reports. The culvert crossings are sized to convey a 25-year storm as described in Section 2 Design Methodologies. The 12" CPP culvert at STA 15+32 will be replaced by an 18" RCP culvert. The two twin pipe culverts at STA 24+92 will be replaced by an R.C.C box culvert of span 9-ft,10-in and rise 5 ft. The 15" culvert of unknown material at STA 34+50, which does not convey any streams or connect any wetland areas, will be removed and the flow will be conveyed by the proposed roadside swale and overland flow to the crossing at 24+92. The 12" CMP culvert at STA 43+75 will be replaced with twin 12" RCP culverts with flared ends on both the inlet and outlet. The 12" CPP culvert at STA 46+60 will be replaced by a 12" RCP culvert with a flared end at both the inlet and outlet. The 36" PVC pipe culvert at STA 50+72 will remain and the 12" CMP crossing at STA 55+20 will also remain. The 12" CMP crossing at STA 82+07 will be replaced by an 18" RCP culvert. Finally, two separate sections of 24" stone box culvert which cross diagonally under Monson Road and Reed Hill Road near Sta. 86+00 and Sta. 87+00, respectively, will be replaced by a concrete box culvert of span 8 ft and rise 4.5 ft at Sta. 86+45. A newly proposed 18" RCP cross culvert will be installed under the re-aligned Reed Hill Road at Sta. 1+50. The box culverts proposed at Sta. 24+92 and 86+45 will both be submerged 2-ft to allow for the placement of natural stream bed material, consistent with the upstream and downstream channel restoration.

Outlet protection will be provided for all culvert crossings. The existing scour hole at STA 24+92 will be preserved and enhanced with native streambed material. The existing scour hole at STA 50+72 will be preserved and not modified. The outfalls at STA 15+32, STA 43+75, STA 46+60, STA 73+25, and STA 82+07 will have proposed modified rockfill aprons for outlet protection. Outlet Protection Calculations are in the Drainage Report in Attachment C.

Water Quality:

The existing roadway has significant sediment deposits and ponded areas. Pavement unraveling led to erosion at the edge of the pavement. Curbing the proposed roadway will significantly reduce the erosion potential at the edge of the pavement and from adjacent properties. Sediment from the roadway runoff will be trapped in the 4-foot sumps of the proposed catch basins. Natural turf will be established within the graded areas adjacent to the roadway. Street sweeping will be conducted on a regular basis.

At the existing outfalls, there is no evidence of erosion. All banks are stable with heavy vegetation and scour holes containing large rocks. A long-term Pollution Prevention Plan/ Operation and Maintenance Plan is included in Attachment D. This plan clearly identifies that the Town Highway maintenance will be responsible for inspections and periodic maintenance, which includes street sweeping and sediment removal.

5.0 THE STORMWATER MANAGEMENT STANDARDS

The Massachusetts Department of Environmental Protection (MassDEP) developed the Stormwater Policy that includes the ten Stormwater Management Standards. These standards address water quality and water quantity. It should be noted that the upstream watershed areas are unchanged. Minor

increases in flows will have negligible effect on the discharges in Vinica Brook. This roadway redevelopment project was designed to comply with the standards up to the maximum extent practicable. See Attachment B for the Stormwater Checklist.

Standard 1: *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

The proposed project will create seven new closed drainage systems, but none of these systems will include new untreated discharges. The redevelopment project includes widening Monson Road and adding a shoulder for the safety of pedestrians and bikes. The total increase in impervious area is 0.70 acres, and the total increase in flow for a 10-yr storm event is 3.83%. The new pipe discharges will be treated by standard water quality measures to the maximum extent practicable as indicated in the Standard 4 explanation. Modified rockfill outfall protection is proposed for each new outfall and is summarized with backup calculations in the Drainage Report in Attachment C.

Standard 2: *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.*

The proposed project will include roadway widening with the addition of 4-ft shoulders to improve safety conditions and meet the requirements of MassDOT. Retention or detention is not practicable within the roadway right of way. The total increase in flows is 1.7 cfs for the 10 Year storm, which is a 3.83% increase over the pre-development peak discharge rate. The total increase in flows for the 2 Year storm is 1.2 cfs. The increase in flow is distributed across multiple outfalls and culvert crossings as shown in Tables 1 and 2 below. The increase in flow was calculated with the Rational Method based on the increase in impervious area per drainage area. This flow will be treated with catch basins with deep sumps as well as natural grass and lined swales. The flow will discharge to areas with outlet protection (level spreaders, modified rockfill aprons, or scour holes), which will reduce the velocity of the flow allowing sediment to deposit and decrease potential erosion.

Table 1. Increase in Flows for 10-year Design Frequency Storm

Drainage Area	Existing Flow (cfs)	Proposed Flow (cfs)	Increase in Flow (cfs)
Sta 11+50 to 14+10	4.47	4.56	0.09
Sta 15+32 Crossing	8.21	8.42	0.21
Sta 24+92 Crossing	8.15	8.41	0.26
Sta 31+62 Outlet/ Runoff	5.39	5.61	0.22
Sta 43+75 Crossing	1.42	1.52	0.10
Sta. 46+60 Crossing	1.82	1.76	-0.05
Sta 50+72 Crossing	5.34	5.65	0.31
Sta 73+23 Outlet/ Runoff	3.36	3.50	0.13
Sta 82+07 Outlet/ Runoff	4.57	4.85	0.28
Sta 85+72 Outlet/ Crossing	2.20	2.36	0.16
Total	**44.9**	**46.6**	**1.7**

The largest increase in flow is 0.31 cfs at the 50+72 crossing. The flow will be dissipated by an existing scour hole before traveling downstream to an unnamed brook. At all the crossings with proposed improvements, there will be a reduction in velocity due to increased openness ratios in the box culverts and larger proposed pipe diameters.

Table 2. Increase in Flows for 2-year Design Frequency Storm

Drainage Area	Existing Flow (cfs)	Proposed Flow (cfs)	Increase in Flow (cfs)
Sta 11+50 to 14+10	3.05	3.11	0.06
Sta 15+30 Crossing	5.60	5.75	0.15
Sta 24+92 Crossing	5.55	5.73	0.18
Sta 31+62 Outlet/ Runoff	3.67	3.82	0.15
Sta 43+75 Crossing	0.96	1.03	0.07
Sta. 46+60 Crossing	1.24	1.20	-0.04
Sta 50+72 Crossing	3.64	3.85	0.21
Sta 73+23 Outlet/ Runoff	2.29	2.38	0.09
Sta 82+07 Outlet/ Runoff	3.11	3.30	0.19
Sta 85+72 Outlet/ Crossing	1.50	1.61	0.11
Total	**30.6**	**31.8**	**1.2**

This roadway project requires road widening, which causes an increase in flow. The site does not contain areas to detain or retain stormwater runoff due to lack of available space within the public layout. The stormwater is treated before discharge, and the outlets contain outlet protection to reduce potential erosion. This roadway redevelopment project will comply with this standard up to the maximum extent practicable.

Standard 3: *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration to the maximum extent possible. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type*

Due to the limitations of right-of-way and existing utilities, there is insufficient space for the installation of recharge BMPs. Efforts were made to reduce the amount of curbing to allow roadway runoff into pervious areas. Roadside swales, including natural grass swales as well as modified rockfill lined swales are proposed along the corridor to help promote infiltration and provide disconnection. Additionally, the creation of approximately 75 linear feet of re-routed and daylighted stream channel increases the land under water area and promotes further recharge. Due to this project being a redevelopment, this standard complies to the maximum extent practicable.

Standard 4: *For new development, stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS)*

This project is a limited project that does not include modifications to the upstream watersheds, but only improvements to the existing roadway and storm drainage systems. All proposed drainage structures will have 4' deep sumps. Natural grass and lined swales are proposed to the maximum extent practicable to keep stormwater off of the roadway, promote infiltration, and contribute to TSS removal.

Standard 5: *Stormwater discharges from areas with higher potential pollutant loads require the use of specific stormwater management BMPs. The use of infiltration practices without pretreatment is prohibited*

This standard is not applicable because roadways are not among the areas classified as having higher potential pollutant loads.

Standard 6: *Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas*

The three perennial brooks crossing Monson Road within the project are designated as Cold-Water Fisheries. These crossings are Vinica Brook at the Reed Hill Road intersection, Schoolhouse Brook (STA 50 +72) and the unnamed brook at STA 24+92. Stormwater discharges have been proposed near existing outfall locations in order to maintain the existing drainage patterns. All new outfalls are proposed outside of wetlands and streams and outfall protection is proposed in advance of the critical areas in order to reduce erosion and excess sediment. Additionally deep sump catch basins are proposed throughout the entire proposed closed drainage system(s) as an approved pretreatment BMP. This proposed BMP together with the proposed roadway improvements represent a significant improvement over the existing conditions given the lack of existing pretreatment of roadway runoff and roadside embankment erosion which is contributing to poor stormwater quality especially near the resource and critical areas immediately adjacent to each culvert crossing.

Regarding other BMPs such as dry water quality swales, wet water quality swales, bioretention cells, and drainage channels, insufficient space within the public layout restricts the installation of additional water quality measures. Linear stormwater infiltration practices, like the ones listed above, were considered for the project, however, due to the relocation of the existing stone walls within the remaining town layout limits to reduce the total length of removal of stone walls below the MEPA threshold, many of the stone walls occupy locations where excavated infiltration swales could be installed without more significant right-of-way impacts. Additionally, in many areas long, linear and parallel wetlands and watercourses run along the roadway and occupy portions of the roadway town layout which also normally be considered for linear practices. Lastly, in order to qualify as a linear stormwater practice, the design would need to provide a certain depth and width in order to provide the minimum quality volume characteristics which significantly increase the easements needed on the abutting private properties which include single family developed and undeveloped residential and large parcels of undeveloped wildlife sanctuary property all of which are densely vegetated with mature shade and other tree species.

Standard 7: *Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. However, if it is not practicable to meet all the standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.*

This project qualifies as a redevelopment project according to the definition within volume 2, chapter 3 of the *Massachusetts Stormwater Handbook.* The project involves maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving.

Piped stormwater systems and roadside swales are proposed to improve the conveyance and quality of stormwater. Stormwater water quality measures including deep sump catch basins are included to increase the removal of total suspended solids. Provision of structural SCMs beyond deep sump catch

basins such as linear infiltration was investigated for this project however provision of such measures is not feasible due to lack of available space within the project right of way.

Standard 8: *Erosion and Sedimentation Controls must be implemented to prevent impacts during construction or land disturbance activities*

A detailed Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is included in Attachment E. The location of proposed erosion control measures and installation details are shown on the plans. These measures include inlet protection on all catch basins and sediment barriers down gradient of all disturbances within the wetland buffer zones. Because the project will disturb more than an acre of land the contractor will request coverage under the NPDES Construction General Permit and will provide a Stormwater Pollution Prevention Plan (SWPPP).

Standard 9: *All stormwater management systems must have an operation and maintenance plan to ensure that systems function as designed*

An Operation and Maintenance Plan is provided in Attachment D.

Standard 10: *All illicit discharges to the system are prohibited*

Illicit discharges are not permitted in the Town of Wales. The project's stormwater management system, as shown on the plans submitted with this report, have been designed in full compliance with Standard 10. The project area does not have any known illicit connections. Any illicit connections to the stormwater management system found in the project limit of work during construction will be removed and/or resolved through MassDOT's Illicit Discharge Detention and Elimination (IDDE) Program. The Long-Term Pollution Prevention Plan, provided in Appendix E, includes measures to prevent illicit discharges.

6.0 EROSION & SEDIMENTATION CONTROL MEASURES

To protect the adjacent properties from construction related activities, a Soil Erosion and Sediment Control Plan has been developed in accordance with the latest Massachusetts Department of Environmental Protection (MassDEP) Erosion and Sediment Control Guidelines. This plan will be implemented prior to the start of any site disturbance and will involve the combined use of compost filter tubes, silt fencing, silt sacks, and vegetative stabilization. Refer to Design Plans for soil erosion and sediment control notes and details.

Once a construction schedule has been established, a responsible person shall be named who will be responsible for implementation of sediment and erosion control measures. This responsibility includes the acquisition of materials, installation, and maintenance of erosion and sediment structures, and the communication and detailed explanation of the requirements and objectives of the erosion and sediment control measures to all people involved in the site work.

Weston & Sampson shall be notified at 1-860-616-6495 of any proposed alteration to the erosion and sediment control plan prior to altering, in order to ensure the feasibility of the addition, subtraction, or change in the plan.

7.0 SUMMARY

The proposed project will improve the roadway, traffic and drainage conditions at the project site. The proposed roadway redevelopment will comply with the standards to the maximum extent practicable. The proposed project shall satisfy the stormwater requirements of the Massachusetts Stormwater Handbook.

Registered Professional Engineer's Certification

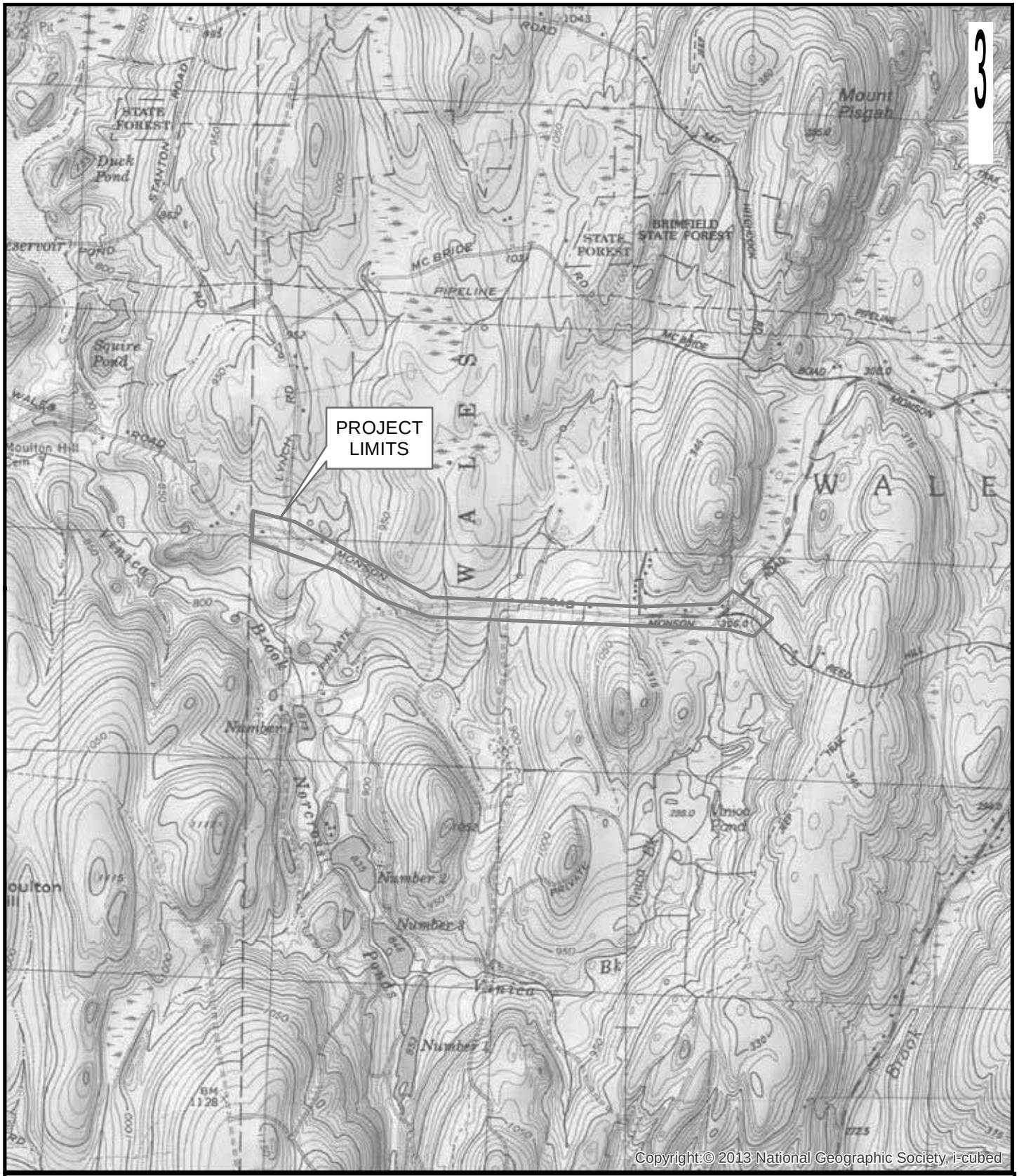
I have reviewed the Stormwater Management Report, including the soils information, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan, the Long-term Post-Construction Operation and Maintenance Plan, and the plans showing the stormwater management system, and have assessed that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also assessed that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date 6/4/2024

ATTACHMENT A

Figures



Project Limits

FIGURE 1
MONSON ROAD IMPROVEMENTS
Wales, MA

LOCUS MAP

1 inch = 2,000 feet

1,000 0 1,000

Scale In Feet

Weston & Sampson

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ATTACHMENT B

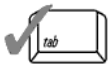
Stormwater Checklist

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
CONRAD C. NUTHMANN
CIVIL
No. 35486
REGISTERED PROFESSIONAL ENGINEER

Conrad C. Nuthmann 6/5/2024
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☐ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☒ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☐ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☐ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☒ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☒ Critical areas and BMPs are identified in the Stormwater Report.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

☐ Limited Project

☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.

☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area

☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff

☐ Bike Path and/or Foot Path

☒ Redevelopment Project

☐ Redevelopment portion of mix of new and redevelopment.

☒ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☒ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

ATTACHMENT C

Drainage Report

Weston & Sampson

westonandsampson.com

712 Brook Street, Suite 103
Rocky Hill, CT 06067
tel: 860.513.1473

REPORT

August 2024

TOWN OF
Wales
MASSACHUSETTS

DRAINAGE REPORT
Monson Road Reconstruction
Project File No.608163

DRAINAGE REPORT

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1.0 INTRODUCTION

This Drainage Report was developed on behalf of the Town of Wales, MA for the Monson Road Transportation Improvement Project (TIP). Monson Road is a two-lane, Rural Major Collector. The project is located along Monson Road beginning at the Wales/Monson town line and traveling east about 1.5 miles to Reed Hill Road. This project consists of full depth reconstruction of Monson Road within the project limits and widening the road from 22' to 28' (10' wide lanes and 4' wide shoulders). Minor horizontal and vertical alignment changes are proposed to meet the current design standards and improve sight lines. Superelevation is also proposed along horizontal curves.

Currently the existing site has stormwater sheet off the road into undefined swales and wetlands. Drainage issues include roadside sediment deposits that cause water to flood the road, which damages the road structure. Pavement unraveling causes erosion at the edge of the pavement. There are also minimal water quality measures. There are nine culvert crossings that convey unnamed streams under Monson Road. The culverts also convey stormwater runoff that travels via roadside swales. These streams eventually discharge into Vinica Brook, which closest point is located approximately 1,000-ft to the south of the Monson Road intersection with Lynch Road. The existing culverts are inadequately sized, and overtopping of the roadway occurs during large storms.

The proposed project includes grass and modified rockfill lined swales in addition to closed drainage systems and curbing. Six of the existing culverts will be modified as described in Section 5.0. These drainage improvements will alleviate flooding and improve water quality within the project site. The project involves maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving.

This report summarizes the existing drainage conditions and issues, the methodology used to perform the drainage analysis, and the proposed improvements to the storm drainage system.

2.0 METHODOLIGIES

Watershed areas were established through the use of project topographic survey, Mass GIS LIDAR Data, and site visits to verify watershed area limits. Site investigation of the entire project area included review of the condition of existing roads, utilities, culverts, and general surroundings. Field observations provided a better understanding of drainage patterns, watershed areas, and structures not included on mapping. Following site investigations, the layout of each drainage system was finalized and mapped. See Appendix A for Drainage Area Maps.

The Rational Method was used to determine the peak surface runoff rate of this watershed. The Rational Method involves three factors: the drainage area, the runoff coefficients based on surface features, and rainfall intensity based on the time of concentration of the drainage area. Individual peak surface runoff rates were determined for each catch basin where storm water is collected. The individual runoff rates were then combined into an overall system to represent the existing conditions. This was done for each of the systems studied, and the findings are discussed in the following sections.

Hydraflow Storm Sewers Extensions for AutoCAD Civil 3D 2023 was used to model the proposed piped drainage systems. The computer program used the Rational Method to determine peak flow rates based

on specific parameters input by the user. The capacity of each pipe was analyzed and compared to the flow in cubic feet per second (cfs) through the system. The software also computed gutter spreads and hydraulic grade lines. The Rational Method input is attached in Appendix B. Hydraflow results are included in Appendix C. The proposed systems were finalized to improve drainage conditions in a cost-effective manner, improve water quality, minimize property impacts, and maintain roadway conditions in the future.

The existing and proposed culverts were analyzed and designed using HY-8 Culvert Hydraulic Analysis Program version 7.50. HY-8 is a computerized implementation of Federal Highway Administration (FHWA) culvert hydraulic design. The program calculates the capacity of the culvert with headwater and tail water influences. The program also calculates energy dissipation. The HY-8 Reports are included in Appendix D.

3.0 DESIGN SUMMARY

The closed drainage systems and cross culverts were designed to meet MassDOT Standards.

3.1 Drainage Regulations

- The Massachusetts Highway Department Project Development & Design Guide - Chapter 8 (Drainage and Erosion Control) has been used as a guideline for the roadway drainage design.
- The roadway storm drain system is designed for a 10-year design storm frequency based on the recommendations for a Rural Major Collector in the Design Guide. A 25-year design storm frequency was checked for systems with low points.
- The cross culverts are designed for a 25-year design storm frequency based on the recommendations for a Rural Major Collector in the Design Guide.

3.2 Rational Method Factors

- Drainage Area - The properties within the watershed limits of the storm drainage systems consist of woods and residential and commercial lots.
- Runoff coefficients were based on land cover obtained from aerial photography, survey, and field observations. The following runoff coefficients were used:
  - Impervious Areas (Asphalt, Concrete, Roofs, Etc.) = 0.90
  - Grass (open space) = 0.3
  - Woods = 0.2
- Precipitation data is based on the most current information taken from NOAA Atlas 14, Volume 10, Version 2, Precipitation Frequency Data Server for Wales, MA.
- Time of concentrations were based on the TR-55 method. A 5-minute minimum time of concentration was used for paved areas. The time of concentrations range from five minutes to twenty-four minutes.

4.0 EXISTING CONDITIONS

The existing drainage at Monson Road includes stormwater sheeting into undefined drainage swales and streamflow to culvert crossings. There are no existing closed drainage systems within the project area. The total impervious area of the existing roadway within the project limits is 4.2 acres and the total pervious area consisting mainly of lawn, brush and lightly wooded areas is 4.9 acres. Sediment deposits cause the stormwater to flood the road, which causes the pavement to unravel. Eight culvert crossings convey unnamed brooks under Monson Road from north to south, and there is one culvert crossing at Sta. 55+20 which conveys a perched wet area from south to north. The eight north to south crossings are located at Sta 15+33, Sta. 24+92, Sta. 34+50 Sta. 43+76, Sta. 46+65, Sta. 50+72, Sta 82+07, and Sta 86+53. These unnamed brooks eventually discharge into Vinica Brook. The culverts also convey stormwater discharge from the northern drainage swales to the southern side of Monson Road. The existing culverts were modeled with HY-8. The models show that stormwater overtops the road for most of the culverts during a 25-year design storm. See Appendix D for existing culvert reports.

5.0 PROPOSED CONDITIONS

The proposed roadway improvements include roadway widening, roadway curbing, and super elevating sections of the roadway, which results in significant drainage revisions. Piped roadway drainage systems consisting of catch basins and manholes are proposed to meet the MassDOT drainage design standards and also improve the existing drainage conditions. The proposed impervious area within the project limits is 5.1 acres and the total pervious area consisting mainly of lawn, brush and lightly wooded areas is 4.0 acres. 0.88 acres of the proposed pavement is new impervious area. The watershed areas remain consistent with the existing drainage patterns as only slight modifications to the existing vertical and horizontal alignments is proposed. See utility plans under separate cover.

5.1 Drainage Swales

Drainage swales are proposed in sections where there is no curbing. The swales will have a bottom width of 1 FT and side slopes of 2:1. Four swales will have grass linings, and two swales will have modified rockfill linings. See Appendix E for Swale Calculations. The swales were designed to withstand the shear stress from a 10-year design frequency storm.

The natural grass swale from STA 14+50 to 17+00 has two sections: the first part conveys water from Sta. 17+00 into the culvert crossing at STA 15+25 and the second part continues west of the culvert crossing to outlet into the 15" RCP under the two residential driveways. This 15" RCP outlets into the grass swale which runs from STA 13+50 to STA 11+50. The existing grade from STA 11+00 to 11+50 carries the water from the swale into the existing wetlands. Curbing is provided from STA 13+50 to 15+00 on the south side of the road to protect runoff from getting in the yard of the house at 170 Monson Road. From STA 15+25 to STA 17+25, due to the superelevation of the roadway and the existing drainage patterns, the flow all sheets off to the southwest into the outlet area of the 18" RCP cross culvert at STA 15+25.

A modified rockfill drainage swale is proposed from STA 31+75 to 39+50 (flowing to the west) to catch the large amount of runoff traveling from the north side of Monson Road down into the project site. There will be no curbing on the northern side of the road to allow the runoff from the road to enter the swale. In addition, there will be no curbing on the south side of the road to allow any water on the high side of

the superelevation to naturally sheet off and follow the existing drainage patterns. At the high point of the roadway, STA 40+30, the modified rockfill swale will tie into a proposed grass swale which will flow to the east to outlet into the twin 12" RCP cross culverts.

After the initiation of the design project, the Town of Wales dug a roadside ditch from Sta. 44+00 to Sta. 46+65 to divert flow away from the existing plugged culvert at Sta. 43+76. The Town then installed a 12" CPP crossing at Sta. 46+65 to convey the diverted flow across Monson Road. This diversion created new wetlands along the side of the road as well as on the south side of the road where the 12" CPP outlets. The proposed conditions will replace the culvert at Sta. 43+76 with twin 12" RCPs and maintain the roadside ditch to divert a portion of the flow away from Sta. 43+76 during large storm events, so stormwater can travel east to the existing low point off the roadway at Sta. 46+65 and enter a proposed 12" RCP culvert to cross Monson Road to the south side. These proposed conditions will maintain the newly created wetlands as well as the existing drainage patterns.

A modified rockfill swale is proposed on the south side of the road from STA 70+50 to the outfall location at STA 73+25. This area of the project site, based on the natural topography, has water travelling onto the roadway from the south. This proposed swale will catch a large area of runoff before it can reach the roadway.

5.2 Storm Sewer Systems

Seven closed storm sewer systems are proposed along Monson Road. See Appendix B for drainage area information and see Appendix C for the Hydraflow Storm Sewer Reports. These systems shall outfall into streams or wooded areas. Modified rockfill aprons are proposed at outlets that do not directly discharge into the outlet protection for the culverts. See Appendix F for outlet protection calculations.

System Sta. 22+25

This system contains six catch basins and 12" or 15" reinforced concrete pipes (RCP). The system captures approximately 650 feet of roadway drainage along Monson Road between Lynch Road and the culvert at STA 24+93.This system also captures off-road drainage which is currently settling in the front yard of property 155 Monson Rd. This system discharges into the modified rockfill outlet protection at Sta. 22+25 directly before the flagged B-series wetlands.

System Sta. 25+50

This system contains two catch basins, and pipes are 12" RCP. The system captures approximately 700 feet of roadway drainage along the southern lane of Monson Road between the culvert at STA 24+93 and Sta. 30+00 (Peck Road). This system discharges into the outlet protection area of the two cross culverts near STA 25+00.

System Sta. 50+50

This system contains six catch basins, and pipes are 12" RCP. The system captures approximately 400 feet of roadway drainage along Monson Road between STA 48+00 and STA 52+00. The low point is located at STA 50+38 where this system outfalls into the proposed outlet protection near the existing 36" PVC cross culvert.

System Sta. 51+24

This system contains fourteen catch basins, and pipes are 12" RCP. The system captures approximately 1835 feet of roadway drainage along of Monson Road between STA 52+00 and STA

70+35. This system flows to the west and outlets into the proposed outlet protection for the existing 36" PVC cross culvert at STA 51+24.

System Sta. 73+30

This system contains five catch basins, and pipes are 12" RCP. The system captures approximately 500 feet of roadway drainage along Monson Road between STA 70+35 and STA 75+33. This system outfalls near the low point of the roadway at STA 73+25 with a proposed modified rockfill apron as outlet protection. The proposed swale on the south side of the road also outlets at the same location.

System Sta. 81+97

This system contains four catch basins, and pipes are 12" RCP. The system captures approximately 590 feet of roadway drainage along Monson Road between STA 75+35 and STA 81+25. There is no curb on the south side of the roadway from STA 76+50 to STA 79+20 so that water can sheet of naturally and eventually flow into the wetlands. At the low point at STA 82+75, there is no curb on either side of the road to allow water to sheet off into the adjacent wetlands. The water from the closed system discharges onto a modified rockfill apron which is part of the outlet protection for the 18" RCP culvert crossing at STA 82+05.

System Sta. 85+72

This system contains four catch basins, and pipes are 12" RCP. The system captures approximately 315 feet of roadway drainage along Monson Road between Sta 83+85 and Sta. 87+00. This system is located at a low point (STA 85+85) and outfalls into the graded rockfill channel which is in the place of the existing Reed Hill Rd. intersection. The adjacent wetland replication area adjoins the existing wetlands to accept the water from this closed system in addition to the box culvert coming from the north side of Monson Road and the proposed 18" culvert which crosses the relocated Reed Hill Road intersection. A proposed grass swale also helps convey water on the south side of Monson Road from STA 84+50 into the wetland replication area.

5.3 Cross Culverts

The nine drainage crossing locations will remain the same, but six of the culverts will be replaced with upgraded sizes and/or improved materials, one culvert will be removed, and two culverts will be retained. See Appendix D for proposed culvert reports. The culvert crossings are sized to convey a 25-year storm as described in Section 3 Design Summary. The 12" CPP culvert at STA 15+33 will be replaced by an 18" RCP culvert. The two twin pipe culverts at STA 24+92 will be replaced by an R.C.C box culvert of span 9.5 ft and rise 6.5 ft. The 15" culvert of unknown material at STA 34+50, which does not convey any streams or connect any wetland areas, will be removed and the flow will be conveyed by the proposed roadside swale and overland flow to the crossing at 24+92. The 12" CMP culvert at STA 43+76 will be replaced with twin 12" RCP culverts with flared ends on both the inlet and outlet. The 12" CPP culvert at STA 46+65 will be replaced by a 12" RCP culvert with a flared end at both the inlet and outlet. The 36" PVC pipe culvert at STA 50+72 will remain. The 12" CMP crossing at STA 55+20 was modeled using Hydraflow, which shows that a 12" pipe has enough capacity to convey the small contributing drainage area during a 25-year storm event, therefore the existing pipe will remain. The 12" CMP crossing at STA 82+07 will be replaced by an 18" RCP culvert. Finally, the 24" stone box culvert which crossed diagonally under Monson Road near STA 86+53 will be replaced by a well-defined box culvert of span 8 ft and rise 4.5 ft. A newly proposed 18" RCP cross culvert will be installed under the re-aligned Reed Hill Road at Sta. 1+50.

Outlet protection will be provided for all culvert crossings. The existing scour hole at STA 24+92 will be preserved and enhanced with native streambed material. The existing scour hole at STA 50+72 will be preserved and not modified. The outfalls at STA 15+33, STA 43+76, STA 46+65, STA 73+25, and STA 82+07 will have proposed modified rockfill aprons for outlet protection. Outlet Protection Calculations are in Appendix F.

5.4 HY-8

The primary software used for hydraulic analysis of culvert is HY-8. The crossings at STA 1+50, 15+33, 43+76, 46+65 and 82+07 were analyzed for existing and proposed conditions. The FHWA Culvert Hydraulic Analysis Program (HY-8) enables to analyze culvert performance for a crossing that has multiple culvert barrels that share the same tailwater and roadway overtopping.
Refer Appendix D for detailed results.

5.5 HEC-RAS

Culvert crossings at St. 24+92, 50+72 and 86+53 were evaluated using HEC-RAS program. Water surface profiles for the brook's 2, 10, 25, 50, and 100-year return frequency flood events were developed in a manner consistent with the standards used to develop water surface profiles under the NFIP. Survey information acquired for the project base plans was input using the HEC-RAS computer application and used as a basis for assembling a flood elevation profile hydraulic model of the project site. In the completed model, the channel and overbanks were assigned roughness coefficients (Manning's "n"). These values were selected based on aerial maps and field visit. All flood simulations performed with the project HEC-RAS model were done in a mixed flow mode and employed the upstream and downstream stream slope as the upstream and downstream boundary condition respectively.

A detailed hydraulic analysis was performed for the culvert crossings (both existing and proposed) in order to evaluate for 2, 5, 10, 25-year storm design. This investigation was conducted in a manner consistent with American Association of State Highway Officials (AASHTO), Federal Highway Administration (FHWA), and Massachusetts Department of Transport (MassDOT) guidelines for preparation of hydraulic studies at bridge sites.

The HEC-RAS model was performed for both existing as well as proposed conditions for the crossing 24+92, the existing crossing at 50+72 and the proposed crossing at 83+56. The geometry data, manning's constant and culvert data were input. Refer Appendix D for output data.

At Station (24+92): A four-sided precast concrete box culvert is proposed at this crossing. The span of culvert is **9.5 ft** and rise of **6.5 ft.** Two feet of the box culvert will be filled with natural stream bottom material. The results show this crossing will handle up to a 100-year event.

At Station (50+72): A 36" PVC pipe culvert exists for this crossing with the invert elevations of 922.04 on the upstream side and 920.04 on the downstream side. Existing structure was modeled using HEC-RAS. The results show this crossing will not overtop during a 25-year design period.

At Station (86+53): A 24" Stone box culvert exists over the entire crossing. A tributary of Vinica Brook crosses Monson Road at this station. The small woodland channel flows under Monson Road into a small depression near the intersection of Reed Hill Road. A precast concrete box culvert of span **8 ft**

and rise **4.5 ft** is proposed for this crossing. 2-feet of natural material will be filled at the bottom. Results indicate the crossing will adequately handle up to a 100-yr storm event.

6.0 TEMPORARY WATER HANDLING

Temporary water handling will be provided using temporary bypass pipes and sandbag systems as shown on the plans. (see design plans for sizes and invert elevations) will be installed. Sandbags in form of cofferdams will. The size of temporary pipes and flow through sandbags was based on HEC-RAS modeling information. A steady flow analysis was performed with approximate inverts and 2-year return period. The 2-year return period is a common design standard for temporary water handling structures and is considered a reasonable balance between the risk of failure and the cost of construction.

7.0 WATER QUALITY MEASURES

The existing roadway has significant sediment deposits and ponded areas. Pavement unraveling led to erosion at the edge of the pavement. Curbing the proposed roadway will significantly reduce the erosion potential at the edge of the pavement and from adjacent properties. Sediment from the roadway runoff will be trapped in the 4-foot sumps of the proposed catch basins. Natural turf will be established within the graded areas adjacent to the roadway. Street sweeping will be conducted on a regular basis. Due to limitations in the amount of public right-of-way, there will be no proposed water quality BMP's in an effort to reduce impacts on private property.

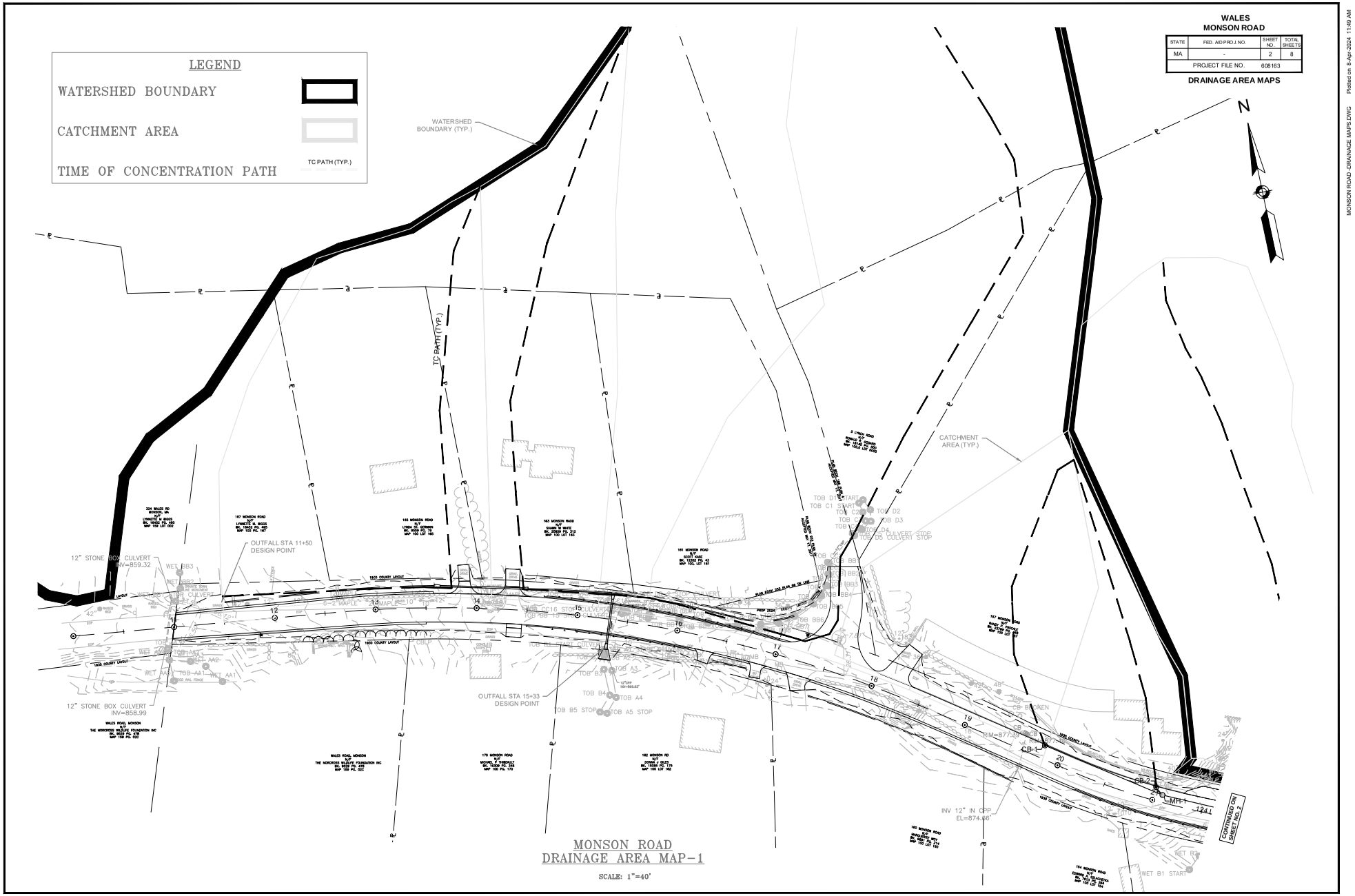
8.0 CONCLUSION

The proposed storm drainage systems are designed in accordance with the guidelines set in Chapter 8 (Drainage and Erosion Control) of the Mass Highway manual. The Hydraflow results show that the proposed systems are designed to convey a 10-year storm. The culverts are designed to convey a 25-year storm. The piped systems will assist in capturing roadway runoff to alleviate any potential flooding. The proposed drainage systems adequately address water quality to the maximum extent practicable.

APPENDIX A

Watershed Maps

MONSON ROAD -DRAINAGE MAPS.DWG Plotted on 8-Apr-2024 11:53 AM



MONSON ROAD
DRAINAGE AREA MAP-1

SCALE: 1"=40'

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	8
PROJECT FILE NO.	608163		

DRAINAGE AREA MAPS

MONSON ROAD -DRAINAGE MAPS.DWG Plotted on 8-Apr-2024 11:49 AM

Project No. 608163.13212

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	8
PROJECT FILE NO. 608163			

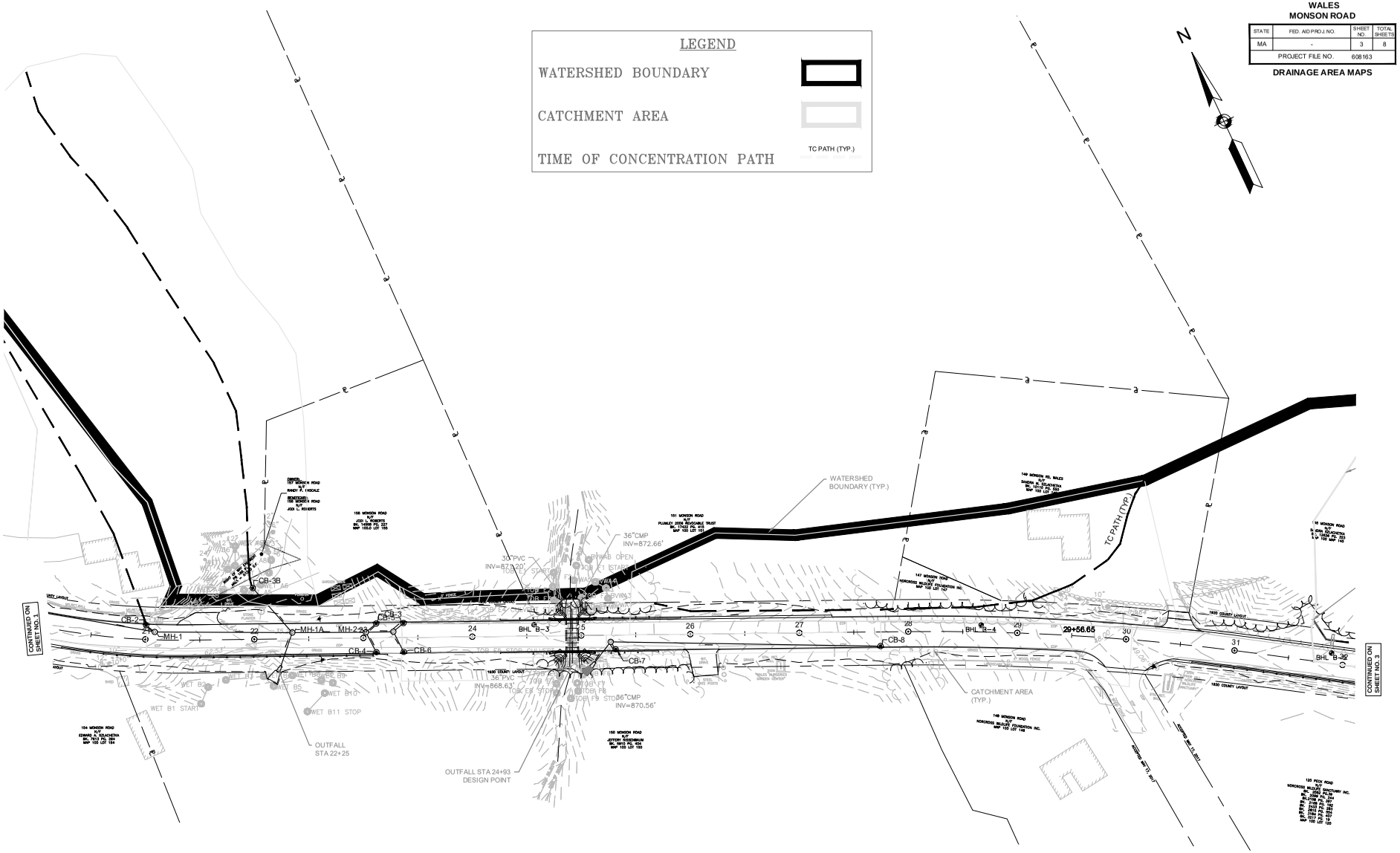
DRAINAGE AREA MAPS

LEGEND

WATERSHED BOUNDARY

CATCHMENT AREA

TIME OF CONCENTRATION PATH — TC PATH (TYP.)



MONSON ROAD
DRAINAGE AREA MAP-2

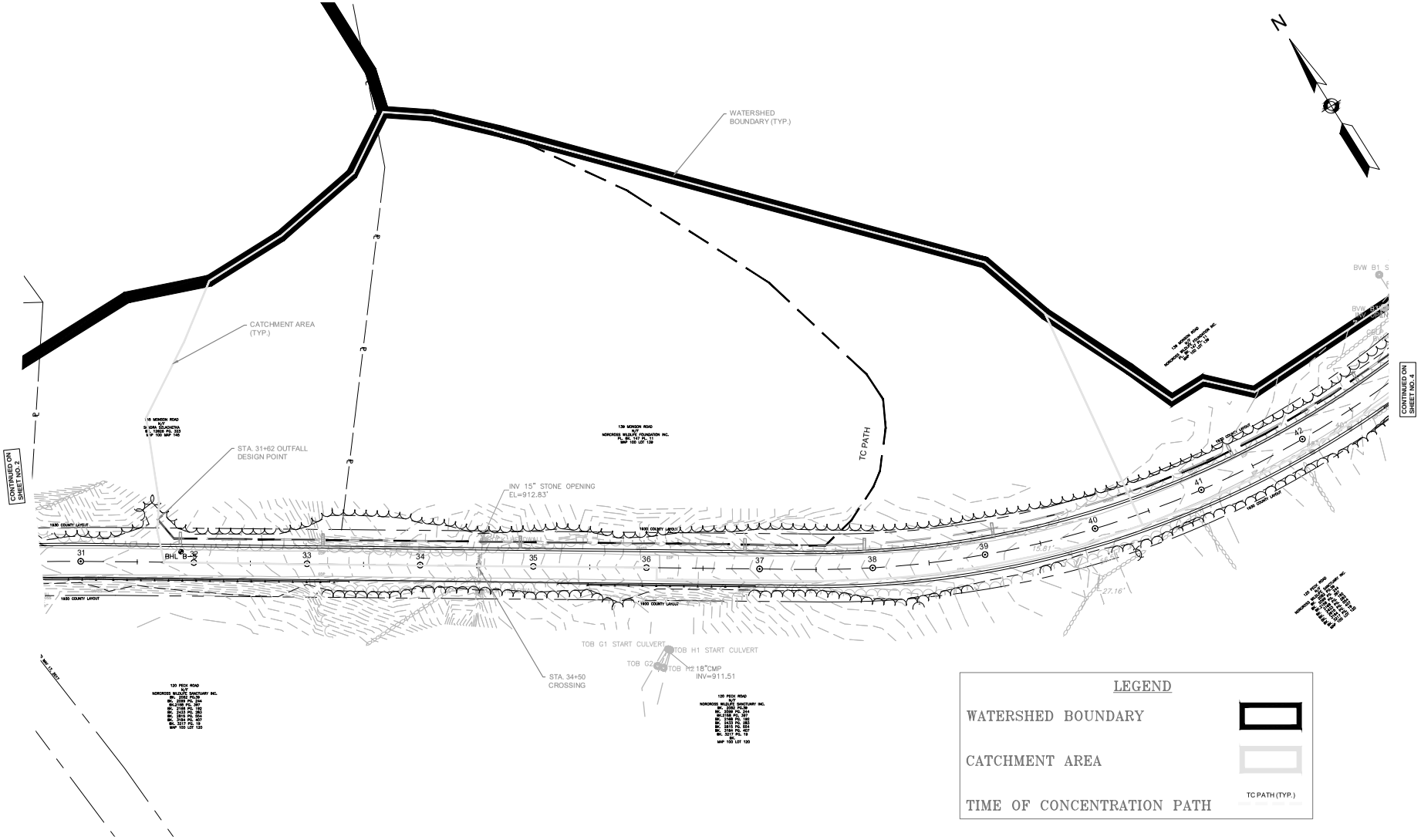
SCALE: 1"=40'

MONSON ROAD-DRAINAGE MAPS.DWG Plotted on 8-Apr-2024 11:49 AM
Project No. 608163.112512

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	8
PROJECT FILE NO.	608163		

DRAINAGE AREA MAPS



LEGEND

WATERSHED BOUNDARY

CATCHMENT AREA

TIME OF CONCENTRATION PATH — TC PATH (TYP.)

MONSON ROAD
DRAINAGE AREA MAP-3

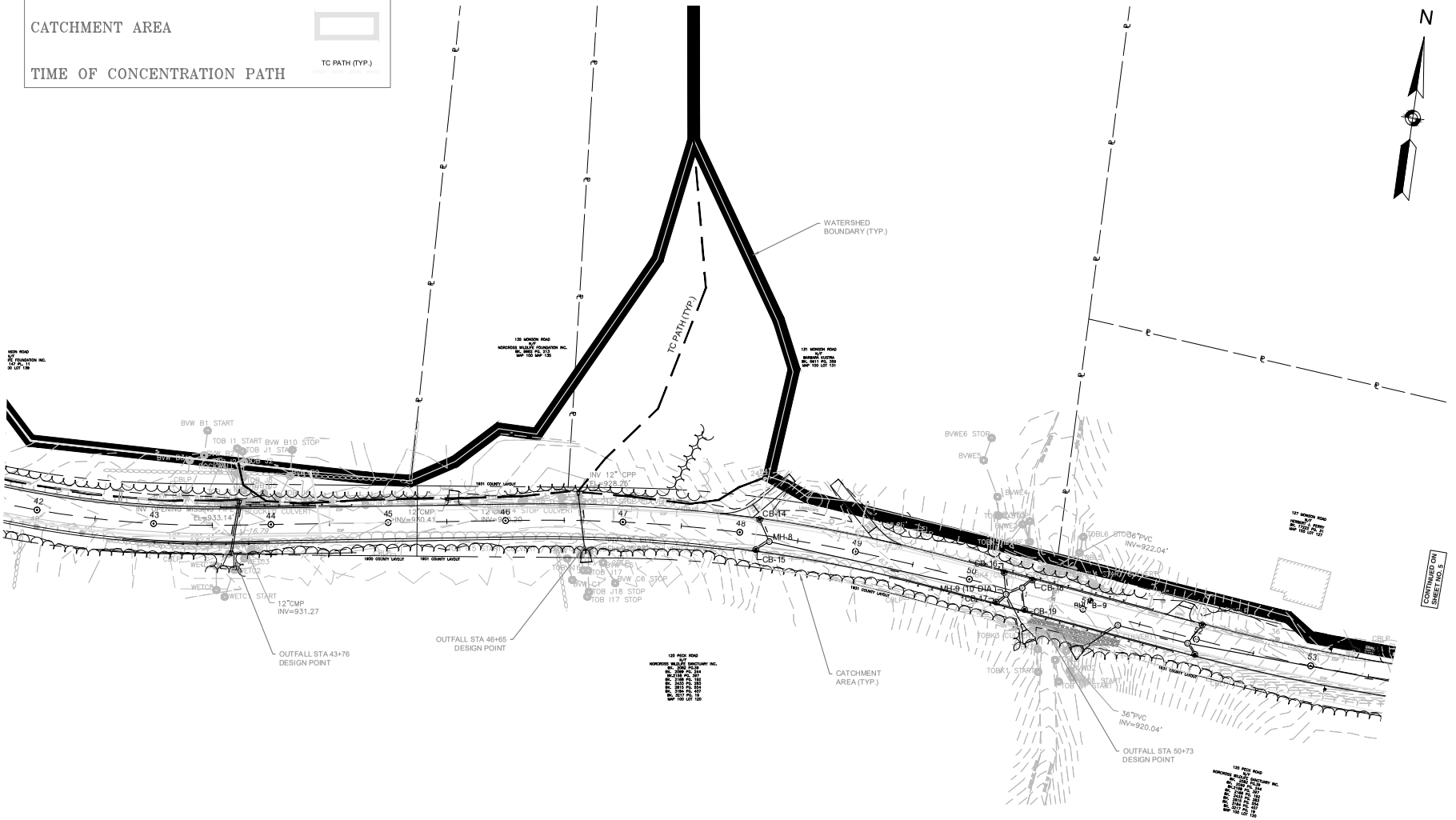
SCALE: 1"=40'

MONSON ROAD-DRAINAGE MAPS.DWG Plotted on 8-Apr-2024 11:49 AM
Proposal No. 608163-128112

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	8
PROJECT FILE NO.	608163		

DRAINAGE AREA MAPS



MONSON ROAD
DRAINAGE AREA MAP-4

SCALE: 1"=40'

MONSON ROAD -DRAINAGE MAPS.DWG Plotted on 8-Apr-2024 11:50 AM

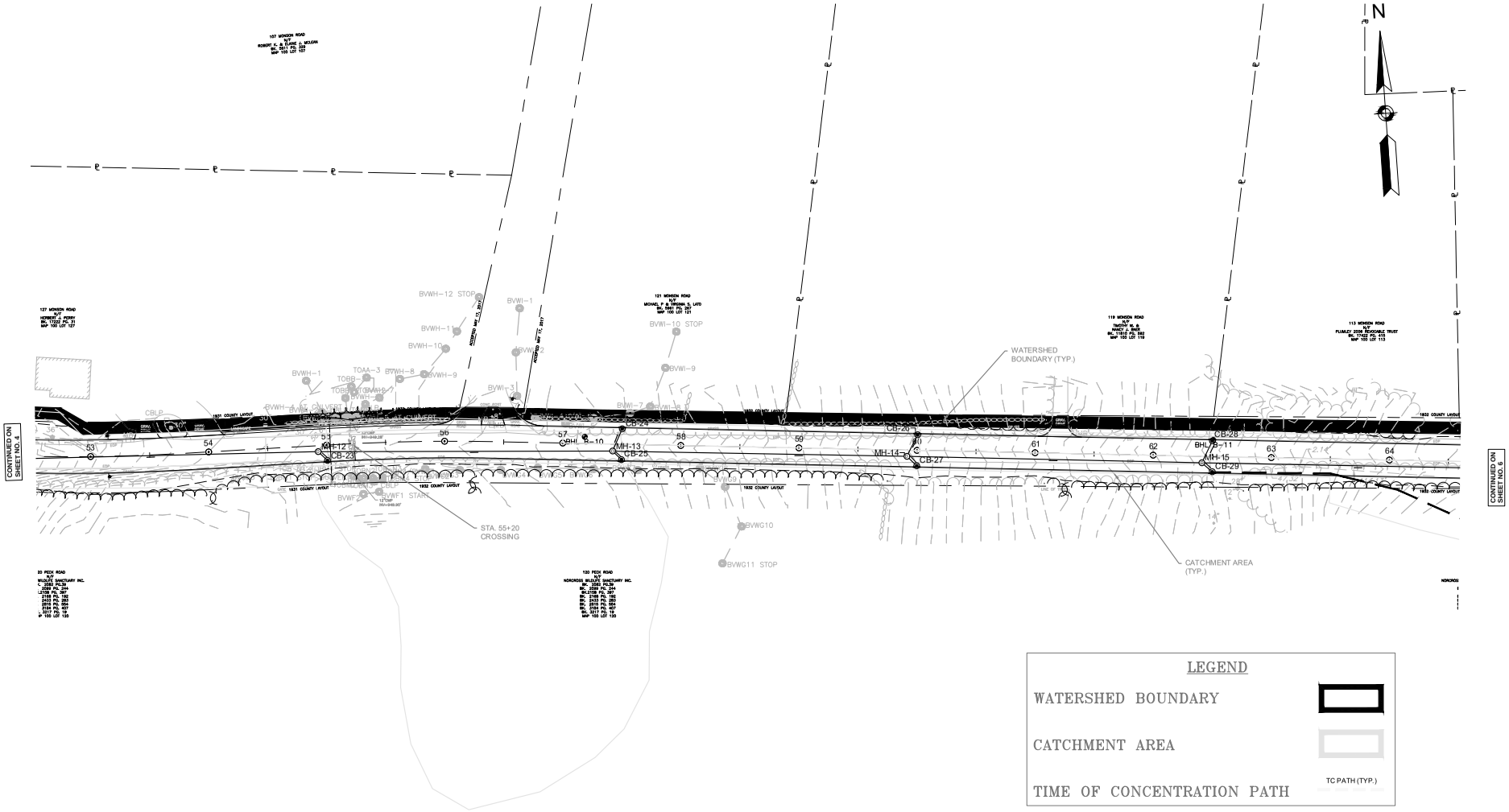
Proposal No. 608163-128112

A00830-784

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	8
PROJECT FILE NO.	608163		

DRAINAGE AREA MAPS



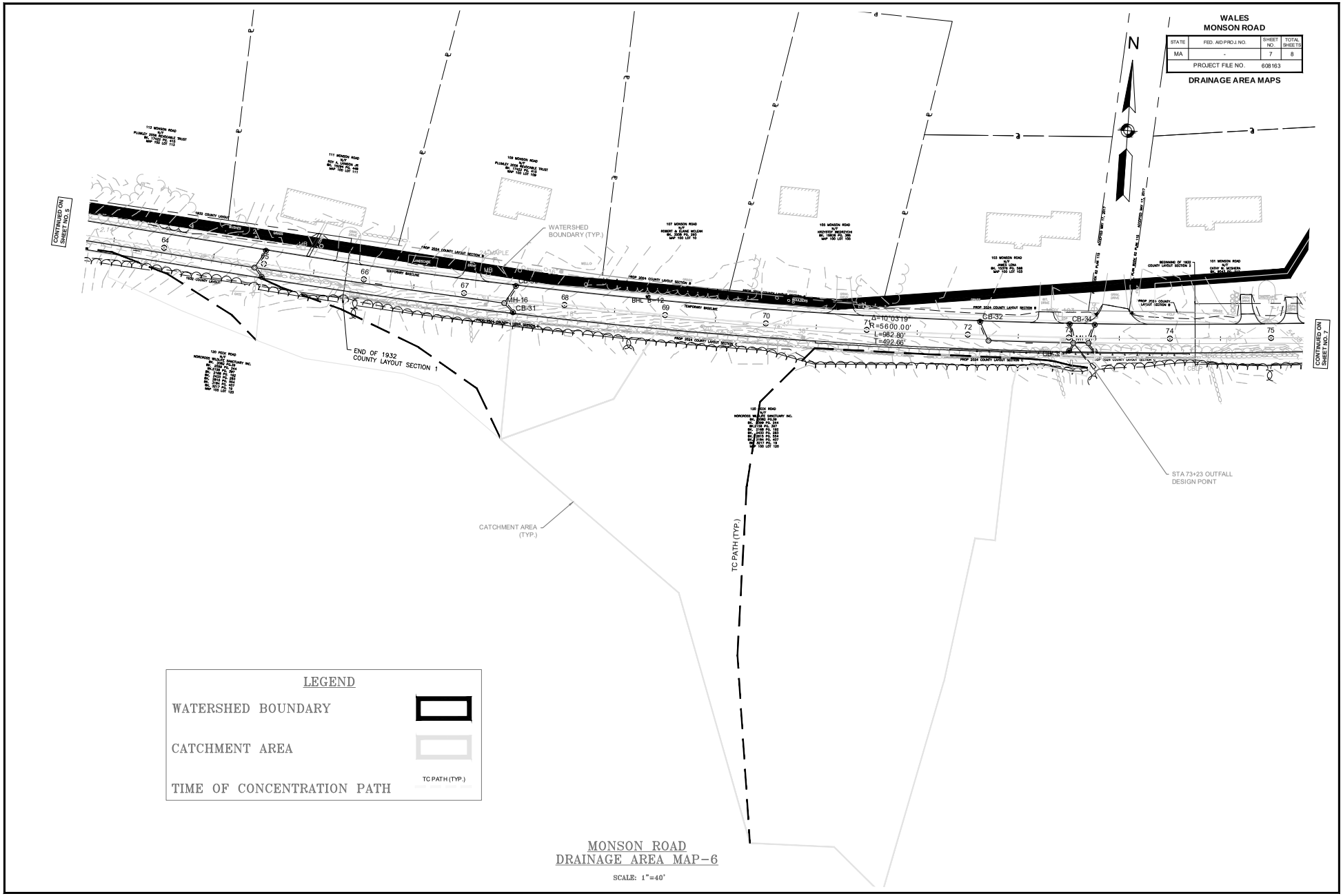
LEGEND

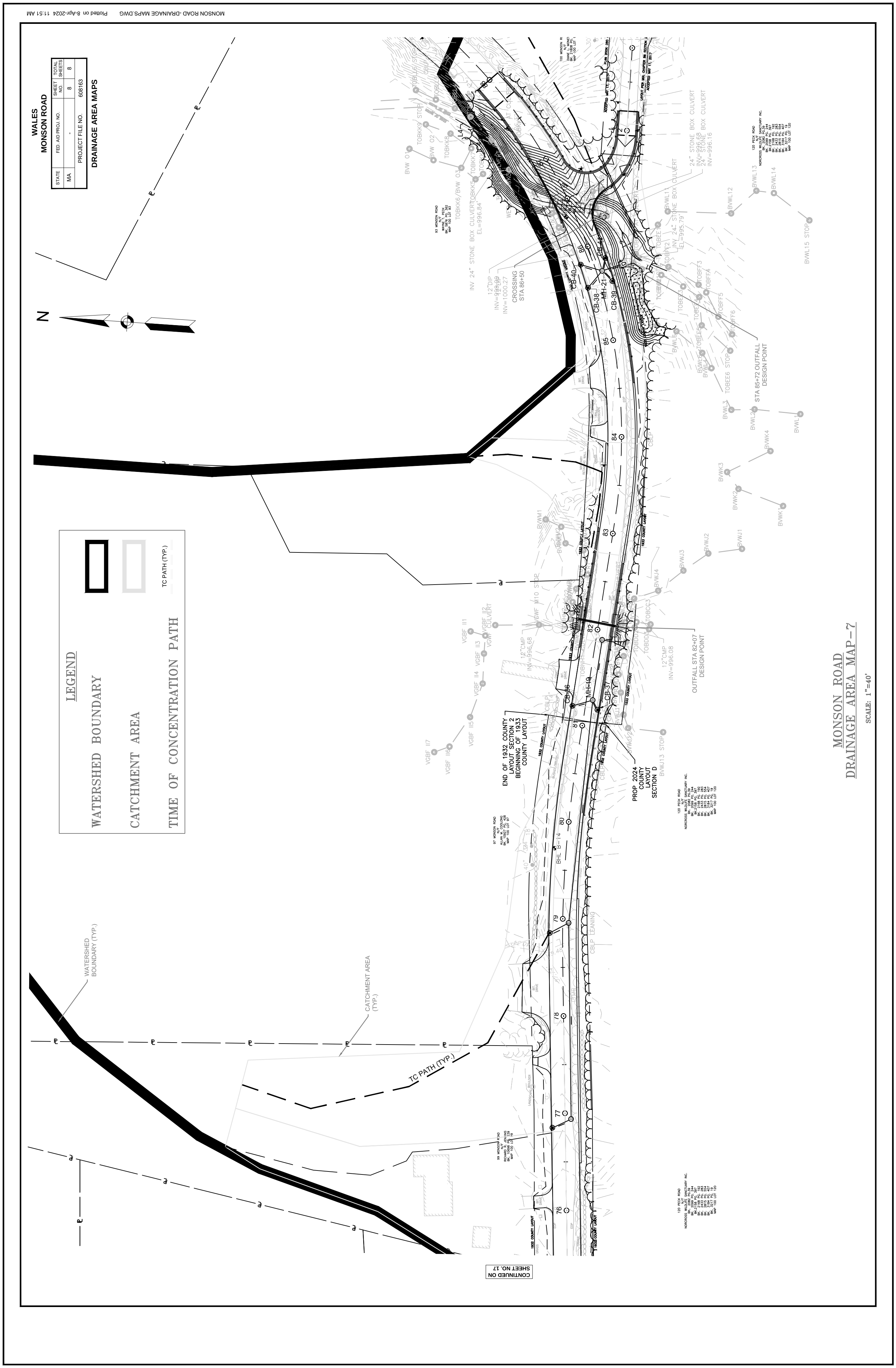
WATERSHED BOUNDARY	
CATCHMENT AREA	
TIME OF CONCENTRATION PATH	TC PATH (TYP.)

MONSON ROAD
DRAINAGE AREA MAP–5

SCALE: 1"=40'

MONSON ROAD-DRAINAGE MAPS.DWG Plotted on 8-Apr-2024 11:59 AM
Proposal No. 608163-1.26.1.2
A0080-785


WALES
MONSON ROAD
STATE | FED. AID PROJ. NO. | SHEET NO. | TOTAL SHEETS
MA | - | 7 | 8
PROJECT FILE NO. 608163
DRAINAGE AREA MAPS
N
CONTINUED ON SHEET NO. 6
CONTINUED ON SHEET NO. 7
WATERSHED BOUNDARY (TYP.)
END OF 1932 COUNTY LAYOUT SECTION 1
CATCHMENT AREA (TYP.)
TC PATH (TYP.)
STA 73+23 OUTFALL DESIGN POINT
Δ=10°03'19"
R=5600.00'
L=982.80'
T=492.66'
CB-31
CB-32
CB-34
MH-16
BHL B-12
LEGEND
WATERSHED BOUNDARY
CATCHMENT AREA
TIME OF CONCENTRATION PATH
TC PATH (TYP.)
MONSON ROAD
DRAINAGE AREA MAP-6
SCALE: 1"=40'
MONSON ROAD-DRAINAGE MAPS.DWG Plotted on 8-Apr-2024 11:50 AM
Project No. 608163.128127


MONSON ROAD -DRAINAGE MAPS.DWG
Plotted on 8-Apr-2024 11:51 AM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
-
SHEET NO.
8
TOTAL SHEETS
8
PROJECT FILE NO.
608163
DRAINAGE AREA MAPS
N
LEGEND
WATERSHED BOUNDARY
CATCHMENT AREA
TIME OF CONCENTRATION PATH
TC PATH (TYP.)
WATERSHED BOUNDARY (TYP.)
CATCHMENT AREA (TYP.)
CROSSING STA 86+50
STA 85+72 OUTFALL DESIGN POINT
OUTFALL STA 82+07 DESIGN POINT
END OF 1932 COUNTY LAYOUT SECTION 2 BEGINNING OF 1933 COUNTY LAYOUT
PROP 2024 COUNTY LAYOUT SECTION D
CB-40
CB-38
MH-21
CB-39
CB-36
MH-19
CB-37
24" STONE BOX CULVERT INV=996.68
24" STONE BOX CULVERT INV=996.16
INV 24" STONE BOX CULVERT EL=996.84'
INV 24" STONE BOX CULVERT EL=995.79'
12"DIP INV=999.99
12"DIP INV=1000.27
12"CMP INV=996.68
12"CMP INV=996.08
93 MONSON ROAD N/F WAYNE T. PECK BK. 5876 PG. 362 MAP 100 LOT 93
97 MONSON ROAD N/F ALLAN M. COOLONG BK. 10927 PG. 428 MAP 100 LOT 97
99 MONSON ROAD N/F RICHARD R. JENKINS BK. 10698 PG. 239 MAP 100 LOT 99
120 PECK ROAD N/F NORCROSS WILDLIFE SANCTUARY INC. BK. 2082 PG.39 BK. 2099 PG. 244 BK.2158 PG. 397 BK. 2168 PG. 192 BK. 2433 PG. 283 BK. 2815 PG. 554 BK. 3184 PG. 407 BK. 3217 PG. 19 MAP 100 LOT 120
76
77
78
79
80
81
82
83
84
85
86
1932 COUNTY LAYOUT
1933 COUNTY LAYOUT
CONTINUED ON SHEET NO. 17
MONSON ROAD
DRAINAGE AREA MAP-7
SCALE: 1"=40'

APPENDIX B

Rational Method Data

Monson Road Reconstruction
Wales, MA

Date: 4/8/2024
By: NSD
Checked By: RSV

Weston & Sampson

TABLE 1

PROPOSED DRAINAGE AREA SUMMARY SHEET
HYDRAFLOW ANALYSIS

Area		Area (s.f)	Area (ac.)	Impervious Area (s.f)	Grass Area (s.f)	Woods Area (s.f)	C-Value	Tc (min.)
Proposed Drainage System								
	STA 24+84							
CB1		48,140	**1.105**	2,722	7,922	37,496	0.26	11
CB2		24,150	**0.554**	5,996	16,154	2,000	0.44	5
CB3		9,479	**0.218**	5,061	4,418		0.62	5
CB3B		92,066	**2.114**	2,150	5,730	84,186	0.22	15
CB4		372	**0.009**	372			0.90	5
CB5		5,665	**0.130**	2,370	3,295		0.55	5
CB6		5,703	**0.131**	2,720	948	2,035	0.55	5
	STA 25+00							
CB7		4,854	**0.111**	4,050	804		0.80	5
CB8		7,359	**0.169**	6,261	1,098		0.81	5
	STA 50+61							
CB14		2,813	**0.065**	769	2,044		0.46	5
CB15		3,181	**0.073**	2,086		1,095	0.66	5
CB16		3,387	**0.078**	762	417	2,208	0.37	5
CB17		4,558	**0.105**	2,885	158	1,515	0.65	5
CB18		7,714	**0.177**	3,404	1,284	3,026	0.53	5
CB19		4,866	**0.112**	2,185	758	1,923	0.53	5
	STA 51+24							
CB20		9,120	**0.209**	6,483	1,406	1,231	0.71	5
CB21		6,026	**0.138**	2,414	1,437	2,175	0.50	5
CB22		2,673	**0.061**	1,854	819		0.72	5
CB23		6,334	**0.145**	5,584		750	0.82	5
CB24		5,414	**0.124**	4,364		1,050	0.76	5
CB25		4,912	**0.113**	4,350		562	0.82	5
CB26		4,444	**0.102**	3,664	780		0.79	5
CB27		3,941	**0.090**	3,578	363		0.84	5
CB28		5,465	**0.125**	3,756	1,709		0.71	5
CB29		10,177	**0.234**	3,549		6,628	0.44	5
CB28B		4,735	**0.109**	3,765	970		0.78	5
CB29B		23,495	**0.539**	3,627		19,868	0.31	7.3
CB30		4,950	**0.114**	3,994	956		0.78	5
CB31		14,123	**0.324**	2,122	12,001		0.39	5
	STA 73+30							
CB32		3,093	**0.071**	2,762	331		0.84	5
CB34		1,830	**0.042**	1,649	181		0.84	5
CB35		700	**0.016**	470	230		0.70	5
CB34B		11,104	**0.255**	4,501	6,603		0.54	5
CB35B		4,454	**0.102**	3,140	1,314		0.72	5
	STA 81+97							
CB36		6,857	**0.157**	1,065	5,792		0.39	5.0
CB36B		36,290	**0.833**	6,103	30,187		0.40	10.0
CB36C		31,245	**0.717**	5,437	25,808		0.40	10.0
CB37		5,183	**0.119**	4,845		338	0.85	5
	STA 85+72							
CB38		11,348	**0.261**	6,499	4,849		0.64	5
CB39		1,038	**0.024**	758		280	0.71	5
CB40		5,335	**0.122**	3,556	1,187	592	0.69	5
CB41		359	**0.008**	273	86		0.76	5

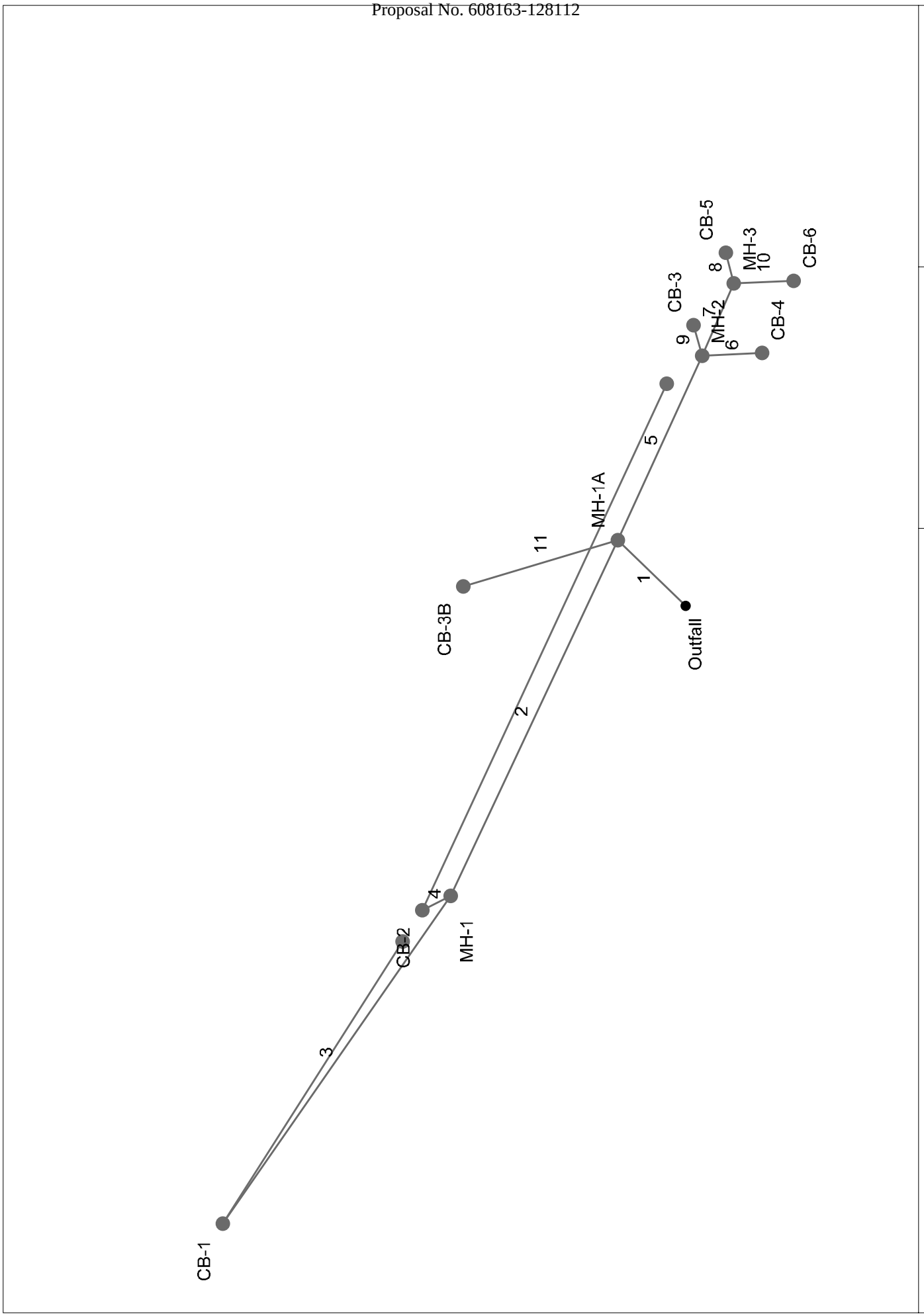
NOTES:
1) Refer to DA-1 - 3 for drainage areas.
2) C-Values were used based on Exhibit 8-8 of the MassDOT Project Development and Design Guide. Values given below.
3) Time of Concentrations (Tc) derived from Hydraflow (TR-55 Method). Refer to Tc computations included.
4) Minimum Tc used for paved areas = 5 min. and grassy areas = 10 min.

Land Cover		C
Impervious		0.9
Grass		0.3
Unimproved (Woods)		0.2

APPENDIX C

Hydraflow Reports

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan

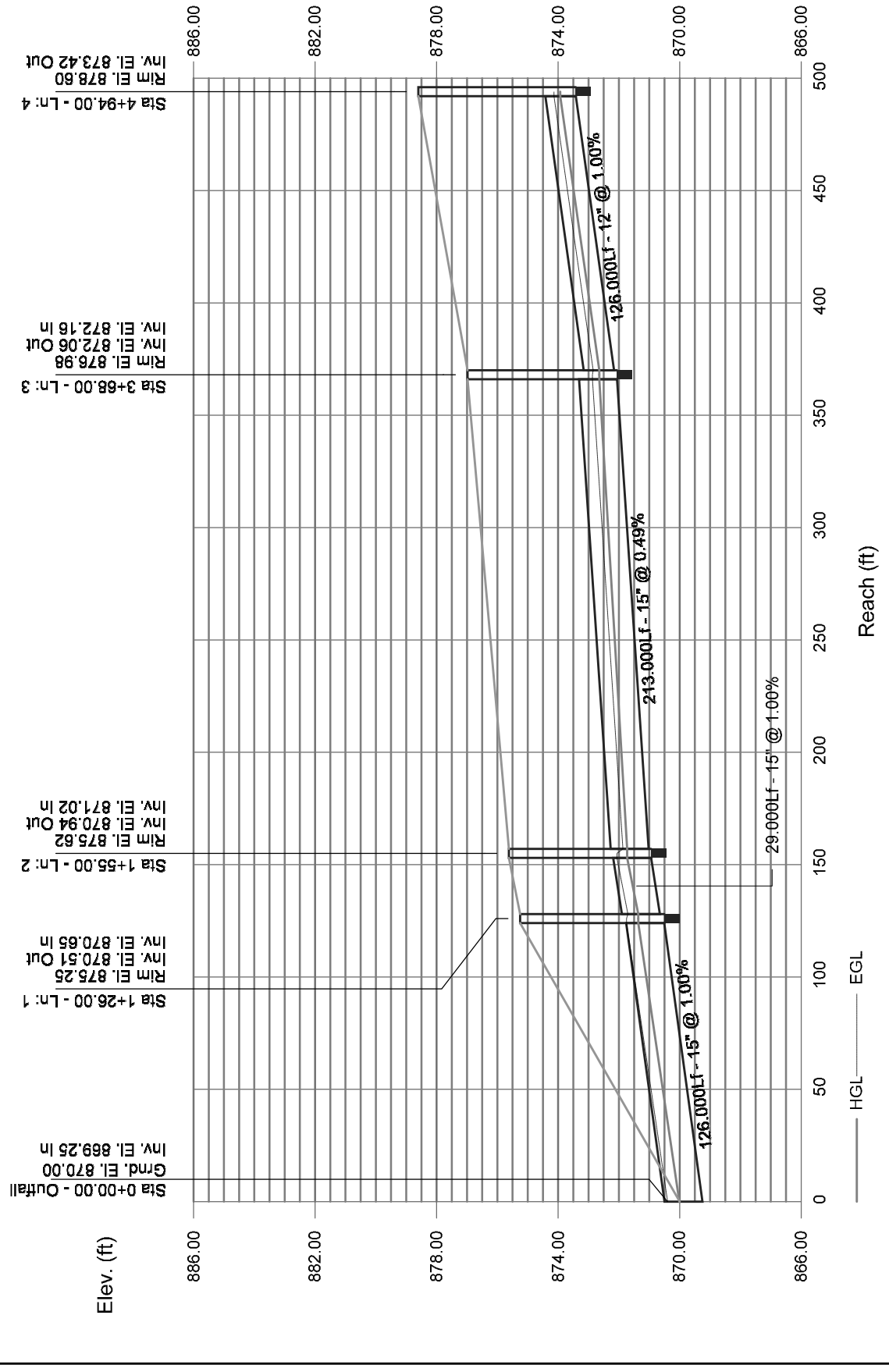


Project File: Sta.24+84-REV2.stm | Number of lines: 11 | Date: 3/15/2024

Storm Sewers v2023.00

Storm Sewer Profile

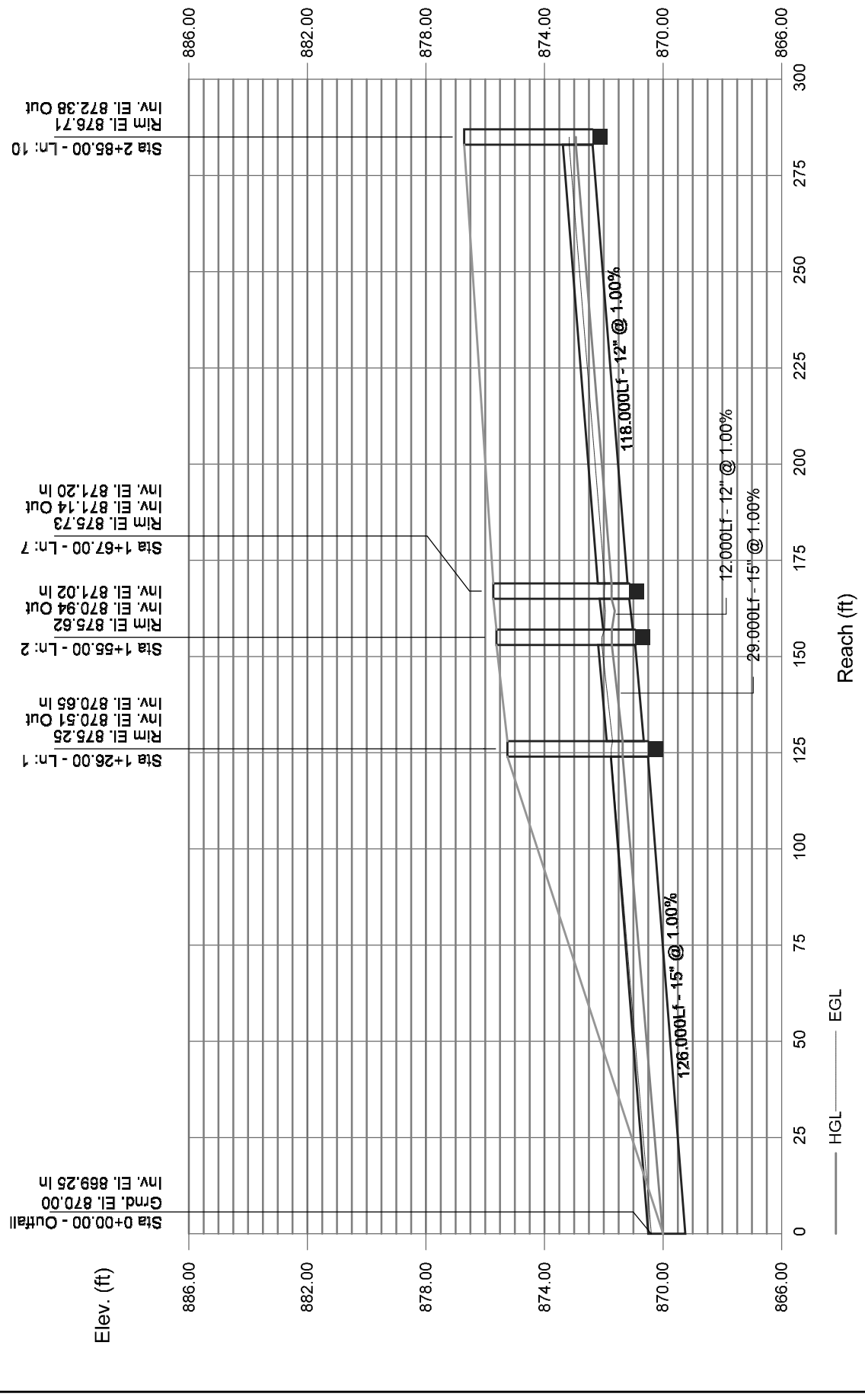
Proj. file: Sta.24+84.stm



Storm Sewers

Storm Sewer Profile

Proj. file: Sta.24+84.stm



Storm Sewers

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-1A	Manhole	875.51	Cir	4.00	4.00	15	Cir	869.82	12 12 12	Cir Cir Cir	870.00 870.00 870.00
2	MH-1	Manhole	876.90	Cir	4.00	4.00	12	Cir	872.06	12 12	Cir Cir	872.16 872.16
3	CB-1	Combination	878.65	Cir	4.00	4.00	12	Cir	873.42			
4	CB-2	Combination	876.63	Cir	4.00	4.00	12	Cir	872.26			
5	MH-2	Manhole	875.15	Cir	4.00	4.00	12	Cir	870.68	12 12 12	Cir Cir Cir	871.02 870.75 871.02
6	CB-4	Combination	874.99	Cir	4.00	4.00	12	Cir	871.22			
7	MH-3	Manhole	875.16	Cir	4.00	4.00	12	Cir	870.88	12 12	Cir Cir	871.00 871.00
8	CB-5	Combination	875.45	Cir	4.00	4.00	12	Cir	871.12			
9	CB-3	Combination	874.99	Cir	4.00	4.00	12	Cir	871.14			
10	CB-6	Combination	875.54	Cir	4.00	4.00	12	Cir	871.21			
11	CB-3B	Combination	874.88	Cir	4.00	4.00	12	Cir	870.55			

Project File: Sta.24+84-REV2.stm | Number of Structures: 11 | Run Date: 3/15/2024

A00830 -794

Proposal No. 608163-128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	30.000	0.00	4.26	0.00	0.00	1.22	0.0	15.9	3.7	4.51	5.78	5.11	15	1.07	869.50	869.82	870.33	870.68	870.75	875.51	MH1A-OUTLET
2	1	124.000	0.00	1.66	0.00	0.00	0.50	0.0	11.6	4.3	2.14	3.98	3.96	12	1.66	870.00	872.06	870.68	872.69	875.51	876.90	MH1-MH1A
3	2	126.000	1.11	1.11	0.30	0.33	0.33	11.1	11.1	4.4	1.47	3.56	3.56	12	1.00	872.16	873.42	872.69	873.93	876.90	878.65	CB1-MH1
4	2	10.000	0.55	0.55	0.30	0.17	0.17	5.0	5.0	5.9	0.97	3.56	2.75	12	1.00	872.16	872.26	872.69	872.67	876.90	876.63	CB2-MH1
5	1	64.000	0.00	0.49	0.00	0.00	0.25	0.0	5.4	5.8	1.46	3.67	3.09	12	1.06	870.00	870.68	870.68	871.19	875.51	875.15	MH2-MH1A
6	5	19.000	0.01	0.01	0.50	0.01	0.01	5.0	5.0	5.9	0.03	3.65	0.78	12	1.05	871.02	871.22	871.19	871.29	875.15	874.99	CB4-MH2
7	5	25.000	0.00	0.26	0.00	0.00	0.18	0.0	5.2	5.9	1.07	2.57	3.12	12	0.52	870.75	870.88	871.20	871.33	875.15	875.16	MH3-MH2
8	7	10.000	0.13	0.13	0.70	0.09	0.09	5.0	5.0	5.9	0.54	3.90	2.08	12	1.20	871.00	871.12	871.47	871.42	875.16	875.45	CB5-MH3
9	5	10.000	0.22	0.22	0.30	0.07	0.07	5.0	5.0	5.9	0.39	3.38	2.65	12	1.20	871.02	871.14	871.25	871.40	875.15	874.99	CB3-MH2
10	7	19.000	0.13	0.13	0.70	0.09	0.09	5.0	5.0	5.9	0.54	3.74	2.08	12	1.11	871.00	871.21	871.47	871.51	875.16	875.54	CB6-MH3
11	1	51.000	2.11	2.11	0.22	0.46	0.46	15.7	15.7	3.7	1.74	3.70	3.44	12	1.08	870.00	870.55	870.68	871.11	875.51	874.88	CB3B-MH1A

Project File: Sta.24+84-REV2.stm | Number of lines: 11 | Run Date: 3/15/2024

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

A00830 -795

Proposal No. 608163-128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-1A	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-1	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	CB-1	1.47	0.00	1.07	0.40	Comb	2.0	2.00	0.00	2.00	2.00	0.014	4.00	0.045	0.020	0.013	0.20	4.86	0.29	2.69	2.0	4
4	CB-2	0.97	0.40	1.13	0.24	Comb	2.0	2.00	0.00	2.00	2.00	0.014	4.00	0.057	0.057	0.013	0.21	3.69	0.28	1.92	2.0	9
5	MH-2	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
6	CB-4	0.03	0.00	0.03	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.12	0.76	0.05	0.76	2.0	Off
7	MH-3	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
8	CB-5	0.54	0.00	0.54	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.03	3.12	0.19	3.12	2.0	Off
9	CB-3	0.39	0.12	0.51	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.02	3.00	0.19	3.00	2.0	Off
10	CB-6	0.54	0.00	0.54	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.03	3.12	0.19	3.12	2.0	Off
11	CB-3B	1.74	0.00	1.74	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.17	8.35	0.33	8.35	2.0	Off

Project File: Sta.24+84-REV2.stm | Number of lines: 11 | Run Date: 3/15/2024

NOTES: Inlet N-Values = 0.016; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

A00830-796

Proposal No. 608163-128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	30.000	0.00	4.26	0.00	0.00	1.22	0.0	16.0	4.6	5.55	5.78	5.36	15	1.07	869.50	869.82	870.48	870.80	870.75	875.51	MH1A-OUTLET
2	1	124.000	0.00	1.66	0.00	0.00	0.50	0.0	11.6	5.3	2.64	3.98	3.94	12	1.66	870.00	872.06	871.25	872.76	875.51	876.90	MH1-MH1A
3	2	126.000	1.11	1.11	0.30	0.33	0.33	11.1	11.1	5.4	1.80	3.56	3.79	12	1.00	872.16	873.42	872.76	873.99	876.90	878.65	CB1-MH1
4	2	10.000	0.55	0.55	0.30	0.17	0.17	5.0	5.0	7.2	1.19	3.56	2.91	12	1.00	872.16	872.26	872.76	872.72	876.90	876.63	CB2-MH1
5	1	64.000	0.00	0.49	0.00	0.00	0.25	0.0	5.5	7.0	1.78	3.67	2.64	12	1.06	870.00	870.68	871.25	871.38	875.51	875.15	MH2-MH1A
6	5	19.000	0.01	0.01	0.50	0.01	0.01	5.0	5.0	7.2	0.04	3.65	0.69	12	1.05	871.02	871.22	871.51	871.30	875.15	874.99	CB4-MH2
7	5	25.000	0.00	0.26	0.00	0.00	0.18	0.0	5.2	7.1	1.30	2.57	2.21	12	0.52	870.75	870.88	871.51	871.53	875.15	875.16	MH3-MH2
8	7	10.000	0.13	0.13	0.70	0.09	0.09	5.0	5.0	7.2	0.66	3.90	2.06	12	1.20	871.00	871.12	871.62	871.46	875.16	875.45	CB5-MH3
9	5	10.000	0.22	0.22	0.30	0.07	0.07	5.0	5.0	7.2	0.48	3.38	1.91	12	1.20	871.02	871.14	871.51	871.43	875.15	874.99	CB3-MH2
10	7	19.000	0.13	0.13	0.70	0.09	0.09	5.0	5.0	7.2	0.66	3.74	2.06	12	1.11	871.00	871.21	871.62	871.55	875.16	875.54	CB6-MH3
11	1	51.000	2.11	2.11	0.22	0.46	0.46	15.7	15.7	4.6	2.14	3.70	2.86	12	1.08	870.00	870.55	871.25	871.40	875.51	874.88	CB3B-MH1A

Project File: Sta.24+84-REV2.stm

Number of lines: 11

Run Date: 4/8/2024

NOTES:Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

A00830 -797

Proposal No. 608163-128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-1A	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-1	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	CB-1	1.80	0.00	1.25	0.55	Comb	2.0	2.00	0.00	2.00	2.00	0.014	4.00	0.045	0.020	0.013	0.21	5.63	0.30	3.04	2.0	4
4	CB-2	1.19	0.55	1.36	0.38	Comb	2.0	2.00	0.00	2.00	2.00	0.014	4.00	0.057	0.057	0.013	0.23	4.03	0.30	2.27	2.0	9
5	MH-2	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
6	CB-4	0.04	0.00	0.04	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.11	0.85	0.05	0.85	2.0	Off
7	MH-3	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
8	CB-5	0.66	0.00	0.66	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.05	3.57	0.22	3.57	2.0	Off
9	CB-3	0.48	0.38	0.85	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.09	4.38	0.25	4.38	2.0	Off
10	CB-6	0.66	0.00	0.66	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.05	3.57	0.22	3.57	2.0	Off
11	CB-3B	2.14	0.00	2.14	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.20	9.92	0.37	9.92	2.0	Off

Project File: Sta.24+84-REV2.stm | Number of lines: 11 | Run Date: 4/8/2024

NOTES: Inlet N-Values = 0.016; Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

A00830 -798

Proposal No. 608163-128112

Storm Sewer Inlet Time Tabulation

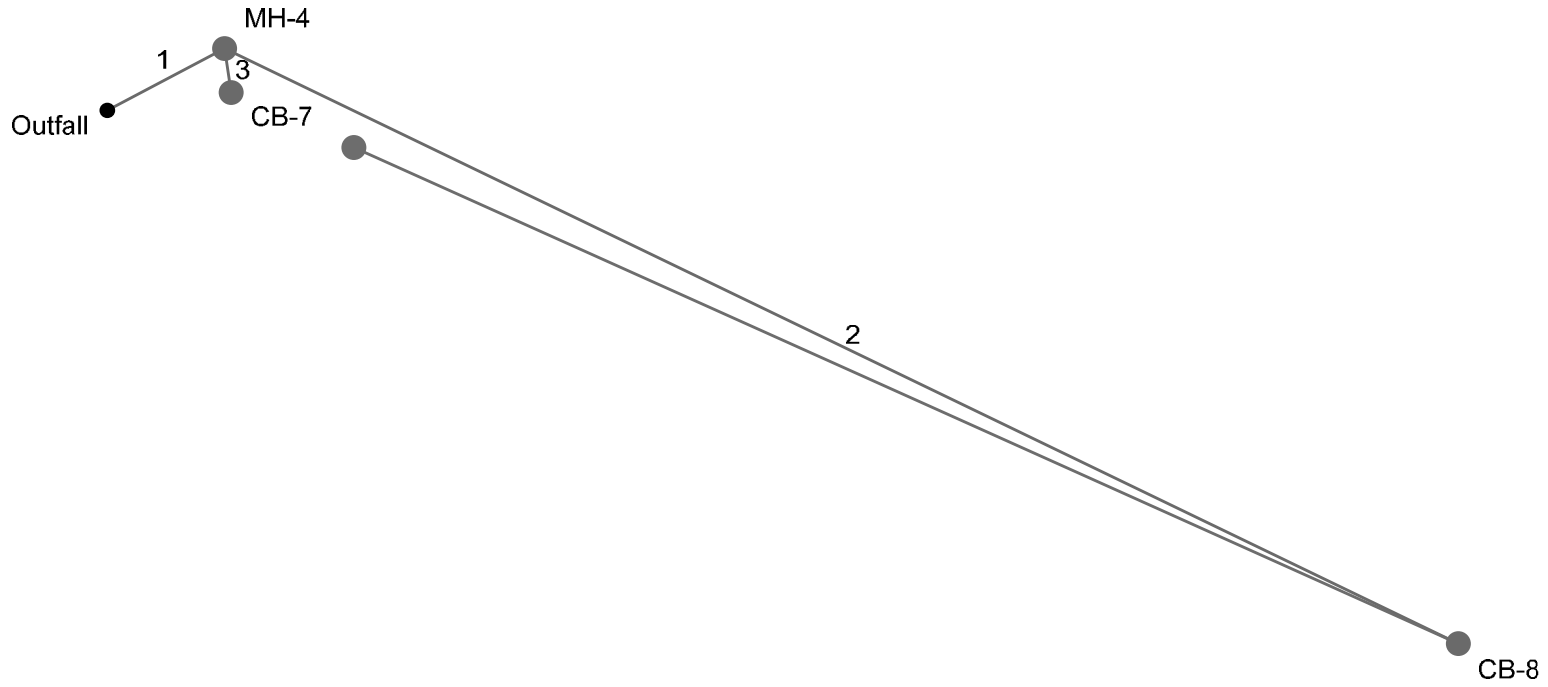
Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	MH1A-OUTLET	User																		0.00
2	MH1-MH1A	User																		0.00
3	CB1-MH1	TR55	0.800	30.00	3.10	5.00	10.05	270.00	7.70	UnPaved	4.48	1.01								11.05
4	CB2-MH1	TR55	0.240	33.00	3.10	5.80	3.90	300.00	8.00	UnPaved	4.56	1.10								5.00
5	MH2-MH1A	User																		0.00
6	CB4-MH2	User																		5.00
7	MH3-MH2	User																		0.00
8	CB5-MH3	User																		5.00
9	CB3-MH2	User																		5.00
10	CB6-MH3	User																		5.00
11	CB3B-MH1A	TR55	0.400	50.00	3.10	1.76	13.19	480.00	4.00	UnPaved	3.23	2.48								15.67

Project File: Sta.24+84-REV2.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 11 | Date: 3/15/2024

A00830 -799

Proposal No. 608163-128112

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



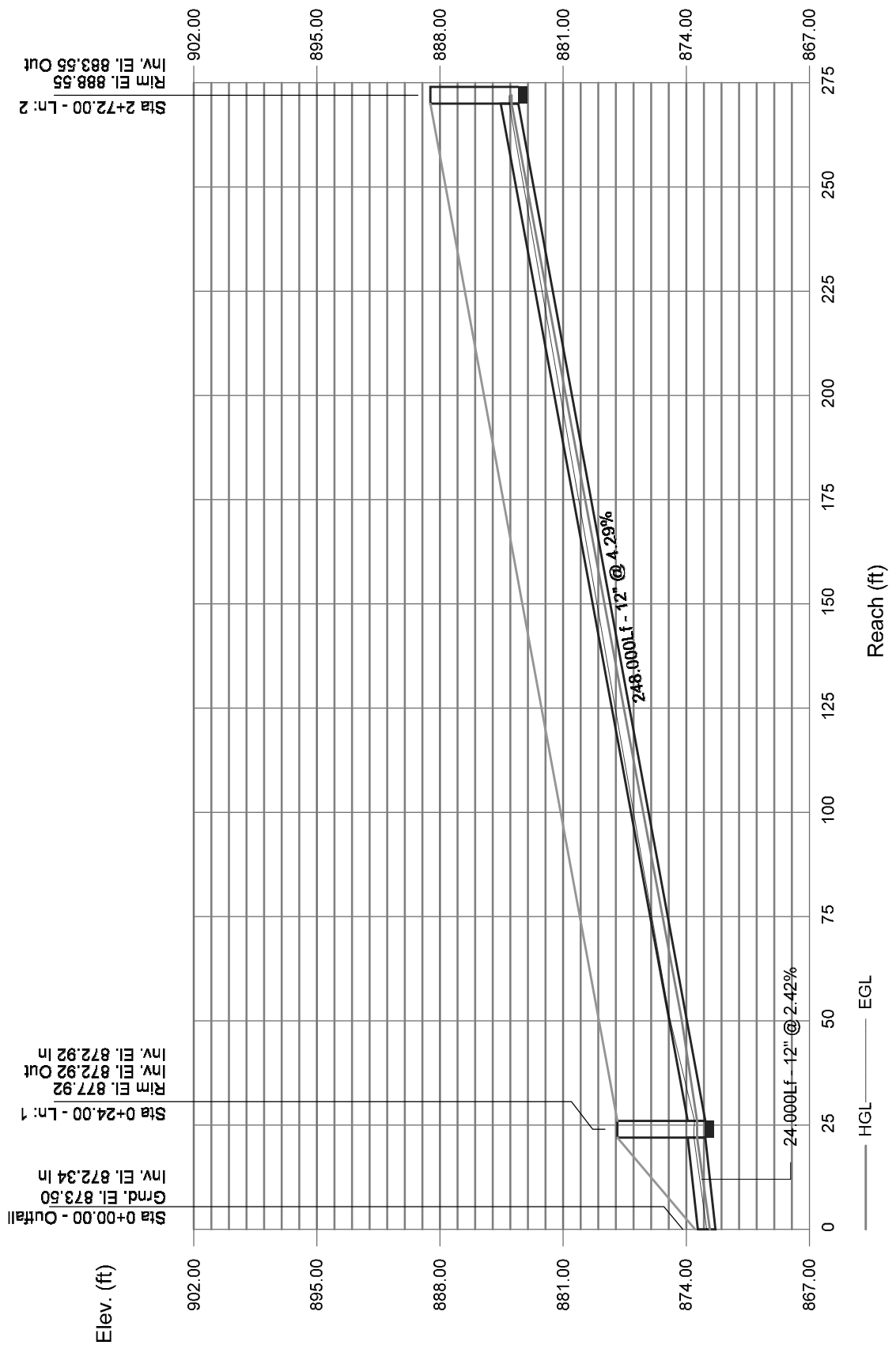
A00830 -800

Proposal No. 608163-128112

Project File: Sta.25+00.stm	Number of lines: 3	Date: 12/5/2023

Storm Sewer Profile

Proj. file: Sta.25+00.stm



Storm Sewers

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-4	Manhole	877.92	Cir	4.00	4.00	12	Cir	872.92	12 12	Cir Cir	872.92 872.92
2	CB-8	Combination	888.55	Cir	4.00	4.00	12	Cir	883.55			
3	CB-7	Combination	877.89	Cir	4.00	4.00	12	Cir	873.06			

Project File: Sta.25+00.stm | Number of Structures: 3 | Run Date: 12/5/2023

A00830 -802

Proposal No. 608163-128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	24.000	0.00	0.28	0.00	0.00	0.23	0.0	6.6	5.4	1.22	5.54	4.53	12	2.42	872.34	872.92	872.66	873.39	873.50	877.92	MH4-OUTLET
2	1	248.000	0.17	0.17	0.81	0.14	0.14	5.0	5.0	5.9	0.81	7.37	2.64	12	4.29	872.92	883.55	873.39	883.93	877.92	888.55	CB8-MH4
3	1	8.000	0.11	0.11	0.80	0.09	0.09	5.0	5.0	5.9	0.52	4.71	2.04	12	1.75	872.92	873.06	873.39	873.36	877.92	877.89	CB7-MH4

Project File: Sta.25+00.stm | Number of lines: 3 | Run Date: 12/5/2023

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

A00830 -803

Proposal No. 608163-128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-4	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	CB-8	0.81	0.00	0.59	0.23	Comb	2.0	2.00	0.00	2.00	2.00	0.060	4.00	0.020	0.020	0.013	0.09	4.42	0.22	2.74	2.0	3
3	CB-7	0.52	0.23	0.51	0.23	Comb	2.0	2.00	0.00	2.00	2.00	0.025	4.00	0.020	0.020	0.013	0.10	5.04	0.23	3.27	2.0	Off

Project File: Sta.25+00.stm | Number of lines: 3 | Run Date: 12/5/2023

NOTES: Inlet N-Values = 0.015; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

A00830 -804

Proposal No. 608163-128112

Storm Sewer Inlet Time Tabulation

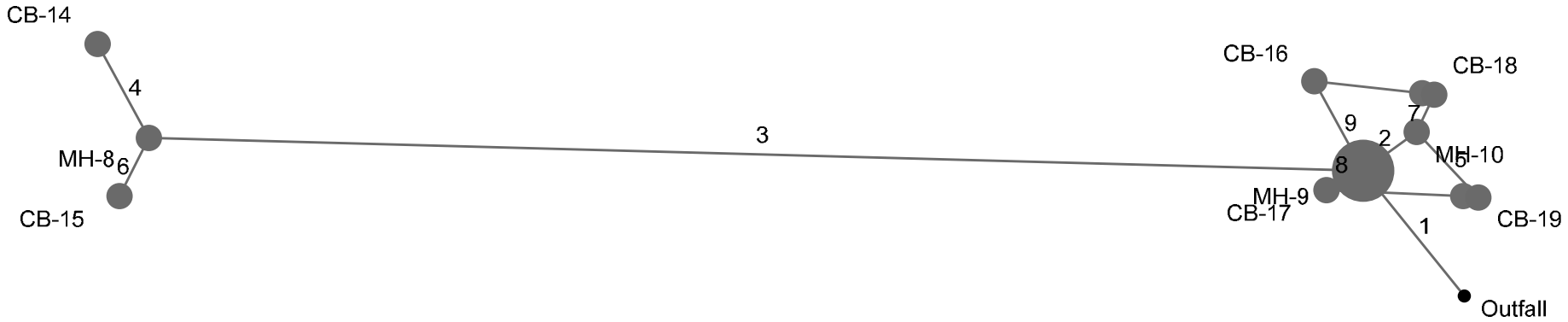
Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	MH4-OUTLET	User																		0.00
2	CB8-MH4	User																		5.00
3	CB7-MH4	User																		5.00

Project File: Sta.25+00.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 3 | Date: 12/5/2023

A00830 -805

Proposal No. 608163-128112

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



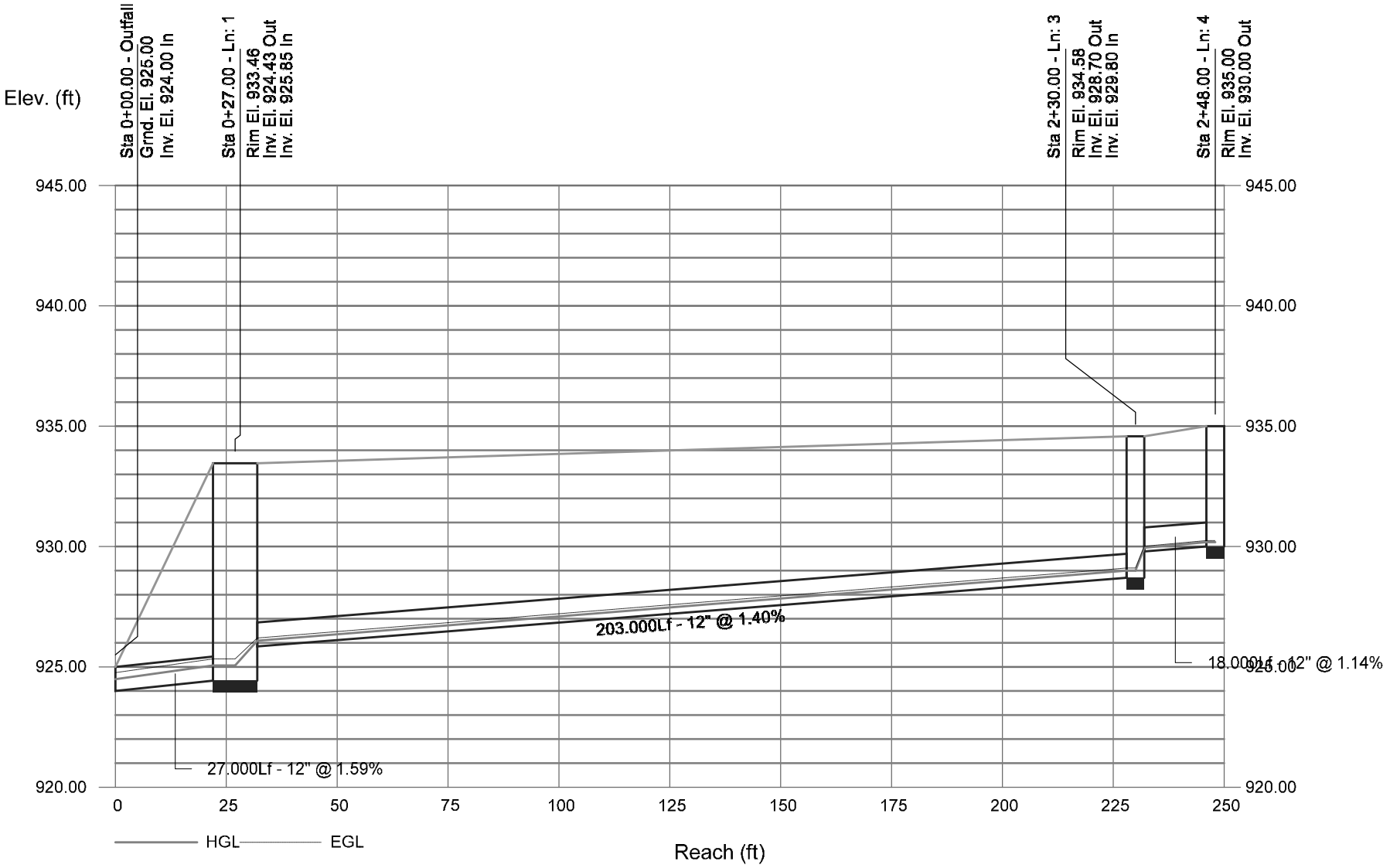
A00830 -806

Proposal No. 608163-128112

Project File: Sta.50+70.stm	Number of lines: 9	Date: 3/15/2024

Storm Sewer Profile

Proj. file: Sta.50+70.stm

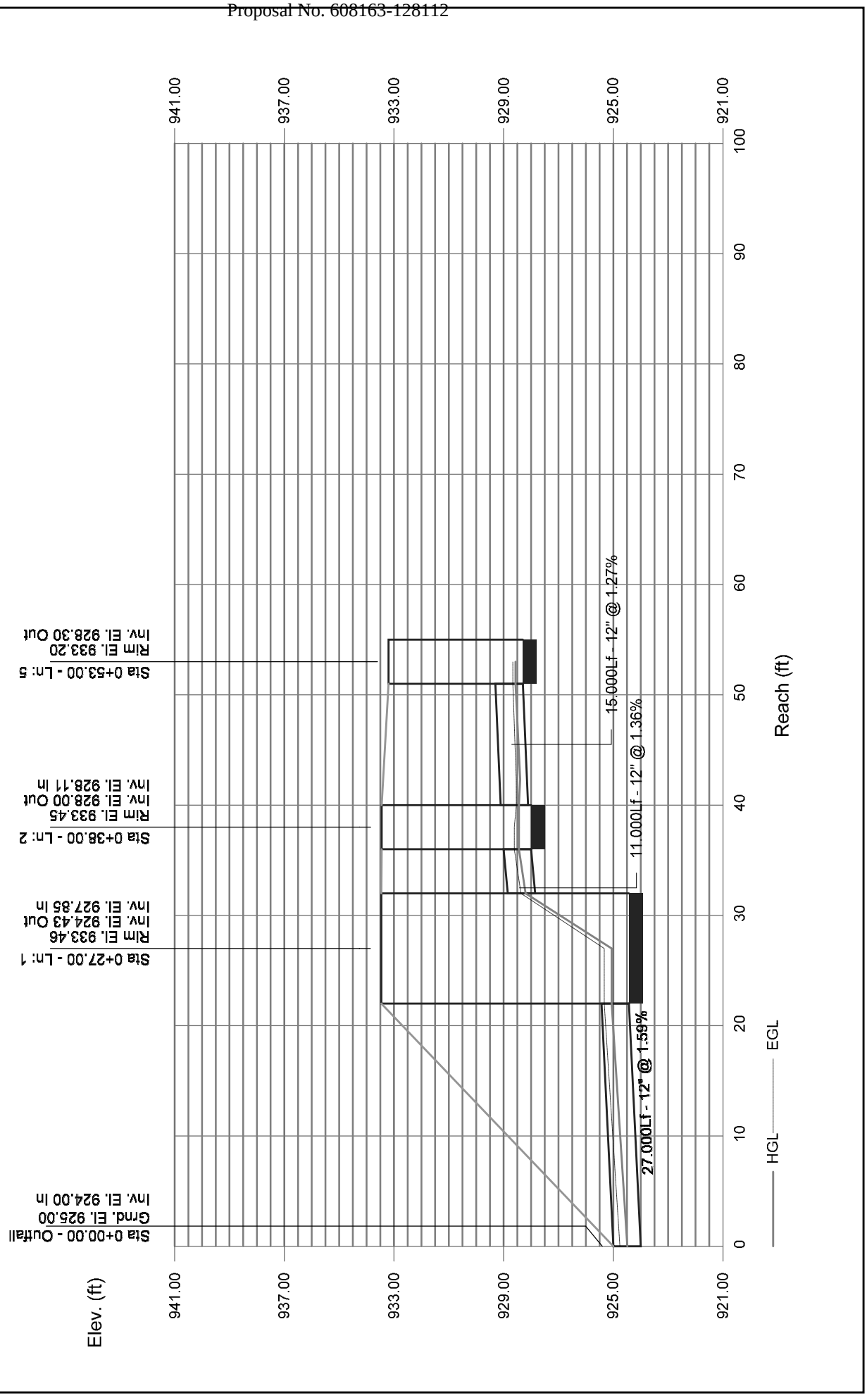


A00830 -807

Proposal No: 6081163-128112

Storm Sewer Profile

Proj. file: Sta.50+70.stm



Storm Sewers

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-9	Manhole	933.46	Cir	10.00	10.00	12	Cir	924.43	12 12 12 12	Cir Cir Cir Cir	927.85 925.85 928.26 928.44
2	MH-10	Manhole	933.45	Cir	4.00	4.00	12	Cir	928.00	12 12	Cir Cir	928.11 928.20
3	MH-8	Manhole	934.58	Cir	4.00	4.00	12	Cir	928.70	12 12	Cir Cir	929.80 928.84
4	CB-14	Combination	935.00	Cir	4.00	4.00	12	Cir	930.00			
5	CB-19	Combination	933.20	Cir	4.00	4.00	12	Cir	928.30			
6	CB-15	Combination	934.02	Cir	4.00	4.00	12	Cir	928.97			
7	CB-18	Combination	933.32	Cir	4.00	4.00	12	Cir	928.31			
8	CB-17	Combination	933.36	Cir	4.00	4.00	12	Cir	928.37			
9	CB-16	Combination	933.61	Cir	4.00	4.00	12	Cir	928.63			

Project File: Sta.50+70.stm | Number of Structures: 9 | Run Date: 3/15/2024

A00830 -809

Proposal No. 608163-128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	27.000	0.00	0.60	0.00	0.00	0.32	0.0	6.3	5.5	1.77	4.49	4.62	12	1.59	924.00	924.43	924.44	925.00	925.00	933.46	MH9-OUTLET
2	1	11.000	0.00	0.29	0.00	0.00	0.15	0.0	5.1	5.9	0.90	4.16	3.66	12	1.36	927.85	928.00	928.17	928.40	933.46	933.45	MH10-MH9
3	1	203.000	0.00	0.13	0.00	0.00	0.07	0.0	5.1	5.9	0.43	4.22	2.98	12	1.40	925.85	928.70	926.07	928.97	933.46	934.58	MH8-MH9
4	3	18.000	0.06	0.06	0.46	0.03	0.03	5.0	5.0	5.9	0.16	3.80	2.16	12	1.14	929.80	930.00	929.94	930.17	934.58	935.00	CB14-MH8
5	2	15.000	0.11	0.11	0.53	0.06	0.06	5.0	5.0	5.9	0.34	4.01	2.10	12	1.27	928.11	928.30	928.40	928.54	933.45	933.20	CB19-MH10
6	3	11.000	0.07	0.07	0.66	0.05	0.05	5.0	5.0	5.9	0.27	3.87	2.52	12	1.18	928.84	928.97	929.02	929.18	934.58	934.02	CB15-MH8
7	2	7.000	0.18	0.18	0.53	0.10	0.10	5.0	5.0	5.9	0.56	4.46	3.29	12	1.57	928.20	928.31	928.44	928.62	933.45	933.32	CB18-MH10
8	1	7.000	0.10	0.10	0.65	0.07	0.07	5.0	5.0	5.9	0.38	4.46	2.95	12	1.57	928.26	928.37	928.46	928.63	933.46	933.36	CB17-MH9
9	1	17.000	0.08	0.08	0.37	0.03	0.03	5.0	5.0	5.9	0.17	3.76	2.20	12	1.12	928.44	928.63	928.59	928.80	933.46	933.61	CB16-MH9

Project File: Sta.50+70.stm

Number of lines: 9

Run Date: 3/15/2024

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

A00830 -810

Proposal No. 608163-128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-9	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-10	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	MH-8	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
4	CB-14	0.16	0.00	0.15	0.01	Comb	2.0	2.00	0.00	2.00	2.00	0.018	4.00	0.020	0.020	0.013	0.06	3.02	0.19	1.22	2.0	Off
5	CB-19	0.34	0.09	0.44	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.00	2.73	0.17	2.73	2.0	Off
6	CB-15	0.27	0.00	0.27	0.00	Comb	2.0	2.00	0.00	2.00	2.00	0.018	4.00	0.048	0.048	0.013	0.10	2.12	0.17	0.13	2.0	Off
7	CB-18	0.56	0.02	0.58	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.04	3.30	0.20	3.30	2.0	Off
8	CB-17	0.38	0.00	0.29	0.09	Comb	2.0	2.00	0.00	2.00	2.00	0.013	4.00	0.020	0.020	0.013	0.09	4.44	0.22	2.63	2.0	5
9	CB-16	0.17	0.00	0.15	0.02	Comb	2.0	2.00	0.00	2.00	2.00	0.013	4.00	0.020	0.020	0.013	0.07	3.31	0.20	1.49	2.0	7

Project File: Sta.50+70.stm | Number of lines: 9 | Run Date: 3/15/2024

NOTES: Inlet N-Values = 0.016; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

A00830 -811

Proposal No. 608163-128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	27.000	0.00	0.60	0.00	0.00	0.32	0.0	6.2	6.7	2.17	4.49	4.92	12	1.59	924.00	924.43	924.49	925.06	925.00	933.46	MH9-OUTLET
2	1	11.000	0.00	0.29	0.00	0.00	0.15	0.0	5.1	7.2	1.10	4.16	3.88	12	1.36	927.85	928.00	928.20	928.44	933.46	933.45	MH10-MH9
3	1	203.000	0.00	0.13	0.00	0.00	0.07	0.0	5.1	7.2	0.53	4.22	3.16	12	1.40	925.85	928.70	926.09	929.00	933.46	934.58	MH8-MH9
4	3	18.000	0.06	0.06	0.46	0.03	0.03	5.0	5.0	7.2	0.20	3.80	2.29	12	1.14	929.80	930.00	929.95	930.18	934.58	935.00	CB14-MH8
5	2	15.000	0.11	0.11	0.53	0.06	0.06	5.0	5.0	7.2	0.42	4.01	2.17	12	1.27	928.11	928.30	928.44	928.57	933.45	933.20	CB19-MH10
6	3	11.000	0.07	0.07	0.66	0.05	0.05	5.0	5.0	7.2	0.33	3.87	2.67	12	1.18	928.84	928.97	929.04	929.21	934.58	934.02	CB15-MH8
7	2	7.000	0.18	0.18	0.53	0.10	0.10	5.0	5.0	7.2	0.69	4.46	3.49	12	1.57	928.20	928.31	928.47	928.66	933.45	933.32	CB18-MH10
8	1	7.000	0.10	0.10	0.65	0.07	0.07	5.0	5.0	7.2	0.47	4.46	3.12	12	1.57	928.26	928.37	928.48	928.65	933.46	933.36	CB17-MH9
9	1	17.000	0.08	0.08	0.37	0.03	0.03	5.0	5.0	7.2	0.21	3.76	2.33	12	1.12	928.44	928.63	928.60	928.82	933.46	933.61	CB16-MH9

Project File: Sta.50+70.stm

Number of lines: 9

Run Date: 4/8/2024

NOTES:Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

A00830 -812

Proposal No. 608163-128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-9	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-10	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	MH-8	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
4	CB-14	0.20	0.00	0.17	0.02	Comb	2.0	2.00	0.00	2.00	2.00	0.018	4.00	0.020	0.020	0.013	0.07	3.25	0.20	1.48	2.0	Off
5	CB-19	0.42	0.13	0.55	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.03	3.17	0.20	3.17	2.0	Off
6	CB-15	0.33	0.00	0.33	0.00	Comb	2.0	2.00	0.00	2.00	2.00	0.018	4.00	0.048	0.048	0.013	0.11	2.28	0.19	0.43	2.0	Off
7	CB-18	0.69	0.03	0.72	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.07	3.79	0.23	3.79	2.0	Off
8	CB-17	0.47	0.00	0.34	0.13	Comb	2.0	2.00	0.00	2.00	2.00	0.013	4.00	0.020	0.020	0.013	0.10	4.78	0.23	2.95	2.0	5
9	CB-16	0.21	0.00	0.18	0.03	Comb	2.0	2.00	0.00	2.00	2.00	0.013	4.00	0.020	0.020	0.013	0.07	3.56	0.20	1.76	2.0	7

Project File: Sta.50+70.stm | Number of lines: 9 | Run Date: 4/8/2024

NOTES: Inlet N-Values = 0.016; Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

A00830 -813

Proposal No. 608163-128112

Storm Sewer Inlet Time Tabulation

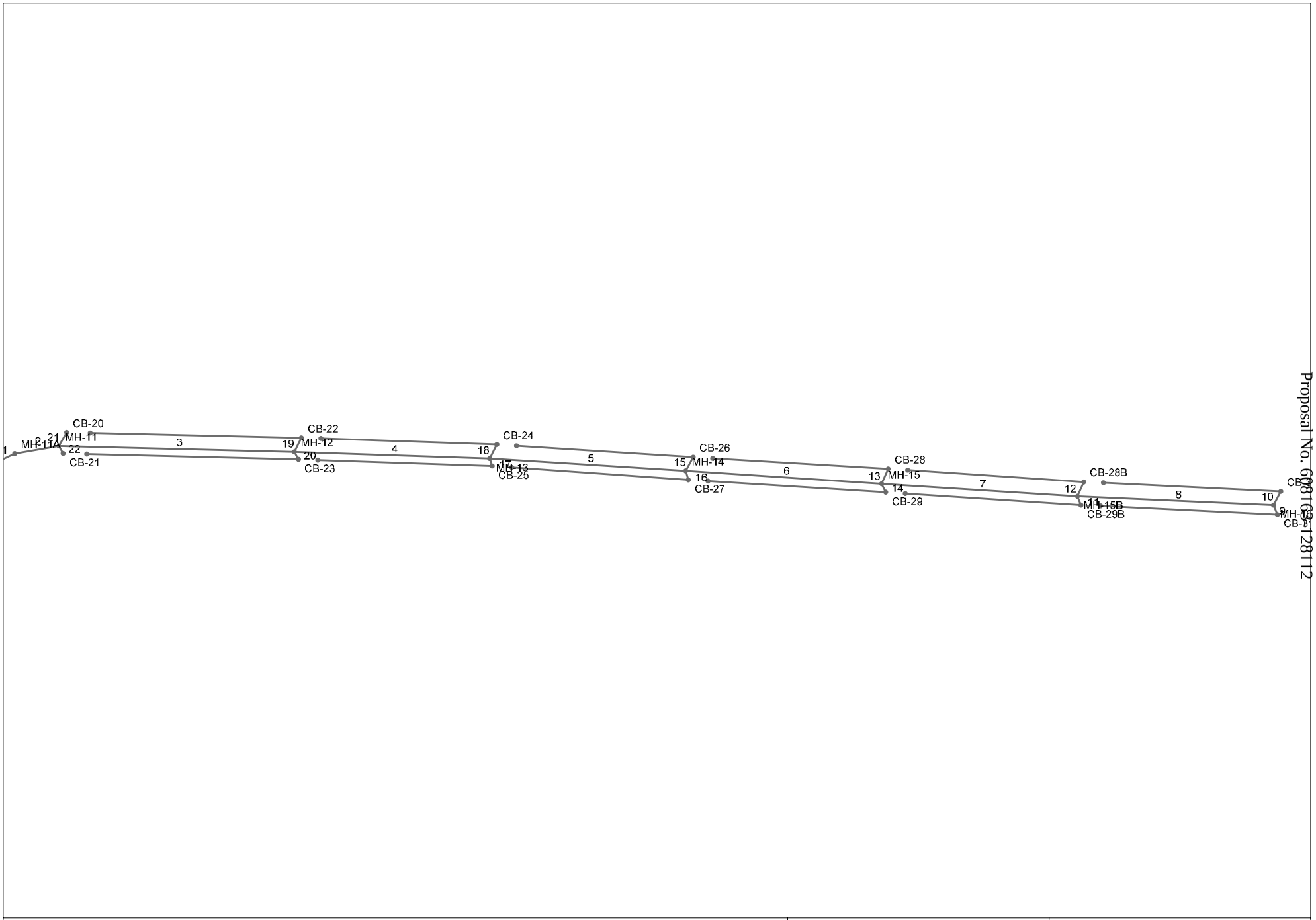
Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	MH9-OUTLET	User																		0.00
2	MH10-MH9	User																		0.00
3	MH8-MH9	User																		0.00
4	CB14-MH8	User																		5.00
5	CB19-MH10	User																		5.00
6	CB15-MH8	User																		5.00
7	CB18-MH10	User																		5.00
8	CB17-MH9	User																		5.00
9	CB16-MH9	User																		5.00

Project File: Sta.50+70.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 9 | Date: 3/15/2024

A00830 -814

Proposal No. 608163-128112

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Sta.51+24.stm	Number of lines: 22	Date: 3/15/2024

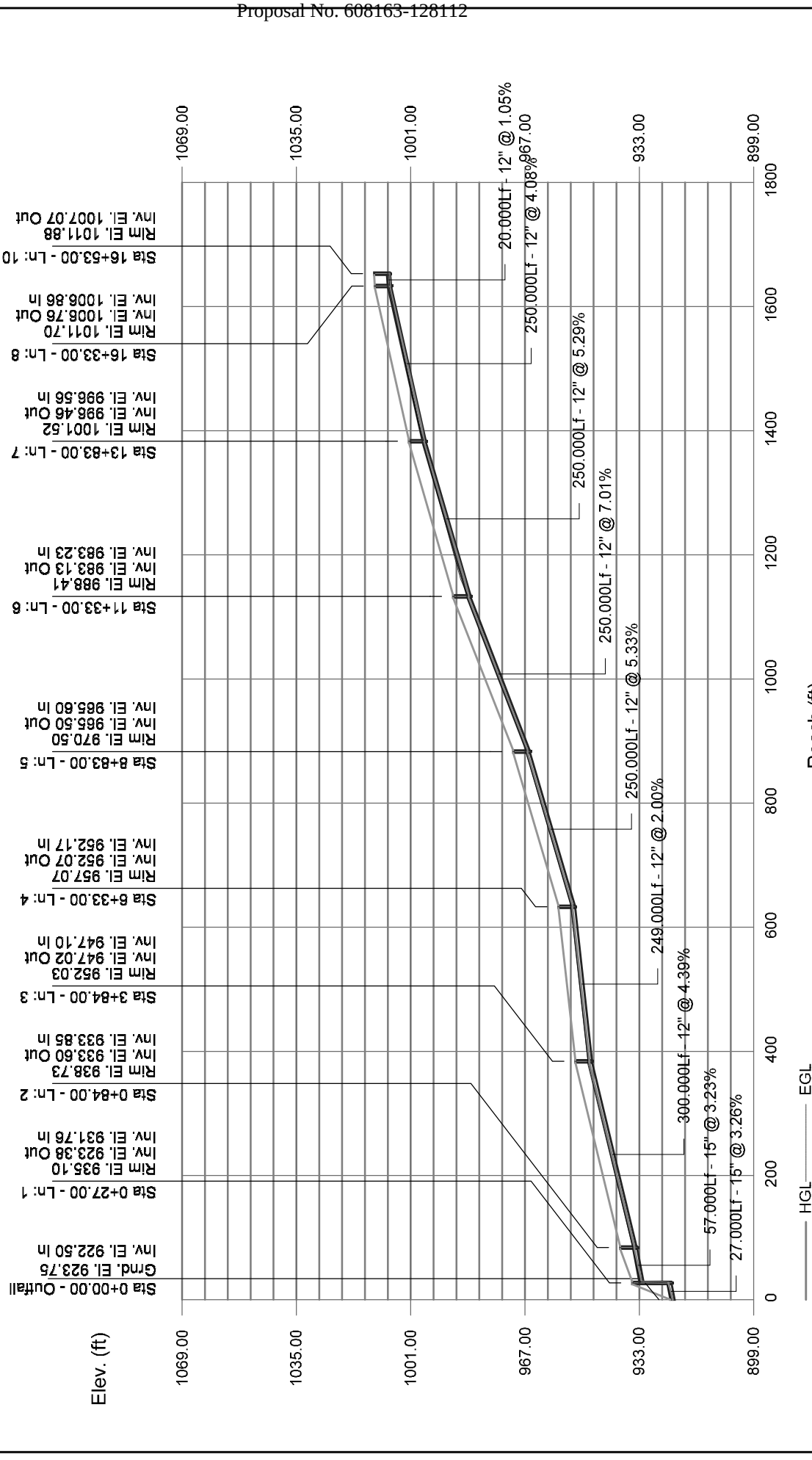
Storm Sewers v2023.00

A00830 -815

Proposal No. 6001691128112

Storm Sewer Profile

Proj. file: Sta.51+24.stm



Storm Sewers

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-11A	Manhole	935.10	Cir	4.00	4.00	15	Cir	923.38	15	Cir	931.76
2	MH-11	Manhole	938.73	Rect	4.00	4.00	15	Cir	933.60	12	Cir	933.85
										12	Cir	933.64
										12	Cir	934.36
3	MH-12	Manhole	952.03	Cir	4.00	4.00	12	Cir	947.02	12	Cir	947.10
										12	Cir	947.21
										12	Cir	947.12
4	MH-13	Manhole	957.07	Cir	4.00	4.00	12	Cir	952.07	12	Cir	952.17
										12	Cir	952.17
										12	Cir	952.17
5	MH-14	Manhole	970.50	Cir	4.00	4.00	12	Cir	965.50	12	Cir	965.60
										12	Cir	965.75
										12	Cir	965.82
6	MH-15	Manhole	988.41	Cir	4.00	4.00	12	Cir	983.13	12	Cir	983.23
										12	Cir	983.34
										12	Cir	983.45
7	MH-15B	Manhole	1001.52	Cir	4.00	4.00	12	Cir	996.46	12	Cir	996.56
										12	Cir	996.67
										12	Cir	996.56
8	MH-16	Manhole	1011.70	Cir	4.00	4.00	12	Cir	1006.76	12	Cir	1007.06
										12	Cir	1006.86
9	CB-31	Combination	1011.79	Cir	4.00	2.00	12	Cir	1007.19			
10	CB-30	Combination	1011.88	Cir	4.00	4.00	12	Cir	1007.07			
11	CB-29B	Combination	1001.78	Cir	4.00	4.00	12	Cir	996.78			
12	CB-28B	Combination	1001.70	Cir	4.00	4.00	12	Cir	996.76			
13	CB-28	Combination	988.60	Cir	4.00	4.00	12	Cir	983.54			
14	CB-29	Combination	988.57	Cir	4.00	4.00	12	Cir	983.57			
15	CB-26	Combination	970.98	Cir	4.00	4.00	12	Cir	965.95			
16	CB-27	Combination	970.94	Cir	4.00	4.00	12	Cir	965.94			

Project File: Sta.51+24.stm | Number of Structures: 22 | Run Date: 3/15/2024

A00830 -817

Proposal No. 608163-128112

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
17	CB-25	Combination	957.22	Cir	4.00	4.00	12	Cir	952.27			
18	CB-24	Combination	957.26	Cir	4.00	4.00	12	Cir	952.37			
19	CB-22	Combination	952.45	Cir	4.00	4.00	12	Cir	947.41			
20	CB-23	Combination	951.93	Cir	4.00	4.00	12	Cir	947.23			
21	CB-20	Combination	938.84	Cir	4.00	4.00	12	Cir	933.84			
22	CB-21	Combination	939.47	Cir	4.00	4.00	12	Cir	934.47			

Project File: Sta.51+24.stm | Number of Structures: 22 | Run Date: 3/15/2024

A00830 -818

Proposal No. 608163-128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	27.000	0.00	2.38	0.00	0.00	1.35	0.0	16.4	3.6	4.91	11.66	7.15	15	3.26	922.50	923.38	923.07	924.28	923.75	935.10	MH11A-OUTLET
2	1	57.000	0.00	2.38	0.00	0.00	1.35	0.0	16.3	3.7	4.94	11.60	7.14	15	3.23	931.76	933.60	932.33	934.50	935.10	938.73	MH11-MH11A
3	2	300.000	0.00	2.03	0.00	0.00	1.13	0.0	15.6	3.7	4.23	7.46	6.84	12	4.39	933.85	947.02	934.50	947.89	938.73	952.03	MH12-MH11
4	3	249.000	0.00	1.82	0.00	0.00	0.96	0.0	14.8	3.8	3.70	5.03	5.48	12	2.00	947.10	952.07	947.89	952.89	952.03	957.07	MH13-MH12
5	4	250.000	0.00	1.63	0.00	0.00	0.81	0.0	14.0	3.9	3.21	8.22	5.14	12	5.33	952.17	965.50	952.89	966.27	957.07	970.50	MH14-MH13
6	5	250.000	0.00	1.44	0.00	0.00	0.66	0.0	13.1	4.1	2.68	9.43	4.69	12	7.01	965.60	983.13	966.27	983.83	970.50	988.41	MH15-MH14
7	6	250.000	0.00	1.08	0.00	0.00	0.46	0.0	12.1	4.2	1.96	8.19	4.00	12	5.29	983.23	996.46	983.83	997.06	988.41	1001.52	MH15B-MH15
8	7	250.000	0.00	0.43	0.00	0.00	0.21	0.0	5.1	5.9	1.23	7.19	3.29	12	4.08	996.56	1006.76	997.06	1007.23	1001.52	1011.70	MH16-MH15B
9	8	13.000	0.32	0.32	0.39	0.12	0.12	5.0	5.0	5.9	0.74	3.56	3.25	12	1.00	1007.06	1007.19	1007.37	1007.55	1011.70	1011.79	CB31-MH16
10	8	20.000	0.11	0.11	0.78	0.09	0.09	5.0	5.0	5.9	0.51	3.65	2.27	12	1.05	1006.86	1007.07	1007.23	1007.37	1011.70	1011.88	CB30-MH16
11	7	12.000	0.54	0.54	0.31	0.17	0.17	12.0	12.0	4.2	0.71	3.41	2.71	12	0.92	996.67	996.78	997.06	997.13	1001.52	1001.78	CB29B-MH15B
12	7	20.000	0.11	0.11	0.78	0.09	0.09	5.0	5.0	5.9	0.51	3.56	1.96	12	1.00	996.56	996.76	997.06	997.06	1001.52	1001.70	CB28B-MH15B
13	6	21.000	0.13	0.13	0.71	0.09	0.09	5.0	5.0	5.9	0.55	3.48	2.05	12	0.95	983.34	983.54	983.83	983.85	988.41	988.60	CB28-MH15
14	6	12.000	0.23	0.23	0.44	0.10	0.10	5.0	5.0	5.9	0.60	3.56	2.46	12	1.00	983.45	983.57	983.83	983.89	988.41	988.57	CB29-MH15
15	5	20.000	0.10	0.10	0.79	0.08	0.08	5.0	5.0	5.9	0.47	3.56	1.85	12	1.00	965.75	965.95	966.27	966.23	970.50	970.98	CB26-MH14
16	5	12.000	0.09	0.09	0.84	0.08	0.08	5.0	5.0	5.9	0.45	3.56	1.92	12	1.00	965.82	965.94	966.27	966.22	970.50	970.94	CB27-MH14
17	4	10.000	0.09	0.09	0.82	0.07	0.07	5.0	5.0	5.9	0.44	3.56	1.62	12	1.00	952.17	952.27	952.89	952.54	957.07	957.22	CB25-MH13
18	4	20.000	0.10	0.10	0.76	0.08	0.08	5.0	5.0	5.9	0.45	3.56	1.64	12	1.00	952.17	952.37	952.89	952.65	957.07	957.26	CB24-MH13
19	3	20.000	0.06	0.06	0.72	0.04	0.04	5.0	5.0	5.9	0.26	3.56	1.31	12	1.00	947.21	947.41	947.89	947.62	952.03	952.45	CB22-MH12
20	3	11.000	0.15	0.15	0.82	0.12	0.12	5.0	5.0	5.9	0.73	3.56	2.01	12	1.00	947.12	947.23	947.89	947.59	952.03	951.93	CB23-MH12
21	2	20.000	0.21	0.21	0.71	0.15	0.15	5.0	5.0	5.9	0.88	3.56	2.15	12	1.00	933.64	933.84	934.50	934.23	938.73	938.84	CB20-MH11
22	2	11.000	0.14	0.14	0.50	0.07	0.07	5.0	5.0	5.9	0.41	3.56	2.75	12	1.00	934.36	934.47	934.59	934.74	938.73	939.47	CB21-MH11

Project File: Sta.51+24.stm | Number of lines: 22 | Run Date: 3/15/2024

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

A00830 -819

Proposal No. 608163-128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-11A	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-11	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	1
3	MH-12	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
4	MH-13	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
5	MH-14	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
6	MH-15	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
7	MH-15B	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
8	MH-16	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
9	CB-31	0.74	0.00	0.53	0.21	Comb	2.0	2.00	0.00	2.00	2.00	0.041	4.00	0.020	0.020	0.013	0.09	4.57	0.22	2.86	2.0	11
10	CB-30	0.51	0.00	0.39	0.11	Comb	2.0	2.00	0.00	2.00	2.00	0.041	4.00	0.020	0.020	0.013	0.08	3.97	0.21	2.28	2.0	12
11	CB-29B	0.71	0.21	0.63	0.29	Comb	2.0	2.00	0.00	2.00	2.00	0.041	4.00	0.020	0.020	0.013	0.10	4.97	0.23	3.24	2.0	14
12	CB-28B	0.51	0.11	0.46	0.16	Comb	2.0	2.00	0.00	2.00	2.00	0.041	4.00	0.020	0.020	0.013	0.09	4.29	0.22	2.59	2.0	13
13	CB-28	0.55	0.16	0.53	0.18	Comb	2.0	2.00	0.00	2.00	2.00	0.066	4.00	0.020	0.020	0.013	0.08	4.12	0.22	2.45	2.0	15
14	CB-29	0.60	0.29	0.64	0.26	Comb	2.0	2.00	0.00	2.00	2.00	0.066	4.00	0.020	0.020	0.013	0.09	4.49	0.22	2.82	2.0	16
15	CB-26	0.47	0.18	0.50	0.15	Comb	2.0	2.00	0.00	2.00	2.00	0.071	4.00	0.020	0.020	0.013	0.08	3.92	0.21	2.25	2.0	18
16	CB-27	0.45	0.26	0.53	0.17	Comb	2.0	2.00	0.00	2.00	2.00	0.071	4.00	0.020	0.020	0.013	0.08	4.05	0.21	2.38	2.0	17
17	CB-25	0.44	0.17	0.45	0.16	Comb	2.0	2.00	0.00	2.00	2.00	0.038	4.00	0.020	0.020	0.013	0.09	4.31	0.22	2.61	2.0	20
18	CB-24	0.45	0.15	0.44	0.15	Comb	2.0	2.00	0.00	2.00	2.00	0.038	4.00	0.020	0.020	0.013	0.09	4.28	0.22	2.58	2.0	19
19	CB-22	0.26	0.15	0.31	0.10	Comb	2.0	2.00	0.00	2.00	2.00	0.014	4.00	0.020	0.020	0.013	0.09	4.49	0.22	2.68	2.0	21
20	CB-23	0.73	0.16	0.60	0.28	Comb	2.0	2.00	0.00	2.00	2.00	0.014	4.00	0.024	0.024	0.013	0.13	5.34	0.25	3.49	2.0	22
21	CB-20	0.88	0.10	0.78	0.21	Comb	2.0	2.00	0.00	2.00	2.00	0.066	4.00	0.028	0.028	0.013	0.11	3.77	0.23	2.10	2.0	Off
22	CB-21	0.41	0.28	0.52	0.17	Comb	2.0	2.00	0.00	2.00	2.00	0.066	4.00	0.020	0.020	0.013	0.08	4.09	0.22	2.43	2.0	Off

Project File: Sta.51+24.stm | Number of lines: 22 | Run Date: 3/15/2024

NOTES: Inlet N-Values = 0.016; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

A00830 -820

Proposal No. 608163-128112

Storm Sewer Inlet Time Tabulation

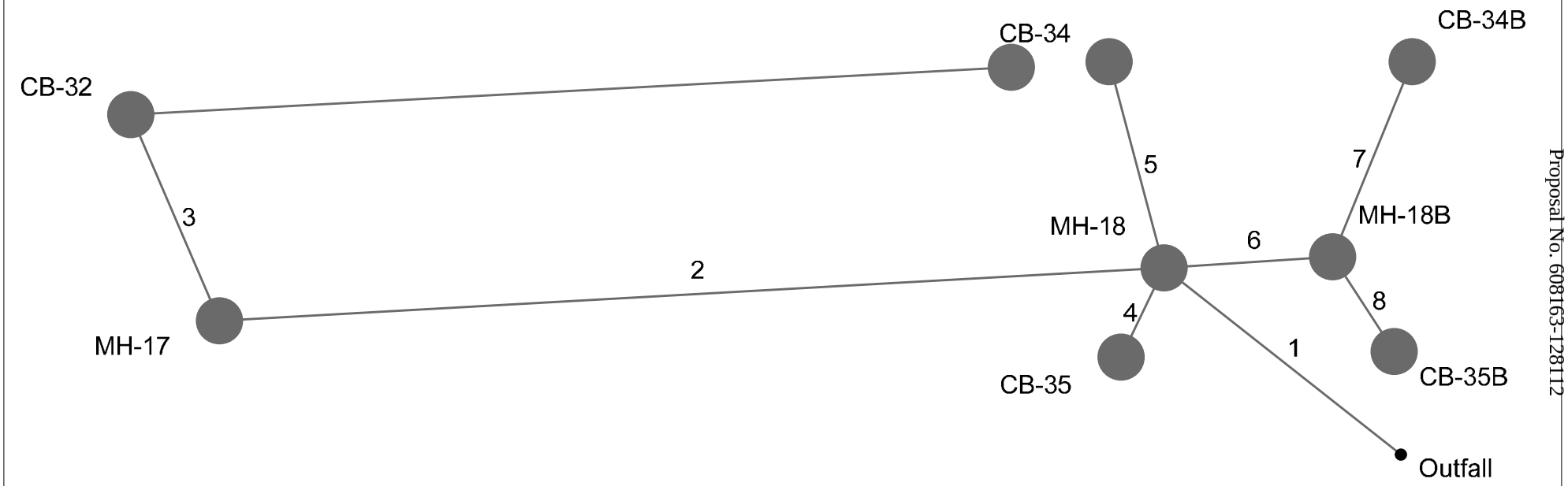
Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	MH11A-OUTLET	User																		0.00
2	MH11-MH11A	User																		0.00
3	MH12-MH11	User																		0.00
4	MH13-MH12	User																		0.00
5	MH14-MH13	User																		0.00
6	MH15-MH14	User																		0.00
7	MH15B-MH15	User																		0.00
8	MH16-MH15B	User																		0.00
9	CB31-MH16	User																		5.00
10	CB30-MH16	User																		5.00
11	CB29B-MH15B	TR55	0.800	30.00	3.10	4.00	10.99	170.00 100.00	13.00 4.00	UnPaved UnPaved	5.82 3.23	0.49 0.52								12.00
12	CB28B-MH15B	User																		5.00
13	CB28-MH15	User																		5.00
14	CB29-MH15	User																		5.00
15	CB26-MH14	User																		5.00
16	CB27-MH14	User																		5.00
17	CB25-MH13	User																		5.00
18	CB24-MH13	User																		5.00
19	CB22-MH12	User																		5.00
20	CB23-MH12	User																		5.00
21	CB20-MH11	User																		5.00
22	CB21-MH11	User																		5.00

Project File: Sta.51+24.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 22 | Date: 3/15/2024

A00830 -821

Proposal No. 608163-128112

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



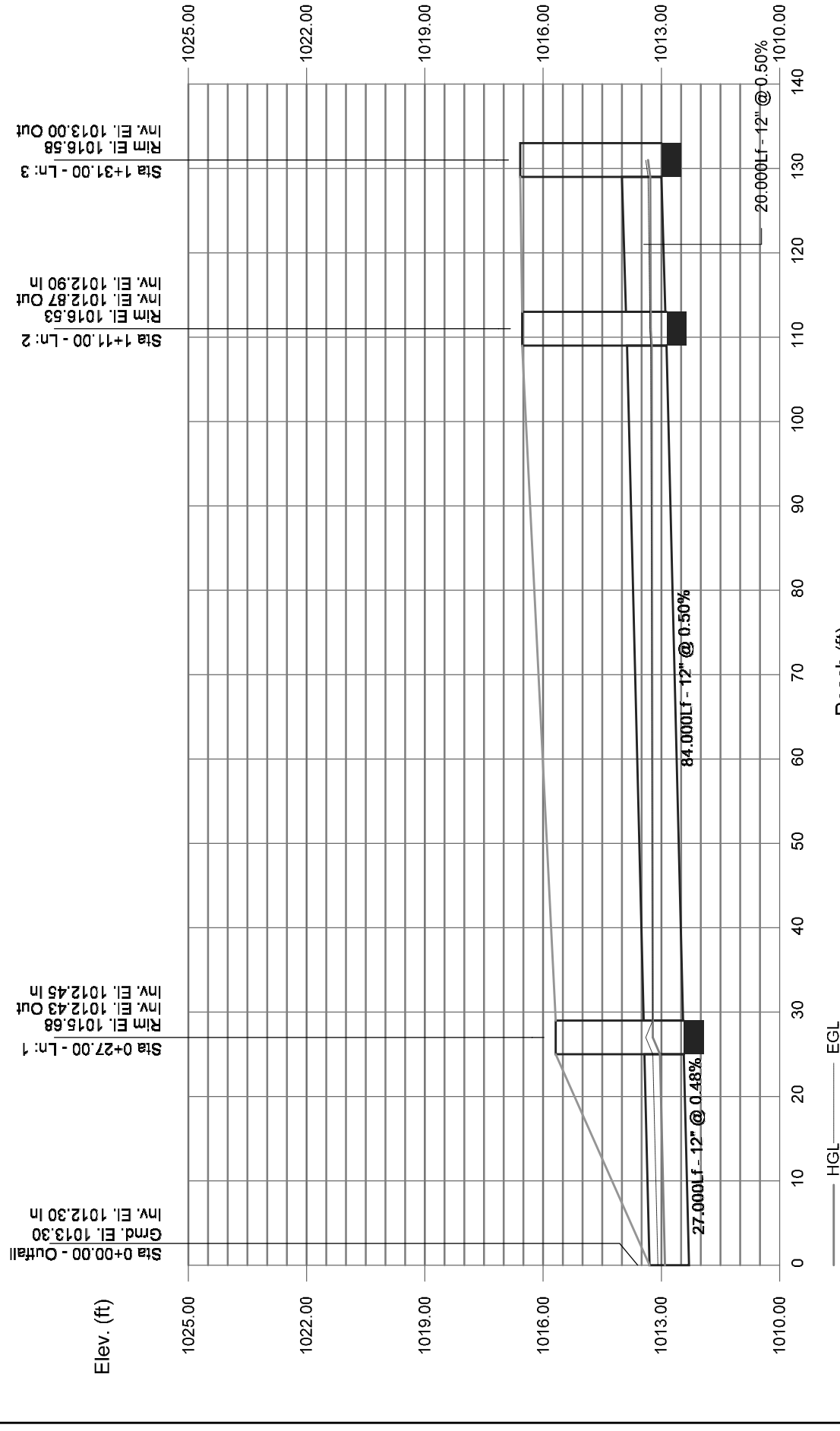
A00830 -822

Proposal No. 608163-128112

Project File: Sta.73+25.stm	Number of lines: 8	Date: 3/15/2024

Storm Sewer Profile

Proj. file: Sta.73+25.stm



Storm Sewers

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-18	Manhole	1015.68	Cir	4.00	4.00	12	Cir	1012.43	12 12 12 12	Cir Cir Cir Cir	1012.45 1012.45 1012.44 1012.45
2	MH-17	Manhole	1016.53	Cir	4.00	4.00	12	Cir	1012.87	12	Cir	1012.90
3	CB-32	Combination	1016.58	Cir	4.00	2.00	12	Cir	1013.00			
4	CB-35	Combination	1015.93	Cir	4.00	4.00	12	Cir	1012.49			
5	CB-34	Combination	1015.52	Cir	4.00	2.00	12	Cir	1012.53			
6	MH-18B	Manhole	1015.73	Cir	4.00	4.00	12	Cir	1012.52	12 12	Cir Cir	1012.53 1012.55
7	CB-34B	Combination	1015.61	Cir	4.00	4.00	12	Cir	1012.63			
8	CB-35B	Combination	1016.00	Cir	4.00	4.00	12	Cir	1012.60			

Project File: Sta.73+25.stm | Number of Structures: 8 | Run Date: 3/15/2024

A00830 -824

Proposal No. 608163-128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	27.000	0.00	0.49	0.00	0.00	0.32	0.0	6.7	5.4	1.69	2.47	3.39	12	0.48	1012.30	1012.43	1012.91	1013.04	1013.30	1015.68	MH18-OUTLET
2	1	84.000	0.00	0.07	0.00	0.00	0.06	0.0	5.2	5.8	0.34	2.52	0.90	12	0.50	1012.45	1012.87	1013.22	1013.25	1015.68	1016.53	MH17-MH18
3	2	20.000	0.07	0.07	0.84	0.06	0.06	5.0	5.0	5.9	0.35	2.52	1.61	12	0.50	1012.90	1013.00	1013.27	1013.28	1016.53	1016.58	CB32-MH17
4	1	9.000	0.02	0.02	0.70	0.01	0.01	5.0	5.0	5.9	0.07	2.37	0.11	12	0.44	1012.45	1012.49	1013.22	1013.22	1015.68	1015.93	CB35-MH18
5	1	19.000	0.04	0.04	0.84	0.03	0.03	5.0	5.0	5.9	0.20	2.45	0.32	12	0.47	1012.44	1012.53	1013.22	1013.22	1015.68	1015.52	CB34-MH18
6	1	15.000	0.00	0.36	0.00	0.00	0.21	0.0	5.2	5.8	1.24	2.43	2.00	12	0.47	1012.45	1012.52	1013.22	1013.23	1015.68	1015.73	MH18B-MH18
7	6	19.000	0.26	0.26	0.54	0.14	0.14	5.0	5.0	5.9	0.83	2.58	1.39	12	0.53	1012.53	1012.63	1013.29	1013.30	1015.73	1015.61	CB34B-MH18B
8	6	10.000	0.10	0.10	0.72	0.07	0.07	5.0	5.0	5.9	0.43	2.52	0.71	12	0.50	1012.55	1012.60	1013.29	1013.29	1015.73	1016.00	CB35B-MH18B

Project File: Sta.73+25.stm | Number of lines: 8 | Run Date: 3/15/2024

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

A00830 -825

Proposal No. 608163-128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-18	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-17	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	CB-32	0.35	0.00	0.28	0.07	Comb	2.0	2.00	0.00	2.00	2.00	0.024	4.00	0.020	0.020	0.013	0.08	3.81	0.21	2.07	2.0	5
4	CB-35	0.07	0.00	0.07	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.09	1.18	0.07	1.18	2.0	Off
5	CB-34	0.20	0.07	0.27	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.04	2.00	0.12	2.00	2.0	Off
6	MH-18B	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	4.00	0.020	0.020	0.013	0.00	0.00	0.00	0.00	0.0	1
7	CB-34B	0.83	0.00	0.83	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.09	4.26	0.25	4.26	2.0	Off
8	CB-35B	0.43	0.00	0.43	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.00	2.67	0.16	2.67	2.0	Off

Project File: Sta.73+25.stm | Number of lines: 8 | Run Date: 3/15/2024

NOTES: Inlet N-Values = 0.016; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

A00830 -826

Proposal No. 608163-128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	27.000	0.00	0.49	0.00	0.00	0.32	0.0	6.9	6.5	2.06	2.47	3.76	12	0.48	1012.30	1012.43	1012.91	1013.14	1013.30	1015.68	MH18-OUTLET
2	1	84.000	0.00	0.07	0.00	0.00	0.06	0.0	5.2	7.1	0.42	2.52	0.85	12	0.50	1012.45	1012.87	1013.33	1013.35	1015.68	1016.53	MH17-MH18
3	2	20.000	0.07	0.07	0.84	0.06	0.06	5.0	5.0	7.2	0.42	2.52	1.40	12	0.50	1012.90	1013.00	1013.36	1013.37	1016.53	1016.58	CB32-MH17
4	1	9.000	0.02	0.02	0.70	0.01	0.01	5.0	5.0	7.2	0.08	2.37	0.11	12	0.44	1012.45	1012.49	1013.33	1013.33	1015.68	1015.93	CB35-MH18
5	1	19.000	0.04	0.04	0.84	0.03	0.03	5.0	5.0	7.2	0.24	2.45	0.34	12	0.47	1012.44	1012.53	1013.33	1013.33	1015.68	1015.52	CB34-MH18
6	1	15.000	0.00	0.36	0.00	0.00	0.21	0.0	5.2	7.1	1.51	2.43	2.13	12	0.47	1012.45	1012.52	1013.33	1013.35	1015.68	1015.73	MH18B-MH18
7	6	19.000	0.26	0.26	0.54	0.14	0.14	5.0	5.0	7.2	1.01	2.58	1.45	12	0.53	1012.53	1012.63	1013.41	1013.42	1015.73	1015.61	CB34B-MH18B
8	6	10.000	0.10	0.10	0.72	0.07	0.07	5.0	5.0	7.2	0.52	2.52	0.74	12	0.50	1012.55	1012.60	1013.41	1013.42	1015.73	1016.00	CB35B-MH18B

Project File: Sta.73+25.stm | Number of lines: 8 | Run Date: 3/15/2024

NOTES:Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

A00830 -827

Proposal No. 608163-128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-18	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-17	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	CB-32	0.42	0.00	0.33	0.10	Comb	2.0	2.00	0.00	2.00	2.00	0.024	4.00	0.020	0.020	0.013	0.08	4.11	0.21	2.38	2.0	5
4	CB-35	0.08	0.00	0.08	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.09	1.31	0.08	1.31	2.0	Off
5	CB-34	0.24	0.10	0.34	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.02	2.30	0.14	2.30	2.0	Off
6	MH-18B	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	4.00	0.020	0.020	0.013	0.00	0.00	0.00	0.00	0.0	1
7	CB-34B	1.01	0.00	1.01	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.10	5.17	0.27	5.17	2.0	Off
8	CB-35B	0.52	0.00	0.52	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	0.02	3.05	0.19	3.05	2.0	Off

Project File: Sta.73+25.stm | Number of lines: 8 | Run Date: 3/15/2024

NOTES: Inlet N-Values = 0.016; Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

A00830 -828

Proposal No. 608163-128112

Storm Sewer Inlet Time Tabulation

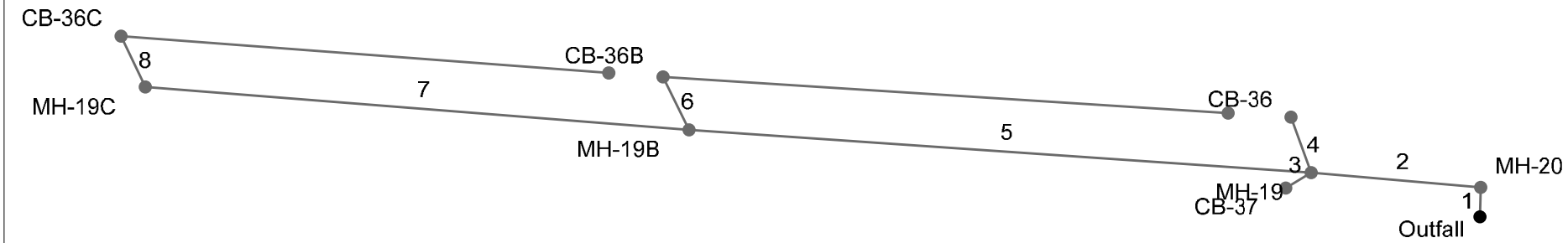
Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	MH18-OUTLET	User																		0.00
2	MH17-MH18	User																		0.00
3	CB32-MH17	User																		5.00
4	CB35-MH18	User																		5.00
5	CB34-MH18	User																		5.00
6	MH18B-MH18	User																		0.00
7	CB34B-MH18B	User																		5.00
8	CB35B-MH18B	User																		5.00

Project File: Sta.73+25.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 8 | Date: 3/15/2024

A00830 -829

Proposal No. 608163-128112

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Sta.81+97.stm	Number of lines: 8	Date: 3/15/2024

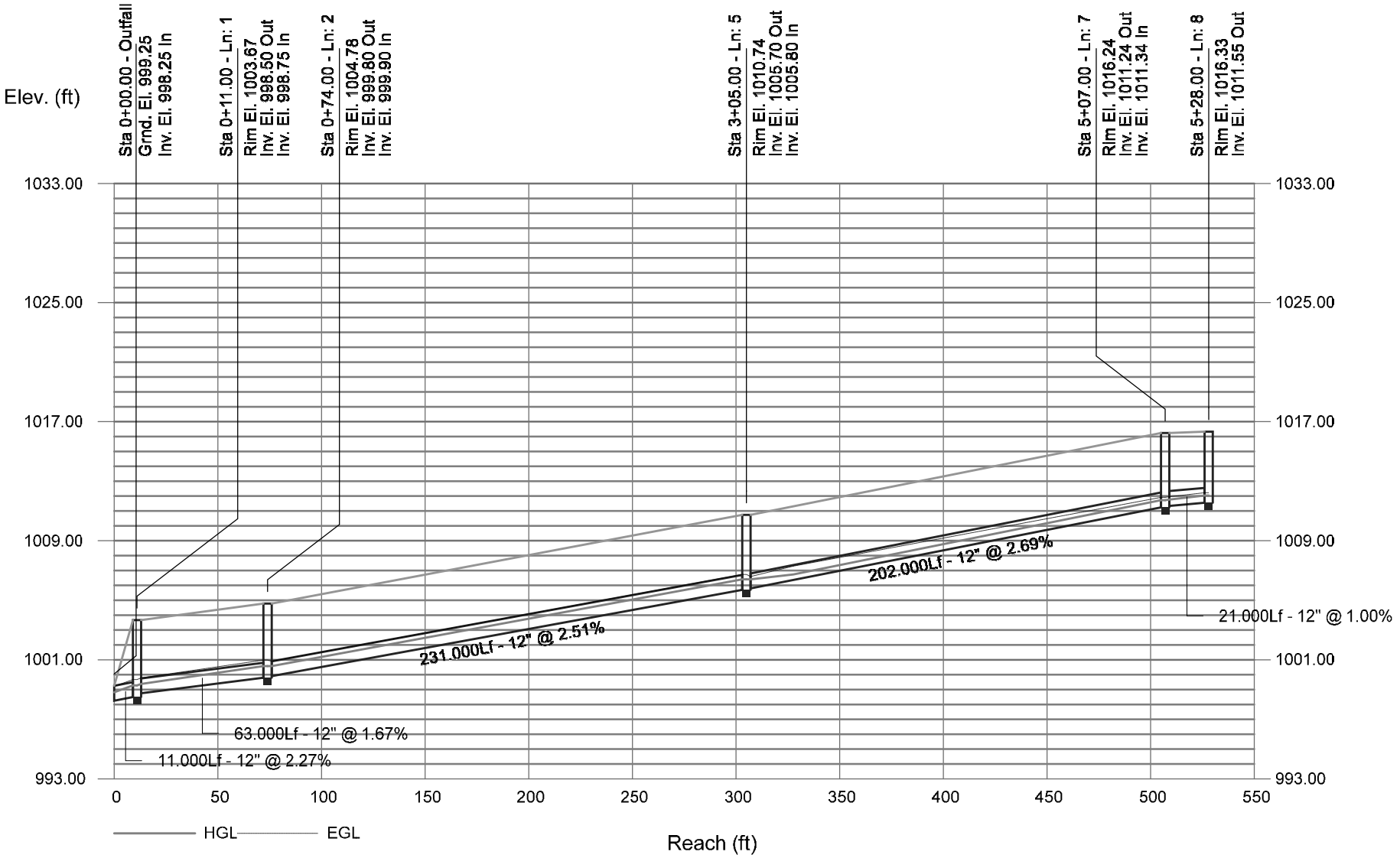
Storm Sewers v2023.00

A00830 -830

Proposal No. 608163-128112

Storm Sewer Profile

Proj. file: Sta.81+97.stm



A00830 -831

Proposal No: 6008163-128112

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-20	Manhole	1003.67	Cir	4.00	4.00	12	Cir	998.50	12	Cir	998.75
2	MH-19	Manhole	1004.78	Cir	4.00	4.00	12	Cir	999.80	12 12 12	Cir Cir Cir	999.90 1000.00 999.90
3	CB-37	Combination	1004.87	Cir	4.00	2.00	12	Cir	1000.01			
4	CB-36	Combination	1005.13	Cir	4.00	2.00	12	Cir	1000.22			
5	MH-19B	Manhole	1010.74	Cir	4.00	4.00	12	Cir	1005.70	12 12	Cir Cir	1006.45 1005.80
6	CB-36B	Combination	1011.71	Cir	4.00	4.00	12	Cir	1006.67			
7	MH-19C	Manhole	1016.24	Cir	4.00	4.00	12	Cir	1011.24	12	Cir	1011.34
8	CB-36C	Combination	1016.33	Cir	4.00	2.00	12	Cir	1011.55			

Project File: Sta.81+97.stm | Number of Structures: 8 | Run Date: 3/15/2024

A00830 -832

Proposal No. 608163-128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	11.000	0.00	1.83	0.00	0.00	0.78	0.0	12.2	4.2	3.31	5.37	6.12	12	2.27	998.25	998.50	998.82	999.28	999.25	1003.67	MH20-OUTLET
2	1	63.000	0.00	1.83	0.00	0.00	0.78	0.0	12.0	4.2	3.33	4.60	5.72	12	1.67	998.75	999.80	999.38	1000.58	1003.67	1004.78	MH19-MH20
3	2	11.000	0.12	0.12	0.85	0.10	0.10	5.0	5.0	5.9	0.60	3.56	1.90	12	1.00	999.90	1000.01	1000.58	1000.33	1004.78	1004.87	CB37-MH19
4	2	22.000	0.16	0.16	0.39	0.06	0.06	5.0	5.0	5.9	0.37	3.56	1.59	12	1.00	1000.00	1000.22	1000.58	1000.47	1004.78	1005.13	CB36-MH19
5	2	231.000	0.00	1.55	0.00	0.00	0.62	0.0	11.2	4.4	2.72	5.64	4.68	12	2.51	999.90	1005.70	1000.58	1006.41	1004.78	1010.74	MH19B-MH19
6	5	22.000	0.83	0.83	0.40	0.33	0.33	10.0	10.0	4.6	1.53	3.56	4.01	12	1.00	1006.45	1006.67	1006.91	1007.19	1010.74	1011.71	CB36B-MH19B
7	5	202.000	0.00	0.72	0.00	0.00	0.29	0.0	10.1	4.6	1.32	5.84	3.07	12	2.69	1005.80	1011.24	1006.41	1011.73	1010.74	1016.24	MH19C-MH19B
8	7	21.000	0.72	0.72	0.40	0.29	0.29	10.0	10.0	4.6	1.33	3.56	3.85	12	1.00	1011.34	1011.55	1011.76	1012.04	1016.24	1016.33	CB36C-MH19C

Project File: Sta.81+97.stm | Number of lines: 8 | Run Date: 3/15/2024

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

A00830 -833

Proposal No. 608163-128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-20	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH-19	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	CB-37	0.60	0.00	0.55	0.06	Comb	2.0	2.00	0.00	2.00	2.00	0.025	4.00	0.042	0.020	0.013	0.12	2.92	0.22	1.20	2.0	Off
4	CB-36	0.37	0.92	0.90	0.39	Comb	2.0	2.00	0.00	2.00	2.00	0.025	4.00	0.031	0.020	0.013	0.15	5.07	0.26	3.00	2.0	Off
5	MH-19B	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	4.00	0.020	0.020	0.013	0.00	0.00	0.00	0.00	0.0	2
6	CB-36B	1.53	0.52	1.13	0.92	Comb	2.0	2.00	0.00	2.00	2.00	0.027	4.00	0.020	0.020	0.013	0.15	7.27	0.27	5.39	2.0	4
7	MH-19C	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	4.00	0.020	0.020	0.013	0.00	0.00	0.00	0.00	0.0	5
8	CB-36C	1.33	0.00	0.81	0.52	Comb	2.0	2.00	0.00	2.00	2.00	0.027	4.00	0.020	0.020	0.013	0.12	6.18	0.25	4.34	2.0	6

Project File: Sta.81+97.stm | Number of lines: 8 | Run Date: 3/15/2024

NOTES: Inlet N-Values = 0.016; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

A00830 -834

Proposal No. 608163-128112

Storm Sewer Inlet Time Tabulation

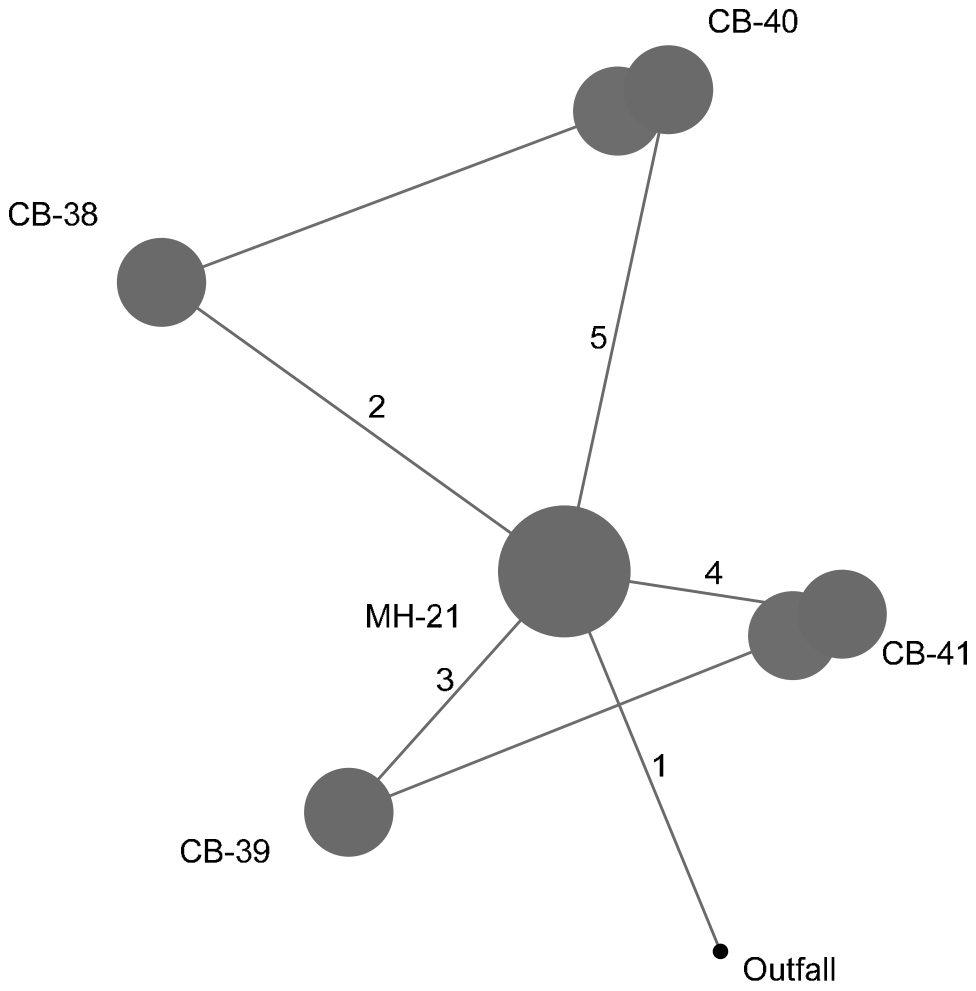
Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	MH20-OUTLET	User																		0.00
2	MH19-MH20	User																		0.00
3	CB37-MH19	User																		5.00
4	CB36-MH19	User																		5.00
5	MH19B-MH19	User																		0.00
6	CB36B-MH19B	User																		10.00
7	MH19C-MH19B	User																		0.00
8	CB36C-MH19C	User																		10.00

Project File: Sta.81+97.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 8 | Date: 3/15/2024

A00830 -835

Proposal No. 608163-128112

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Sta.85+72.stm	Number of lines: 5	Date: 4/8/2024

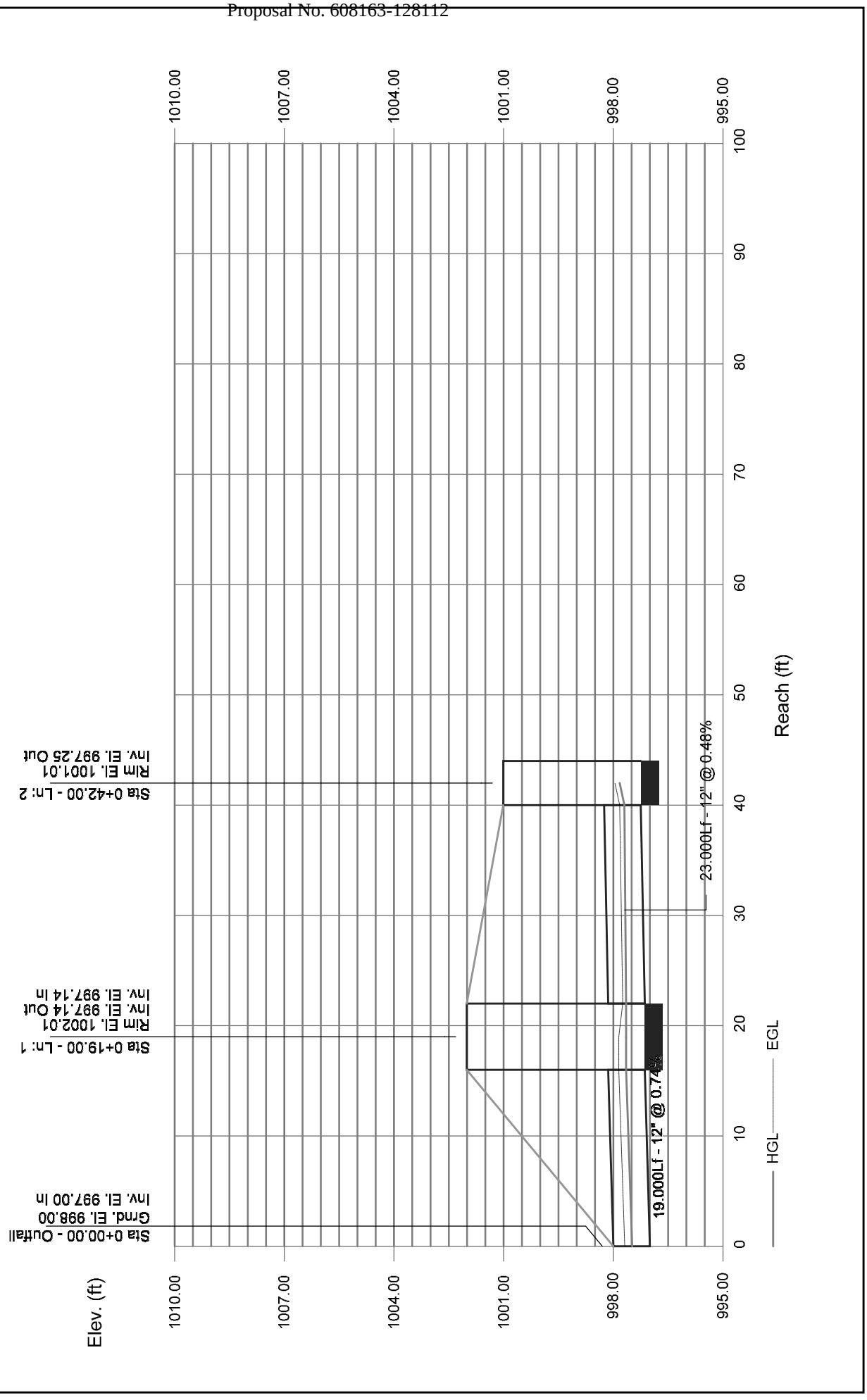
Storm Sewers v2023.00

A00830 -836

Proposal No. 608163-128112

Proj. file: Sta.85+72.stm

Storm Sewer Profile



Storm Sewers

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-21	Manhole	1002.01	Cir	6.00	6.00	12	Cir	997.14	12 12 12 12	Cir Cir Cir Cir	997.14 997.14 997.14 997.14
2	CB-38	Combination	1001.01	Cir	4.00	4.00	12	Cir	997.25			
3	CB-39	Combination	1002.33	Cir	4.00	4.00	12	Cir	997.21			
4	CB-41	Combination	1002.17	Cir	4.00	4.00	12	Cir	997.21			
5	CB-40	Combination	1000.85	Cir	4.00	4.00	12	Cir	997.25			

Project File: Sta.85+72.stm | Number of Structures: 5 | Run Date: 4/8/2024

A00830 -838

Proposal No. 608163-128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	19.000	0.00	0.41	0.00	0.00	0.27	0.0	6.7	5.4	1.45	3.06	3.72	12	0.74	997.00	997.14	997.49	997.65	998.00	1002.01	MH21-OUTLET
2	1	23.000	0.26	0.26	0.64	0.17	0.17	5.0	5.0	5.9	0.98	2.46	2.66	12	0.48	997.14	997.25	997.65	997.70	1002.01	1001.01	CB38-MH21
3	1	15.000	0.02	0.02	0.71	0.01	0.01	5.0	5.0	5.9	0.08	2.43	0.23	12	0.47	997.14	997.21	997.65	997.65	1002.01	1002.33	CB39-MH21
4	1	13.000	0.01	0.01	0.76	0.01	0.01	5.0	5.0	5.9	0.04	2.61	0.12	12	0.54	997.14	997.21	997.65	997.65	1002.01	1002.17	CB41-MH21
5	1	23.000	0.12	0.12	0.69	0.08	0.08	5.0	5.0	5.9	0.49	2.46	1.42	12	0.48	997.14	997.25	997.65	997.66	1002.01	1000.85	CB40-MH21

Project File: Sta.85+72.stm | Number of lines: 5 | Run Date: 4/8/2024

NOTES:Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period =Yrs. 10 ; c = cir e = ellip b = box

A00830 -839

Proposal No. 608163-128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-21	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	CB-38	0.98	0.00	0.87	0.11	Comb	2.0	2.00	0.00	2.00	2.00	0.012	4.00	0.060	0.060	0.013	0.19	3.22	0.25	1.43	2.0	5
3	CB-39	0.08	0.00	0.08	0.00	Comb	2.0	2.00	0.00	2.00	2.00	0.012	4.00	0.020	0.020	0.013	0.05	2.55	0.18	0.70	2.0	4
4	CB-41	0.04	0.00	0.05	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.11	0.99	0.06	0.99	2.0	Off
5	CB-40	0.49	0.11	0.60	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.060	0.060	0.013	0.04	2.04	0.21	2.04	2.0	Off

Project File: Sta.85+72.stm | Number of lines: 5 | Run Date: 4/8/2024

NOTES: Inlet N-Values = 0.016; Intensity = 37.17 / (Inlet time + 7.30) ^ 0.73; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

A00830 -840

Proposal No. 608163-128112

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	19.000	0.00	0.41	0.00	0.00	0.27	0.0	6.7	6.6	1.78	3.06	3.96	12	0.74	997.00	997.14	997.55	997.71	998.00	1002.01	MH21-OUTLET
2	1	23.000	0.26	0.26	0.64	0.17	0.17	5.0	5.0	7.2	1.20	2.46	2.80	12	0.48	997.14	997.25	997.71	997.76	1002.01	1001.01	CB38-MH21
3	1	15.000	0.02	0.02	0.71	0.01	0.01	5.0	5.0	7.2	0.10	2.43	0.24	12	0.47	997.14	997.21	997.71	997.71	1002.01	1002.33	CB39-MH21
4	1	13.000	0.01	0.01	0.76	0.01	0.01	5.0	5.0	7.2	0.05	2.61	0.13	12	0.54	997.14	997.21	997.71	997.71	1002.01	1002.17	CB41-MH21
5	1	23.000	0.12	0.12	0.69	0.08	0.08	5.0	5.0	7.2	0.60	2.46	1.48	12	0.48	997.14	997.25	997.71	997.72	1002.01	1000.85	CB40-MH21

Project File: Sta.85+72.stm

Number of lines: 5

Run Date: 4/8/2024

NOTES:Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

A00830 -841

Proposal No. 608163-128112

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH-21	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	CB-38	1.20	0.00	1.02	0.17	Comb	2.0	2.00	0.00	2.00	2.00	0.012	4.00	0.060	0.060	0.013	0.21	3.47	0.27	1.69	2.0	5
3	CB-39	0.10	0.00	0.10	0.01	Comb	2.0	2.00	0.00	2.00	2.00	0.012	4.00	0.020	0.020	0.013	0.05	2.75	0.18	0.90	2.0	4
4	CB-41	0.05	0.01	0.06	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.020	0.020	0.013	-0.10	1.12	0.07	1.12	2.0	Off
5	CB-40	0.60	0.17	0.77	0.00	Comb	2.0	2.00	4.00	2.00	2.00	Sag	4.00	0.060	0.060	0.013	0.08	2.41	0.25	2.41	2.0	Off

Project File: Sta.85+72.stm | Number of lines: 5 | Run Date: 4/8/2024

NOTES: Inlet N-Values = 0.016; Intensity = 42.77 / (Inlet time + 7.20) ^ 0.71; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

A00830 -842

Proposal No. 608163-128112

Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	MH21-OUTLET	User																		0.00
2	CB38-MH21	User																		5.00
3	CB39-MH21	User																		5.00
4	CB41-MH21	User																		5.00
5	CB40-MH21	User																		5.00

Project File: Sta.85+72.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 5 | Date: 4/8/2024

A00830 -843

Proposal No. 608163-128112

APPENDIX D

HY-8 Reports

DRAINAGE REPORT

Existing

HY-8 Reports

STA 15+33 Existing
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 5.00 cfs

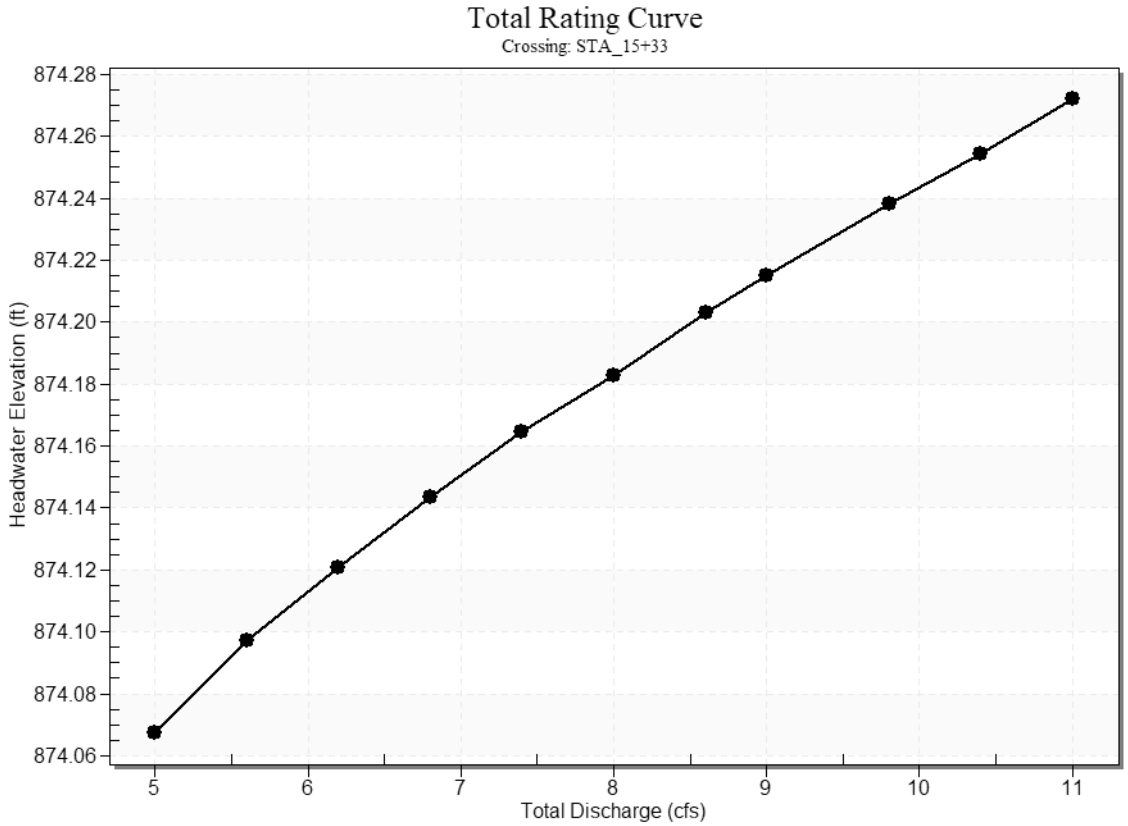
Design Flow: 9.00 cfs

Maximum Flow: 11.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: STA_15+33

Headwater Elevation (ft)	Total Discharge (cfs)	12 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
874.07	5.00	4.15	0.84	16
874.10	5.60	4.17	1.40	4
874.12	6.20	4.18	2.00	4
874.14	6.80	4.19	2.59	4
874.16	7.40	4.21	3.16	3
874.18	8.00	4.22	3.75	3
874.20	8.60	4.23	4.35	3
874.21	9.00	4.23	4.75	3
874.24	9.80	4.25	5.54	3
874.25	10.40	4.26	6.14	3
874.27	11.00	4.26	6.73	3
874.00	4.11	4.11	0.00	Overtopping

Rating Curve Plot for Crossing: STA_15+33



Culvert Data: 12

Table 2 - Culvert Summary Table: 12

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5.00 cfs	4.15 cfs	874.07	1.75	3.818	7-M2c	1.00	0.86	0.86	0.13	5.78	2.08
5.60 cfs	4.17 cfs	874.10	1.75	3.847	7-M2c	1.00	0.86	0.86	0.14	5.79	2.18
6.20 cfs	4.18 cfs	874.12	1.76	3.871	7-M2c	1.00	0.86	0.86	0.15	5.80	2.27
6.80 cfs	4.19 cfs	874.14	1.77	3.894	7-M2c	1.00	0.86	0.86	0.16	5.82	2.35

7.40 cfs	4.21 cfs	874.16	1.77	3.915	7-M2c	1.00	0.86	0.86	0.16	5.83	2.42
8.00 cfs	4.22 cfs	874.18	1.78	3.933	7-M2c	1.00	0.87	0.87	0.17	5.84	2.50
8.60 cfs	4.23 cfs	874.20	1.79	3.953	7-M2c	1.00	0.87	0.87	0.18	5.85	2.57
9.00 cfs	4.23 cfs	874.21	1.79	3.965	7-M2c	1.00	0.87	0.87	0.18	5.85	2.61
9.80 cfs	4.25 cfs	874.24	1.80	3.988	7-M2c	1.00	0.87	0.87	0.19	5.87	2.70
10.40 cfs	4.26 cfs	874.25	1.80	4.004	7-M2c	1.00	0.87	0.87	0.20	5.88	2.76
11.00 cfs	4.26 cfs	874.27	1.81	4.022	7-M2c	1.00	0.87	0.87	0.21	5.88	2.82

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

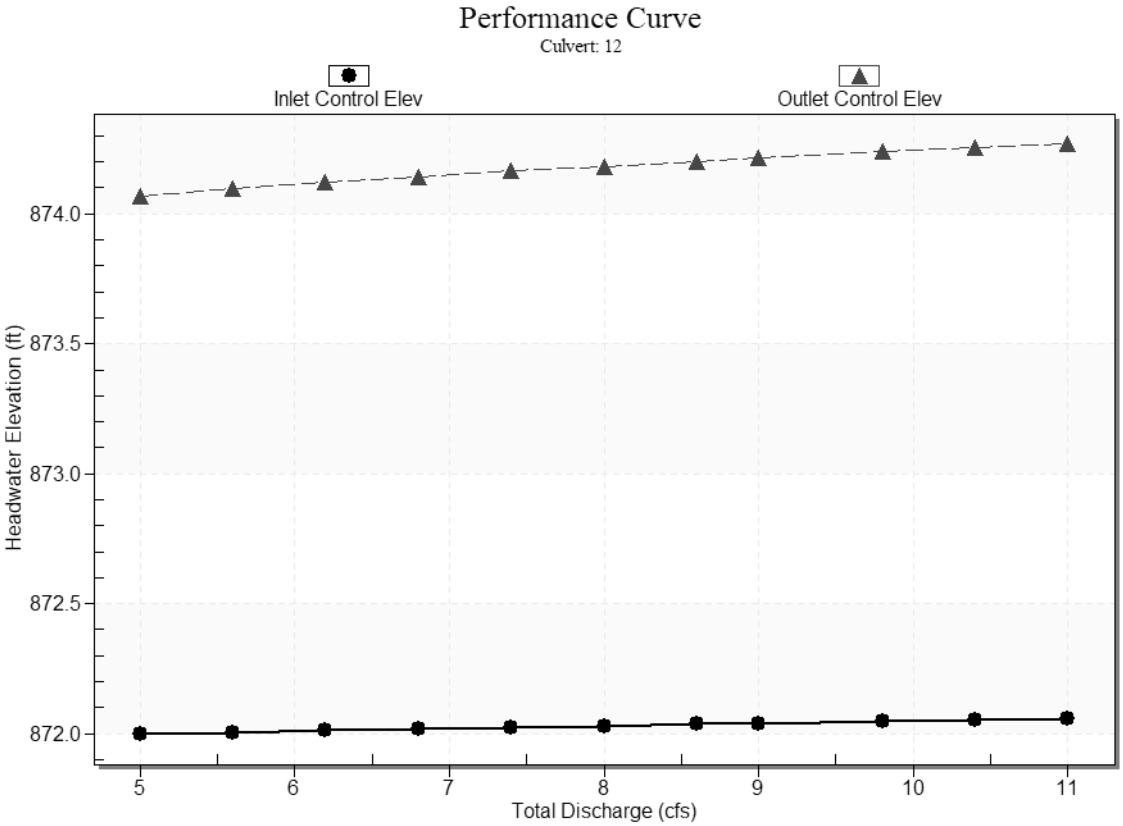
Inlet Elevation (invert): 870.25 ft,

Outlet Elevation (invert): 869.63 ft

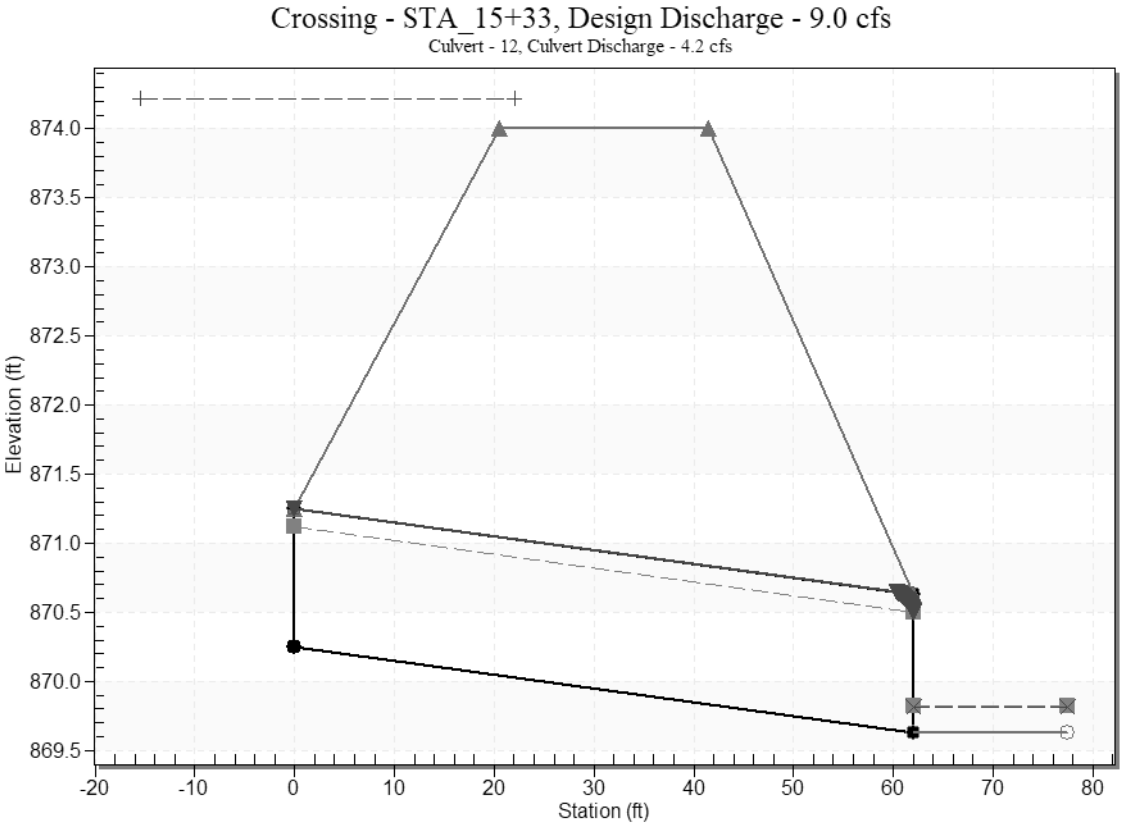
Culvert Length: 62.00 ft,

Culvert Slope: 0.0100

Culvert Performance Curve Plot: 12



Water Surface Profile Plot for Culvert: 12



Site Data - 12

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 870.25 ft

Outlet Station: 62.00 ft

Outlet Elevation: 869.63 ft

Number of Barrels: 1

Culvert Data Summary - 12

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated PE

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: STA_15+33

Table 3 - Downstream Channel Rating Curve (Crossing: STA_15+33)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	869.76	0.13	2.08	0.40	1.03
5.60	869.77	0.14	2.18	0.43	1.05
6.20	869.78	0.15	2.27	0.46	1.06
6.80	869.79	0.16	2.35	0.49	1.07
7.40	869.79	0.16	2.42	0.51	1.07
8.00	869.80	0.17	2.50	0.53	1.08
8.60	869.81	0.18	2.57	0.56	1.09
9.00	869.81	0.18	2.61	0.57	1.09
9.80	869.82	0.19	2.70	0.60	1.10
10.40	869.83	0.20	2.76	0.63	1.11
11.00	869.84	0.21	2.82	0.65	1.12

Tailwater Channel Data - STA_15+33

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 18.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0500

Channel Manning's n: 0.0400

Channel Invert Elevation: 869.63 ft

Roadway Data for Crossing: STA_15+33

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 16.00 ft

Crest Elevation: 874.00 ft

Roadway Surface: Paved

Roadway Top Width: 21.00 ft

STA 25+92 Existing
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 22.00 cfs

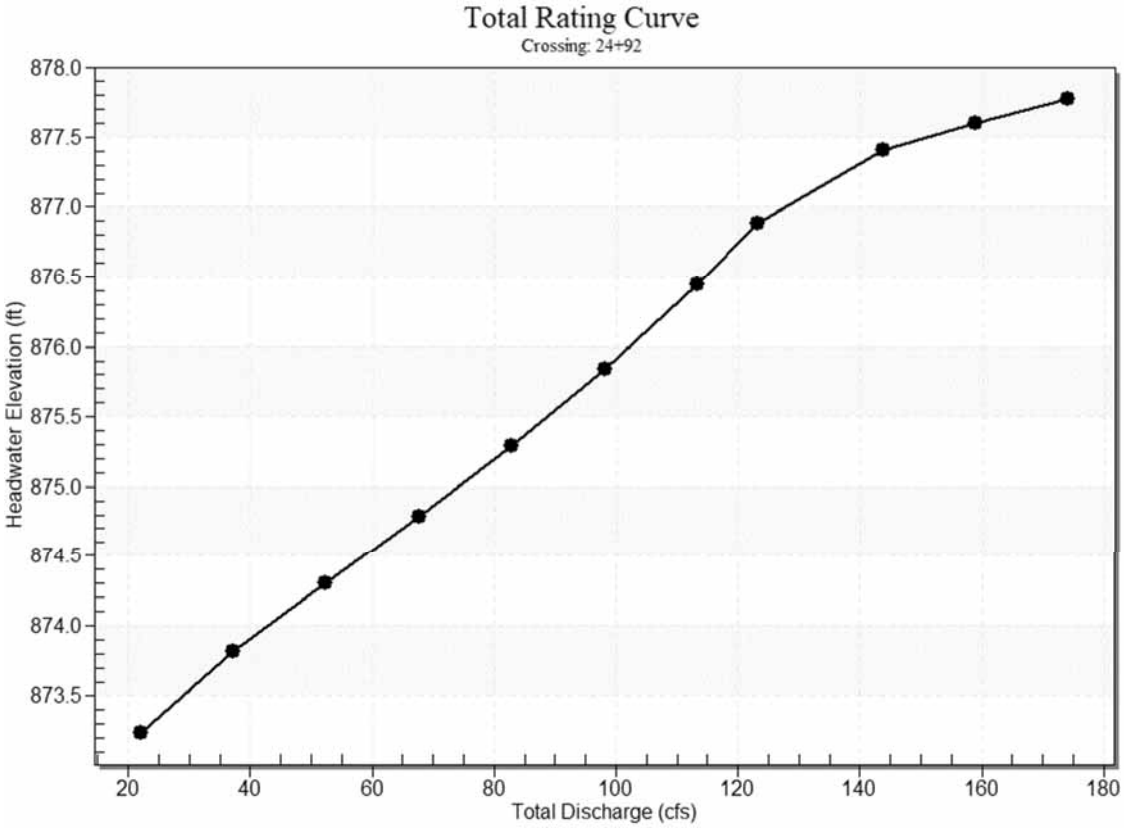
Design Flow: 123.00 cfs

Maximum Flow: 174.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: 24+92

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
873.24	22.00	19.92	2.07	0.00	6
873.81	37.20	29.45	7.75	0.00	4
874.30	52.40	37.68	14.74	0.00	2
874.79	67.60	45.15	22.45	0.00	3
875.29	82.80	51.89	30.92	0.00	3
875.84	98.00	58.27	39.73	0.00	4
876.45	113.20	64.64	48.57	0.00	4
876.89	123.00	68.78	54.18	0.00	8
877.40	143.60	73.35	60.17	10.07	6
877.60	158.80	75.00	62.29	21.48	5
877.77	174.00	76.41	64.07	33.43	4
877.10	127.41	70.70	56.72	0.00	Overtopping

Rating Curve Plot for Crossing: 24+92



Culvert Data: Culvert 1

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.00 cfs	19.92 cfs	873.24	2.04	0.0*	1-S2n	0.73	1.43	0.84	0.24	12.27	4.39
37.20 cfs	29.45 cfs	873.81	2.61	0.321	1-S2n	0.89	1.76	1.06	0.33	13.16	5.34
52.40 cfs	37.68 cfs	874.30	3.10	0.863	5-S2n	1.01	2.00	1.23	0.40	13.74	6.06
67.60 cfs	45.15 cfs	874.79	3.59	1.392	5-S2n	1.11	2.19	1.38	0.46	14.23	6.66

82.80 cfs	51.89 cfs	875.29	4.09	2.232	5-S2n	1.20	2.34	1.50	0.52	14.65	7.16
98.00 cfs	58.27 cfs	875.84	4.64	2.680	5-S2n	1.28	2.47	1.61	0.58	15.03	7.60
113.20 cfs	64.64 cfs	876.45	5.25	3.162	5-S2n	1.35	2.58	1.72	0.63	15.41	8.00
123.00 cfs	68.78 cfs	876.89	5.69	3.495	5-S2n	1.40	2.64	1.79	0.66	15.66	8.24
143.60 cfs	73.35 cfs	877.40	6.20	3.878	5-S2n	1.46	2.70	1.86	0.72	15.94	8.69
158.80 cfs	75.00 cfs	877.60	6.40	4.022	5-S2n	1.47	2.72	1.88	0.77	16.04	9.00
174.00 cfs	76.41 cfs	877.77	6.57	4.146	5-S2n	1.49	2.73	1.91	0.81	16.13	9.29

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

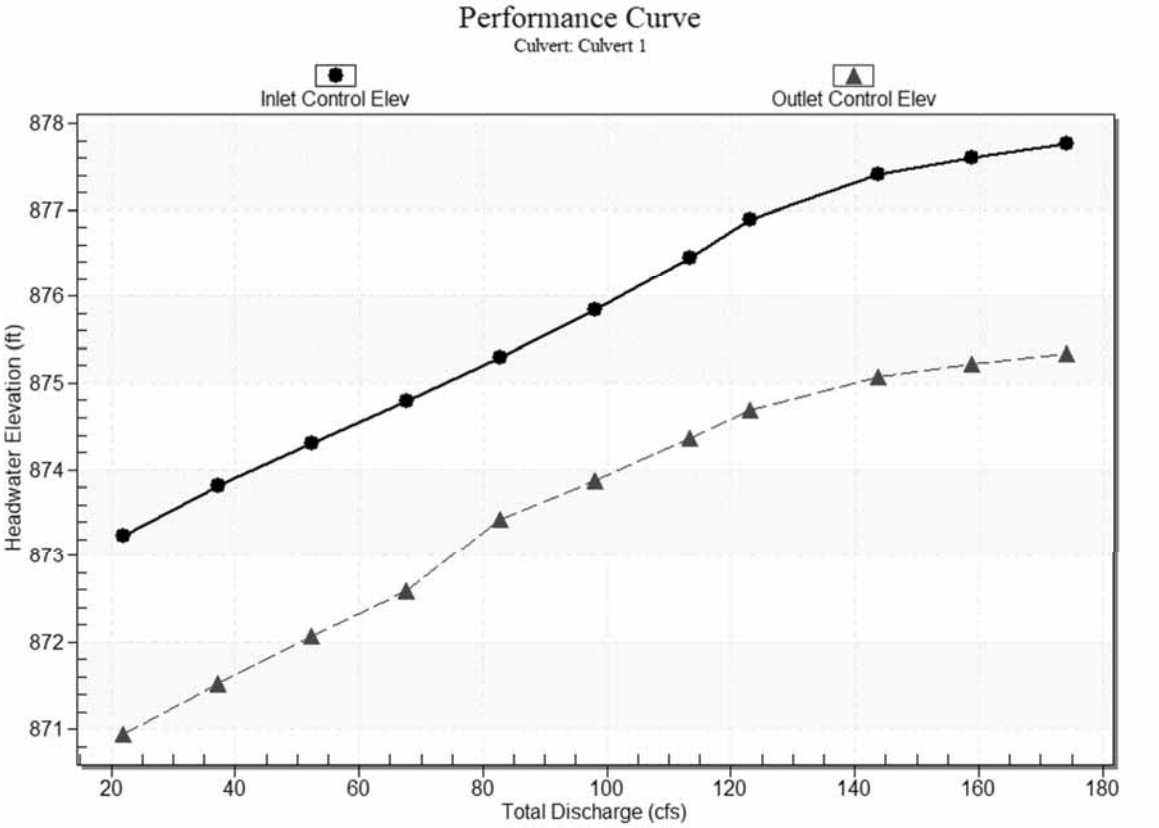
Inlet Elevation (invert): 871.20 ft,

Outlet Elevation (invert): 869.29 ft

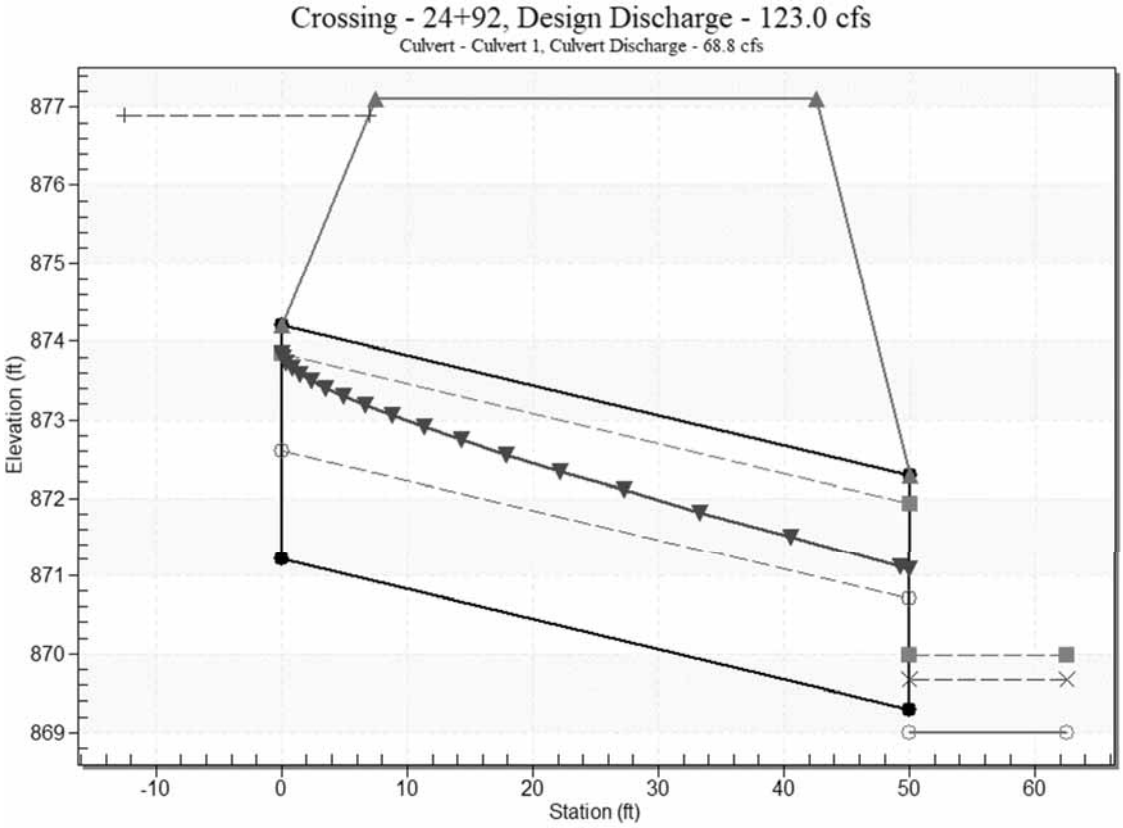
Culvert Length: 50.04 ft,

Culvert Slope: 0.0382

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 871.20 ft

Outlet Station: 50.00 ft

Outlet Elevation: 869.29 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: PVC

Embedment: 0.00 in

Barrel Manning's n: 0.0110

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Culvert Data: Culvert 2

Table 3 - Culvert Summary Table: Culvert 2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.00 cfs	2.07 cfs	873.24	0.58	0.0*	1-S2n	0.32	0.45	0.32	0.24	5.01	4.39
37.20 cfs	7.75 cfs	873.81	1.15	0.0*	1-S2n	0.62	0.88	0.62	0.33	7.39	5.34
52.40 cfs	14.74 cfs	874.30	1.64	0.0*	1-S2n	0.85	1.22	0.85	0.40	8.90	6.06
67.60 cfs	22.45 cfs	874.79	2.13	0.0*	1-S2n	1.06	1.52	1.06	0.46	10.02	6.66
82.80 cfs	30.92 cfs	875.29	2.63	0.0*	1-S2n	1.26	1.80	1.29	0.52	10.62	7.16
98.00 cfs	39.73 cfs	875.84	3.18	0.730	5-S2n	1.46	2.05	1.49	0.58	11.34	7.60
113.20 cfs	48.57 cfs	876.45	3.79	1.974	5-S2n	1.64	2.27	1.67	0.63	12.00	8.00
123.00 cfs	54.18 cfs	876.89	4.23	2.523	5-S2n	1.76	2.39	1.79	0.66	12.29	8.24
143.60 cfs	60.17 cfs	877.40	4.74	3.161	5-S2n	1.89	2.50	1.93	0.72	12.53	8.69
158.80 cfs	62.29 cfs	877.60	4.94	3.399	5-S2n	1.93	2.54	1.98	0.77	12.61	9.00
174.00 cfs	64.07 cfs	877.77	5.11	3.604	5-S2	1.97	2.57	2.01	0.81	12.70	9.29

n

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

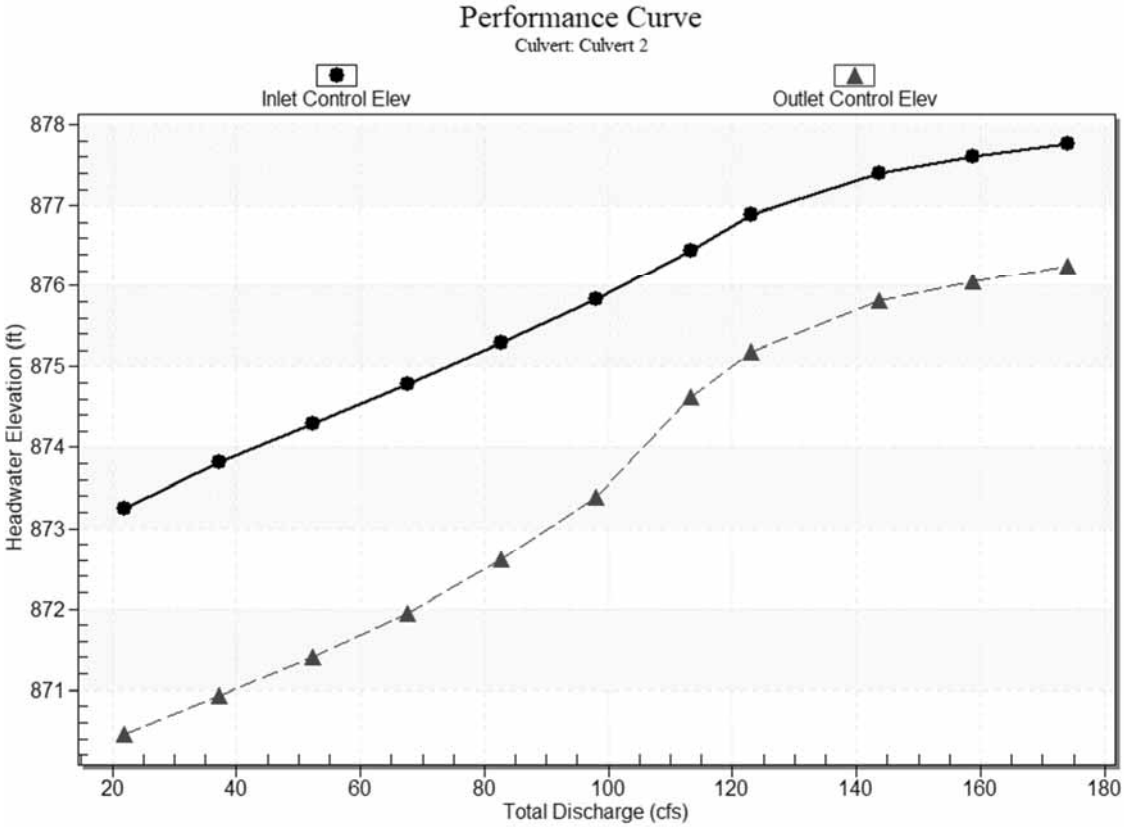
Inlet Elevation (invert): 872.66 ft,

Outlet Elevation (invert): 870.00 ft

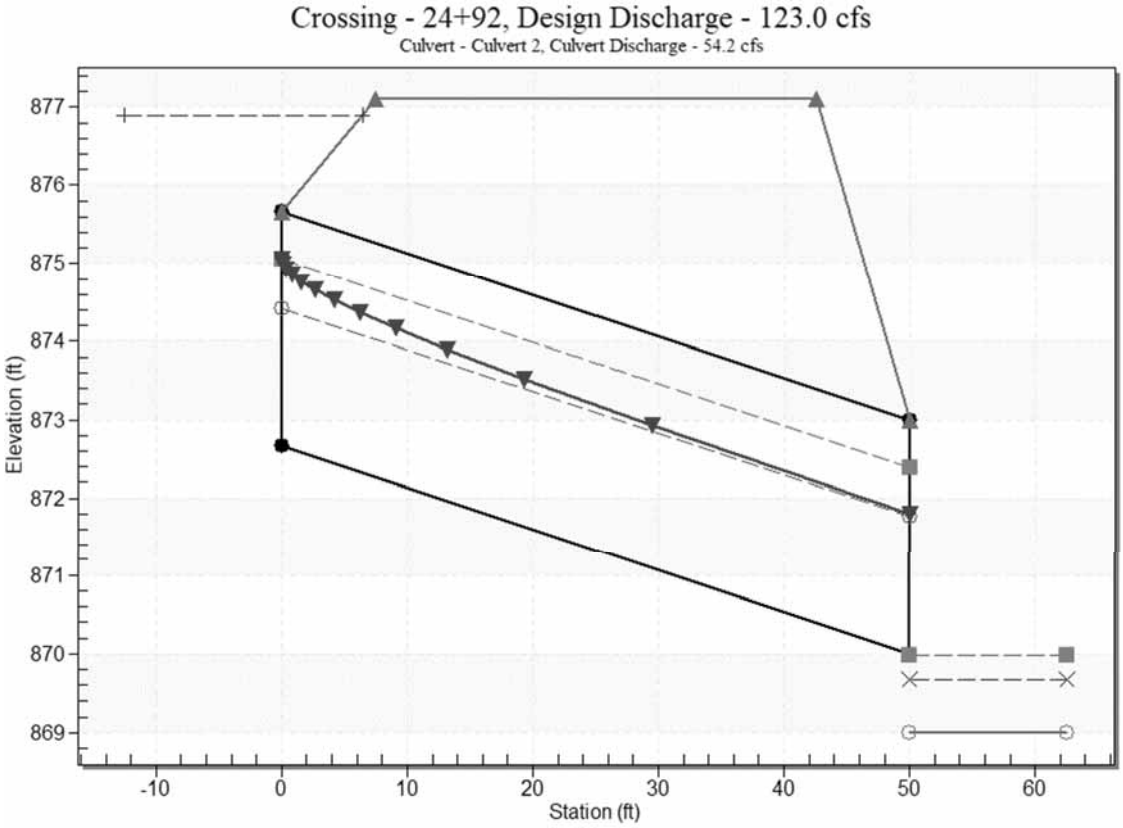
Culvert Length: 50.07 ft,

Culvert Slope: 0.0532

Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 872.66 ft

Outlet Station: 50.00 ft

Outlet Elevation: 870.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: 24+92

Table 4 - Downstream Channel Rating Curve (Crossing: 24+92)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
22.00	869.24	0.24	4.39	1.49	1.62
37.20	869.33	0.33	5.34	2.04	1.70
52.40	869.40	0.40	6.06	2.50	1.75
67.60	869.46	0.46	6.66	2.90	1.79
82.80	869.52	0.52	7.16	3.27	1.82
98.00	869.58	0.58	7.60	3.61	1.85
113.20	869.63	0.63	8.00	3.92	1.87
123.00	869.66	0.66	8.24	4.12	1.89
143.60	869.72	0.72	8.69	4.50	1.91
158.80	869.77	0.77	9.00	4.77	1.93
174.00	869.81	0.81	9.29	5.03	1.94

Tailwater Channel Data - 24+92

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 20.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.1000

Channel Manning's n: 0.0400

Channel Invert Elevation: 869.00 ft

Roadway Data for Crossing: 24+92

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 20.00 ft

Crest Elevation: 877.10 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

STA 43+76 Existing
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 9.00 cfs

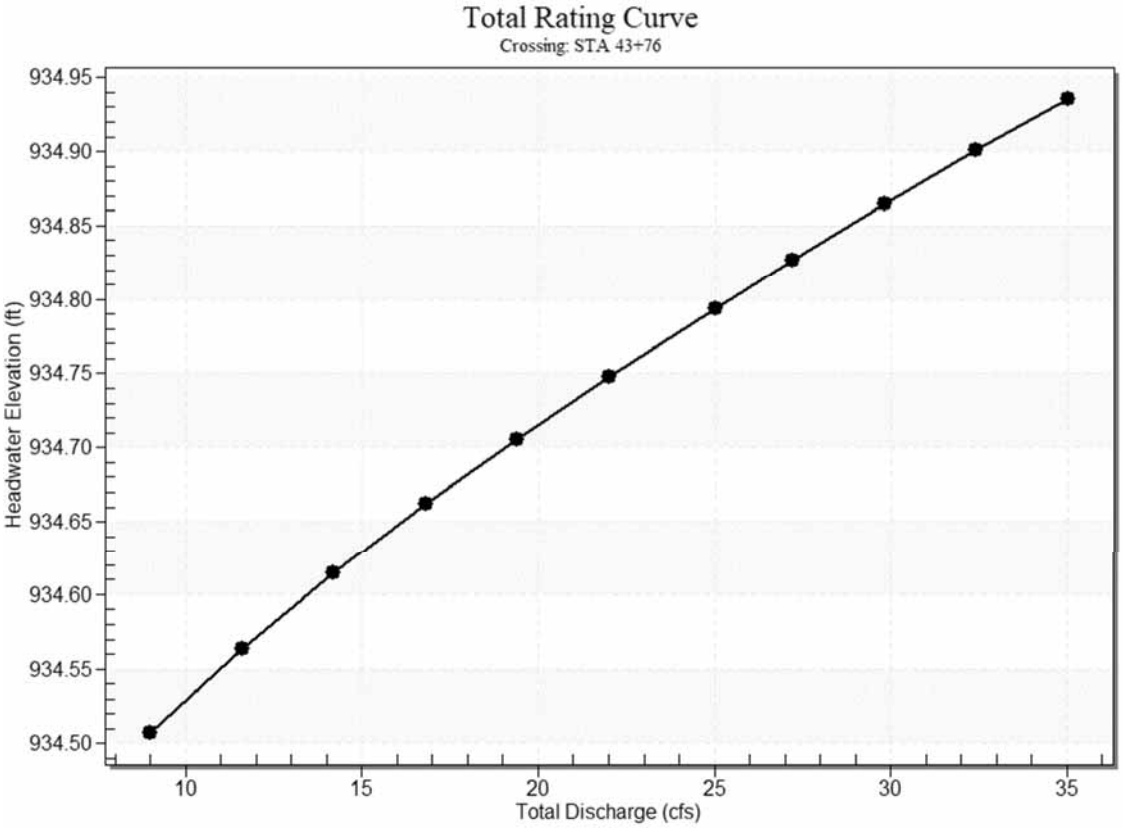
Design Flow: 25.00 cfs

Maximum Flow: 35.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: STA 43+76

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
934.51	9.00	3.33	5.63	8
934.56	11.60	3.46	8.09	4
934.61	14.20	3.58	10.60	4
934.66	16.80	3.68	13.11	4
934.71	19.40	3.77	15.58	3
934.75	22.00	3.86	18.11	3
934.79	25.00	3.95	21.02	3
934.83	27.20	4.02	23.17	3
934.86	29.80	4.09	25.70	3
934.90	32.40	4.16	28.24	3
934.94	35.00	4.22	30.72	2
934.30	2.78	2.78	0.00	Overtopping

Rating Curve Plot for Crossing: STA 43+76



Culvert Data: Culvert 1

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
9.00 cfs	3.33 cfs	934.51	1.37	0.0*	5-S2n	0.50	0.78	0.50	0.27	8.41	1.44
11.60 cfs	3.46 cfs	934.56	1.42	0.0*	5-S2n	0.51	0.79	0.52	0.31	8.45	1.58
14.20 cfs	3.58 cfs	934.61	1.47	0.040	5-S2n	0.52	0.81	0.53	0.35	8.51	1.69
16.80 cfs	3.68 cfs	934.66	1.52	0.105	5-S2n	0.53	0.82	0.54	0.38	8.56	1.79

19.40 cfs	3.77 cfs	934.71	1.57	0.164	5-S2n	0.53	0.83	0.55	0.42	8.62	1.88
22.00 cfs	3.86 cfs	934.75	1.61	0.220	5-S2n	0.54	0.83	0.55	0.45	8.66	1.96
25.00 cfs	3.95 cfs	934.79	1.65	0.282	5-S2n	0.55	0.84	0.56	0.48	8.71	2.05
27.20 cfs	4.02 cfs	934.83	1.69	0.325	5-S2n	0.56	0.85	0.57	0.50	8.74	2.11
29.80 cfs	4.09 cfs	934.86	1.72	0.375	5-S2n	0.56	0.86	0.57	0.53	8.78	2.17
32.40 cfs	4.16 cfs	934.90	1.76	0.423	5-S2n	0.57	0.86	0.58	0.56	8.81	2.23
35.00 cfs	4.22 cfs	934.94	1.80	0.468	5-S2n	0.57	0.87	0.59	0.58	8.84	2.29

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

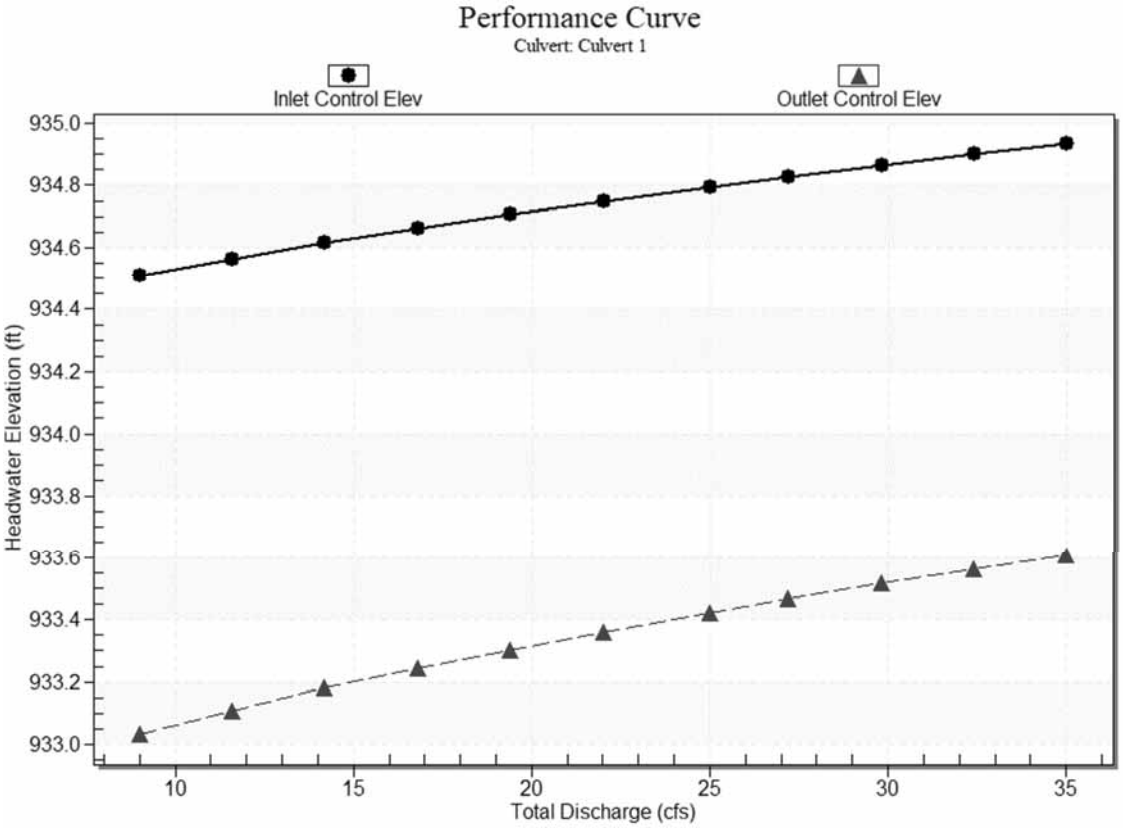
Inlet Elevation (invert): 933.14 ft,

Outlet Elevation (invert): 931.27 ft

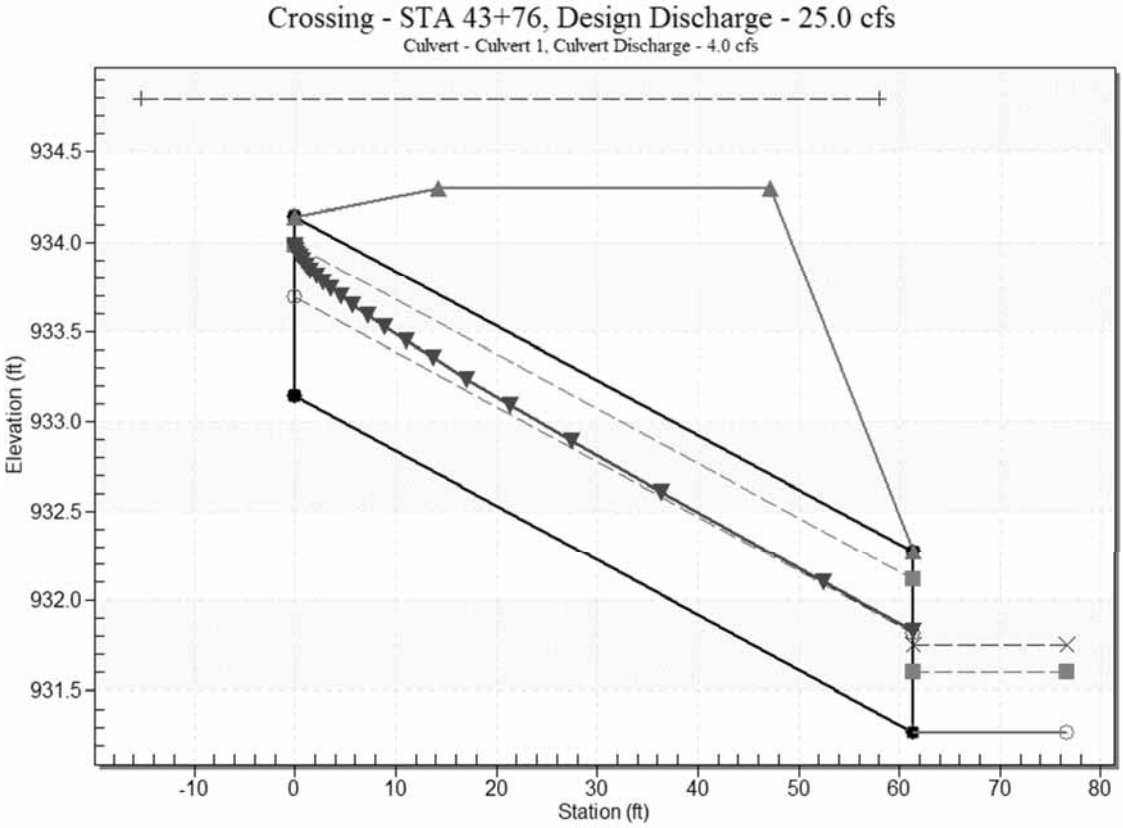
Culvert Length: 61.37 ft,

Culvert Slope: 0.0305

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 933.14 ft

Outlet Station: 61.34 ft

Outlet Elevation: 931.27 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: STA 43+76

Table 3 - Downstream Channel Rating Curve (Crossing: STA 43+76)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
9.00	931.54	0.27	1.44	0.17	0.52
11.60	931.58	0.31	1.58	0.19	0.53
14.20	931.62	0.35	1.69	0.22	0.54
16.80	931.65	0.38	1.79	0.24	0.55
19.40	931.69	0.42	1.88	0.26	0.55
22.00	931.72	0.45	1.96	0.28	0.56
25.00	931.75	0.48	2.05	0.30	0.56
27.20	931.77	0.50	2.11	0.32	0.57
29.80	931.80	0.53	2.17	0.33	0.57
32.40	931.83	0.56	2.23	0.35	0.58
35.00	931.85	0.58	2.29	0.36	0.58

Tailwater Channel Data - STA 43+76

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 21.00 ft

Side Slope (H:V): 9.00 (_:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0400

Channel Invert Elevation: 931.27 ft

Roadway Data for Crossing: STA 43+76

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 20.00 ft

Crest Elevation: 934.30 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

STA 50+72 Existing
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 40.00 cfs

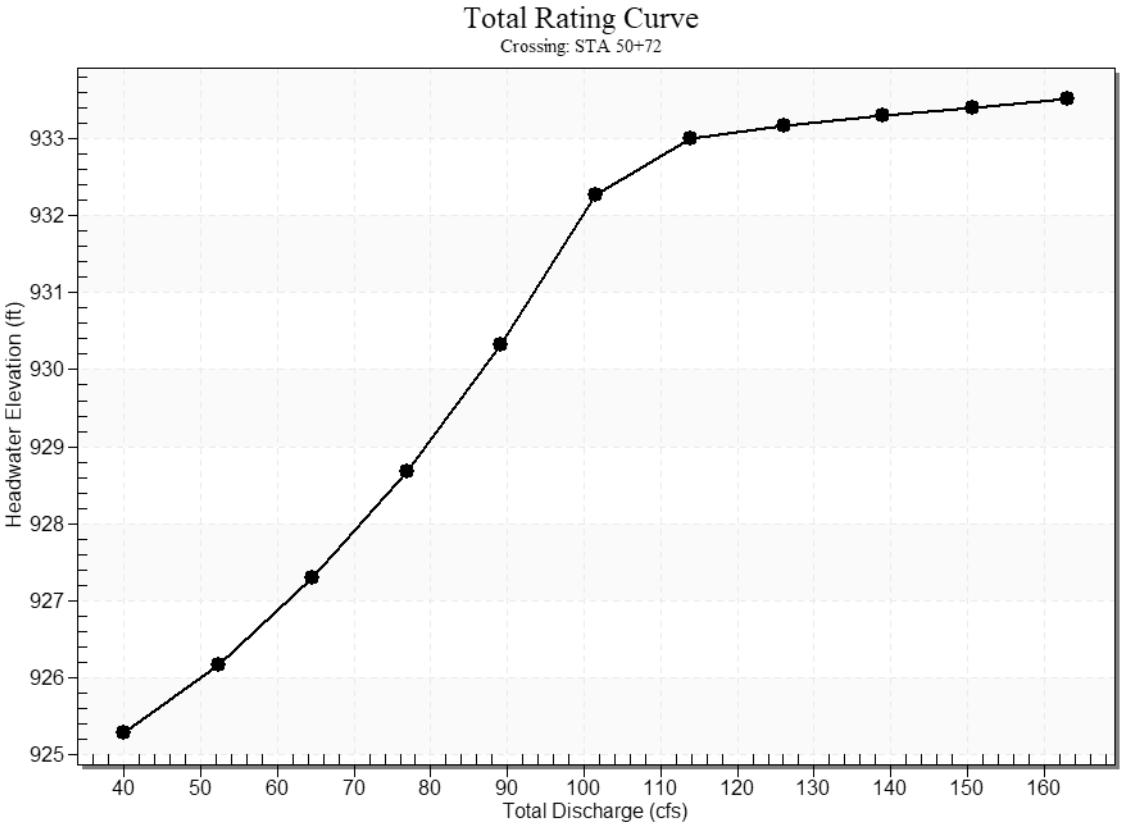
Design Flow: 139.00 cfs

Maximum Flow: 163.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: STA 50+72

Headwater Elevation (ft)	Total Discharge (cfs)	36 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
925.29	40.00	40.00	0.00	1
926.17	52.30	52.30	0.00	1
927.29	64.60	64.60	0.00	1
928.68	76.90	76.90	0.00	1
930.32	89.20	89.20	0.00	1
932.27	101.50	101.50	0.00	1
933.00	113.80	105.69	8.07	7
933.16	126.10	106.57	19.49	6
933.29	139.00	107.32	31.62	5
933.40	150.70	107.91	42.65	4
933.51	163.00	108.49	54.42	4
932.80	104.55	104.55	0.00	Overtopping

Rating Curve Plot for Crossing: STA 50+72



Culvert Data: 36

Table 2 - Culvert Summary Table: 36

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
40.00 cfs	40.00 cfs	925.29	3.25	0.908	5-S2n	0.97	2.06	1.25	0.66	14.38	4.32
52.30 cfs	52.30 cfs	926.17	4.13	2.126	5-S2n	1.12	2.35	1.47	0.77	15.13	4.68
64.60 cfs	64.60 cfs	927.29	5.25	3.003	5-S2n	1.26	2.58	1.68	0.86	15.88	4.98
76.90 cfs	76.90 cfs	928.68	6.64	4.007	5-S2n	1.39	2.74	1.87	0.94	16.64	5.24

89.20 cfs	89.20 cfs	930.32	8.28	5.141	5-S2n	1.51	2.84	2.03	1.01	17.49	5.47
101.50 cfs	101.50 cfs	932.27	10.23	6.363	5-S2n	1.63	2.80	2.18	1.08	18.46	5.68
113.80 cfs	105.69 cfs	933.00	10.96	6.926	5-S2n	1.67	3.00	2.26	1.15	18.48	5.86
126.10 cfs	106.57 cfs	933.16	11.12	7.025	5-S2n	1.68	3.00	2.27	1.21	18.56	6.03
139.00 cfs	107.32 cfs	933.29	11.25	7.109	5-S2n	1.69	3.00	2.28	1.27	18.62	6.20
150.70 cfs	107.91 cfs	933.40	11.36	7.177	5-S2n	1.70	3.00	2.29	1.32	18.68	6.34
163.00 cfs	108.49 cfs	933.51	11.47	7.244	5-S2n	1.70	3.00	2.29	1.38	18.73	6.48

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

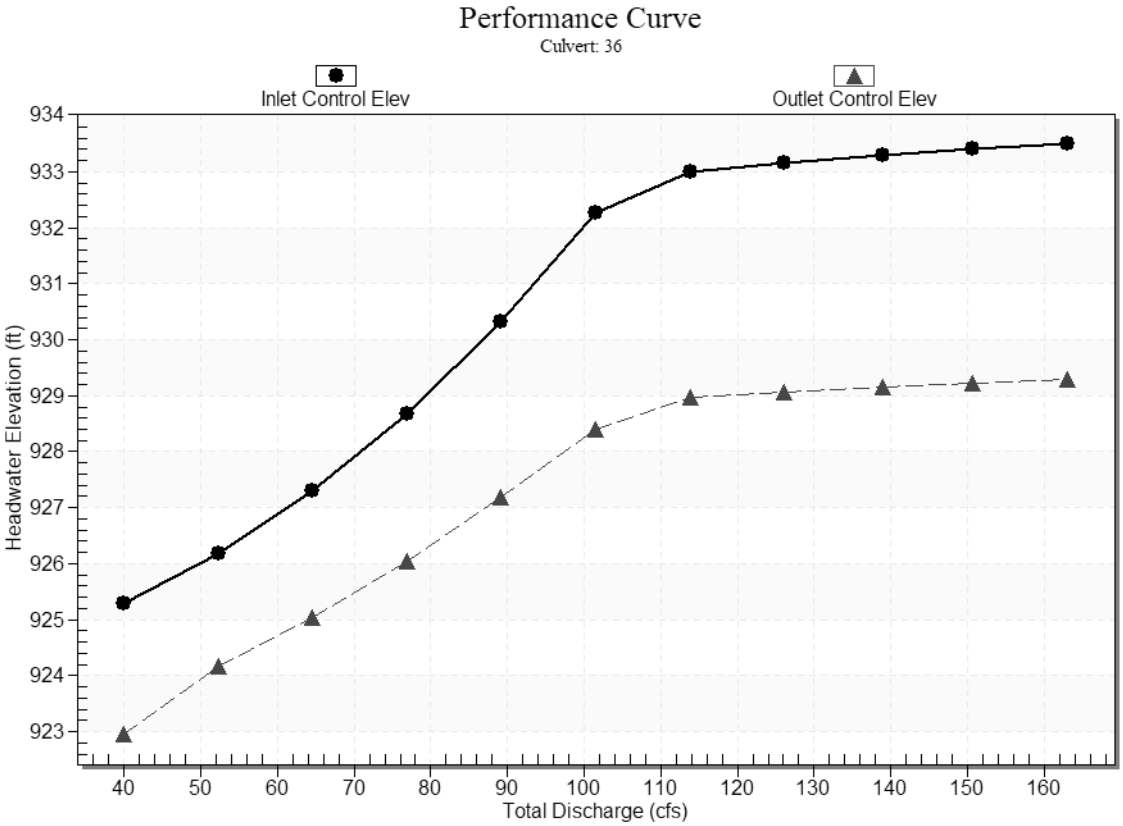
Inlet Elevation (invert): 922.04 ft,

Outlet Elevation (invert): 920.04 ft

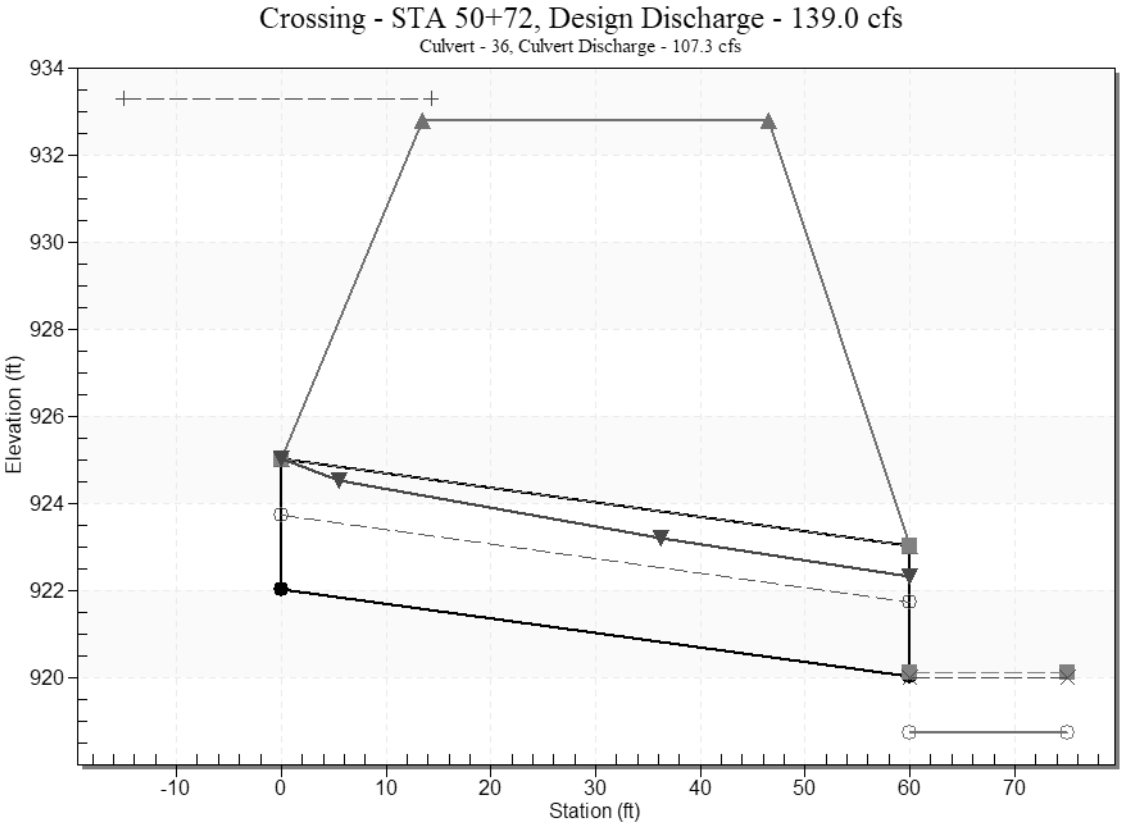
Culvert Length: 60.03 ft,

Culvert Slope: 0.0333

Culvert Performance Curve Plot: 36



Water Surface Profile Plot for Culvert: 36



Site Data - 36

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 922.04 ft

Outlet Station: 60.00 ft

Outlet Elevation: 920.04 ft

Number of Barrels: 1

Culvert Data Summary - 36

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: PVC

Embedment: 0.00 in

Barrel Manning's n: 0.0090

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: STA 50+72

Table 3 - Downstream Channel Rating Curve (Crossing: STA 50+72)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
40.00	919.41	0.66	4.32	1.36	1.06
52.30	919.52	0.77	4.68	1.58	1.08
64.60	919.61	0.86	4.98	1.76	1.10
76.90	919.69	0.94	5.24	1.93	1.11
89.20	919.76	1.01	5.47	2.09	1.12
101.50	919.83	1.08	5.68	2.23	1.13
113.80	919.90	1.15	5.86	2.37	1.14
126.10	919.96	1.21	6.03	2.49	1.15
139.00	920.02	1.27	6.20	2.62	1.16
150.70	920.07	1.32	6.34	2.73	1.17
163.00	920.13	1.38	6.48	2.84	1.17

Tailwater Channel Data - STA 50+72

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 6.00 (_:1)

Channel Slope: 0.0330

Channel Manning's n: 0.0400

Channel Invert Elevation: 918.75 ft

Roadway Data for Crossing: STA 50+72

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 30.00 ft

Crest Elevation: 932.80 ft

Roadway Surface: Paved

Roadway Top Width: 33.00 ft

STA 82+07 Existing
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 5.00 cfs

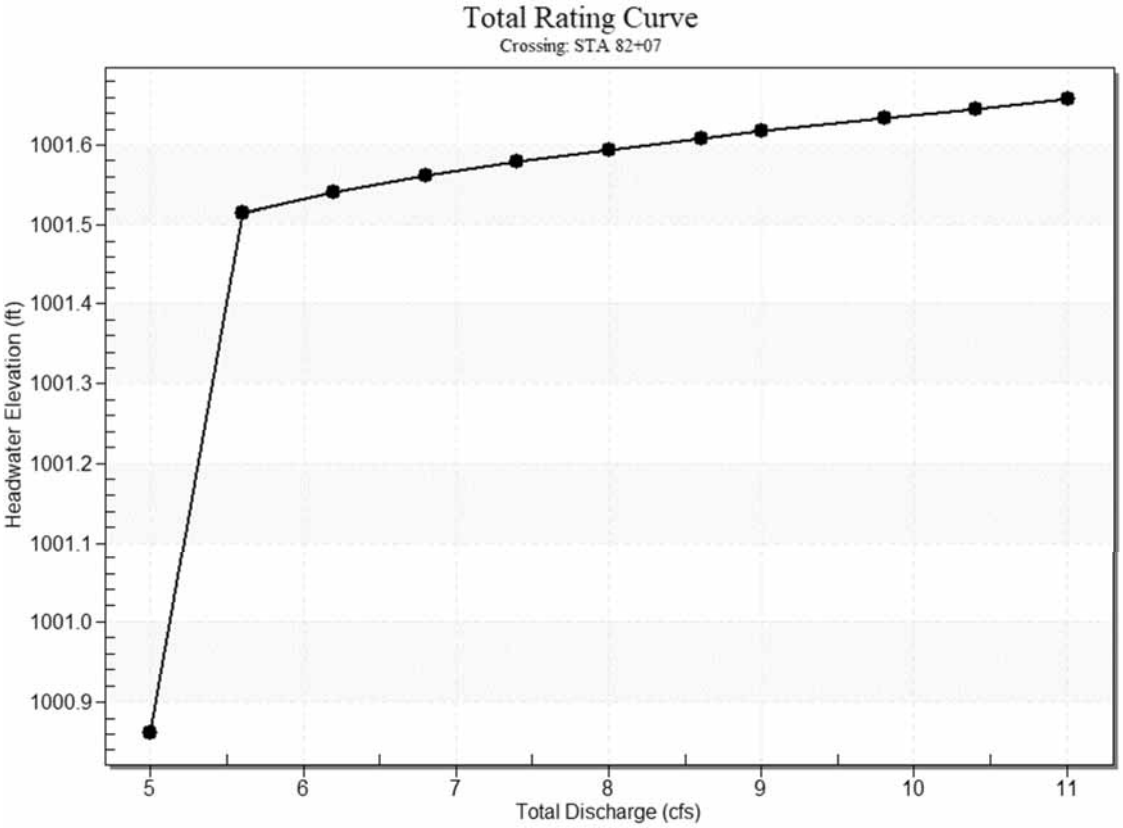
Design Flow: 9.00 cfs

Maximum Flow: 11.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: STA 82+07

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1000.86	5.00	5.00	0.00	1
1001.51	5.60	5.41	0.15	49
1001.54	6.20	5.42	0.73	5
1001.56	6.80	5.43	1.32	4
1001.58	7.40	5.44	1.93	4
1001.59	8.00	5.45	2.50	3
1001.61	8.60	5.46	3.10	3
1001.62	9.00	5.47	3.51	3
1001.63	9.80	5.48	4.30	3
1001.65	10.40	5.48	4.90	3
1001.66	11.00	5.49	5.50	3
1001.50	5.40	5.40	0.00	Overtopping

Rating Curve Plot for Crossing: STA 82+07



Culvert Data: Culvert 1

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5.00 cfs	5.00 cfs	1000.86	2.23	4.182	7-M2c	1.00	0.92	0.92	0.10	6.63	2.00
5.60 cfs	5.41 cfs	1001.51	2.49	4.834	7-M2c	1.00	0.94	0.94	0.11	7.08	2.09
6.20 cfs	5.42 cfs	1001.54	2.50	4.861	7-M2c	1.00	0.94	0.94	0.11	7.09	2.18
6.80 cfs	5.43 cfs	1001.56	2.51	4.881	7-M2c	1.00	0.94	0.94	0.12	7.11	2.26

7.40 cfs	5.44 cfs	1001.58	2.52	4.898	7-M2c	1.00	0.94	0.94	0.13	7.12	2.34
8.00 cfs	5.45 cfs	1001.59	2.52	4.913	7-M2c	1.00	0.94	0.94	0.13	7.13	2.41
8.60 cfs	5.46 cfs	1001.61	2.53	4.928	7-M2c	1.00	0.94	0.94	0.14	7.14	2.48
9.00 cfs	5.47 cfs	1001.62	2.53	4.937	7-M2c	1.00	0.94	0.94	0.14	7.15	2.52
9.80 cfs	5.48 cfs	1001.63	2.54	4.953	7-M2c	1.00	0.94	0.94	0.15	7.16	2.61
10.40 cfs	5.48 cfs	1001.65	2.54	4.965	7-M2c	1.00	0.94	0.94	0.15	7.16	2.67
11.00 cfs	5.49 cfs	1001.66	2.55	4.977	7-M2c	1.00	0.94	0.94	0.16	7.17	2.73

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

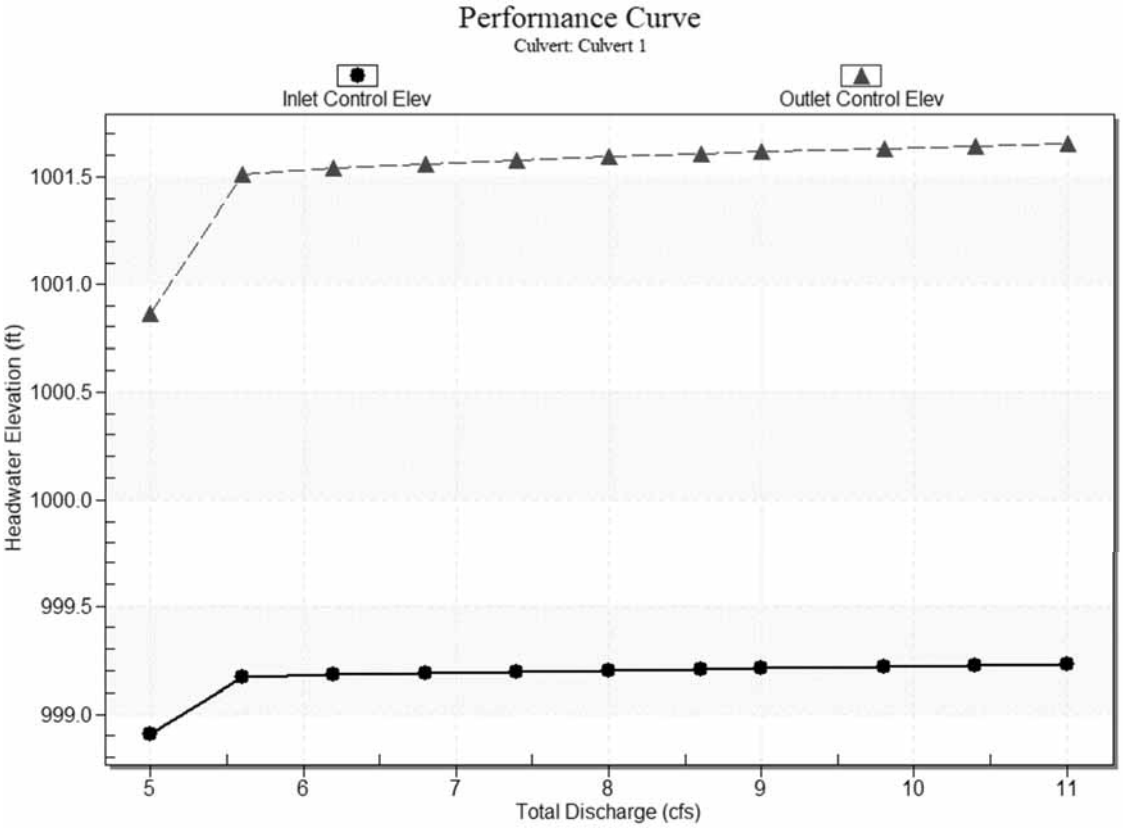
Inlet Elevation (invert): 996.68 ft,

Outlet Elevation (invert): 996.08 ft

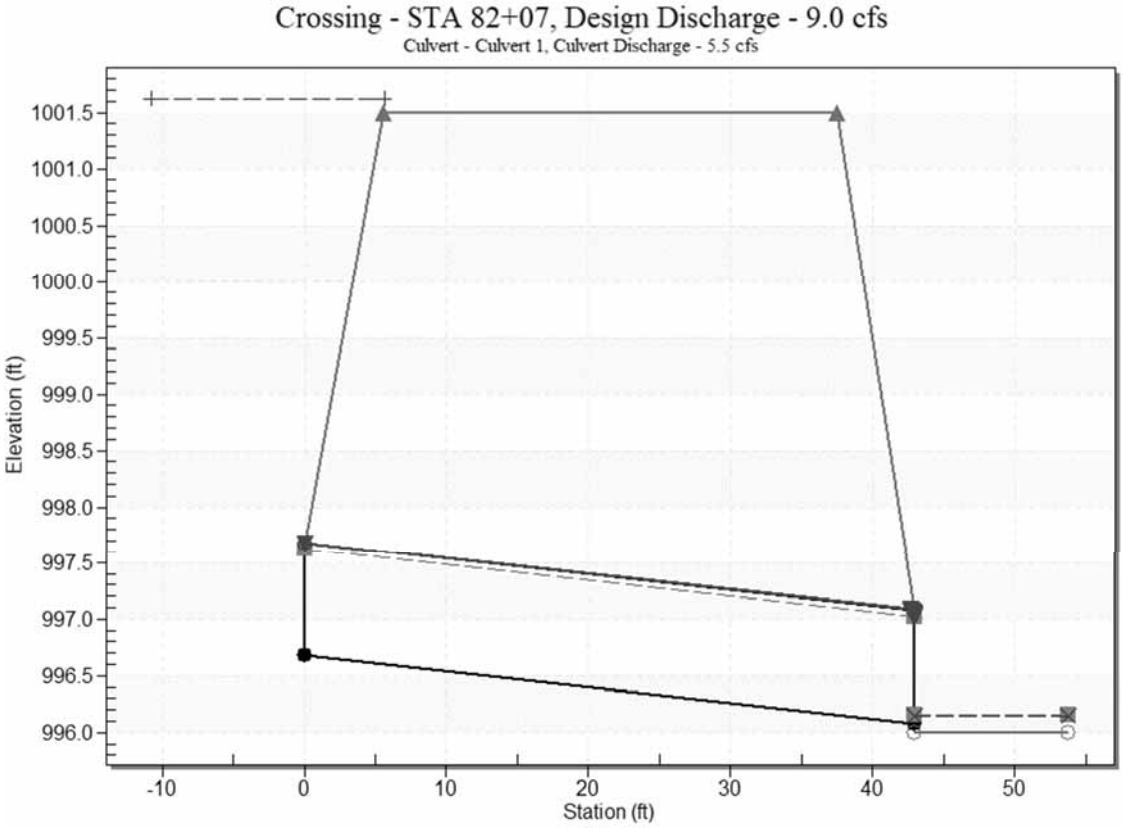
Culvert Length: 43.00 ft,

Culvert Slope: 0.0140

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 996.68 ft

Outlet Station: 43.00 ft

Outlet Elevation: 996.08 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: STA 82+07

Table 3 - Downstream Channel Rating Curve (Crossing: STA 82+07)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	996.10	0.10	2.00	0.22	1.12
5.60	996.11	0.11	2.09	0.24	1.14
6.20	996.11	0.11	2.18	0.25	1.15
6.80	996.12	0.12	2.26	0.27	1.16
7.40	996.13	0.13	2.34	0.28	1.17
8.00	996.13	0.13	2.41	0.30	1.18
8.60	996.14	0.14	2.48	0.31	1.19
9.00	996.14	0.14	2.52	0.32	1.19
9.80	996.15	0.15	2.61	0.33	1.20
10.40	996.15	0.15	2.67	0.35	1.21
11.00	996.16	0.16	2.73	0.36	1.21

Tailwater Channel Data - STA 82+07

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 25.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0360

Channel Manning's n: 0.0300

Channel Invert Elevation: 996.00 ft

Roadway Data for Crossing: STA 82+07

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 30.00 ft

Crest Elevation: 1001.50 ft

Roadway Surface: Paved

Roadway Top Width: 32.00 ft

STA 85+60 Existing
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 26.00 cfs

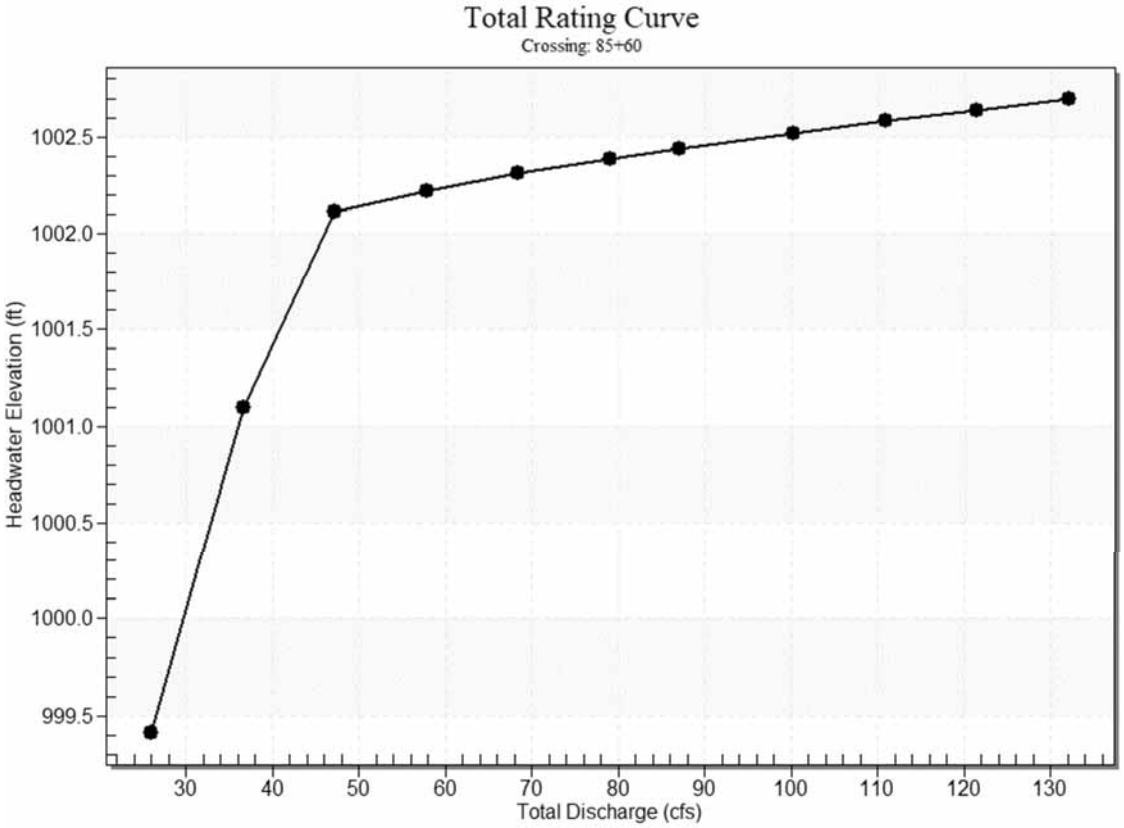
Design Flow: 87.00 cfs

Maximum Flow: 132.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: 85+60

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
999.41	26.00	26.00	0.00	1
1001.10	36.60	36.60	0.00	1
1002.11	47.20	41.63	5.48	6
1002.22	57.80	42.11	15.60	6
1002.31	68.40	42.47	25.85	5
1002.39	79.00	42.79	36.09	4
1002.44	87.00	43.00	43.95	4
1002.52	100.20	43.33	56.83	4
1002.58	110.80	43.58	67.08	3
1002.64	121.40	43.81	77.50	3
1002.70	132.00	44.03	87.91	3
1002.00	41.10	41.10	0.00	Overtopping

Rating Curve Plot for Crossing: 85+60



Culvert Data: Culvert 1

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
26.00 cfs	26.00 cfs	999.41	3.25	2.849	5-S2n	1.71	1.74	1.71	0.57	7.62	4.30
36.60 cfs	36.60 cfs	1001.10	4.94	4.305	6-FFc	2.00	2.00	2.00	0.70	9.15	4.87
47.20 cfs	41.63 cfs	1002.11	5.95	5.090	6-FFc	2.00	2.00	2.00	0.82	10.41	5.33
57.80 cfs	42.11 cfs	1002.22	6.06	5.171	6-FFc	2.00	2.00	2.00	0.92	10.53	5.73

68.40 cfs	42.47 cfs	1002.31	6.15	5.233	6-FFc	2.00	2.00	2.00	1.02	10.62	6.07
79.00 cfs	42.79 cfs	1002.39	6.23	5.286	6-FFc	2.00	2.00	2.00	1.11	10.70	6.38
87.00 cfs	43.00 cfs	1002.44	6.28	5.323	6-FFc	2.00	2.00	2.00	1.18	10.75	6.60
100.20 cfs	43.33 cfs	1002.52	6.36	5.380	6-FFc	2.00	2.00	2.00	1.28	10.83	6.92
110.80 cfs	43.58 cfs	1002.58	6.42	5.422	6-FFc	2.00	2.00	2.00	1.36	10.89	7.16
121.40 cfs	43.81 cfs	1002.64	6.48	5.463	6-FFc	2.00	2.00	2.00	1.44	10.95	7.38
132.00 cfs	44.03 cfs	1002.70	6.54	5.502	6-FFc	2.00	2.00	2.00	1.51	11.01	7.58

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

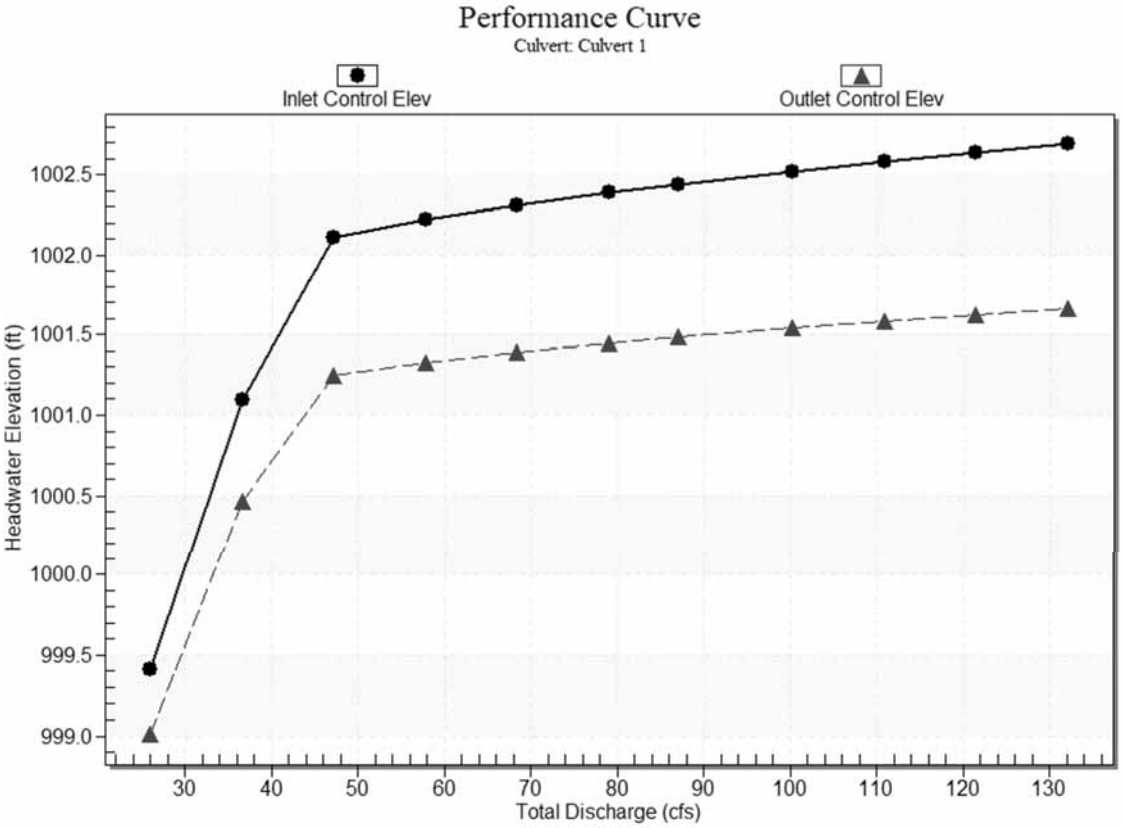
Inlet Elevation (invert): 996.16 ft,

Outlet Elevation (invert): 995.79 ft

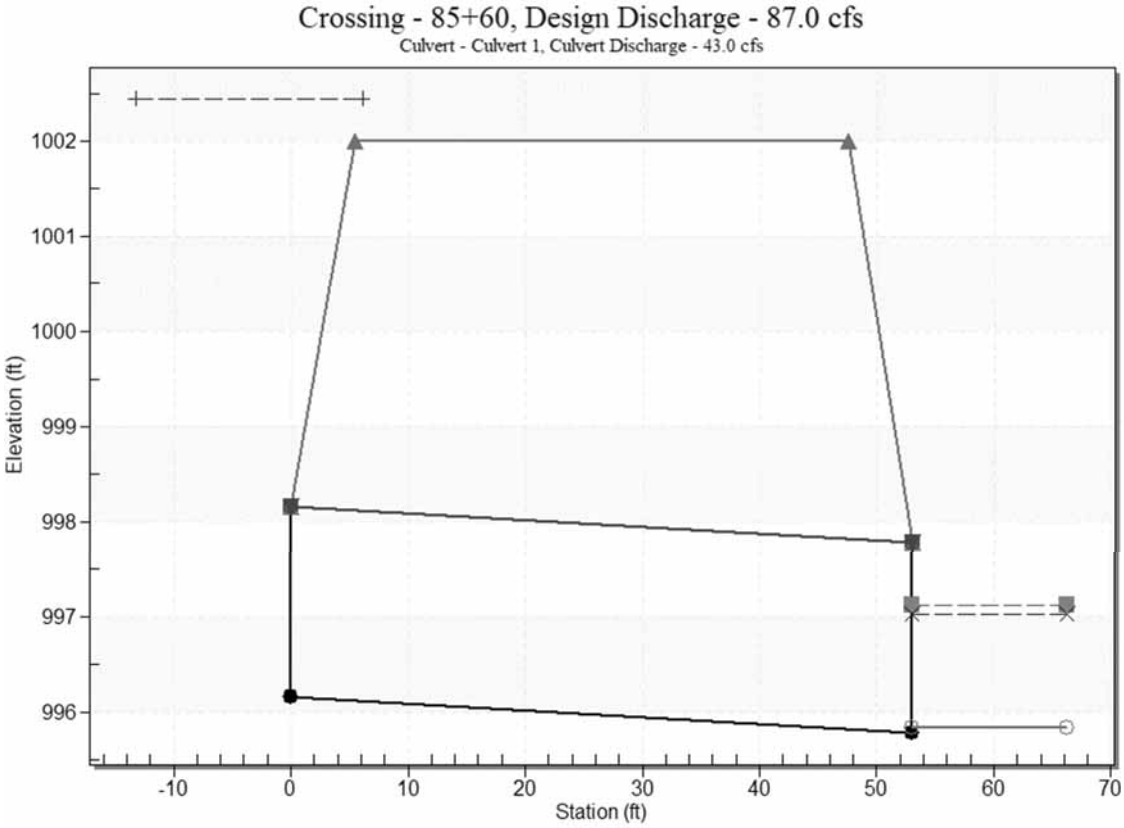
Culvert Length: 53.00 ft,

Culvert Slope: 0.0070

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 996.16 ft

Outlet Station: 53.00 ft

Outlet Elevation: 995.79 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 2.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Tailwater Data for Crossing: 85+60

Table 3 - Downstream Channel Rating Curve (Crossing: 85+60)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
26.00	996.41	0.57	4.30	1.78	1.03
36.60	996.54	0.70	4.87	2.19	1.06
47.20	996.66	0.82	5.33	2.55	1.08
57.80	996.76	0.92	5.73	2.88	1.09
68.40	996.86	1.02	6.07	3.19	1.11
79.00	996.95	1.11	6.38	3.47	1.12
87.00	997.02	1.18	6.60	3.68	1.13
100.20	997.12	1.28	6.92	4.00	1.14
110.80	997.20	1.36	7.16	4.25	1.14
121.40	997.28	1.44	7.38	4.49	1.15
132.00	997.35	1.51	7.58	4.72	1.16

Tailwater Channel Data - 85+60

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 1.00 (_:1)

Channel Slope: 0.0500

Channel Manning's n: 0.0500

Channel Invert Elevation: 995.84 ft

Roadway Data for Crossing: 85+60

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 1002.00 ft

Roadway Surface: Paved

Roadway Top Width: 42.00 ft

WALES. MA

DRAINAGE REPORT

Proposed

HY-8 Reports

Proposed STA 1+50
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.50 cfs

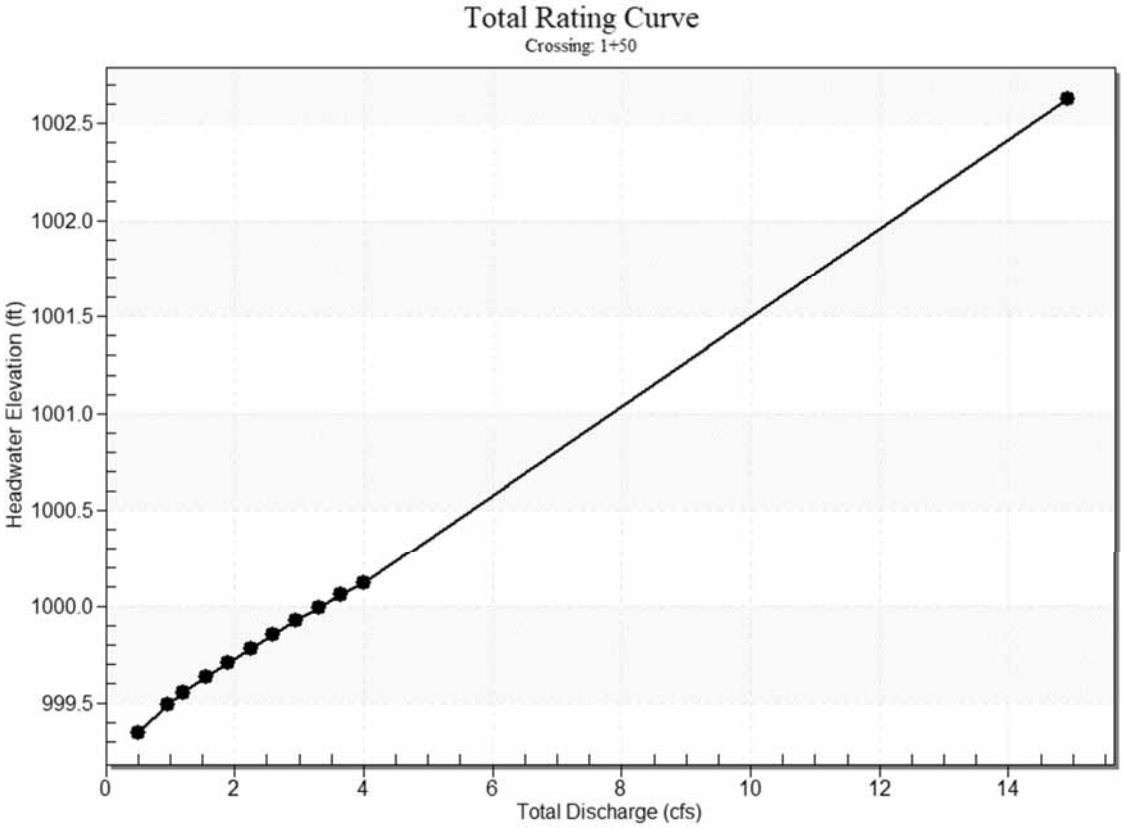
Design Flow: 0.97 cfs

Maximum Flow: 4.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: 1+50

Headwater Elevation (ft)	Total Discharge (cfs)	18 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
999.35	0.50	0.50	0.00	1
999.50	0.97	0.97	0.00	1
999.55	1.20	1.20	0.00	1
999.63	1.55	1.55	0.00	1
999.71	1.90	1.90	0.00	1
999.78	2.25	2.25	0.00	1
999.86	2.60	2.60	0.00	1
999.93	2.95	2.95	0.00	1
999.99	3.30	3.30	0.00	1
1000.06	3.65	3.65	0.00	1
1000.12	4.00	4.00	0.00	1
1002.60	14.34	14.34	0.00	Overtopping

Rating Curve Plot for Crossing: 1+50



Culvert Data: 18

Table 2 - Culvert Summary Table: 18

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.50 cfs	0.50 cfs	999.35	0.35	0.0*	1-S2n	0.18	0.26	0.18	0.10	4.08	0.79
0.97 cfs	0.97 cfs	999.50	0.50	0.0*	1-S2n	0.25	0.37	0.25	0.15	4.96	1.02
1.20 cfs	1.20 cfs	999.55	0.55	0.0*	1-S2n	0.28	0.41	0.28	0.17	5.28	1.10
1.55 cfs	1.55 cfs	999.63	0.63	0.0*	1-S2n	0.32	0.47	0.32	0.20	5.69	1.21

1.90 cfs	1.90 cfs	999.71	0.71	0.0*	1-S2n	0.35	0.52	0.35	0.23	6.03	1.30
2.25 cfs	2.25 cfs	999.78	0.78	0.0*	1-S2n	0.38	0.57	0.38	0.25	6.32	1.39
2.60 cfs	2.60 cfs	999.86	0.86	0.0*	1-S2n	0.41	0.61	0.41	0.27	6.60	1.46
2.95 cfs	2.95 cfs	999.93	0.93	0.0*	1-S2n	0.44	0.65	0.44	0.29	6.85	1.53
3.30 cfs	3.30 cfs	999.99	0.99	0.0*	1-S2n	0.47	0.69	0.47	0.31	7.06	1.59
3.65 cfs	3.65 cfs	1000.06	1.06	0.0*	1-S2n	0.49	0.73	0.49	0.33	7.20	1.65
4.00 cfs	4.00 cfs	1000.12	1.12	0.0*	1-S2n	0.51	0.77	0.51	0.35	7.46	1.70

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

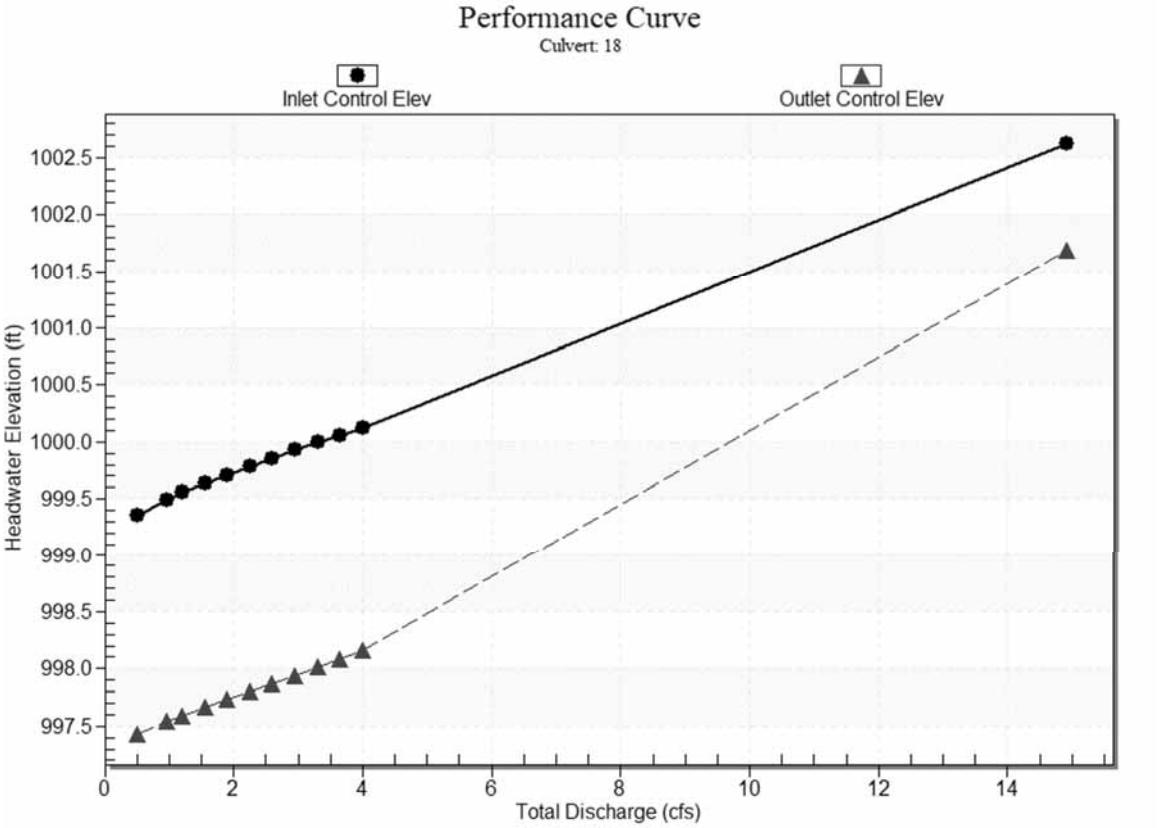
Inlet Elevation (invert): 999.00 ft,

Outlet Elevation (invert): 997.16 ft

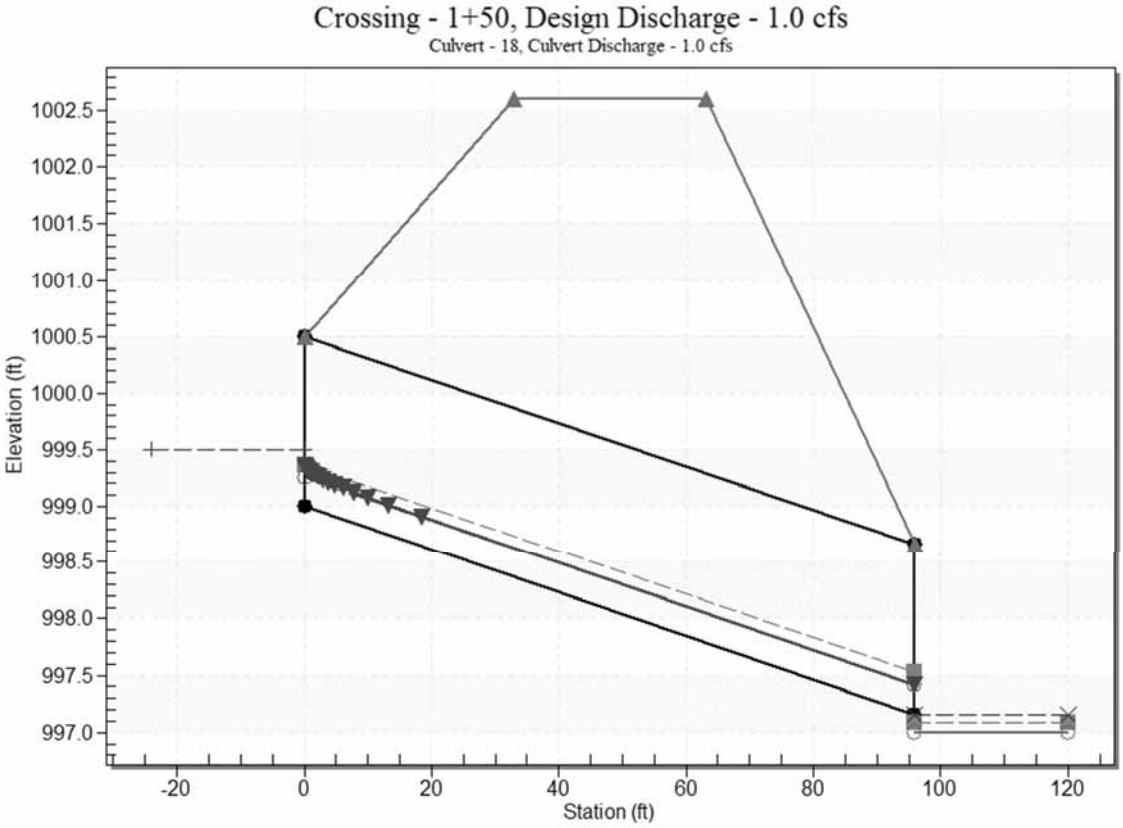
Culvert Length: 96.02 ft,

Culvert Slope: 0.0192

Culvert Performance Curve Plot: 18



Water Surface Profile Plot for Culvert: 18



Site Data - 18

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 999.00 ft

Outlet Station: 96.00 ft

Outlet Elevation: 997.16 ft

Number of Barrels: 1

Culvert Data Summary - 18

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: 1+50

Table 3 - Downstream Channel Rating Curve (Crossing: 1+50)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.50	997.10	0.10	0.79	0.06	0.44
0.97	997.15	0.15	1.02	0.09	0.47
1.20	997.17	0.17	1.10	0.11	0.48
1.55	997.20	0.20	1.21	0.12	0.49
1.90	997.23	0.23	1.30	0.14	0.50
2.25	997.25	0.25	1.39	0.16	0.51
2.60	997.27	0.27	1.46	0.17	0.51
2.95	997.29	0.29	1.53	0.18	0.52
3.30	997.31	0.31	1.59	0.20	0.52
3.65	997.33	0.33	1.65	0.21	0.53
4.00	997.35	0.35	1.70	0.22	0.53

Tailwater Channel Data - 1+50

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 6.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0400

Channel Invert Elevation: 997.00 ft

Roadway Data for Crossing: 1+50

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 40.00 ft

Crest Elevation: 1002.60 ft

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

STA 15+33
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 5.00 cfs

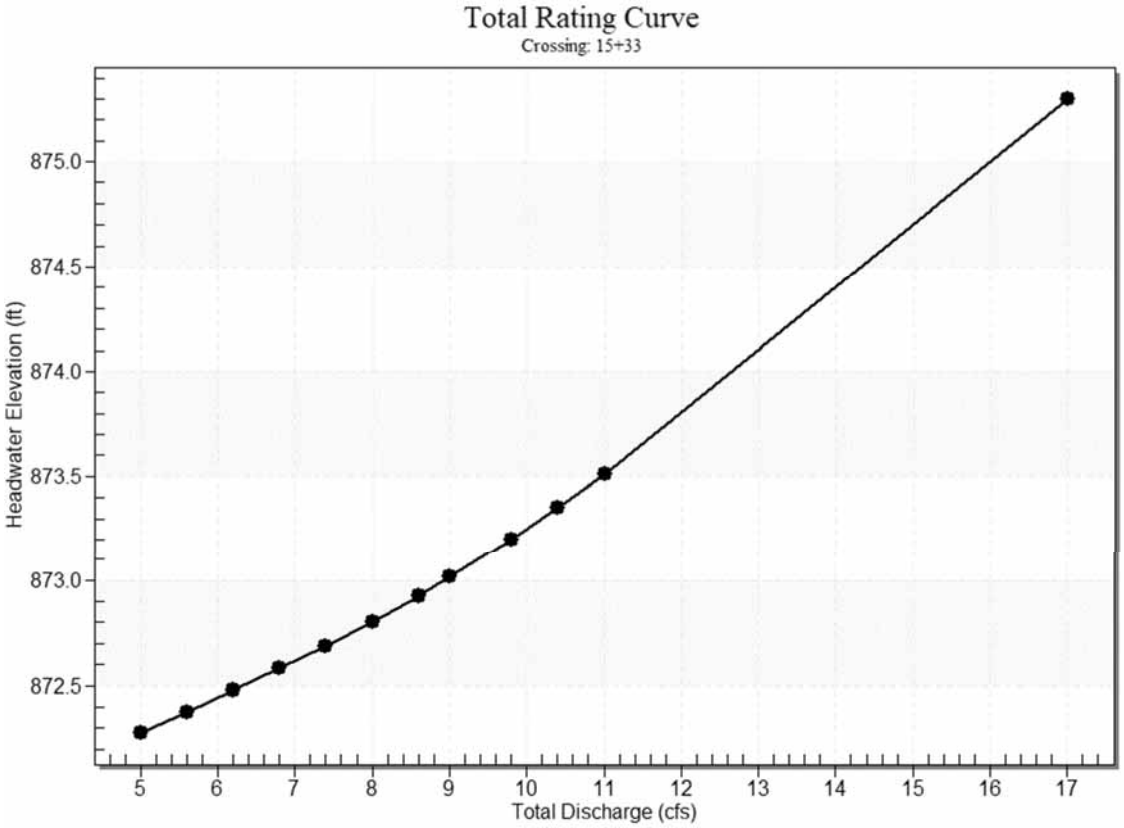
Design Flow: 9.00 cfs

Maximum Flow: 11.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: 15+33

Headwater Elevation (ft)	Total Discharge (cfs)	18 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
872.28	5.00	5.00	0.00	1
872.38	5.60	5.60	0.00	1
872.48	6.20	6.20	0.00	1
872.58	6.80	6.80	0.00	1
872.69	7.40	7.40	0.00	1
872.80	8.00	8.00	0.00	1
872.93	8.60	8.60	0.00	1
873.01	9.00	9.00	0.00	1
873.20	9.80	9.80	0.00	1
873.35	10.40	10.40	0.00	1
873.51	11.00	11.00	0.00	1
875.23	15.98	15.98	0.00	Overtopping

Rating Curve Plot for Crossing: 15+33



Culvert Data: 18

Table 2 - Culvert Summary Table: 18

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5.00 cfs	5.00 cfs	872.28	1.28	0.0*	1-S2n	0.52	0.86	0.54	0.21	8.68	2.73
5.60 cfs	5.60 cfs	872.38	1.38	0.0*	1-S2n	0.55	0.91	0.58	0.22	8.90	2.84
6.20 cfs	6.20 cfs	872.48	1.48	0.079	1-S2n	0.58	0.96	0.62	0.24	9.09	2.95
6.80 cfs	6.80 cfs	872.58	1.58	0.210	5-S2n	0.61	1.01	0.65	0.25	9.28	3.05

7.40 cfs	7.40 cfs	872.69	1.69	0.347	5-S2n	0.64	1.05	0.68	0.26	9.45	3.14
8.00 cfs	8.00 cfs	872.80	1.80	0.489	5-S2n	0.67	1.10	0.72	0.27	9.61	3.22
8.60 cfs	8.60 cfs	872.93	1.93	0.819	5-S2n	0.70	1.14	0.75	0.28	9.76	3.31
9.00 cfs	9.00 cfs	873.01	2.01	0.908	5-S2n	0.71	1.16	0.77	0.29	9.86	3.36
9.80 cfs	9.80 cfs	873.20	2.20	1.095	5-S2n	0.75	1.21	0.81	0.31	10.04	3.46
10.40 cfs	10.40 cfs	873.35	2.35	1.242	5-S2n	0.78	1.24	0.84	0.32	10.18	3.53
11.00 cfs	11.00 cfs	873.51	2.51	1.396	5-S2n	0.80	1.27	0.87	0.33	10.31	3.60

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

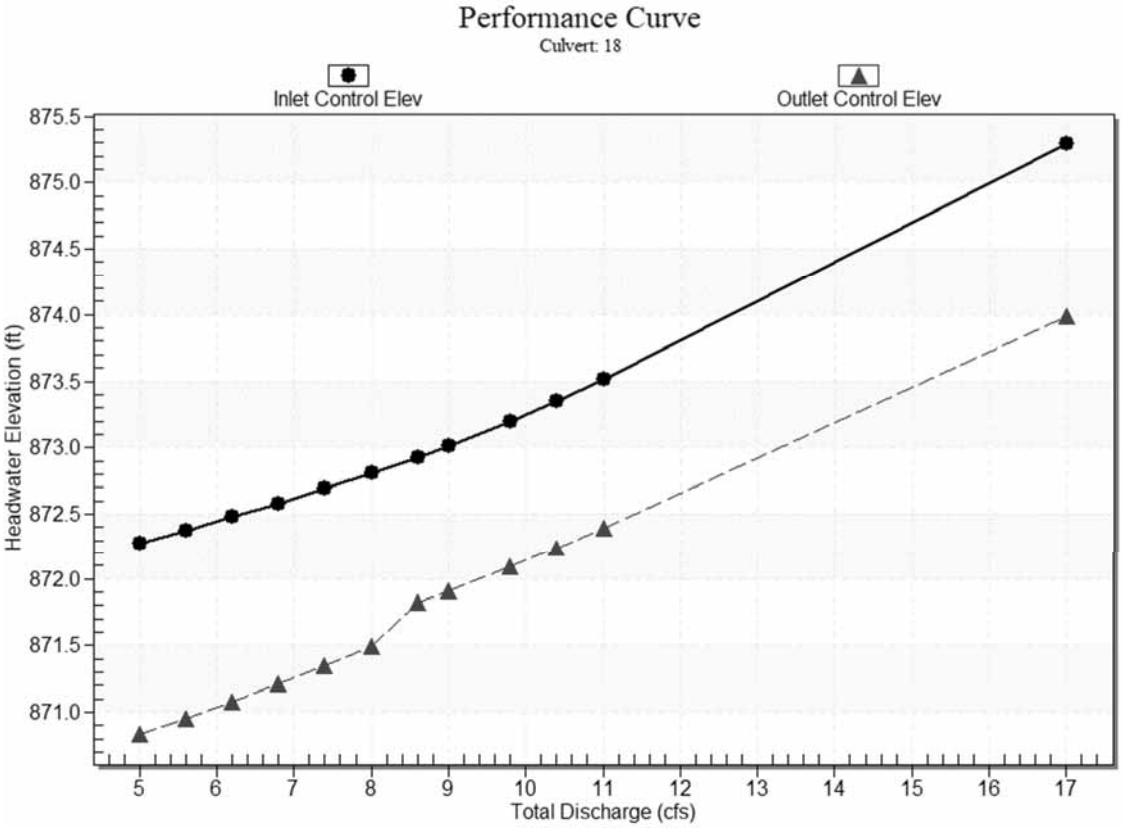
Inlet Elevation (invert): 871.00 ft,

Outlet Elevation (invert): 869.70 ft

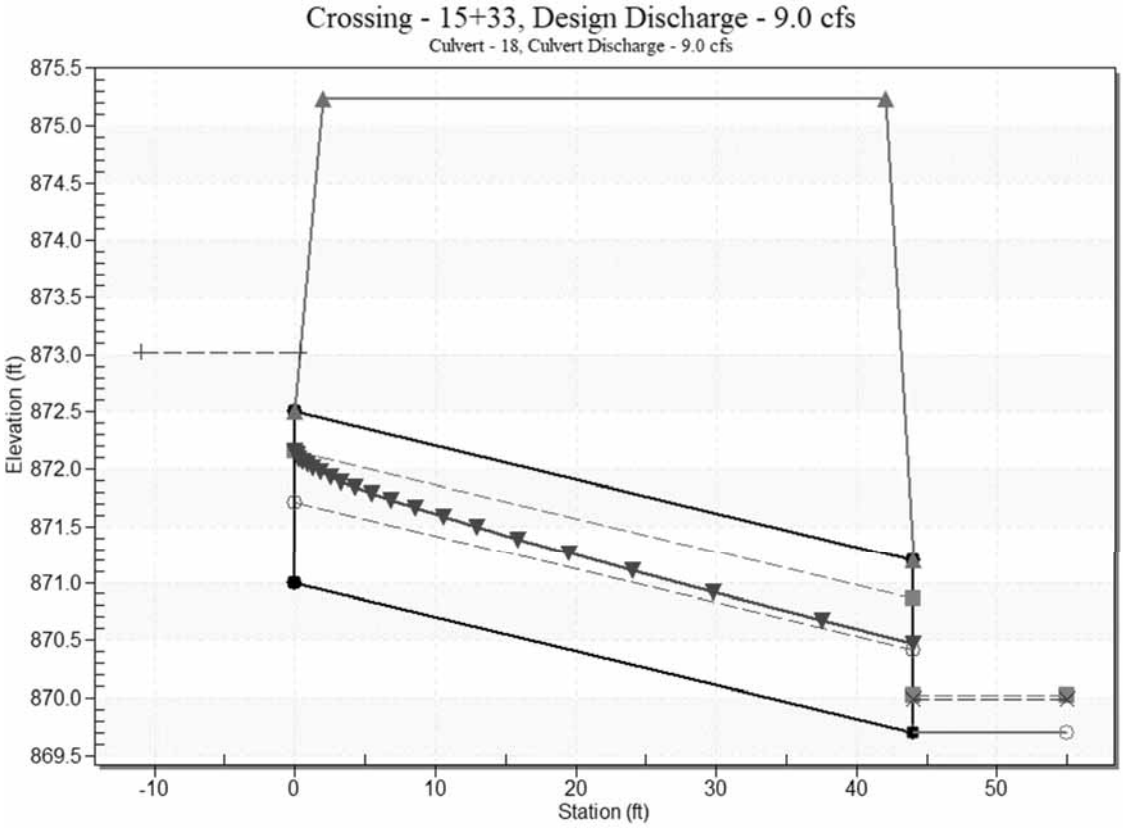
Culvert Length: 44.02 ft,

Culvert Slope: 0.0295

Culvert Performance Curve Plot: 18



Water Surface Profile Plot for Culvert: 18



Site Data - 18

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 871.00 ft

Outlet Station: 44.00 ft

Outlet Elevation: 869.70 ft

Number of Barrels: 1

Culvert Data Summary - 18

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: 15+33

Table 3 - Downstream Channel Rating Curve (Crossing: 15+33)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	869.91	0.21	2.73	0.65	1.11
5.60	869.92	0.22	2.84	0.69	1.12
6.20	869.94	0.24	2.95	0.73	1.13
6.80	869.95	0.25	3.05	0.77	1.14
7.40	869.96	0.26	3.14	0.81	1.14
8.00	869.97	0.27	3.22	0.85	1.15
8.60	869.98	0.28	3.31	0.89	1.16
9.00	869.99	0.29	3.36	0.91	1.16
9.80	870.01	0.31	3.46	0.96	1.17
10.40	870.02	0.32	3.53	0.99	1.18
11.00	870.03	0.33	3.60	1.02	1.18

Tailwater Channel Data - 15+33

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0500

Channel Manning's n: 0.0400

Channel Invert Elevation: 869.70 ft

Roadway Data for Crossing: 15+33

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 16.00 ft

Crest Elevation: 875.23 ft

Roadway Surface: Paved

Roadway Top Width: 40.00 ft

Sta. 43+76 (Split Flow w/ 46+65) HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 9.00 cfs

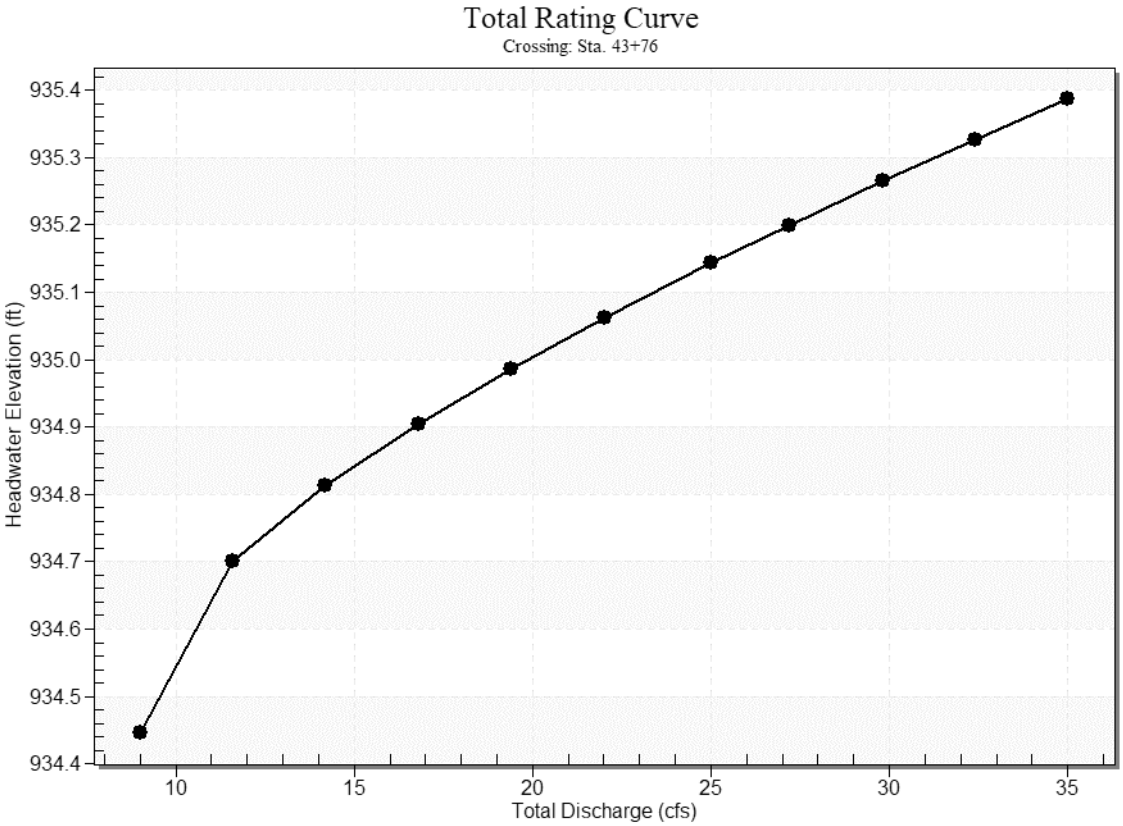
Design Flow: 25.00 cfs

Maximum Flow: 35.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: Sta. 43+76

Headwater Elevation (ft)	Total Discharge (cfs)	12 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
934.45	9.00	9.00	0.00	1
934.70	11.60	9.83	1.74	8
934.81	14.20	10.18	4.01	6
934.90	16.80	10.45	6.33	5
934.99	19.40	10.69	8.69	4
935.06	22.00	10.90	11.08	4
935.14	25.00	11.13	13.86	4
935.20	27.20	11.28	15.88	3
935.26	29.80	11.46	18.31	3
935.33	32.40	11.63	20.76	3
935.39	35.00	11.78	23.21	3
934.55	9.35	9.35	0.00	Overtopping

Rating Curve Plot for Crossing: Sta. 43+76



Culvert Data: 12

Table 2 - Culvert Summary Table: 12

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
9.00 cfs	9.00 cfs	934.45	1.95	0.819	5-S2n	0.59	0.89	0.61	0.27	9.00	1.44
11.60 cfs	9.83 cfs	934.70	2.20	1.106	5-S2n	0.62	0.91	0.65	0.31	9.17	1.58
14.20 cfs	10.18 cfs	934.81	2.31	1.230	5-S2n	0.64	0.92	0.66	0.35	9.25	1.69
16.80 cfs	10.45 cfs	934.90	2.40	1.332	5-S2n	0.65	0.93	0.67	0.38	9.31	1.79

19.40 cfs	10.69 cfs	934.99	2.49	1.422	5-S2n	0.66	0.93	0.68	0.42	9.34	1.88
22.00 cfs	10.90 cfs	935.06	2.56	1.505	5-S2n	0.67	0.94	0.69	0.45	9.38	1.96
25.00 cfs	11.13 cfs	935.14	2.64	1.596	5-S2n	0.68	0.94	0.70	0.48	9.43	2.05
27.20 cfs	11.28 cfs	935.20	2.70	1.657	5-S2n	0.69	0.94	0.71	0.50	9.45	2.11
29.80 cfs	11.46 cfs	935.26	2.76	1.728	5-S2n	0.69	0.95	0.72	0.53	9.48	2.17
32.40 cfs	11.63 cfs	935.33	2.83	1.797	5-S2n	0.70	0.95	0.73	0.56	9.51	2.23
35.00 cfs	11.78 cfs	935.39	2.89	1.862	5-S2n	0.71	0.95	0.73	0.58	9.53	2.29

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

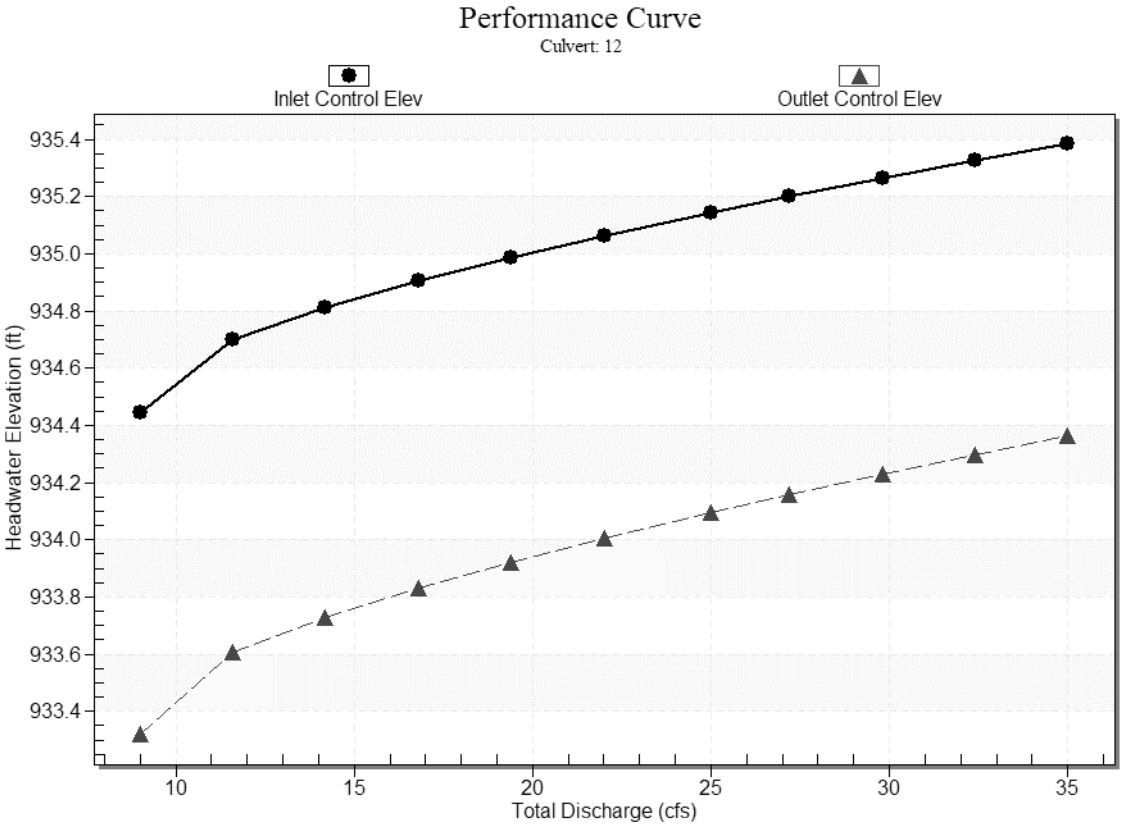
Inlet Elevation (invert): 932.50 ft,

Outlet Elevation (invert): 930.96 ft

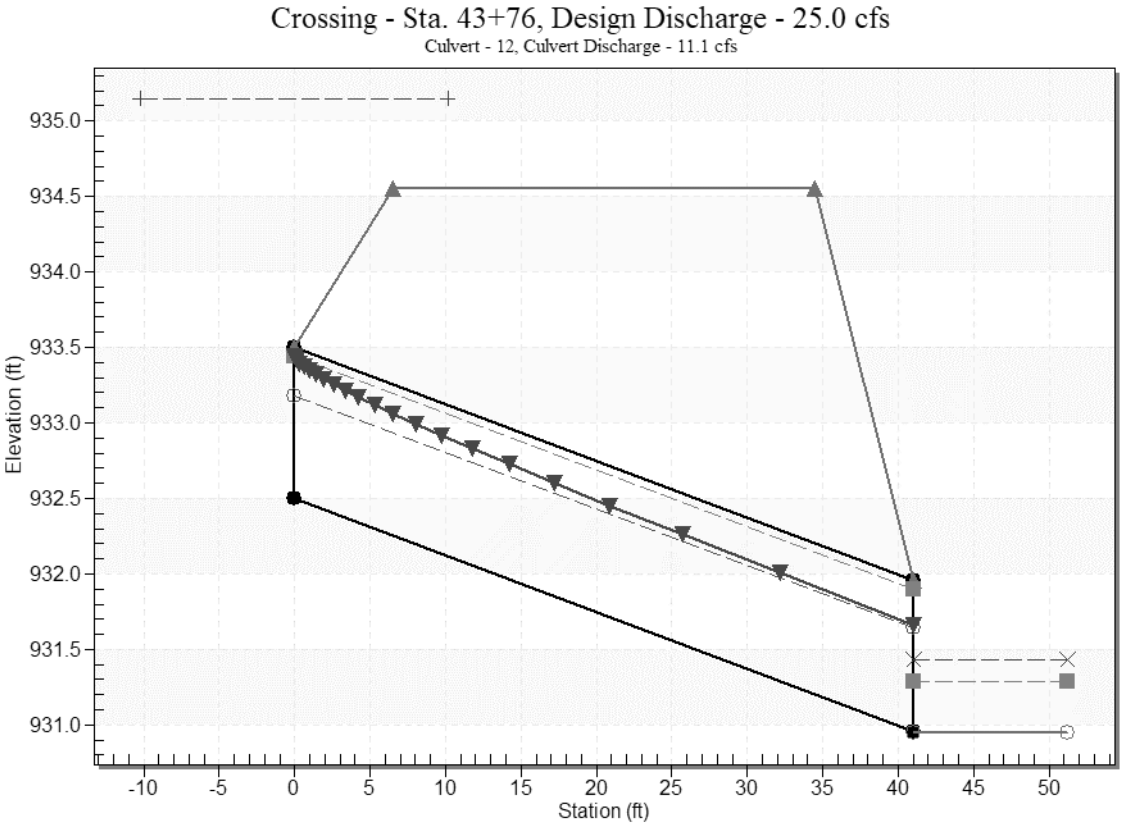
Culvert Length: 41.03 ft,

Culvert Slope: 0.0376

Culvert Performance Curve Plot: 12



Water Surface Profile Plot for Culvert: 12



Site Data - 12

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 932.50 ft

Outlet Station: 41.00 ft

Outlet Elevation: 930.96 ft

Number of Barrels: 2

Culvert Data Summary - 12

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: Sta. 43+76

Table 3 - Downstream Channel Rating Curve (Crossing: Sta. 43+76)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
9.00	931.22	0.27	1.44	0.17	0.52
11.60	931.26	0.31	1.58	0.19	0.53
14.20	931.30	0.35	1.69	0.22	0.54
16.80	931.33	0.38	1.79	0.24	0.55
19.40	931.37	0.42	1.88	0.26	0.55
22.00	931.40	0.45	1.96	0.28	0.56
25.00	931.43	0.48	2.05	0.30	0.56
27.20	931.45	0.50	2.11	0.32	0.57
29.80	931.48	0.53	2.17	0.33	0.57
32.40	931.51	0.56	2.23	0.35	0.58
35.00	931.53	0.58	2.29	0.36	0.58

Tailwater Channel Data - Sta. 43+76

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 21.00 ft

Side Slope (H:V): 9.00 (_:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0400

Channel Invert Elevation: 930.95 ft

Roadway Data for Crossing: Sta. 43+76

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 ft

Crest Elevation: 934.55 ft

Roadway Surface: Paved

Roadway Top Width: 28.00 ft

Sta 46+65 (Split Flow w/ Sta 43+76) HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 9.00 cfs

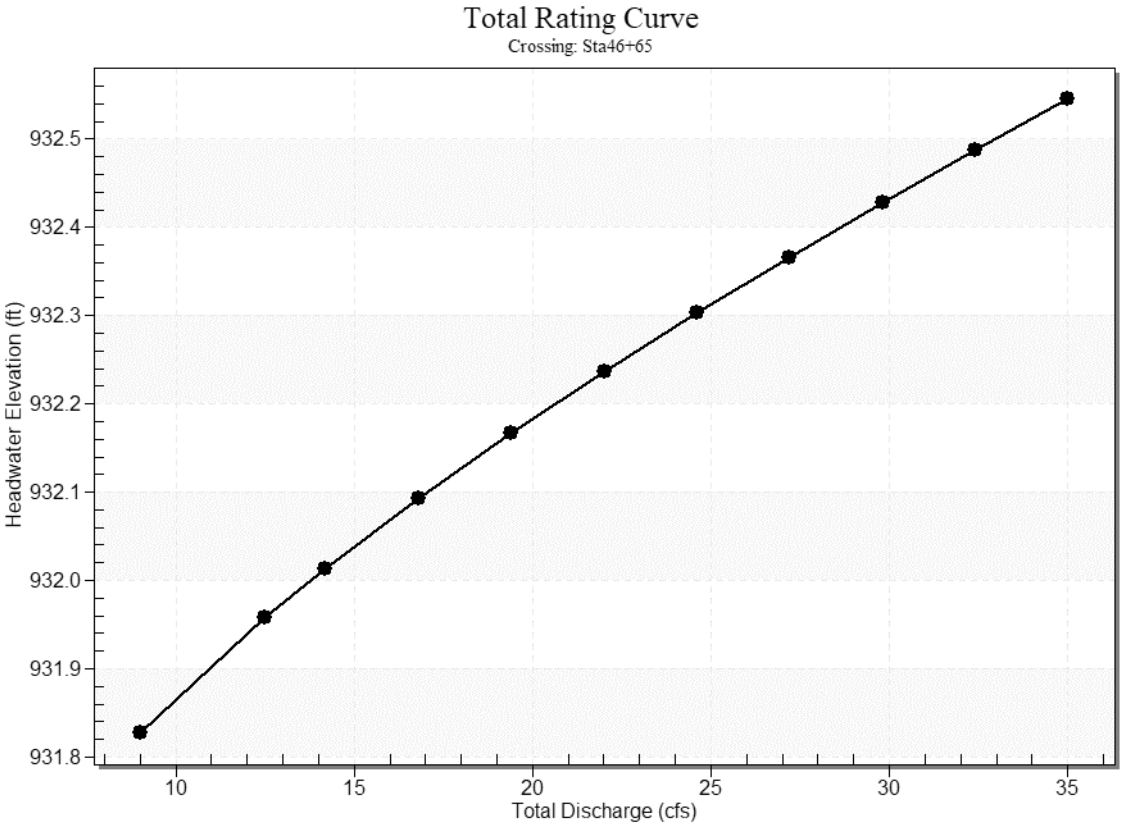
Design Flow: 12.50 cfs

Maximum Flow: 35.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: Sta46+65

Headwater Elevation (ft)	Total Discharge (cfs)	12 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
931.83	9.00	5.29	3.68	9
931.96	12.50	5.48	7.00	5
932.01	14.20	5.55	8.62	4
932.09	16.80	5.66	11.12	4
932.17	19.40	5.76	13.63	4
932.24	22.00	5.86	16.14	4
932.30	24.60	5.94	18.63	3
932.37	27.20	6.02	21.16	3
932.43	29.80	6.10	23.69	3
932.49	32.40	6.17	26.22	3
932.55	35.00	6.24	28.76	3
931.58	4.92	4.92	0.00	Overtopping

Rating Curve Plot for Crossing: Sta46+65



Culvert Data: 12

Table 2 - Culvert Summary Table: 12

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
9.00 cfs	5.29 cfs	931.83	2.43	0.0*	5-S2n	0.51	0.93	0.53	0.79	12.39	1.78
12.50 cfs	5.48 cfs	931.96	2.56	0.0*	5-S2n	0.52	0.94	0.55	0.94	12.49	1.96
14.20 cfs	5.55 cfs	932.01	2.61	0.0*	5-S2n	0.52	0.94	0.55	1.00	12.53	2.03
16.80 cfs	5.66 cfs	932.09	2.69	0.0*	5-S2n	0.53	0.95	0.56	1.09	12.59	2.12

19.40 cfs	5.76 cfs	932.17	2.77	0.083	5-S2n	0.54	0.95	0.56	1.17	12.65	2.21
22.00 cfs	5.86 cfs	932.24	2.84	0.233	5-S2n	0.54	0.95	0.57	1.24	12.70	2.28
24.60 cfs	5.94 cfs	932.30	2.90	0.374	5-S2n	0.55	0.95	0.57	1.32	12.75	2.35
27.20 cfs	6.02 cfs	932.37	2.97	0.509	5-S2n	0.55	0.95	0.58	1.38	12.79	2.42
29.80 cfs	6.10 cfs	932.43	3.03	0.638	5-S2n	0.55	0.94	0.58	1.44	12.79	2.48
32.40 cfs	6.17 cfs	932.49	3.09	0.759	5-S2n	0.56	0.92	0.59	1.50	12.85	2.53
35.00 cfs	6.24 cfs	932.55	3.15	0.875	5-S2n	0.56	0.92	0.59	1.56	12.88	2.59

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

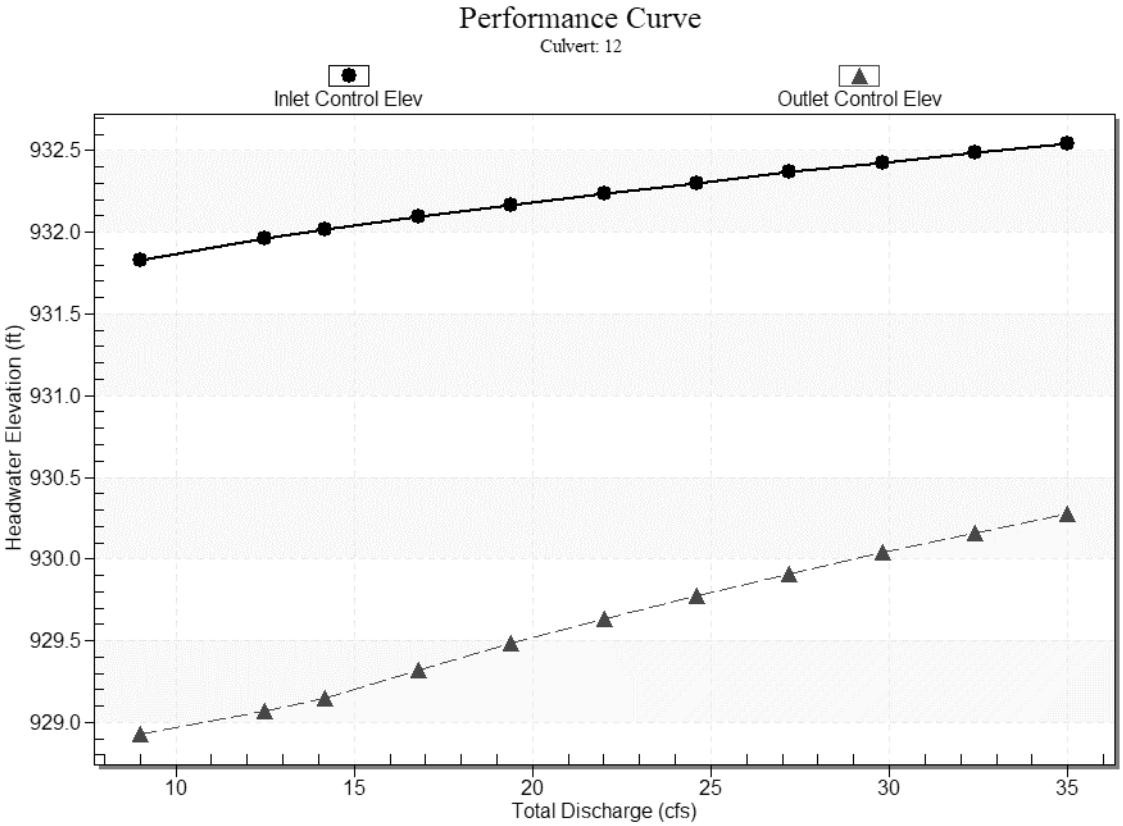
Inlet Elevation (invert): 929.40 ft,

Outlet Elevation (invert): 926.00 ft

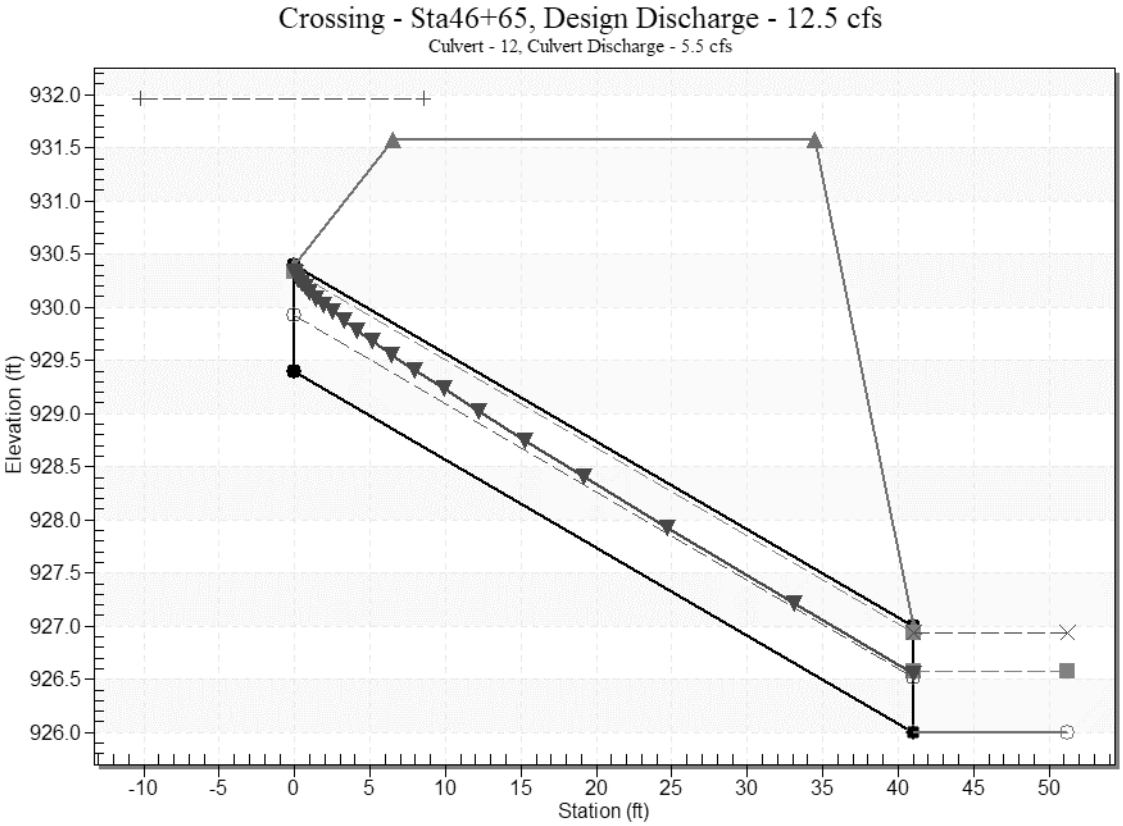
Culvert Length: 41.14 ft,

Culvert Slope: 0.0829

Culvert Performance Curve Plot: 12



Water Surface Profile Plot for Culvert: 12



Site Data - 12

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 929.40 ft

Outlet Station: 41.00 ft

Outlet Elevation: 926.00 ft

Number of Barrels: 1

Culvert Data Summary - 12

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: Sta46+65

Table 3 - Downstream Channel Rating Curve (Crossing: Sta46+65)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
9.00	926.79	0.79	1.78	0.25	0.41
12.50	926.94	0.94	1.96	0.29	0.42
14.20	927.00	1.00	2.03	0.31	0.43
16.80	927.09	1.09	2.12	0.34	0.43
19.40	927.17	1.17	2.21	0.36	0.44
22.00	927.24	1.24	2.28	0.39	0.44
24.60	927.32	1.32	2.35	0.41	0.44
27.20	927.38	1.38	2.42	0.43	0.45
29.80	927.44	1.44	2.48	0.45	0.45
32.40	927.50	1.50	2.53	0.47	0.45
35.00	927.56	1.56	2.59	0.49	0.45

Tailwater Channel Data - Sta46+65

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 4.00 ft

Side Slope (H:V): 3.00 (_:1)

Channel Slope: 0.0050

Channel Manning's n: 0.0400

Channel Invert Elevation: 926.00 ft

Roadway Data for Crossing: Sta46+65

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 ft

Crest Elevation: 931.58 ft

Roadway Surface: Paved

Roadway Top Width: 28.00 ft

Proposed STA 82+07
HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 5.00 cfs

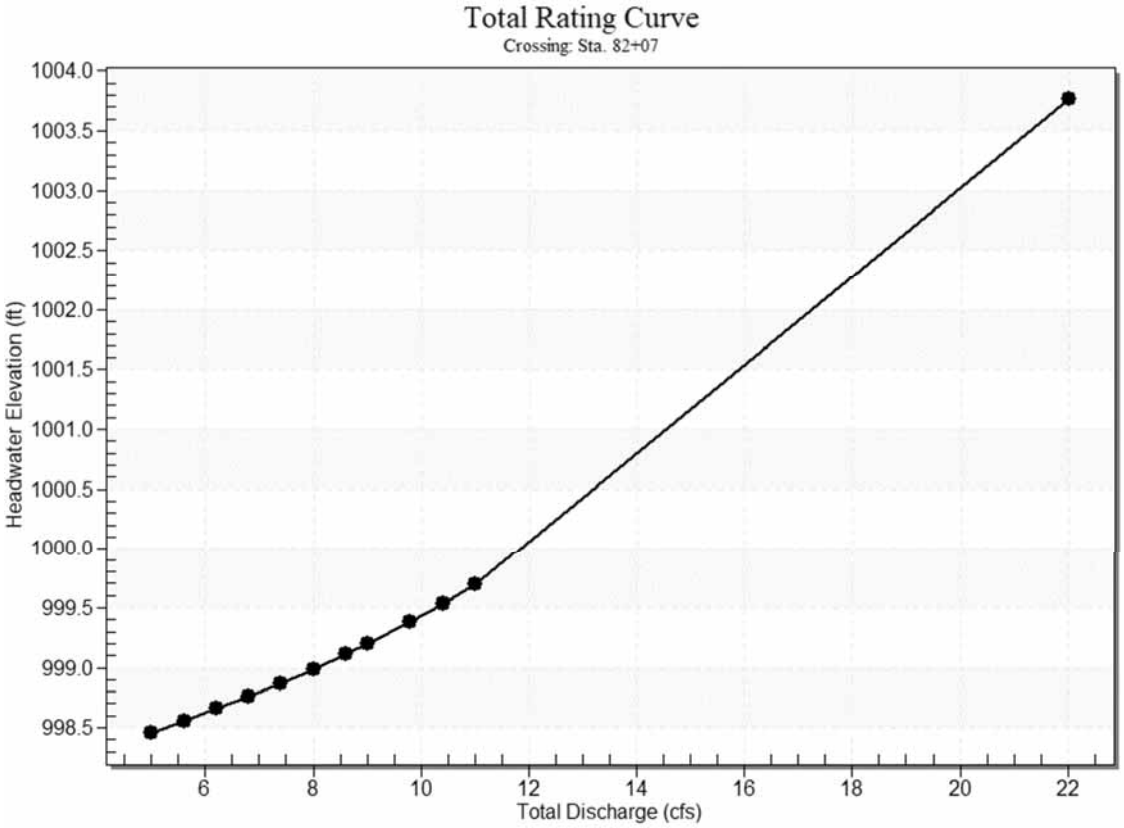
Design Flow: 9.00 cfs

Maximum Flow: 11.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: Sta. 82+07

Headwater Elevation (ft)	Total Discharge (cfs)	18 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
998.46	5.00	5.00	0.00	1
998.56	5.60	5.60	0.00	1
998.66	6.20	6.20	0.00	1
998.76	6.80	6.80	0.00	1
998.87	7.40	7.40	0.00	1
998.99	8.00	8.00	0.00	1
999.11	8.60	8.60	0.00	1
999.20	9.00	9.00	0.00	1
999.38	9.80	9.80	0.00	1
999.53	10.40	10.40	0.00	1
999.69	11.00	11.00	0.00	1
1003.70	20.61	20.61	0.00	Overtopping

Rating Curve Plot for Crossing: Sta. 82+07



Culvert Data: 18

Table 2 - Culvert Summary Table: 18

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5.00 cfs	5.00 cfs	998.46	1.29	0.549	1-S2n	0.64	0.86	0.66	0.10	6.70	2.00
5.60 cfs	5.60 cfs	998.56	1.39	0.670	1-S2n	0.68	0.91	0.70	0.11	6.89	2.09
6.20 cfs	6.20 cfs	998.66	1.49	0.796	1-S2n	0.72	0.96	0.75	0.11	7.06	2.18
6.80 cfs	6.80 cfs	998.76	1.59	0.927	5-S2n	0.76	1.01	0.79	0.12	7.22	2.26

7.40 cfs	7.40 cfs	998.87	1.70	1.063	5-S2n	0.80	1.05	0.83	0.13	7.37	2.34
8.00 cfs	8.00 cfs	998.99	1.82	1.204	5-S2n	0.84	1.10	0.87	0.13	7.51	2.41
8.60 cfs	8.60 cfs	999.11	1.94	1.534	5-S2n	0.88	1.14	0.91	0.14	7.64	2.48
9.00 cfs	9.00 cfs	999.20	2.03	1.622	5-S2n	0.91	1.16	0.94	0.14	7.72	2.52
9.80 cfs	9.80 cfs	999.38	2.21	1.807	5-S2n	0.96	1.21	0.99	0.15	7.88	2.61
10.40 cfs	10.40 cfs	999.53	2.36	1.954	5-S2n	1.00	1.24	1.03	0.15	8.00	2.67
11.00 cfs	11.00 cfs	999.69	2.52	2.107	5-S2n	1.04	1.27	1.08	0.16	8.10	2.73

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

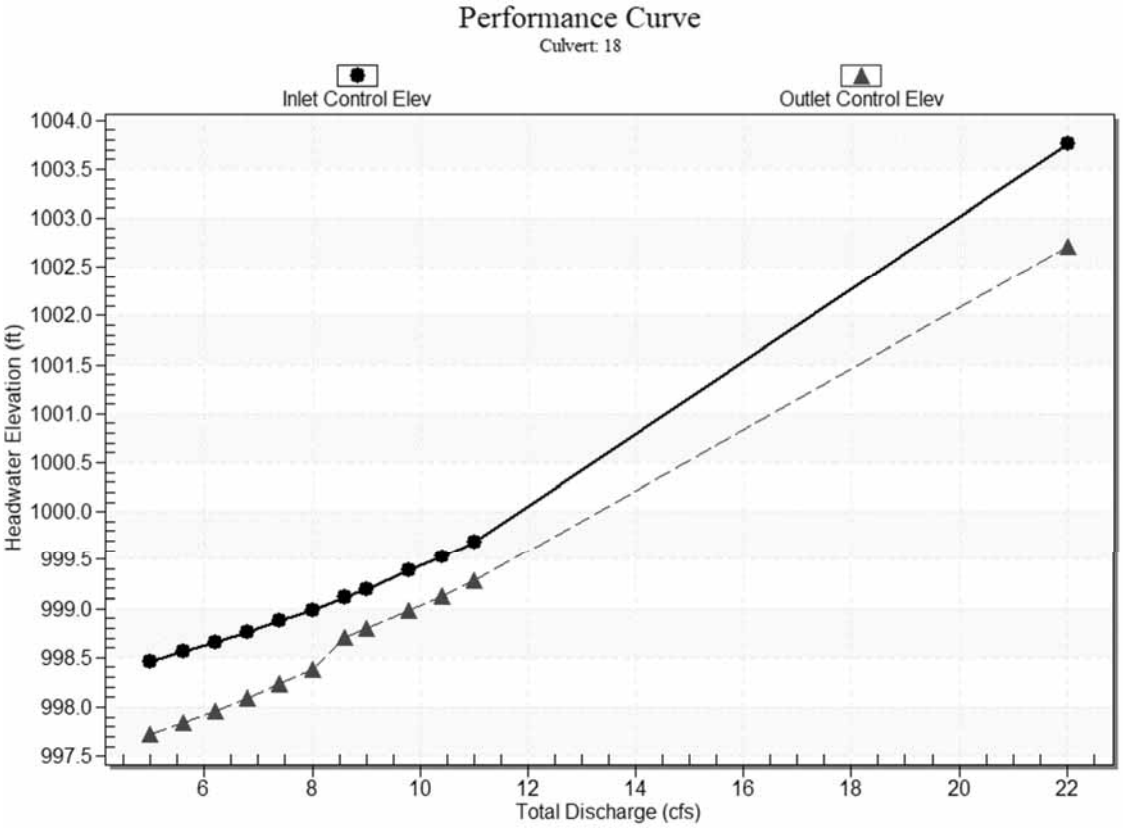
Inlet Elevation (invert): 997.17 ft,

Outlet Elevation (invert): 996.59 ft

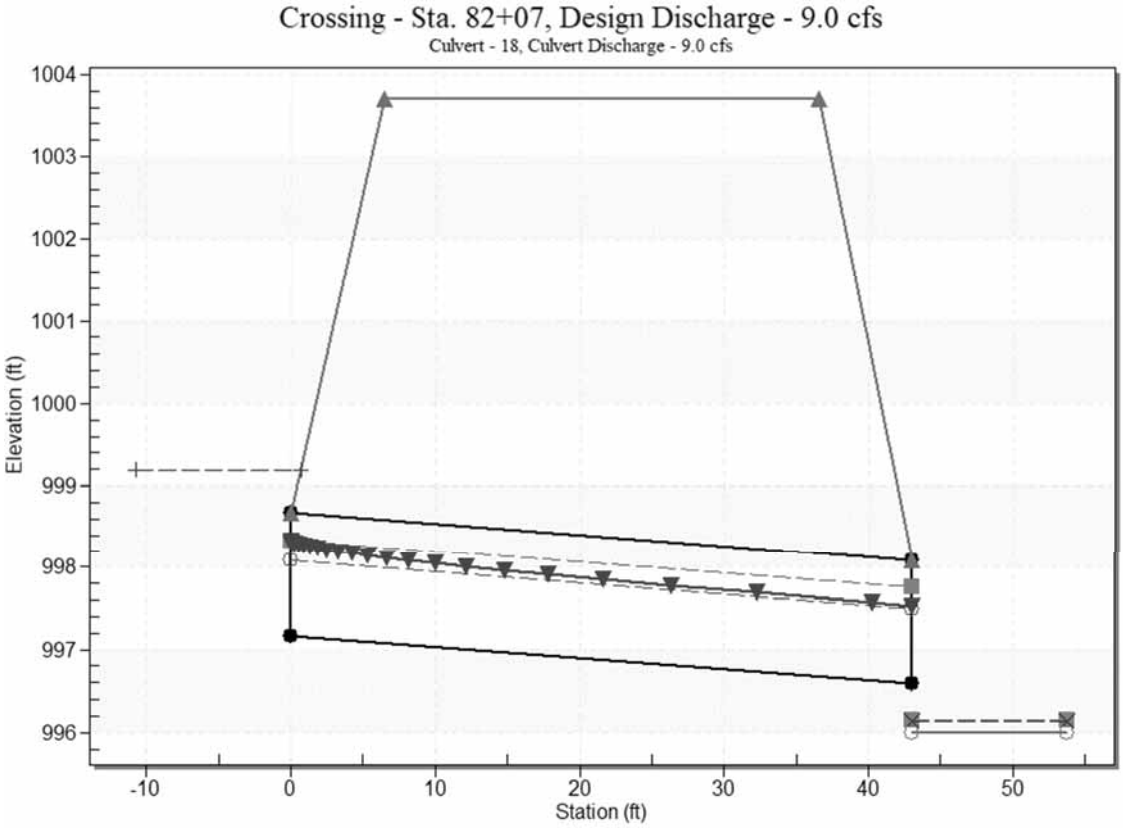
Culvert Length: 43.00 ft,

Culvert Slope: 0.0135

Culvert Performance Curve Plot: 18



Water Surface Profile Plot for Culvert: 18



Site Data - 18

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 997.17 ft

Outlet Station: 43.00 ft

Outlet Elevation: 996.59 ft

Number of Barrels: 1

Culvert Data Summary - 18

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: Sta. 82+07

Table 3 - Downstream Channel Rating Curve (Crossing: Sta. 82+07)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.00	996.10	0.10	2.00	0.22	1.12
5.60	996.11	0.11	2.09	0.24	1.14
6.20	996.11	0.11	2.18	0.25	1.15
6.80	996.12	0.12	2.26	0.27	1.16
7.40	996.13	0.13	2.34	0.28	1.17
8.00	996.13	0.13	2.41	0.30	1.18
8.60	996.14	0.14	2.48	0.31	1.19
9.00	996.14	0.14	2.52	0.32	1.19
9.80	996.15	0.15	2.61	0.33	1.20
10.40	996.15	0.15	2.67	0.35	1.21
11.00	996.16	0.16	2.73	0.36	1.21

Tailwater Channel Data - Sta. 82+07

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 25.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0360

Channel Manning's n: 0.0300

Channel Invert Elevation: 996.00 ft

Roadway Data for Crossing: Sta. 82+07

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 1003.70 ft

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

APPENDIX E

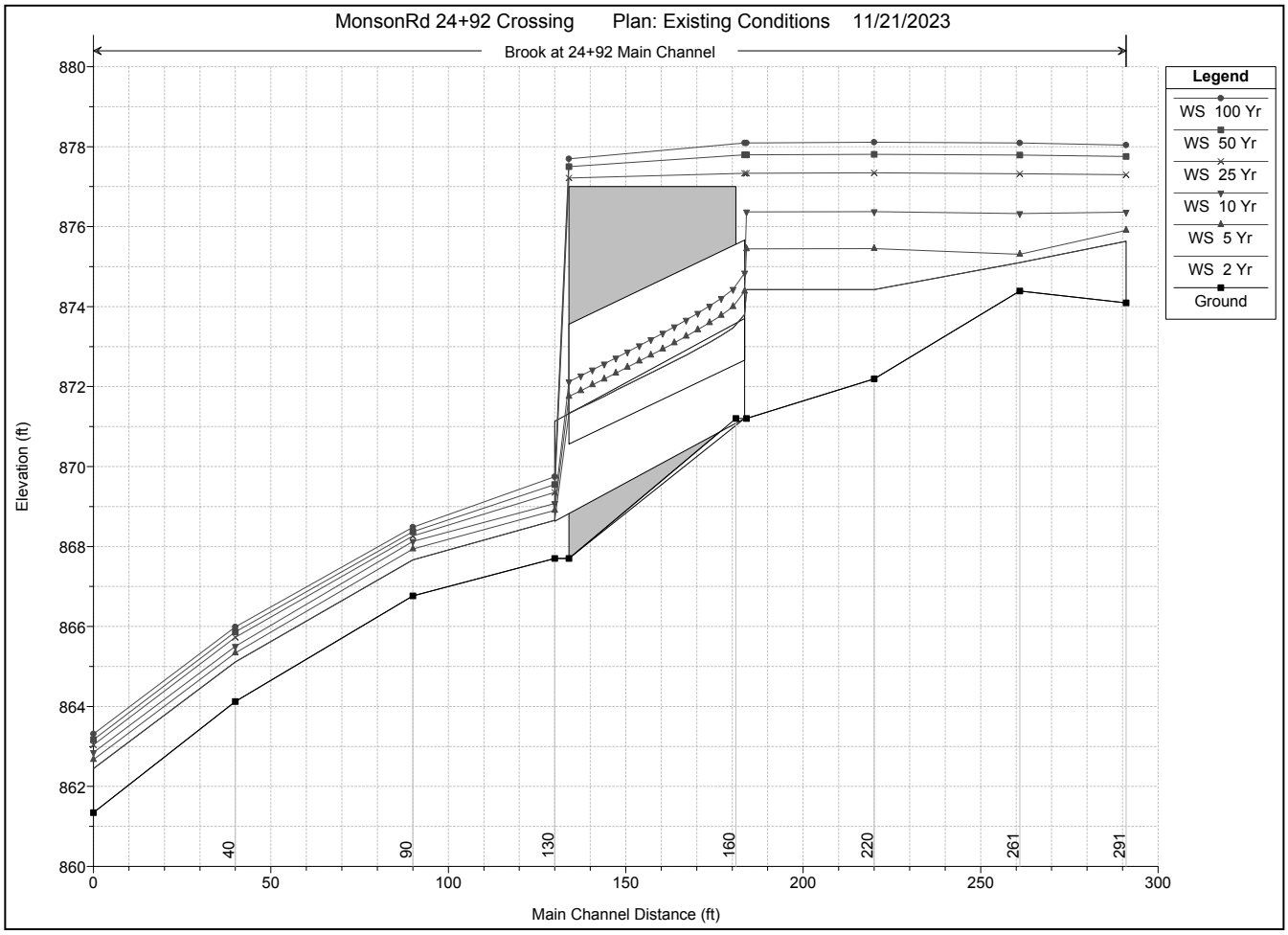
HEC-RAS

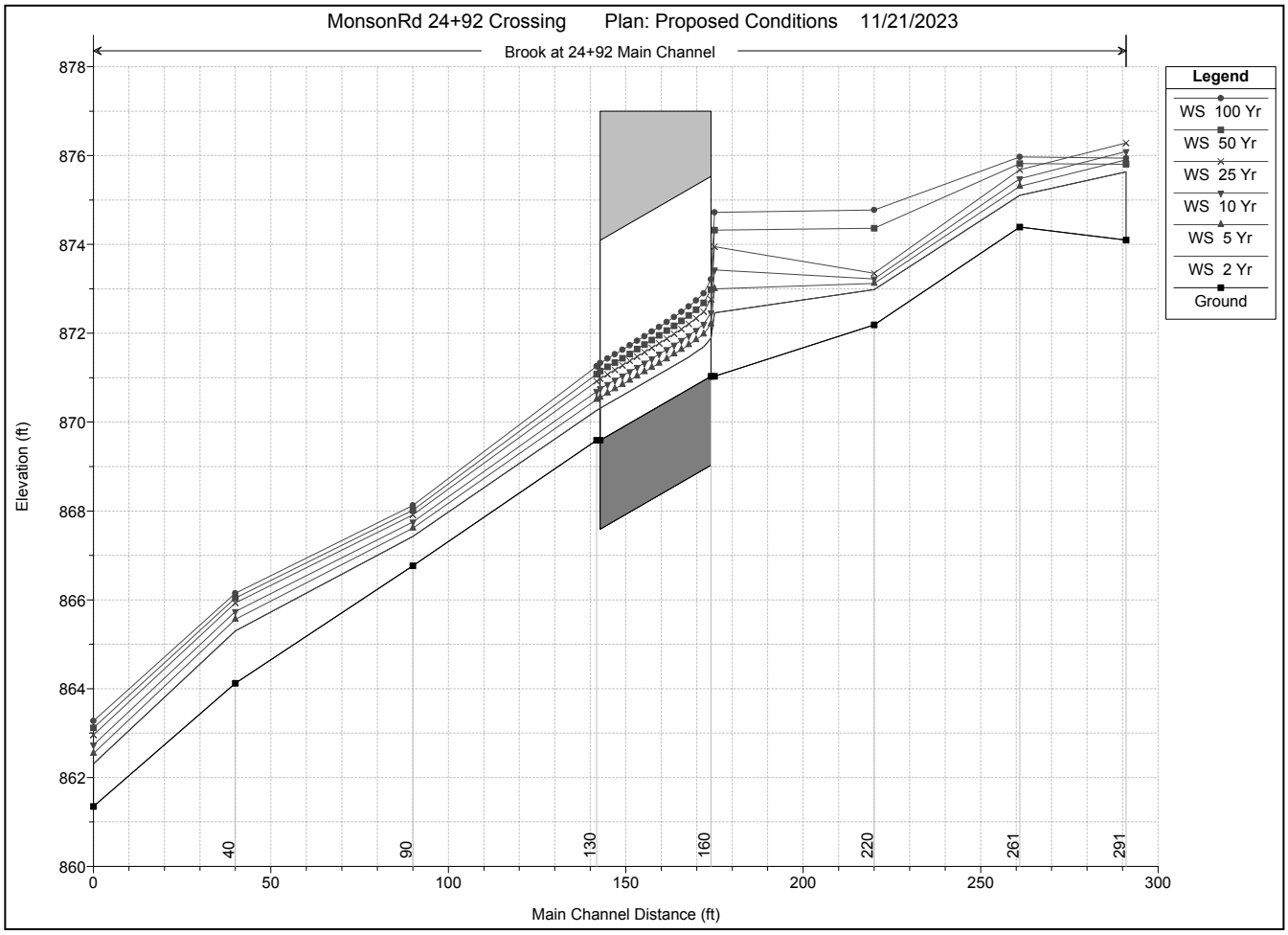
HEC-RAS Computed Results for crossing 24+92 proposed

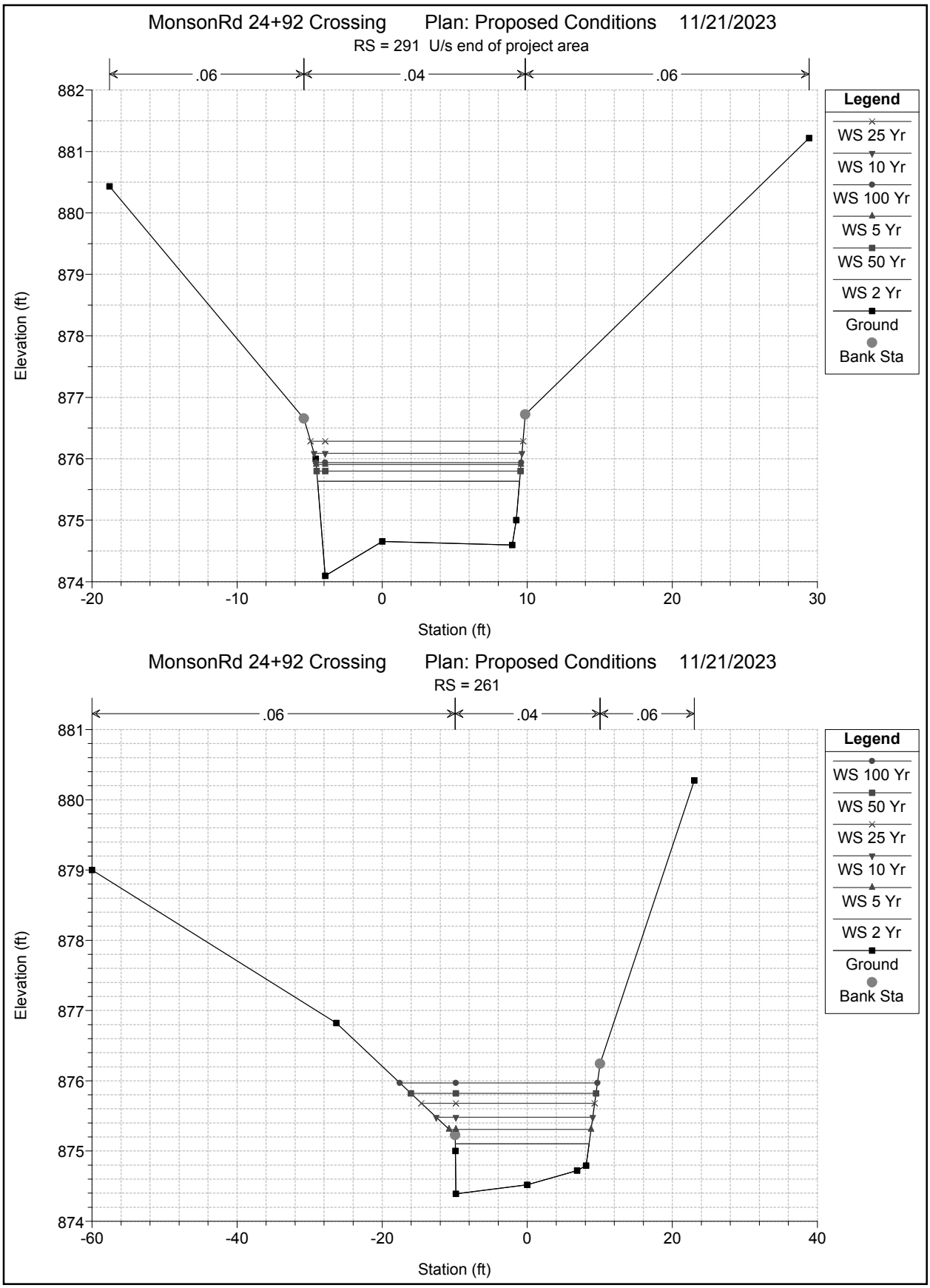
HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ.MILES)	0.903
DESIGN FLOOD DISCHARGE (C.F.S)	123
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S)	6.32
DESIGN FLOOD ELEVATION (FEET, NAVD)	873.95
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S)	174
BASE FLOOD ELEVATION (FEET, NAVD)	874.72
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY	25
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY	100
FLOOD OF RECORD	
DISCHARGE (C.F.S)	Unknown
FREQUENCY (IF KNOWN, YEARS)	Unknown
MAXIMUM ELEVATION (FEET, NAVD)	Unknown
DATE (MM/YYYY)	Unknown
HISTORY OF ICE FLOCS	Unknown

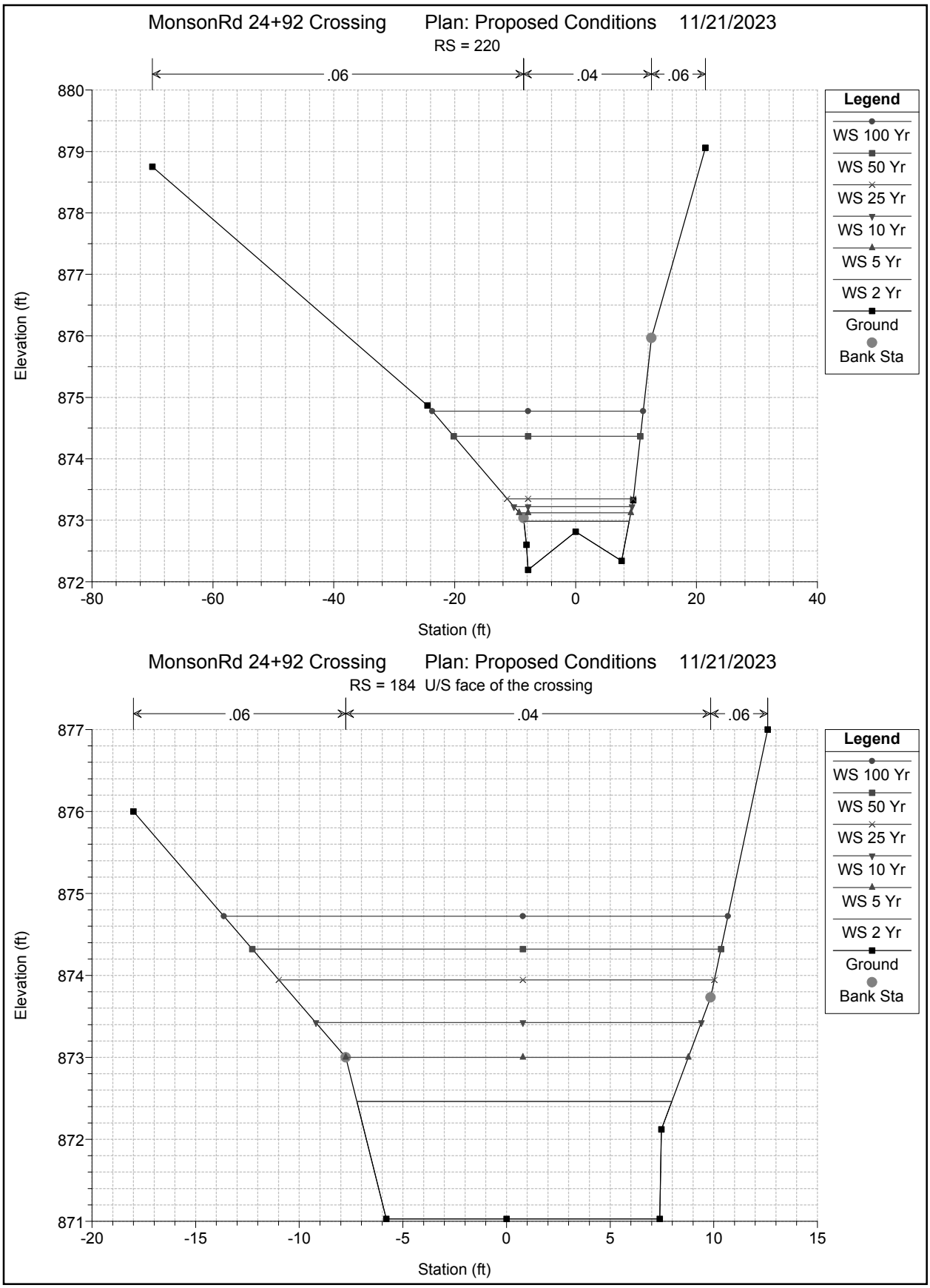
TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S)	43
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY	5.23
DESIGN FLOOD ELEVATION (FEET,NAVD)	876.1

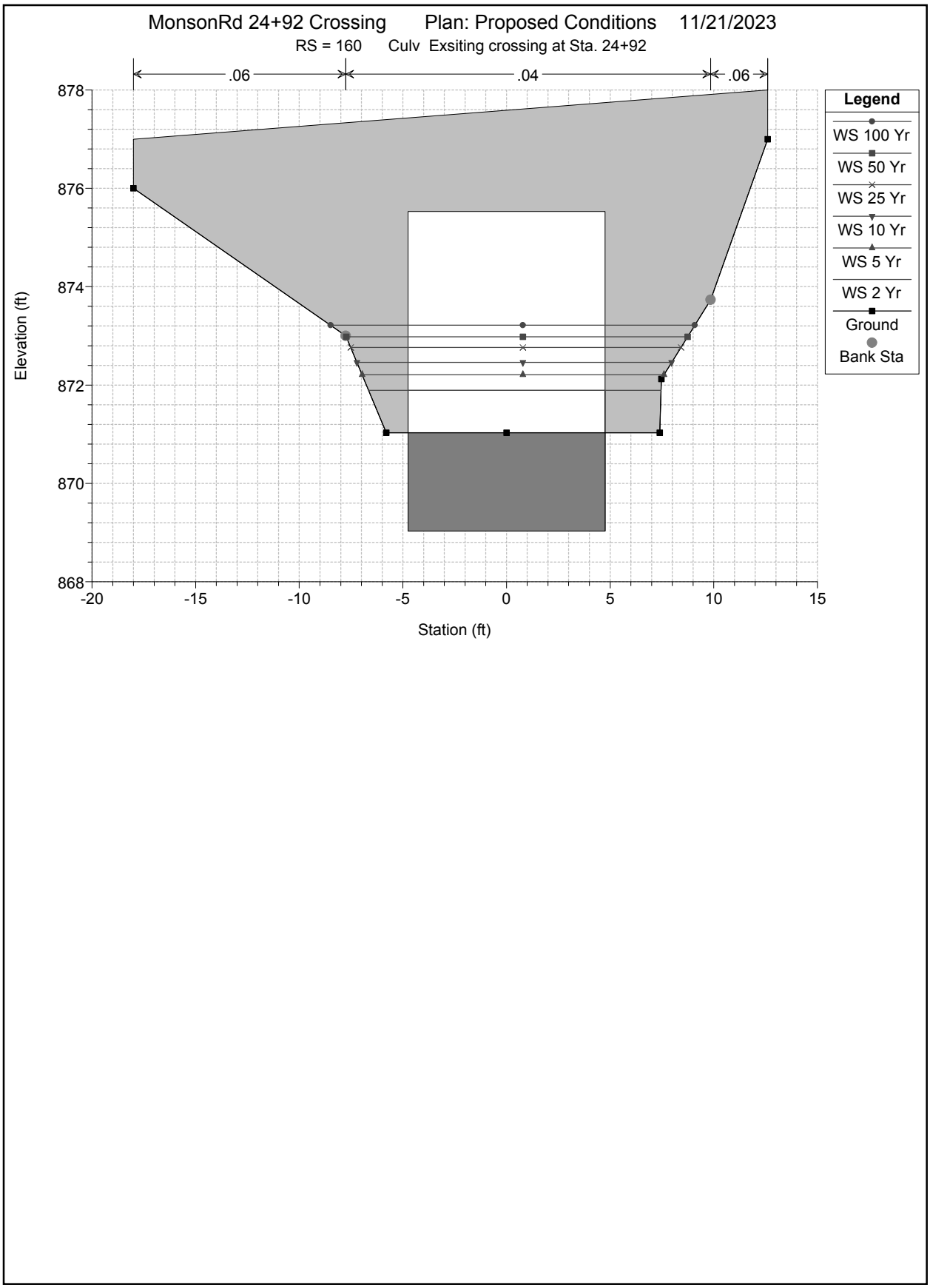
Section	**Length (ft)**	**Span (ft)**	**Rise (ft)**	**Invert (u/s)**	**Invert (d/s)**
R.C Box Culvert	31.21	9.5	6.5	871.03	869.59

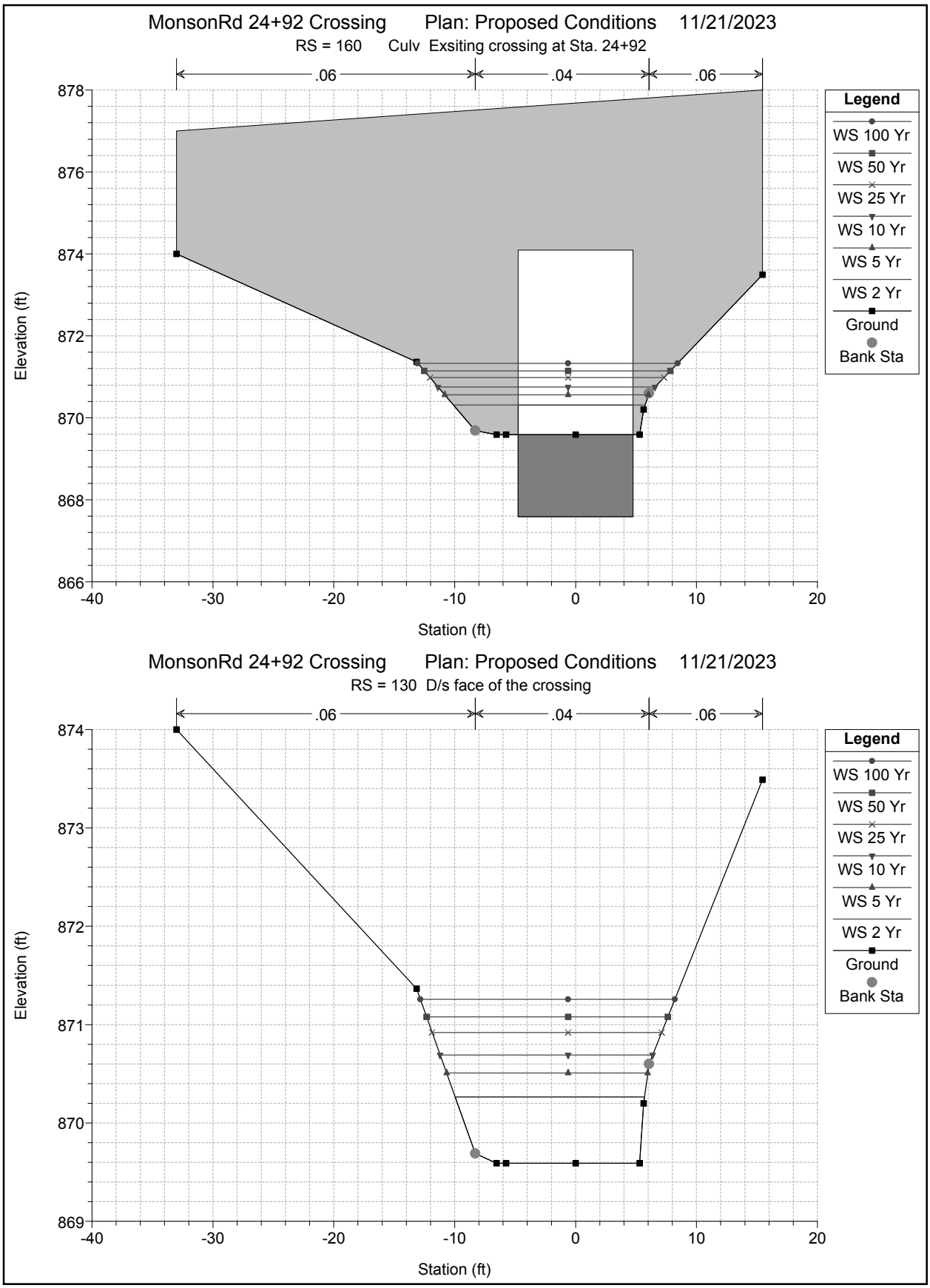

MonsonRd 24+92 Crossing Plan: Existing Conditions 11/21/2023
Brook at 24+92 Main Channel
Elevation (ft)
Main Channel Distance (ft)
880
878
876
874
872
870
868
866
864
862
860
0
50
100
150
200
250
300
40
90
130
160
220
261
291
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground

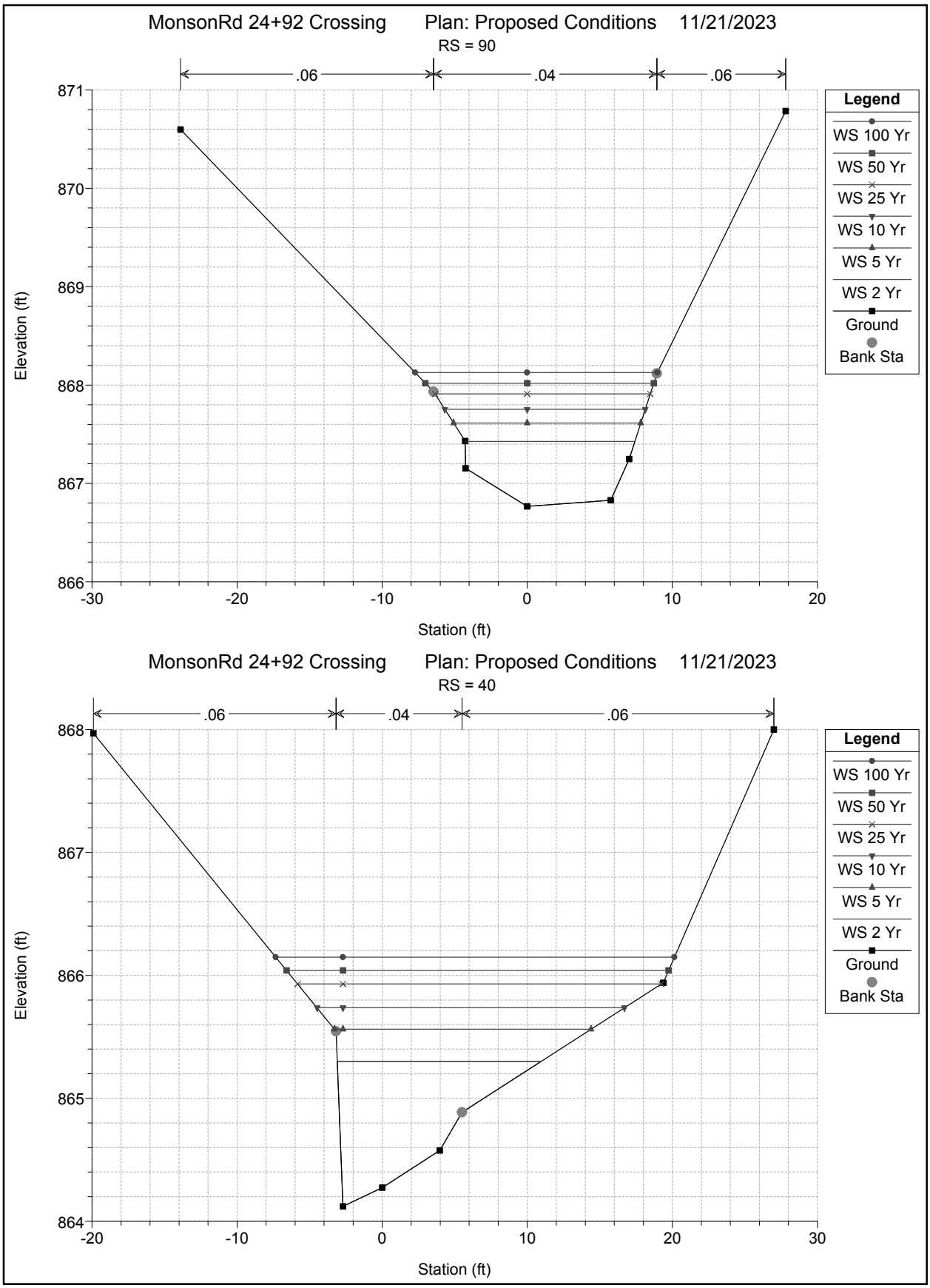

MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
Brook at 24+92 Main Channel
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Elevation (ft)
Main Channel Distance (ft)
878
876
874
872
870
868
866
864
862
860
0
50
100
150
200
250
300
40
90
130
160
220
261
291

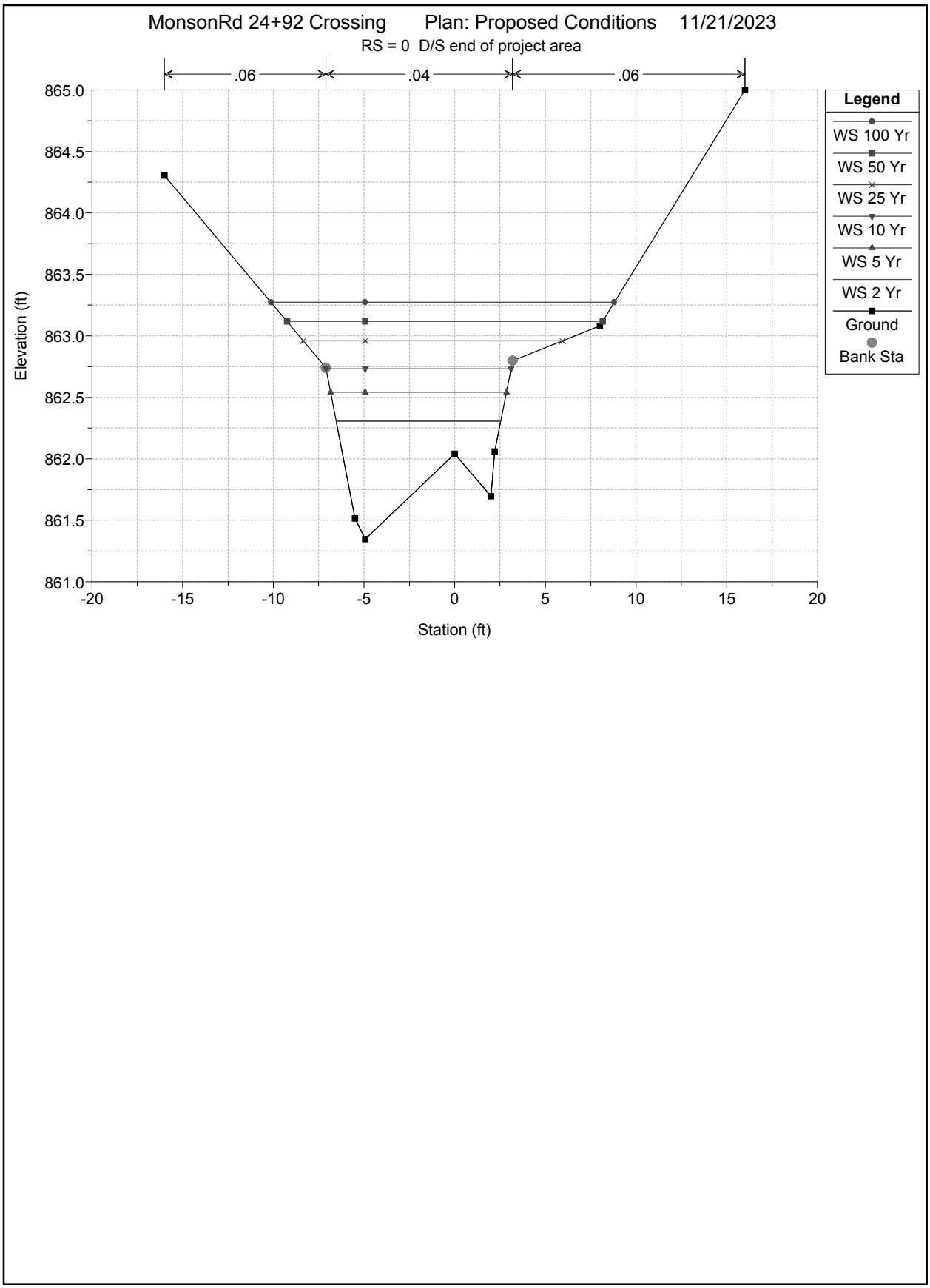

MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 291 U/s end of project area
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 25 Yr
WS 10 Yr
WS 100 Yr
WS 5 Yr
WS 50 Yr
WS 2 Yr
Ground
Bank Sta
MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 261
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta


MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 220
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 184 U/S face of the crossing
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta


MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 160 Culv Exsiting crossing at Sta. 24+92
.06
.04
.06
878
876
874
872
870
868
Elevation (ft)
-20
-15
-10
-5
0
5
10
15
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta


MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 160 Culv Exsiting crossing at Sta. 24+92
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 130 D/s face of the crossing
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta


MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 90
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 40
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta


MonsonRd 24+92 Crossing Plan: Proposed Conditions 11/21/2023
RS = 0 D/S end of project area
.06
.04
.06
Elevation (ft)
Station (ft)
865.0
864.5
864.0
863.5
863.0
862.5
862.0
861.5
861.0
-20
-15
-10
-5
0
5
10
15
20
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta

HEC-RAS Plan: Exist River: Brook at 24+92 Reach: Main Channel

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	291	2 Yr	43.00	874.10	875.63	875.23	875.77	0.006791	2.93	14.70	13.93	0.50
Main Channel	291	5 Yr	69.00	874.10	875.91	875.48	876.12	0.008508	3.73	18.51	14.12	0.57
Main Channel	291	10 Yr	92.00	874.10	876.36	875.68	876.57	0.006020	3.67	25.08	14.77	0.50
Main Channel	291	25 Yr	123.00	874.10	877.30	875.92	877.45	0.002536	3.11	40.73	20.05	0.34
Main Channel	291	50 Yr	147.00	874.10	877.75	876.10	877.90	0.002041	3.11	50.68	23.65	0.32
Main Channel	291	100 Yr	174.00	874.10	878.04	876.28	878.21	0.002053	3.32	57.84	25.93	0.32
Main Channel	261	2 Yr	43.00	874.39	875.10	875.10	875.38	0.029929	4.22	10.20	18.45	1.00
Main Channel	261	5 Yr	69.00	874.39	875.31	875.31	875.68	0.027589	4.92	14.04	19.58	1.00
Main Channel	261	10 Yr	92.00	874.39	876.33		876.43	0.002553	2.56	40.10	31.59	0.35
Main Channel	261	25 Yr	123.00	874.39	877.32		877.38	0.000818	1.97	78.88	47.62	0.21
Main Channel	261	50 Yr	147.00	874.39	877.79		877.84	0.000619	1.91	103.13	56.34	0.19
Main Channel	261	100 Yr	174.00	874.39	878.09		878.14	0.000598	2.00	120.89	61.94	0.19
Main Channel	220	2 Yr	43.00	872.19	874.43	873.12	874.45	0.000483	1.15	42.65	31.46	0.15
Main Channel	220	5 Yr	69.00	872.19	875.45	873.35	875.46	0.000244	1.06	80.46	43.27	0.12
Main Channel	220	10 Yr	92.00	872.19	876.37		876.38	0.000141	0.97	126.10	55.86	0.09
Main Channel	220	25 Yr	123.00	872.19	877.35		877.36	0.000094	0.93	187.38	70.07	0.08
Main Channel	220	50 Yr	147.00	872.19	877.81		877.82	0.000090	0.97	221.42	76.84	0.08
Main Channel	220	100 Yr	174.00	872.19	878.11		878.12	0.000098	1.05	245.16	81.22	0.08
Main Channel	184	2 Yr	43.00	871.20	874.42	871.96	874.43	0.000149	0.85	53.33	23.04	0.09
Main Channel	184	5 Yr	69.00	871.20	875.44	872.21	875.46	0.000129	0.97	79.06	27.39	0.09
Main Channel	184	10 Yr	92.00	871.20	876.37	872.41	876.38	0.000104	1.01	105.91	30.07	0.08
Main Channel	184	25 Yr	123.00	871.20	877.34	872.65	877.35	0.000094	1.08	135.44	30.60	0.08
Main Channel	184	50 Yr	147.00	871.20	877.80	872.81	877.82	0.000101	1.18	149.53	30.60	0.08
Main Channel	184	100 Yr	174.00	871.20	878.09	872.99	878.12	0.000119	1.32	158.61	30.60	0.09
Main Channel	160		Culvert									
Main Channel	130	2 Yr	43.00	867.70	868.66	868.57	868.96	0.020428	4.43	9.71	11.70	0.86
Main Channel	130	5 Yr	69.00	867.70	868.90	868.85	869.37	0.023223	5.47	12.63	11.91	0.94
Main Channel	130	10 Yr	92.00	867.70	869.08	869.08	869.68	0.026087	6.26	14.71	12.20	1.00
Main Channel	130	25 Yr	123.00	867.70	869.35	869.35	870.06	0.025316	6.77	18.18	12.94	1.01
Main Channel	130	50 Yr	147.00	867.70	869.55	869.55	870.33	0.024776	7.08	20.76	13.47	1.01
Main Channel	130	100 Yr	174.00	867.70	869.75	869.75	870.60	0.024193	7.41	23.49	14.02	1.00
Main Channel	90	2 Yr	43.00	866.77	867.67	867.67	868.01	0.027657	4.71	9.13	13.26	1.00
Main Channel	90	5 Yr	69.00	866.77	867.94	867.94	868.38	0.025952	5.31	12.99	15.06	1.01
Main Channel	90	10 Yr	92.00	866.77	868.13	868.13	868.65	0.024492	5.79	16.00	16.73	1.01

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Proposal No. 608163-128112

HEC-RAS Plan: Exist River: Brook at 24+92 Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	90	25 Yr	123.00	866.77	868.26	868.37	868.99	0.028912	6.83	18.34	18.05	1.12
Main Channel	90	50 Yr	147.00	866.77	868.37	868.54	869.23	0.030415	7.43	20.37	19.13	1.16
Main Channel	90	100 Yr	174.00	866.77	868.48	868.71	869.48	0.032139	8.07	22.50	20.20	1.21
Main Channel	40	2 Yr	43.00	864.12	865.11	865.36	865.90	0.067632	7.16	6.26	11.48	1.51
Main Channel	40	5 Yr	69.00	864.12	865.34	865.68	866.38	0.064742	8.34	9.25	14.57	1.53
Main Channel	40	10 Yr	92.00	864.12	865.50	865.93	866.71	0.063759	9.12	11.81	16.78	1.55
Main Channel	40	25 Yr	123.00	864.12	865.73	866.15	866.99	0.054635	9.56	16.05	21.03	1.48
Main Channel	40	50 Yr	147.00	864.12	865.86	866.29	867.21	0.052564	10.01	19.05	23.72	1.47
Main Channel	40	100 Yr	174.00	864.12	865.99	866.44	867.43	0.051739	10.50	22.16	25.77	1.48
Main Channel	0	2 Yr	43.00	861.35	862.45	862.65	863.19	0.066836	6.91	6.22	9.44	1.50
Main Channel	0	5 Yr	69.00	861.35	862.67	863.00	863.71	0.068697	8.18	8.44	10.04	1.57
Main Channel	0	10 Yr	92.00	861.35	862.85	863.27	864.10	0.066222	8.97	10.31	11.83	1.59
Main Channel	0	25 Yr	123.00	861.35	863.04	863.54	864.58	0.065444	10.00	12.92	16.08	1.62
Main Channel	0	50 Yr	147.00	861.35	863.17	863.72	864.87	0.063441	10.58	15.21	17.93	1.63
Main Channel	0	100 Yr	174.00	861.35	863.31	863.90	865.14	0.061000	11.09	17.79	19.30	1.62

HEC-RAS Plan: prop River: Brook at 24+92 Reach: Main Channel

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	291	2 Yr	43.00	874.10	875.63	875.23	875.77	0.006822	2.93	14.67	13.93	0.50
Main Channel	291	5 Yr	69.00	874.10	875.91	875.48	876.12	0.008494	3.73	18.51	14.12	0.57
Main Channel	291	10 Yr	92.00	874.10	876.09	875.68	876.38	0.010123	4.36	21.10	14.33	0.63
Main Channel	291	25 Yr	123.00	874.10	876.28	875.92	876.69	0.012395	5.14	23.92	14.65	0.71
Main Channel	291	50 Yr	147.00	874.10	875.80	876.09	876.96	0.050095	8.64	17.02	14.05	1.38
Main Channel	291	100 Yr	174.00	874.10	875.94	876.28	877.25	0.050078	9.17	18.97	14.14	1.40
Main Channel	261	2 Yr	43.00	874.39	875.10	875.10	875.38	0.029929	4.22	10.20	18.45	1.00
Main Channel	261	5 Yr	69.00	874.39	875.31	875.31	875.68	0.027589	4.92	14.04	19.58	1.00
Main Channel	261	10 Yr	92.00	874.39	875.48	875.48	875.92	0.024916	5.32	17.56	21.56	0.98
Main Channel	261	25 Yr	123.00	874.39	875.68	875.68	876.19	0.022903	5.77	22.12	23.89	0.97
Main Channel	261	50 Yr	147.00	874.39	875.82	875.82	876.38	0.021751	6.05	25.62	25.53	0.96
Main Channel	261	100 Yr	174.00	874.39	875.97	875.97	876.57	0.020640	6.32	29.57	27.26	0.95
Main Channel	220	2 Yr	43.00	872.19	872.98	873.12	873.49	0.076775	5.74	7.49	17.42	1.54
Main Channel	220	5 Yr	69.00	872.19	873.12	873.35	873.87	0.078410	6.92	10.00	18.48	1.63
Main Channel	220	10 Yr	92.00	872.19	873.22	873.51	874.17	0.082184	7.83	11.86	19.52	1.71
Main Channel	220	25 Yr	123.00	872.19	873.35	873.71	874.52	0.080896	8.69	14.48	20.87	1.74
Main Channel	220	50 Yr	147.00	872.19	874.37	873.85	874.61	0.006361	4.09	40.77	30.86	0.55
Main Channel	220	100 Yr	174.00	872.19	874.77	873.99	874.97	0.004204	3.77	54.21	34.89	0.46
Main Channel	184	2 Yr	43.00	871.03	872.46	871.71	872.53	0.002652	2.14	20.06	15.19	0.33
Main Channel	184	5 Yr	69.00	871.03	873.00	871.96	873.09	0.002383	2.41	28.59	16.52	0.32
Main Channel	184	10 Yr	92.00	871.03	873.42	872.16	873.53	0.002121	2.57	36.03	18.60	0.31
Main Channel	184	25 Yr	123.00	871.03	873.95	872.40	874.06	0.001820	2.72	46.40	21.01	0.30
Main Channel	184	50 Yr	147.00	871.03	874.32	872.57	874.44	0.001618	2.81	54.60	22.61	0.29
Main Channel	184	100 Yr	174.00	871.03	874.72	872.75	874.85	0.001449	2.90	63.98	24.32	0.28
Main Channel	160		Culvert									
Main Channel	130	2 Yr	43.00	869.59	870.26	870.26	870.59	0.027595	4.58	9.68	15.66	1.00
Main Channel	130	5 Yr	69.00	869.59	870.51	870.51	870.93	0.025058	5.30	13.60	16.64	0.99
Main Channel	130	10 Yr	92.00	869.59	870.69	870.69	871.20	0.023566	5.80	16.75	17.58	0.99
Main Channel	130	25 Yr	123.00	869.59	870.92	870.92	871.52	0.021537	6.32	20.93	18.98	0.98
Main Channel	130	50 Yr	147.00	869.59	871.08	871.08	871.74	0.020548	6.66	24.03	19.96	0.98
Main Channel	130	100 Yr	174.00	869.59	871.26	871.26	871.97	0.019231	6.96	27.66	21.05	0.96
Main Channel	90	2 Yr	43.00	866.77	867.43	867.66	868.19	0.087757	7.01	6.13	11.71	1.71
Main Channel	90	5 Yr	69.00	866.77	867.61	867.94	868.65	0.088978	8.17	8.45	12.92	1.78
Main Channel	90	10 Yr	92.00	866.77	867.75	868.13	868.99	0.089077	8.92	10.32	13.83	1.82

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Proposal No. 608163-128112

HEC-RAS Plan: prop River: Brook at 24+92 Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	90	25 Yr	123.00	866.77	867.91	868.37	869.40	0.091293	9.80	12.54	14.84	1.88
Main Channel	90	50 Yr	147.00	866.77	868.02	868.54	869.69	0.089500	10.37	14.20	15.74	1.89
Main Channel	90	100 Yr	174.00	866.77	868.13	868.71	870.00	0.088274	10.98	15.96	16.70	1.91
Main Channel	40	2 Yr	43.00	864.12	865.30	865.36	865.75	0.029337	5.47	8.69	14.04	1.03
Main Channel	40	5 Yr	69.00	864.12	865.56	865.68	866.15	0.029358	6.40	12.83	17.69	1.06
Main Channel	40	10 Yr	92.00	864.12	865.74	865.93	866.43	0.029868	7.10	16.21	21.18	1.09
Main Channel	40	25 Yr	123.00	864.12	865.93	866.15	866.75	0.030526	7.86	20.67	25.06	1.13
Main Channel	40	50 Yr	147.00	864.12	866.04	866.29	866.96	0.031932	8.44	23.53	26.33	1.17
Main Channel	40	100 Yr	174.00	864.12	866.15	866.44	867.17	0.033594	9.04	26.45	27.48	1.22
Main Channel	0	2 Yr	43.00	861.35	862.31	862.65	863.49	0.135916	8.71	4.94	9.07	2.08
Main Channel	0	5 Yr	69.00	861.35	862.54	863.00	863.99	0.113529	9.67	7.14	9.69	1.99
Main Channel	0	10 Yr	92.00	861.35	862.73	863.27	864.34	0.099306	10.18	9.04	10.20	1.91
Main Channel	0	25 Yr	123.00	861.35	862.96	863.54	864.76	0.083177	10.77	11.73	14.30	1.81
Main Channel	0	50 Yr	147.00	861.35	863.12	863.72	865.00	0.073977	11.11	14.26	17.40	1.74
Main Channel	0	100 Yr	174.00	861.35	863.27	863.90	865.23	0.067208	11.44	17.09	18.94	1.69

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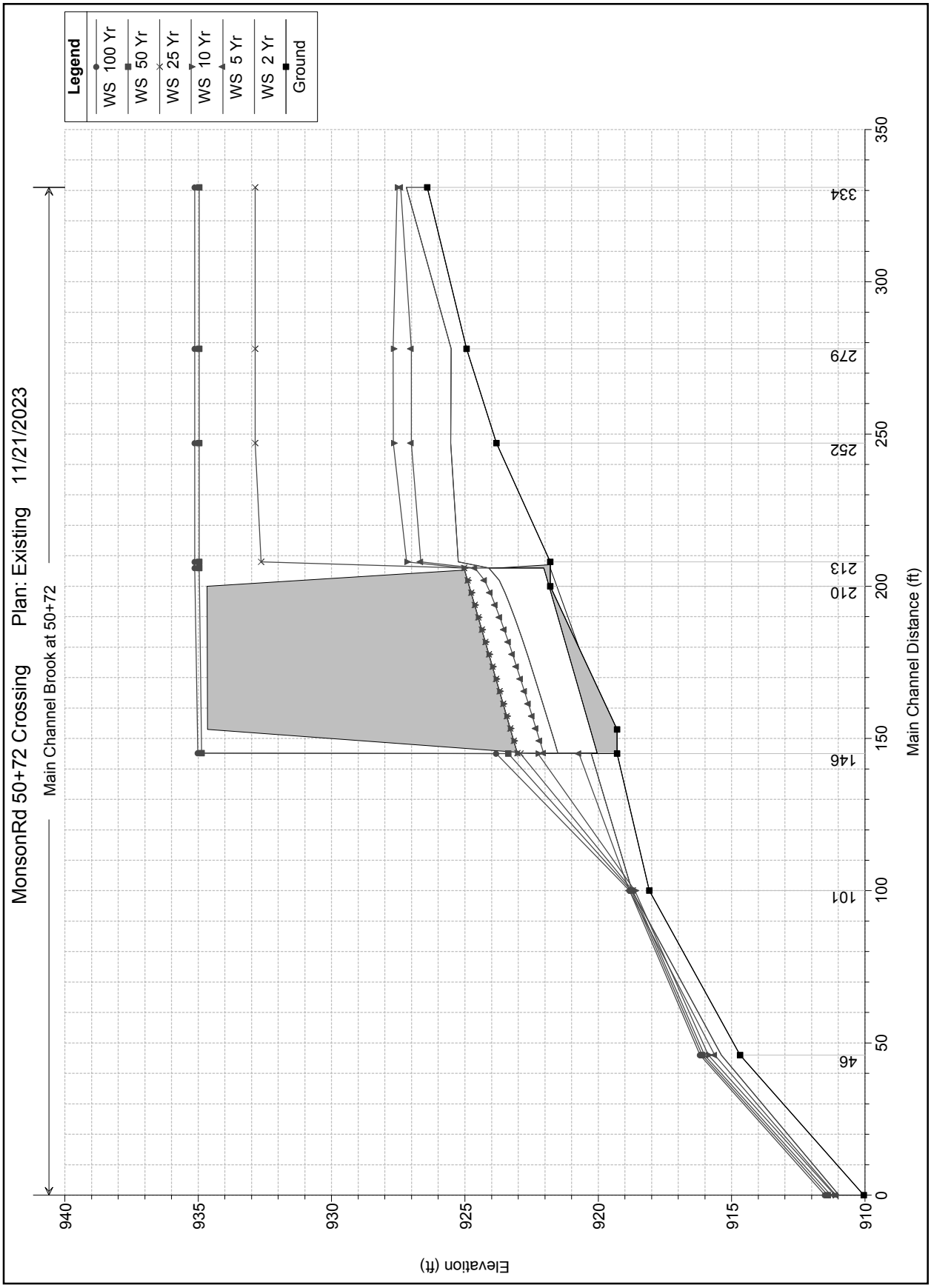
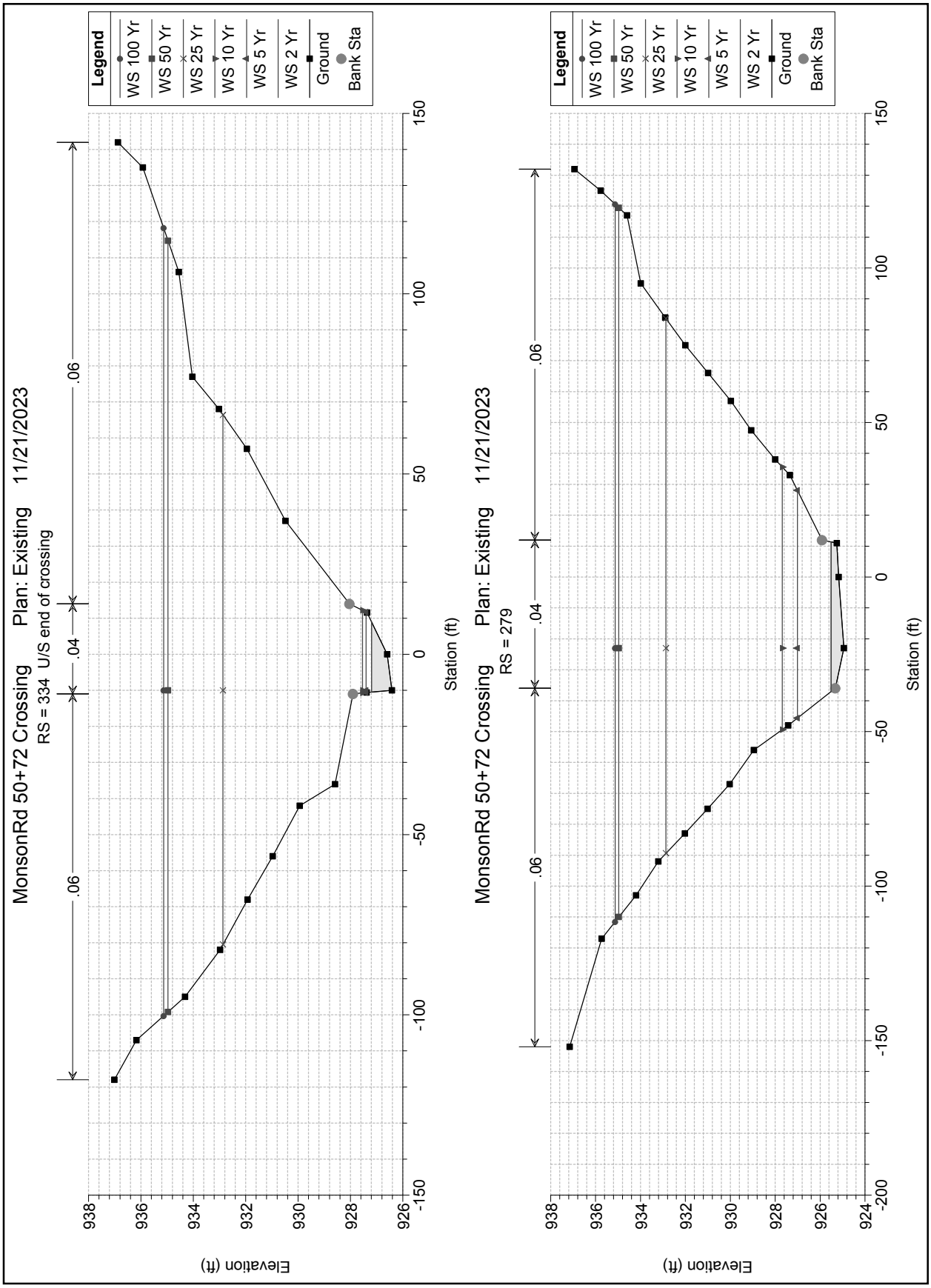
HEC-RAS Computed Results for crossing 50+72 proposed

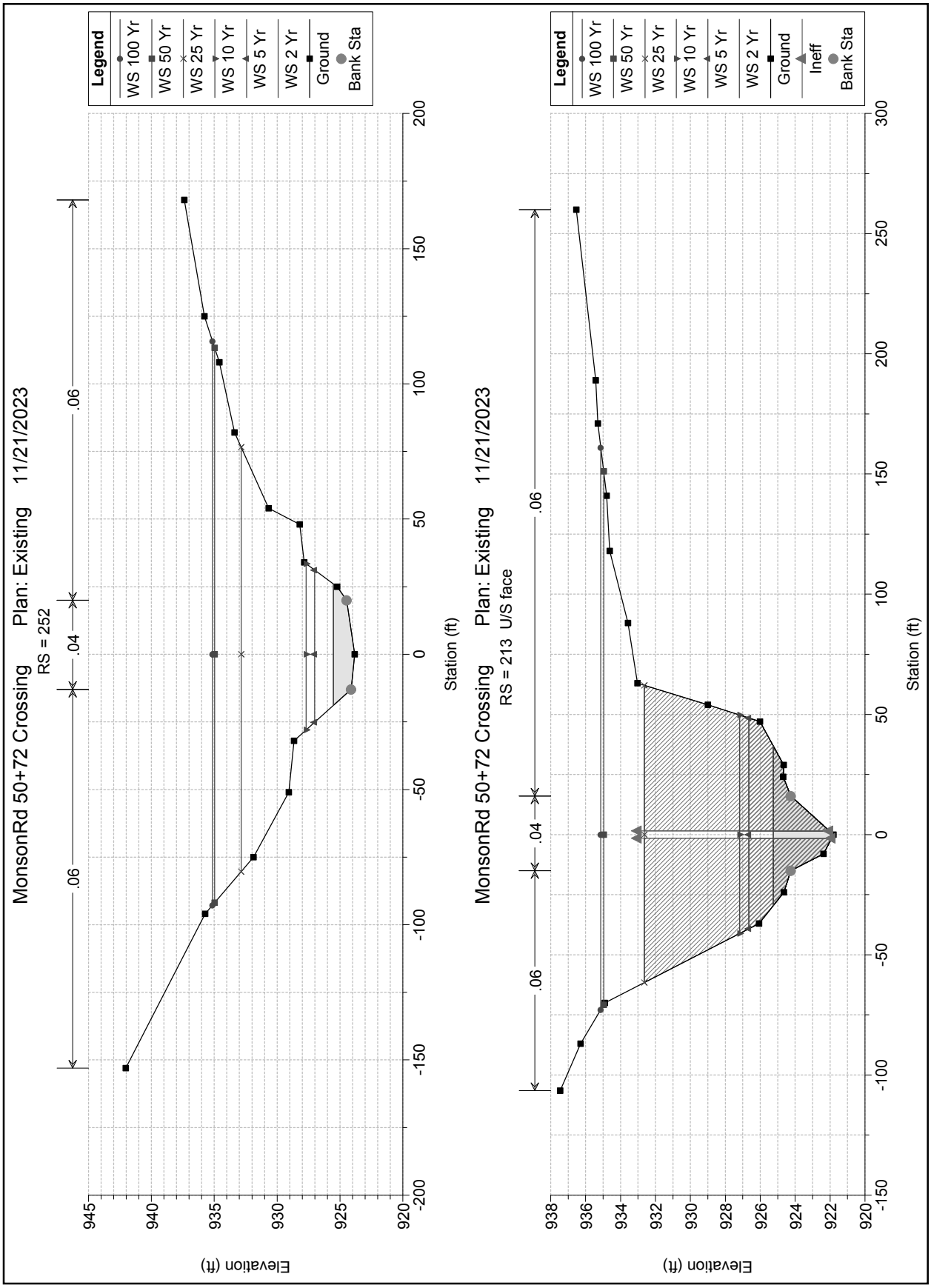
HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ.MILES)	
DESIGN FLOOD DISCHARGE (C.F.S)	116
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S)	10.75
DESIGN FLOOD ELEVATION (FEET, NAVD)	932.64
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S)	163
BASE FLOOD ELEVATION (FEET, NAVD)	933.34
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY	25
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY	100
FLOOD OF RECORD	
DISCHARGE (C.F.S)	Unknown
FREQUENCY (IF KNOWN, YEARS)	Unknown
MAXIMUM ELEVATION (FEET, NAVD)	Unknown
DATE (MM/YYYY)	Unknown
HISTORY OF ICE FLOCS	Unknown

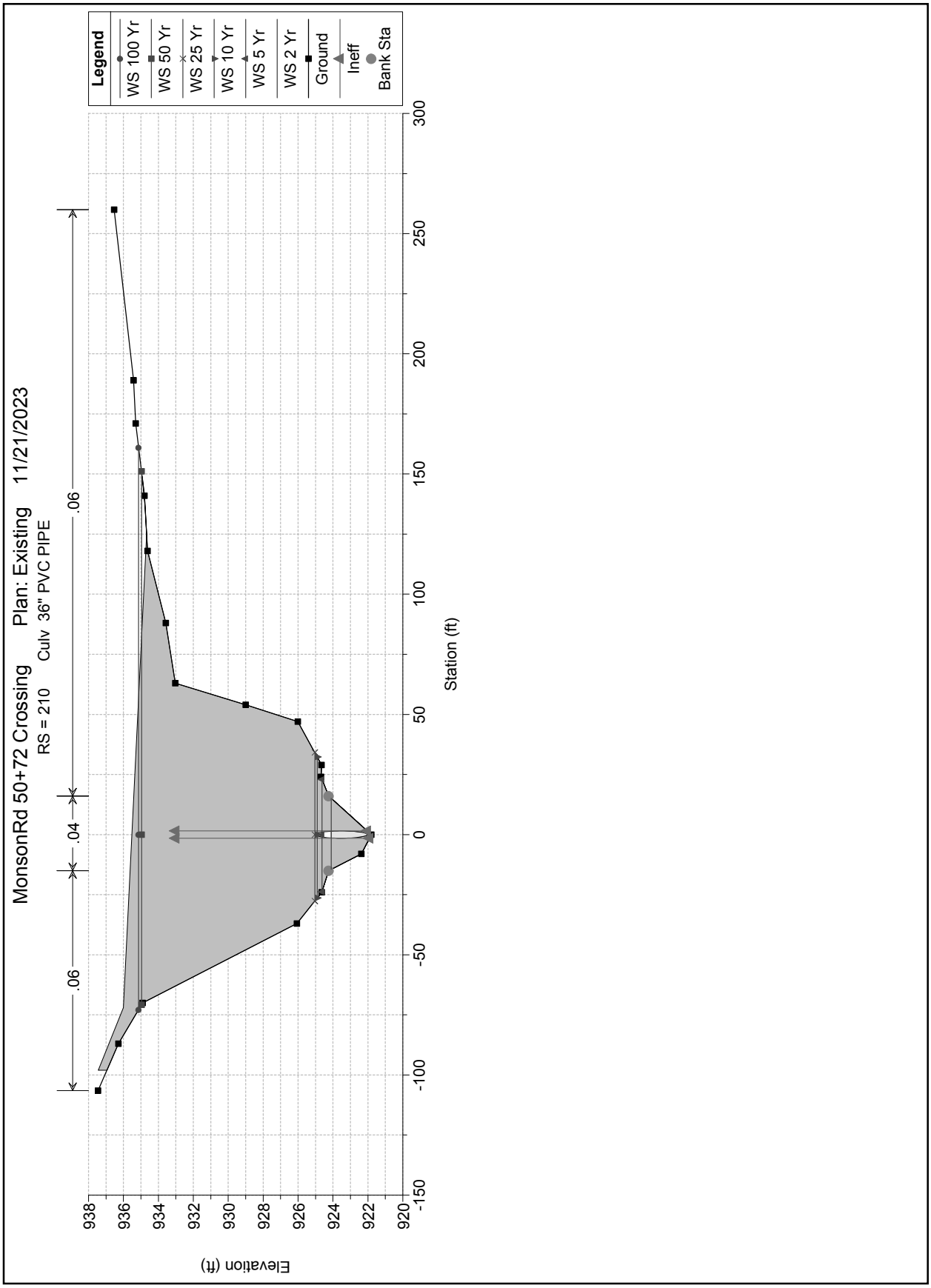
TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S)	40
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY	
DESIGN FLOOD ELEVATION (FEET,NAVD)	

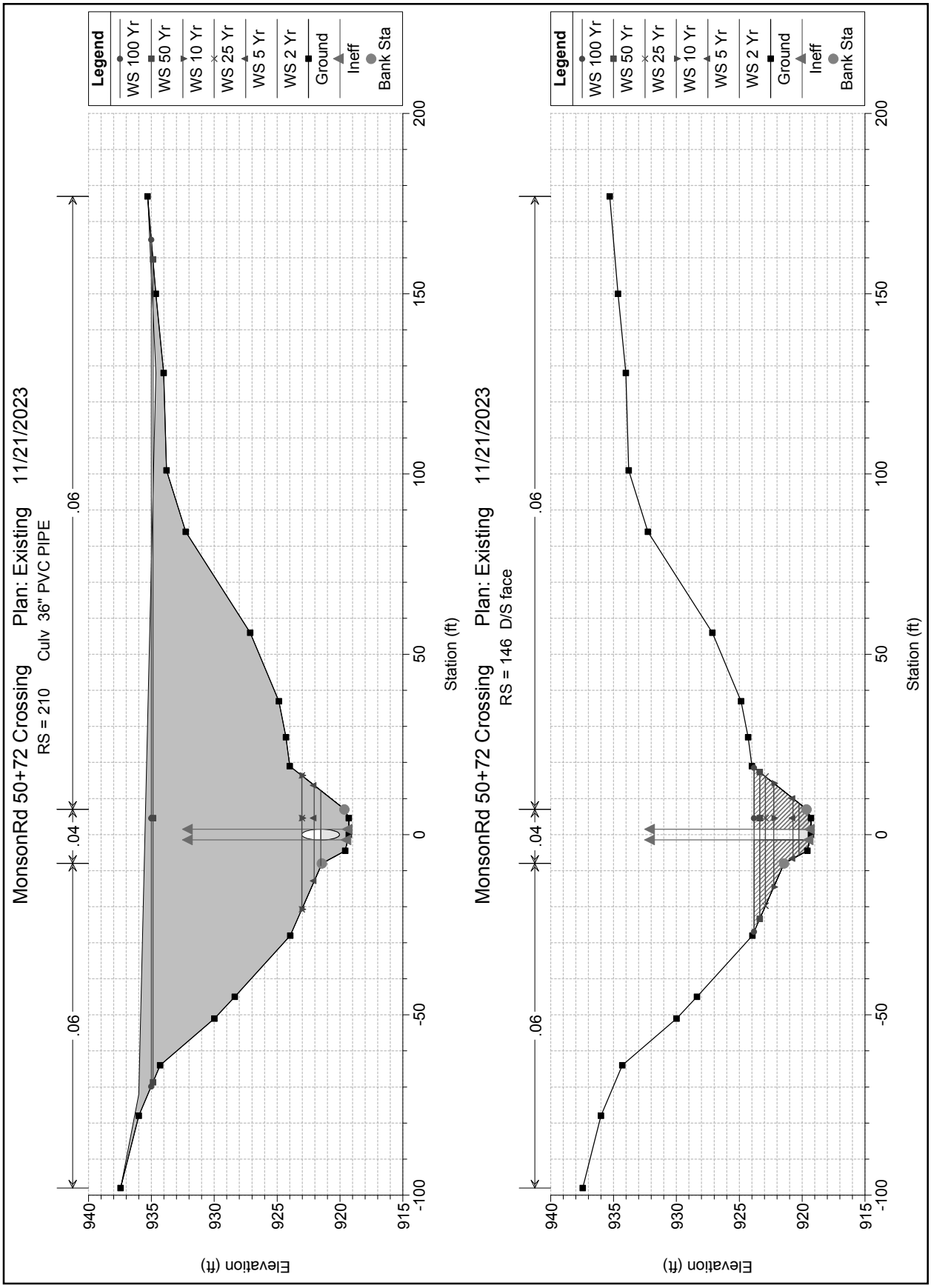
Section	Length (ft)	Span (ft)	Diameter (ft)	Invert (u/s)	Invert (d/s)
Circular Culvert	60.8	3	3	922.04	920.04

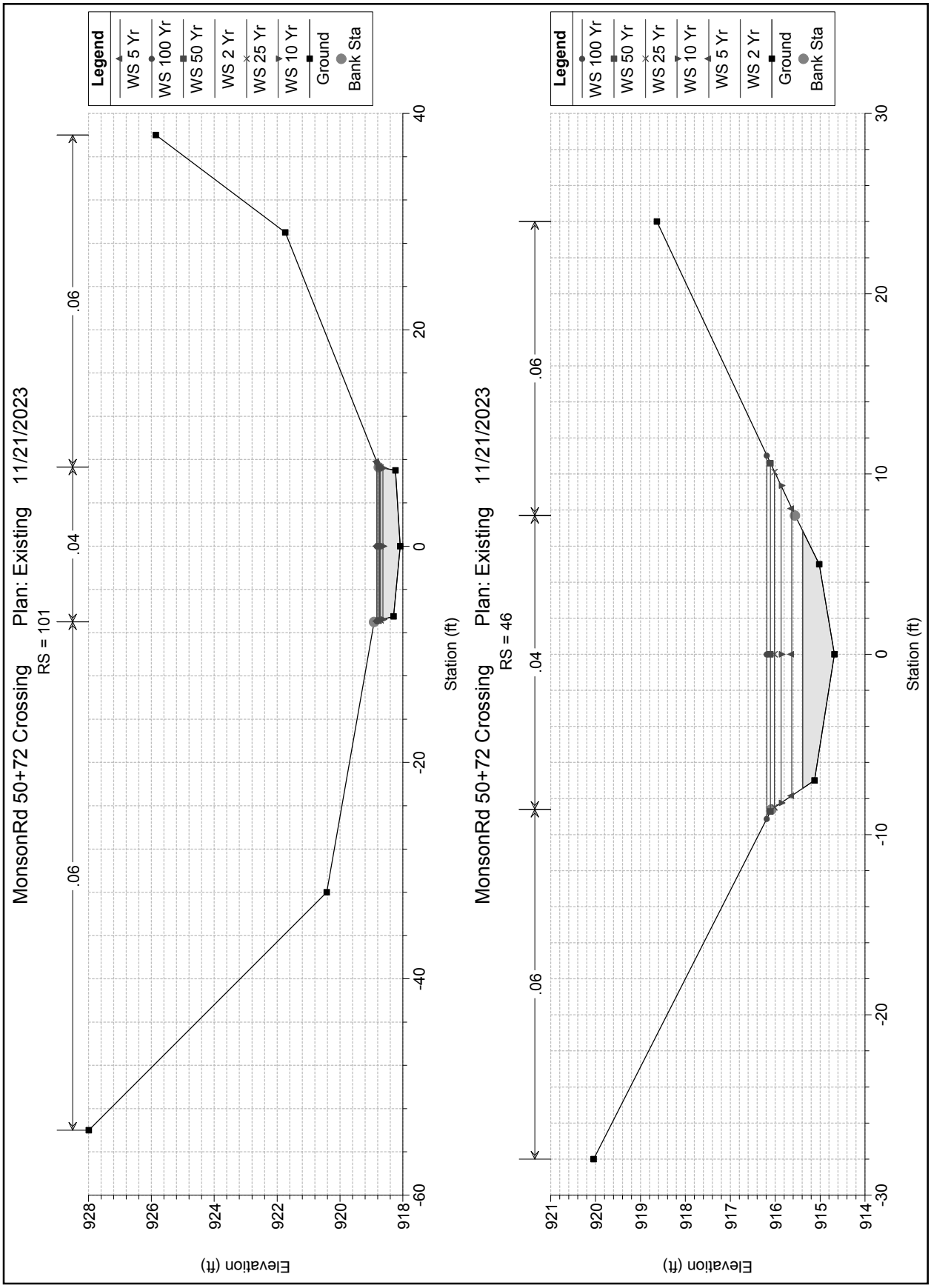

MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
Main Channel Brook at 50+72
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Elevation (ft)
Main Channel Distance (ft)
940
935
930
925
920
915
910
0
50
100
150
200
250
300
350
46
101
146
210
213
252
279
334

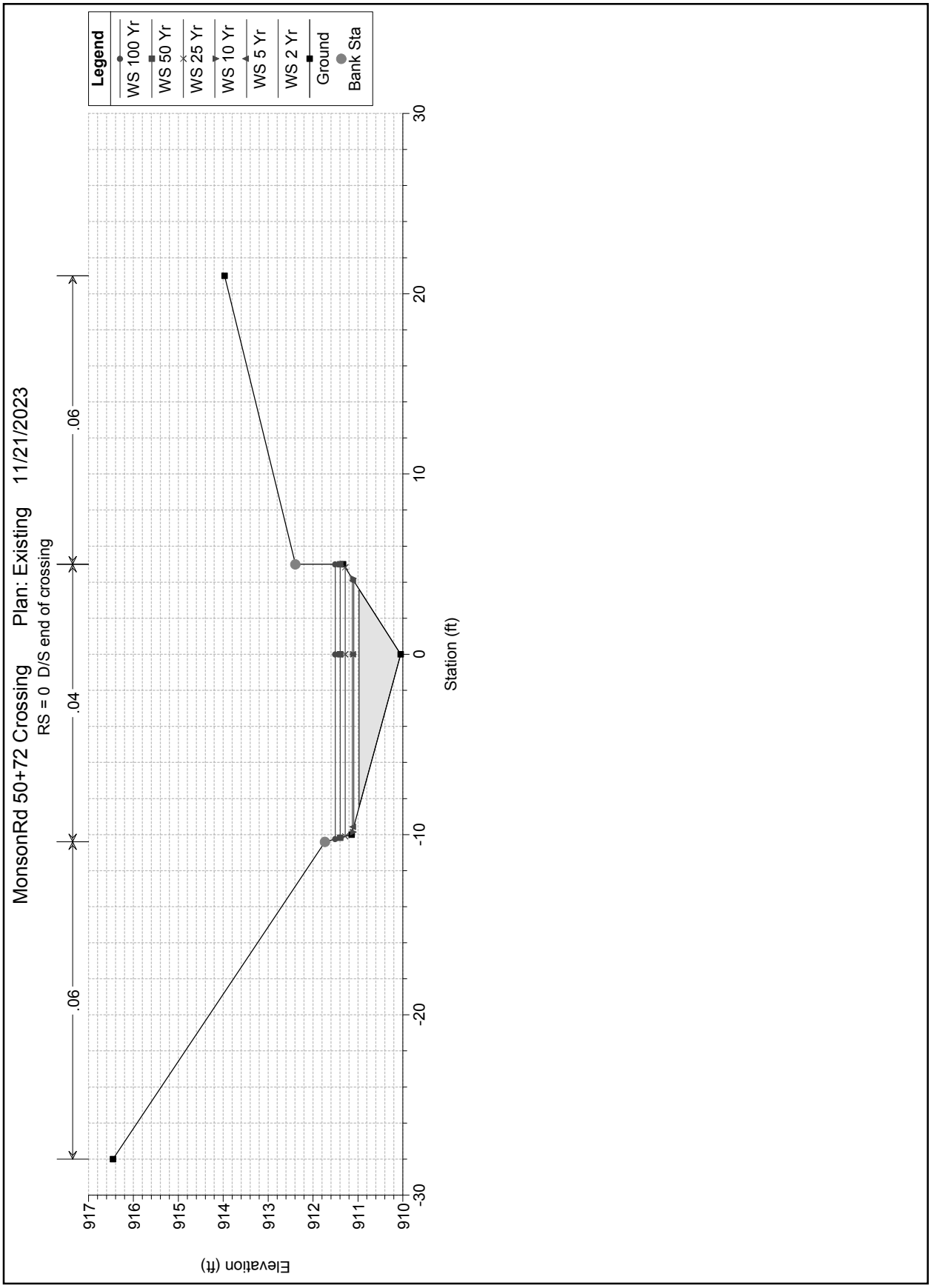

MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 334 U/S end of crossing
.06
.04
.06
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
938
936
934
932
930
928
926
150
100
50
0
-50
-100
-150
MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 279
.06
.04
.06
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
938
936
934
932
930
928
926
924
150
100
50
0
-50
-100
-150
-200


MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 252
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)
945
940
935
930
925
920
200
150
100
50
0
-50
-100
-150
-200
MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 213 U/S face
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)
938
936
934
932
930
928
926
924
922
920
300
250
200
150
100
50
0
-50
-100
-150


MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 210 Culv 36" PVC PIPE
.06
.04
.06
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
Elevation (ft)
938
936
934
932
930
928
926
924
922
920
Station (ft)
300
250
200
150
100
50
0
-50
-100
-150


MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 210 Culv 36" PVC PIPE
Legend
WS 100 Yr
WS 50 Yr
WS 10 Yr
WS 25 Yr
WS 5 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
.06
.04
.06
Elevation (ft)
940
935
930
925
920
915
-100
-50
0
50
100
150
200
Station (ft)
MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 146 D/S face
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Ineff
Bank Sta
.06
.04
.06
Elevation (ft)
940
935
930
925
920
915
-100
-50
0
50
100
150
200
Station (ft)


MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 101
Legend
WS 5 Yr
WS 100 Yr
WS 50 Yr
WS 2 Yr
WS 25 Yr
WS 10 Yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)
928
926
924
922
920
918
40
20
0
-20
-40
-60
MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 46
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)
921
920
919
918
917
916
915
914
30
20
10
0
-10
-20
-30


MonsonRd 50+72 Crossing Plan: Existing 11/21/2023
RS = 0 D/S end of crossing
Legend
WS 100 Yr
WS 50 Yr
WS 25 Yr
WS 10 Yr
WS 5 Yr
WS 2 Yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
917
916
915
914
913
912
911
910
Station (ft)
30
20
10
0
-10
-20
-30

HEC-RAS Plan: Exst River: Main Channel Reach: Brook at 50+72

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Brook at 50+72	334	2 Yr	40.00	926.41	927.20	927.20	927.46	0.030832	4.07	9.83	19.51	1.01
Brook at 50+72	334	5 Yr	65.00	926.41	927.41	927.41	927.73	0.028816	4.58	14.19	22.34	1.01
Brook at 50+72	334	10 Yr	86.00	926.41	927.54	927.54	927.93	0.027344	4.98	17.25	22.94	1.01
Brook at 50+72	334	25 Yr	116.00	926.41	932.86	927.72	932.87	0.000013	0.43	463.57	146.85	0.03
Brook at 50+72	334	50 Yr	139.00	926.41	934.96	927.84	934.97	0.000005	0.31	831.05	213.91	0.02
Brook at 50+72	334	100 Yr	163.00	926.41	935.13	927.96	935.13	0.000006	0.35	867.47	218.55	0.02
Brook at 50+72	279	2 Yr	40.00	924.94	925.51	925.40	925.58	0.011315	2.13	18.87	48.50	0.60
Brook at 50+72	279	5 Yr	65.00	924.94	927.01	925.50	927.01	0.000144	0.68	107.26	73.71	0.09
Brook at 50+72	279	10 Yr	86.00	924.94	927.69	925.58	927.69	0.000081	0.63	161.79	85.03	0.07
Brook at 50+72	279	25 Yr	116.00	924.94	932.86		932.87	0.000002	0.21	823.56	173.02	0.01
Brook at 50+72	279	50 Yr	139.00	924.94	934.96		934.97	0.000001	0.18	1241.22	229.51	0.01
Brook at 50+72	279	100 Yr	163.00	924.94	935.13		935.13	0.000001	0.21	1280.14	232.20	0.01
Brook at 50+72	252	2 Yr	40.00	923.82	925.53		925.54	0.000268	0.78	55.96	44.97	0.11
Brook at 50+72	252	5 Yr	65.00	923.82	927.01		927.01	0.000060	0.59	130.59	56.23	0.06
Brook at 50+72	252	10 Yr	86.00	923.82	927.69		927.69	0.000049	0.61	170.66	61.43	0.06
Brook at 50+72	252	25 Yr	116.00	923.82	932.86		932.87	0.000002	0.25	759.54	157.00	0.01
Brook at 50+72	252	50 Yr	139.00	923.82	934.96		934.97	0.000001	0.21	1137.50	205.18	0.01
Brook at 50+72	252	100 Yr	163.00	923.82	935.13		935.13	0.000002	0.24	1172.36	208.53	0.01
Brook at 50+72	213	2 Yr	40.00	921.80	925.25	923.65	925.49	0.002277	3.96	10.10	66.47	0.38
Brook at 50+72	213	5 Yr	65.00	921.80	926.65	924.33	926.97	0.001884	4.55	14.30	87.66	0.37
Brook at 50+72	213	10 Yr	86.00	921.80	927.19	924.83	927.64	0.002312	5.41	15.91	90.93	0.41
Brook at 50+72	213	25 Yr	116.00	921.80	932.64	925.49	932.85	0.000398	3.59	32.28	123.70	0.19
Brook at 50+72	213	50 Yr	139.00	921.80	934.96	925.94	934.97	0.000001	0.21	1214.13	221.92	0.01
Brook at 50+72	213	100 Yr	163.00	921.80	935.13	926.41	935.13	0.000001	0.24	1252.53	233.86	0.01
Brook at 50+72	210		Culvert									
Brook at 50+72	146	2 Yr	40.00	919.29	920.26	921.08	923.38	0.157973	14.17	2.82	14.54	2.58
Brook at 50+72	146	5 Yr	65.00	919.29	920.73	921.77	924.42	0.109571	15.42	4.22	16.69	2.29
Brook at 50+72	146	10 Yr	86.00	919.29	922.26	922.26	923.74	0.016438	9.76	8.81	28.77	1.00
Brook at 50+72	146	25 Yr	116.00	919.29	922.92	922.92	924.72	0.015232	10.75	10.79	35.79	1.00
Brook at 50+72	146	50 Yr	139.00	919.29	923.38	923.38	925.41	0.014659	11.43	12.16	40.68	1.00
Brook at 50+72	146	100 Yr	163.00	919.29	923.83	923.83	926.09	0.014206	12.07	13.51	45.47	1.00
Brook at 50+72	101	2 Yr	40.00	918.08	918.74	918.82	919.15	0.044569	5.14	7.78	14.15	1.22
Brook at 50+72	101	5 Yr	65.00	918.08	918.83	919.07	919.62	0.071050	7.15	9.10	14.75	1.58

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Proposal No. 608163-128112

HEC-RAS Plan: Exst River: Main Channel Reach: Brook at 50+72 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Brook at 50+72	101	10 Yr	86.00	918.08	918.63	919.27	921.55	0.410756	13.69	6.28	14.00	3.60
Brook at 50+72	101	25 Yr	116.00	918.08	918.71	919.50	922.56	0.445820	15.74	7.37	14.11	3.84
Brook at 50+72	101	50 Yr	139.00	918.08	918.77	919.65	923.26	0.459074	17.01	8.17	14.23	3.95
Brook at 50+72	101	100 Yr	163.00	918.08	918.82	919.79	923.95	0.465437	18.16	8.99	14.69	4.03
Brook at 50+72	46	2 Yr	40.00	914.68	915.39	915.56	915.98	0.079859	6.16	6.49	14.29	1.61
Brook at 50+72	46	5 Yr	65.00	914.68	915.63	915.80	916.27	0.053473	6.40	10.16	15.93	1.40
Brook at 50+72	46	10 Yr	86.00	914.68	915.87	915.97	916.46	0.033671	6.15	14.18	17.60	1.16
Brook at 50+72	46	25 Yr	116.00	914.68	916.01	916.19	916.79	0.037296	7.09	16.77	18.60	1.25
Brook at 50+72	46	50 Yr	139.00	914.68	916.11	916.34	917.03	0.040066	7.75	18.51	19.32	1.31
Brook at 50+72	46	100 Yr	163.00	914.68	916.19	916.49	917.28	0.042985	8.43	20.12	20.15	1.37
Brook at 50+72	0	2 Yr	40.00	910.05	910.97	911.22	911.77	0.105045	7.14	5.60	12.10	1.85
Brook at 50+72	0	5 Yr	65.00	910.05	911.09	911.45	912.39	0.145922	9.12	7.13	13.65	2.22
Brook at 50+72	0	10 Yr	86.00	910.05	911.12	911.62	913.13	0.217622	11.36	7.57	14.06	2.73
Brook at 50+72	0	25 Yr	116.00	910.05	911.28	911.85	913.43	0.177670	11.74	9.88	14.92	2.54
Brook at 50+72	0	50 Yr	139.00	910.05	911.39	912.01	913.64	0.156288	12.03	11.56	15.17	2.43
Brook at 50+72	0	100 Yr	163.00	910.05	911.50	912.16	913.87	0.140339	12.34	13.21	15.25	2.34

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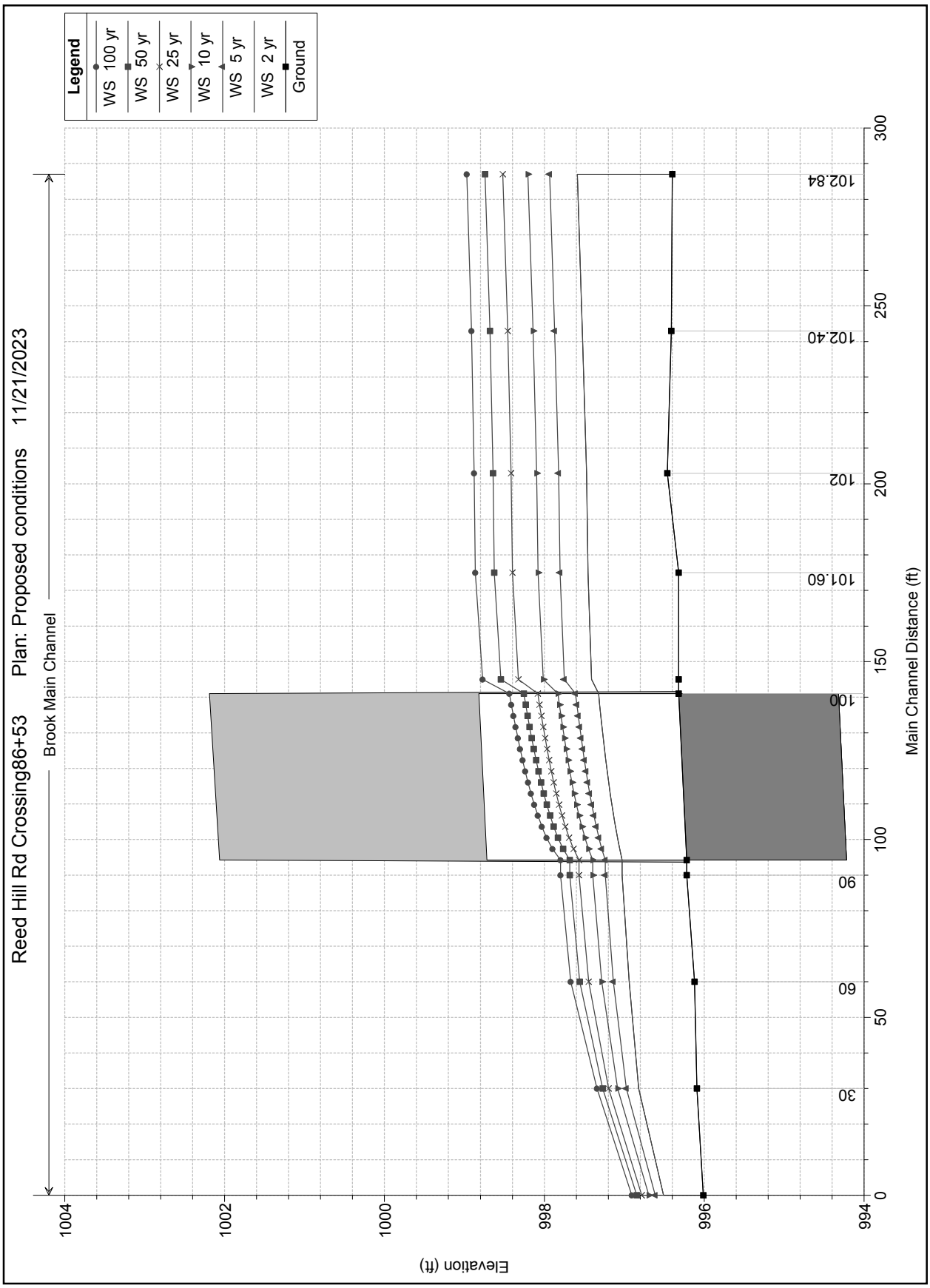
Proposal No. 608163-128112

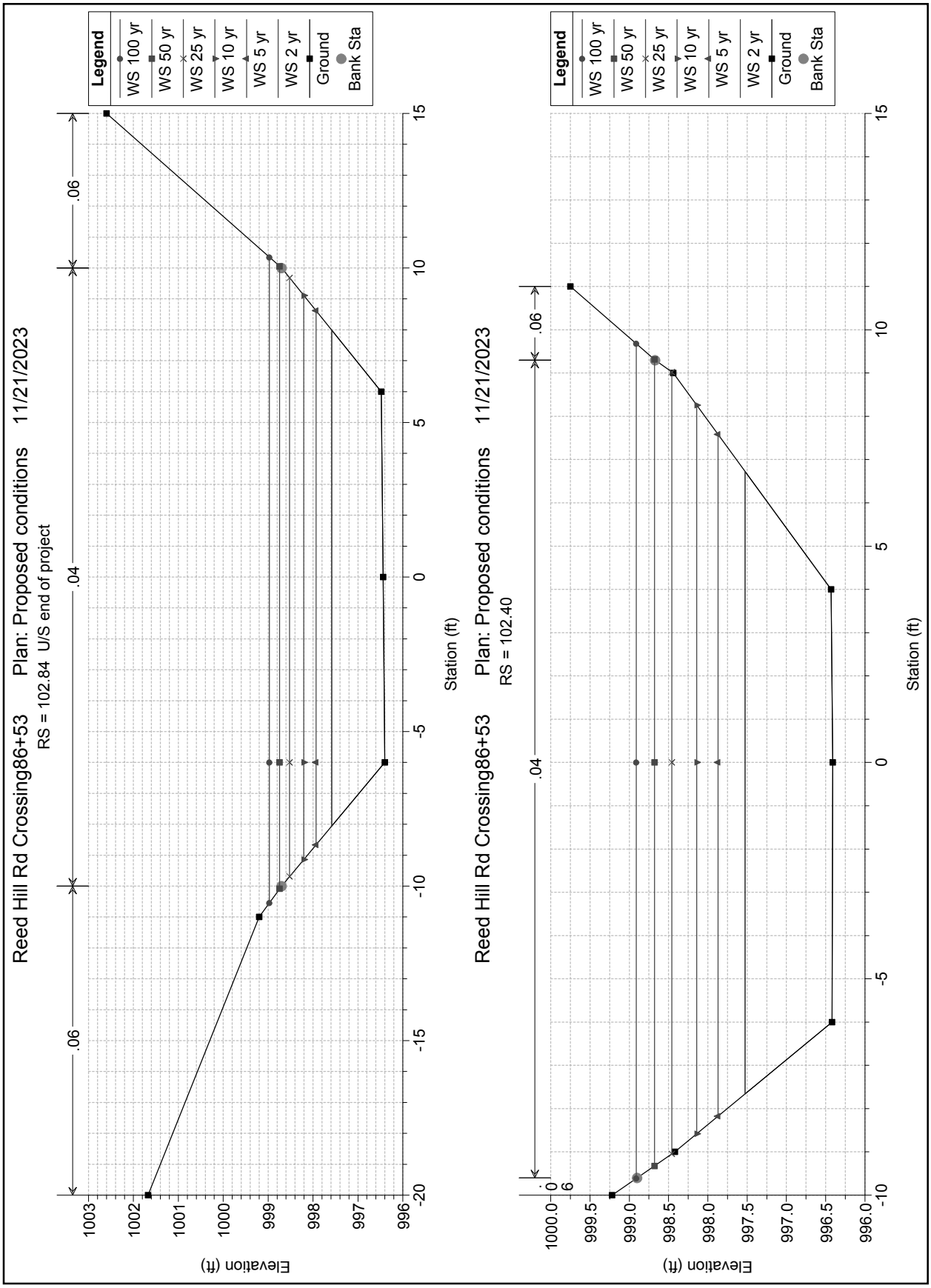
HEC-RAS Computed Results for crossing 86+53 proposed

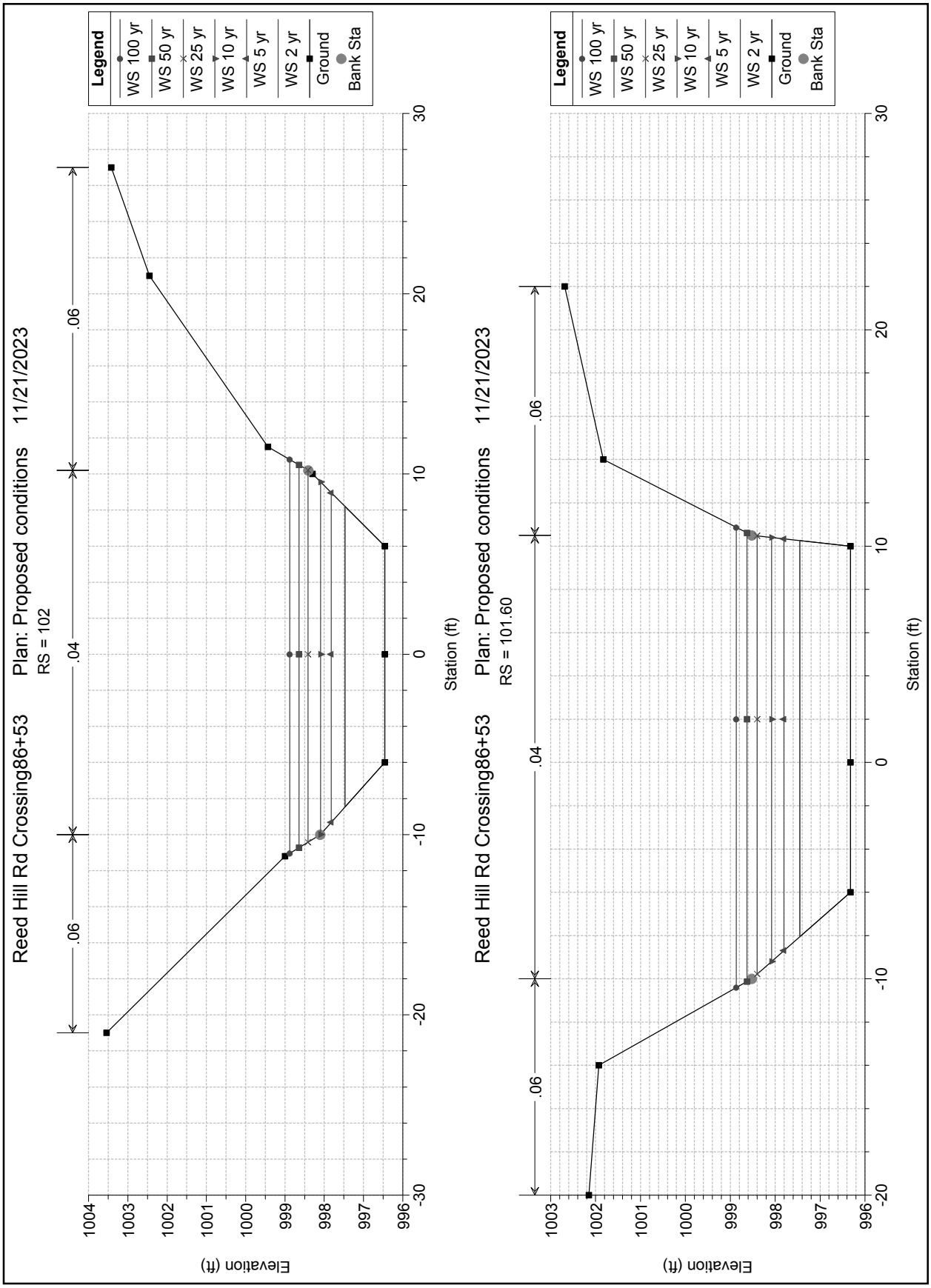
HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ.MILES)	0.33
DESIGN FLOOD DISCHARGE (C.F.S)	52
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S)	3.22
DESIGN FLOOD ELEVATION (FEET, NAVD)	998.32
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S)	73
BASE FLOOD ELEVATION (FEET, NAVD)	998.77
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY	25
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY	100
FLOOD OF RECORD	
DISCHARGE (C.F.S)	Unknown
FREQUENCY (IF KNOWN, YEARS)	Unknown
MAXIMUM ELEVATION (FEET, NAVD)	Unknown
DATE (MM/YYYY)	Unknown
HISTORY OF ICE FLOCS	Unknown

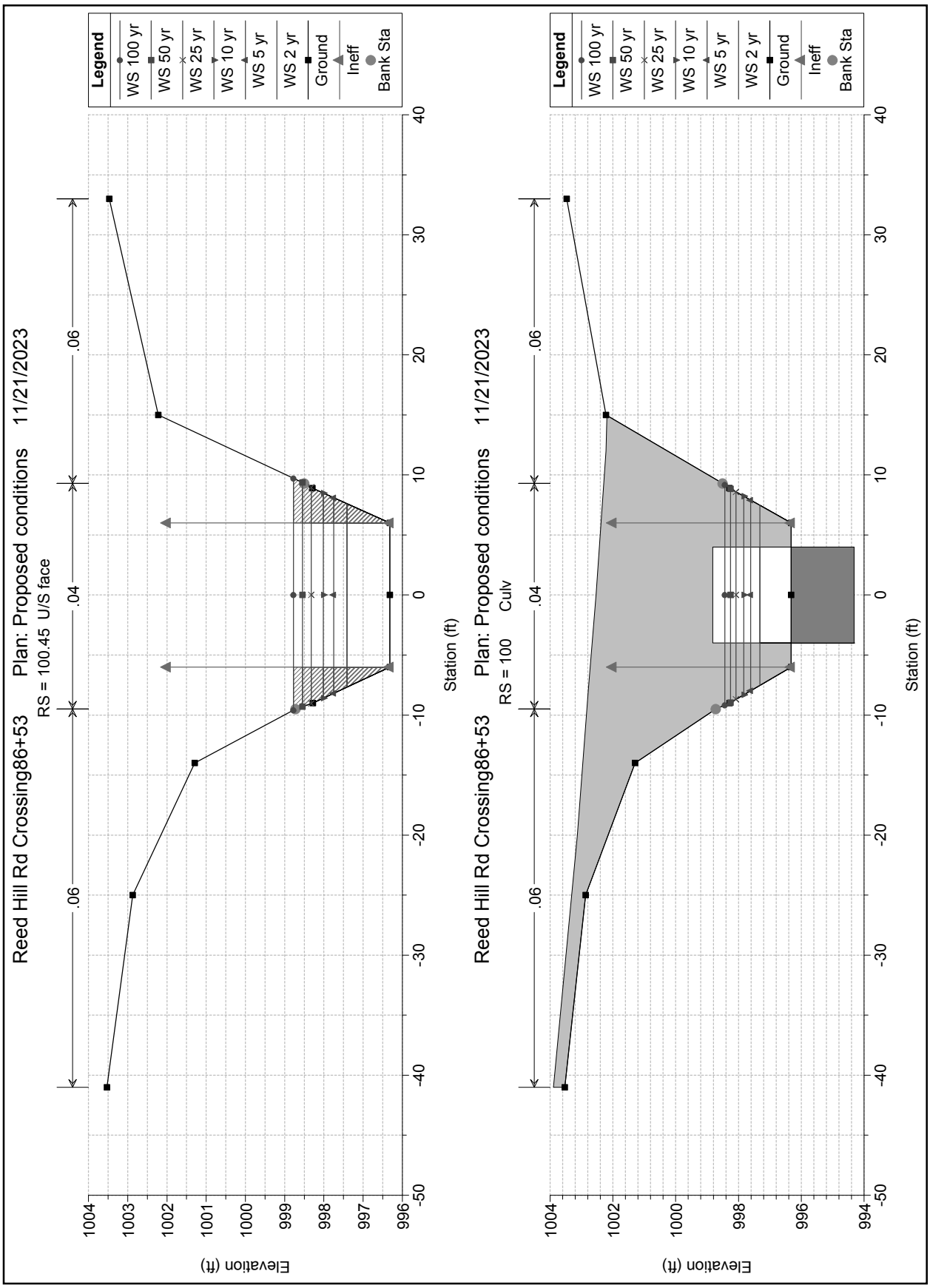
TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S)	18
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY	8.91
DESIGN FLOOD ELEVATION (FEET,NAVD)	1001.42

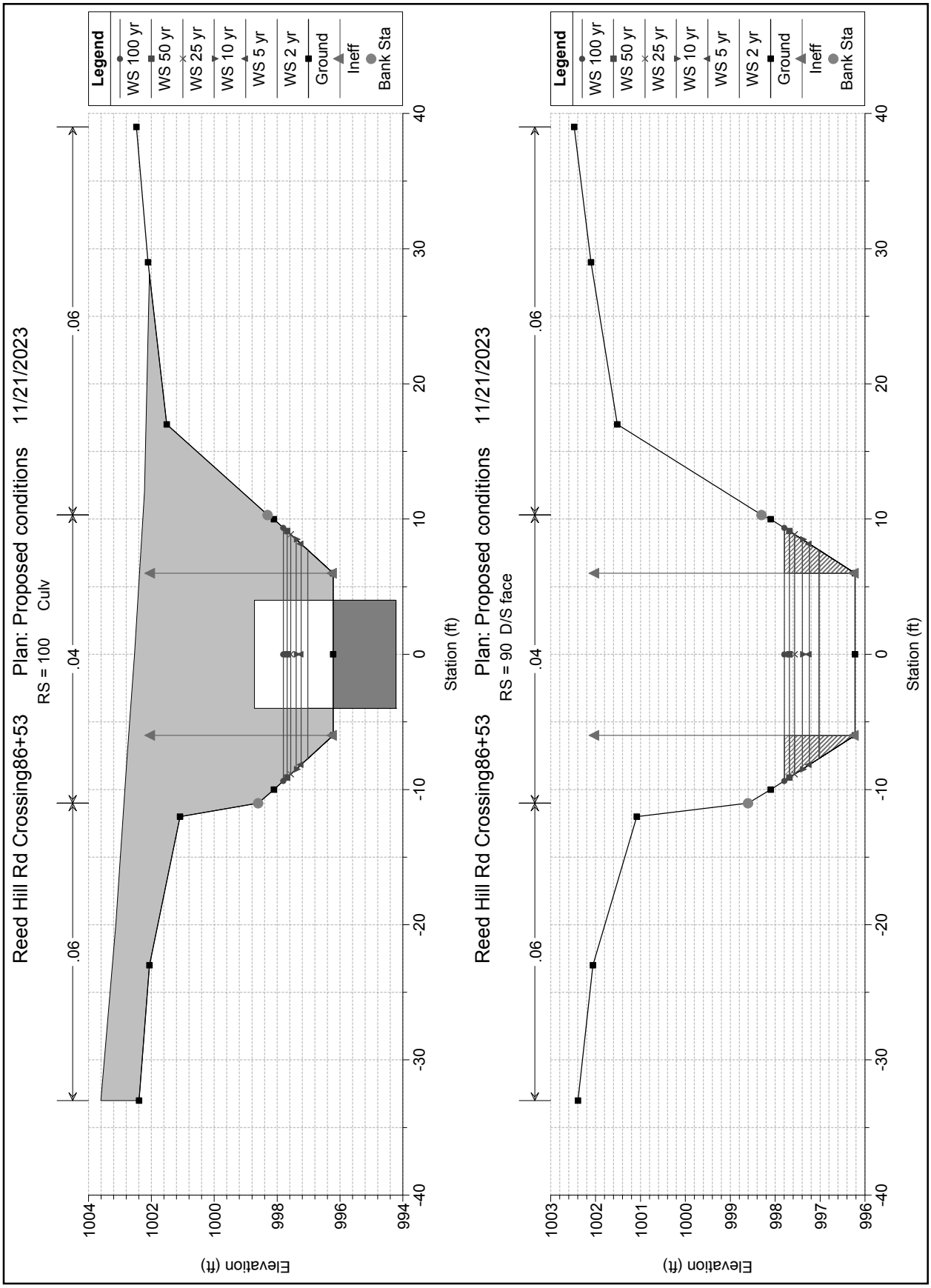
Section	**Length (ft)**	**Span (ft)**	**Rise (ft)**	**Invert (u/s)**	**Invert (d/s)**
R.C Box Culvert	50	8	4.5	994.32	994.22

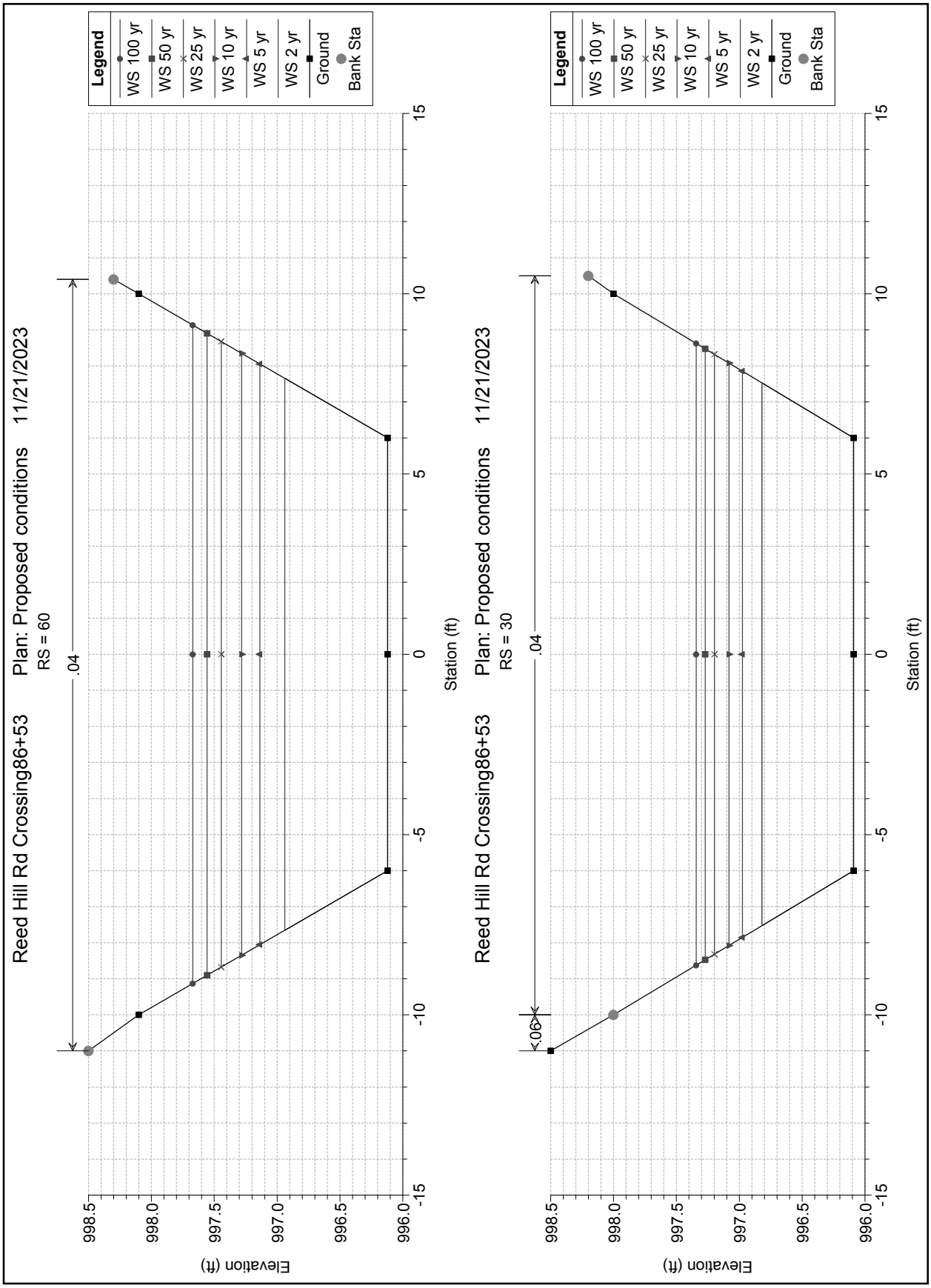

Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
Brook Main Channel
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Elevation (ft)
Main Channel Distance (ft)
994
996
998
1000
1002
1004
0
30
50
60
90
100
150
200
250
300
101.60
102
102.40
102.84

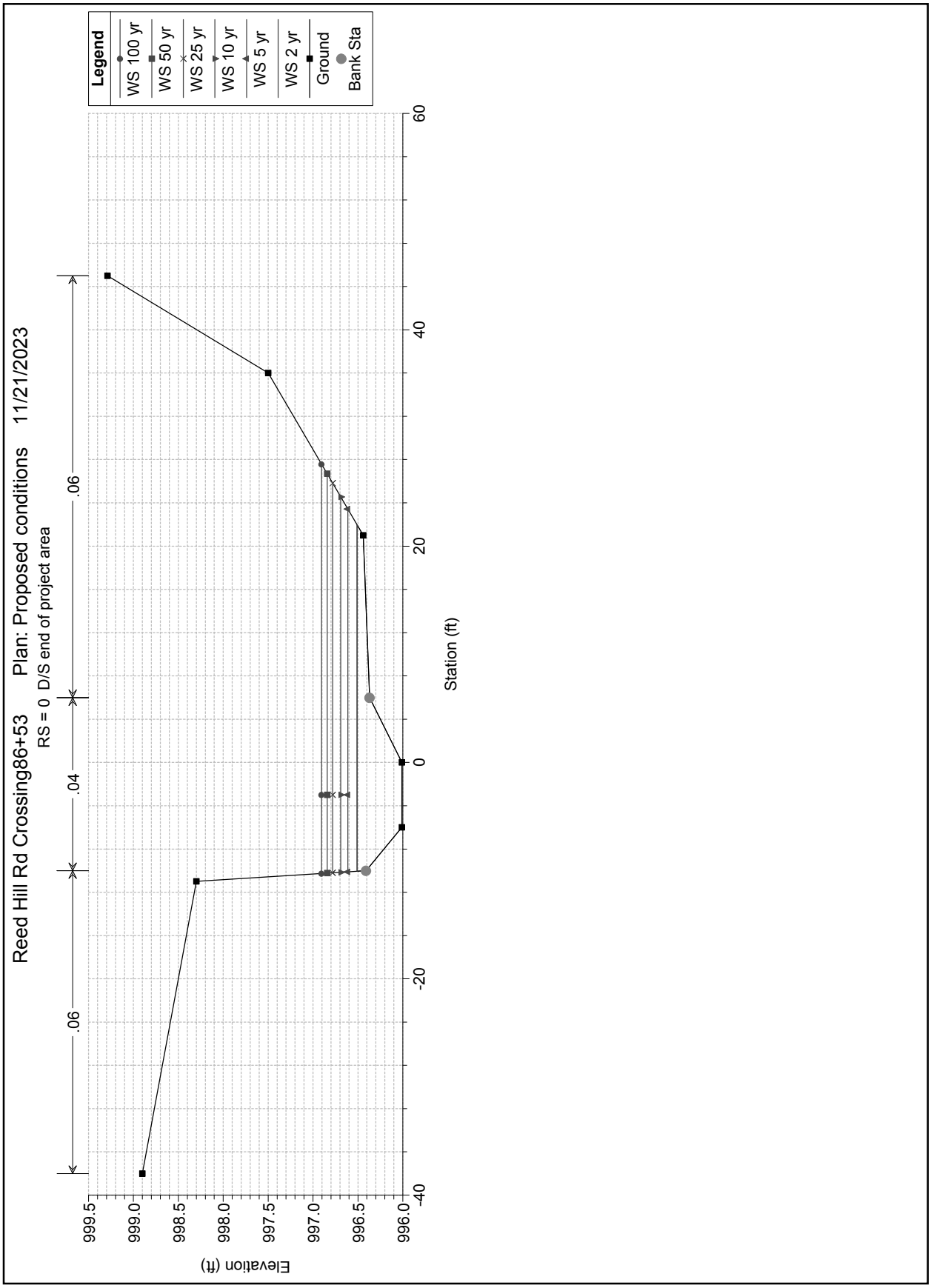

Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 102.84 U/S end of project
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)
Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 102.40
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)


Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 102
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)
Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 101.60
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)


Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 100.45 U/S face
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Ineff
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)
Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 100 Culv
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Ineff
Bank Sta
.06
.04
.06
Elevation (ft)
Station (ft)


Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 100
Culv
.06
.04
.06
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 90
D/S face
.06
.04
.06
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 60
.04
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
998.5
998.0
997.5
997.0
996.5
996.0
15
10
5
0
-5
-10
-15
Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 30
.04
.06
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Reed Hill Rd Crossing86+53
Plan: Proposed conditions
11/21/2023
RS = 0 D/S end of project area
.06
.04
.06
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
Elevation (ft)
999.5
999.0
998.5
998.0
997.5
997.0
996.5
996.0
-40
-20
0
20
40
60
Station (ft)

HEC-RAS Plan: prop River: Brook Reach: Main Channel

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	102.84	2 yr	18.00	996.40	997.59	996.84	997.61	0.000952	1.12	16.08	16.06	0.20
Main Channel	102.84	5 yr	29.00	996.40	997.93	996.99	997.96	0.000986	1.33	21.88	17.29	0.21
Main Channel	102.84	10 yr	39.00	996.40	998.21	997.10	998.24	0.000992	1.46	26.72	18.25	0.21
Main Channel	102.84	25 yr	52.00	996.40	998.52	997.24	998.56	0.000986	1.59	32.64	19.37	0.22
Main Channel	102.84	50 yr	62.00	996.40	998.74	997.33	998.79	0.000966	1.67	37.02	20.14	0.22
Main Channel	102.84	100 yr	73.00	996.40	998.97	997.43	999.02	0.000908	1.75	41.71	20.89	0.21
Main Channel	102.40	2 yr	18.00	996.41	997.53		997.55	0.001475	1.33	13.50	14.38	0.24
Main Channel	102.40	5 yr	29.00	996.41	997.87		997.91	0.001473	1.55	18.70	15.76	0.25
Main Channel	102.40	10 yr	39.00	996.41	998.14		998.19	0.001444	1.69	23.12	16.84	0.25
Main Channel	102.40	25 yr	52.00	996.41	998.46		998.51	0.001393	1.82	28.63	18.07	0.25
Main Channel	102.40	50 yr	62.00	996.41	998.68		998.74	0.001332	1.90	32.71	18.64	0.25
Main Channel	102.40	100 yr	73.00	996.41	998.91		998.97	0.001248	1.97	37.10	19.29	0.25
Main Channel	102	2 yr	18.00	996.46	997.47		997.49	0.001395	1.24	14.48	16.66	0.24
Main Channel	102	5 yr	29.00	996.46	997.82		997.85	0.001276	1.41	20.59	18.28	0.23
Main Channel	102	10 yr	39.00	996.46	998.10		998.13	0.001197	1.51	25.80	19.54	0.23
Main Channel	102	25 yr	52.00	996.46	998.42		998.46	0.001068	1.62	32.24	20.64	0.23
Main Channel	102	50 yr	62.00	996.46	998.64		998.69	0.000972	1.69	36.99	21.23	0.22
Main Channel	102	100 yr	73.00	996.46	998.88		998.93	0.000897	1.75	42.05	21.84	0.22
Main Channel	101.60	2 yr	18.00	996.32	997.45		997.47	0.000625	0.93	19.44	18.32	0.16
Main Channel	101.60	5 yr	29.00	996.32	997.80		997.82	0.000662	1.12	25.98	19.03	0.17
Main Channel	101.60	10 yr	39.00	996.32	998.08		998.10	0.000680	1.25	31.30	19.60	0.17
Main Channel	101.60	25 yr	52.00	996.32	998.40		998.43	0.000690	1.38	37.71	20.25	0.18
Main Channel	101.60	50 yr	62.00	996.32	998.63		998.66	0.000680	1.46	42.37	20.74	0.18
Main Channel	101.60	100 yr	73.00	996.32	998.86		998.90	0.000657	1.55	47.33	21.27	0.18
Main Channel	100.45	2 yr	18.00	996.32	997.41	996.73	997.44	0.001225	1.38	13.08	15.27	0.23
Main Channel	100.45	5 yr	29.00	996.32	997.75	996.88	997.79	0.001288	1.69	17.15	16.29	0.25
Main Channel	100.45	10 yr	39.00	996.32	998.01	997.01	998.07	0.001319	1.92	20.34	17.09	0.26
Main Channel	100.45	25 yr	52.00	996.32	998.32	997.16	998.40	0.001340	2.16	24.06	18.02	0.27
Main Channel	100.45	50 yr	62.00	996.32	998.54	997.26	998.63	0.001347	2.32	26.69	18.67	0.27
Main Channel	100.45	100 yr	73.00	996.32	998.77	997.37	998.87	0.001349	2.48	29.43	19.31	0.28
Main Channel	100		Culvert									
Main Channel	90	2 yr	18.00	996.22	997.03	996.63	997.08	0.003347	1.86	9.67	15.43	0.37
Main Channel	90	5 yr	29.00	996.22	997.24	996.79	997.33	0.003986	2.37	12.22	16.33	0.41
Main Channel	90	10 yr	39.00	996.22	997.39	996.91	997.51	0.004479	2.77	14.09	17.00	0.45

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Proposal No. 608163-128112

HEC-RAS Plan: prop River: Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	90	25 yr	52.00	996.22	997.57	997.06	997.73	0.005057	3.22	16.15	17.73	0.49
Main Channel	90	50 yr	62.00	996.22	997.68	997.17	997.88	0.005461	3.54	17.54	18.22	0.52
Main Channel	90	100 yr	73.00	996.22	997.80	997.28	998.03	0.005871	3.86	18.93	18.71	0.54
Main Channel	60	2 yr	18.00	996.12	996.94		996.98	0.002948	1.61	11.18	15.31	0.33
Main Channel	60	5 yr	29.00	996.12	997.14		997.20	0.003645	2.03	14.28	16.11	0.38
Main Channel	60	10 yr	39.00	996.12	997.28		997.37	0.004144	2.34	16.67	16.70	0.41
Main Channel	60	25 yr	52.00	996.12	997.45		997.56	0.004663	2.67	19.45	17.35	0.45
Main Channel	60	50 yr	62.00	996.12	997.56		997.69	0.004990	2.90	21.41	17.81	0.47
Main Channel	60	100 yr	73.00	996.12	997.67		997.82	0.005291	3.11	23.46	18.26	0.48
Main Channel	30	2 yr	18.00	996.09	996.82		996.87	0.004345	1.82	9.88	15.06	0.40
Main Channel	30	5 yr	29.00	996.09	996.97		997.06	0.005849	2.37	12.25	15.70	0.47
Main Channel	30	10 yr	39.00	996.09	997.08	996.75	997.20	0.007099	2.79	13.98	16.16	0.53
Main Channel	30	25 yr	52.00	996.09	997.20	996.88	997.36	0.008642	3.28	15.86	16.64	0.59
Main Channel	30	50 yr	62.00	996.09	997.27	996.98	997.48	0.009811	3.63	17.10	16.95	0.64
Main Channel	30	100 yr	73.00	996.09	997.34	997.07	997.59	0.011118	3.99	18.30	17.24	0.68
Main Channel	0	2 yr	18.00	996.01	996.51	996.49	996.62	0.020035	2.76	7.67	32.01	0.79
Main Channel	0	5 yr	29.00	996.01	996.61	996.59	996.76	0.020008	3.24	11.09	33.54	0.82
Main Channel	0	10 yr	39.00	996.01	996.69	996.66	996.86	0.020010	3.58	13.78	34.70	0.84
Main Channel	0	25 yr	52.00	996.01	996.78	996.75	996.98	0.020022	3.95	16.93	36.01	0.86
Main Channel	0	50 yr	62.00	996.01	996.84	996.81	997.07	0.020016	4.20	19.19	36.92	0.88
Main Channel	0	100 yr	73.00	996.01	996.91	996.87	997.15	0.020015	4.44	21.54	37.84	0.89

A00830 -949

Proposal No. 608163-128112

APPENDIX F

Drainage Swales

Weston & Sampson

PROJECT:
MONSON ROAD RECONSTRUCTION
WALES, MA
JOB NO: 2170841

STA 11+50 Lt to STA 13+50 Lt

SWALE LINING DESIGN

B	Base width	1	ft	
	Side Slopes	2	ft/ft	

Equation 7.12 Maximum Shear Stress

$\tau = \Upsilon d S$

Υ	Unit Weight of Water	62.4	lb/ft^3	
d	max. dept of flow	0.41	ft	(10 year)
	From Express Calcs			
S	avg. bed slope	0.031	ft/ft	

τ	0.79	lb/ft^2

Turf Establishment (Permissible Unit Shear Strees 1.0 lb/ft^2)

Weston & Sampson

PROJECT:
MONSON ROAD RECONSTRUCTION
WALES, MA
JOB NO: 2170841

STA14+50 to 17+00 LT

SWALE LINING DESIGN

B	Base width	1	ft	
	Side Slopes	2	ft/ft	

Equation 7.12 Maximum Shear Stress

$\tau = \Upsilon d S$

Υ	Unit Weight of Water	62.4	lb/ft^3	
d	max. dept of flow	0.63	ft	(10 year)
	From Express Calcs			
S	avg. bed slope	0.025	ft/ft	

τ	0.98	lb/ft^2

Turf Establishment (Permissible Unit Shear Strees 1.0 lb/ft^2)

Weston & Sampson

PROJECT:
MONSON ROAD RECONSTRUCTION
WALES, MA
JOB NO: 2170841

STA31+65 Lt to STA40+40

SWALE LINING DESIGN

B	Base width	1	ft
	Side Slopes	2	ft/ft

Equation 7.12 Maximum Shear Stress

$\tau = \Upsilon d S$

Υ	Unit Weight of Water	62.4	lb/ft^3	
d	max. dept of flow From Express Calcs	0.57	ft	(10 year)
S	avg. bed slope	0.047	ft/ft	

τ	1.67	lb/ft^2

Rock Riprap (6" diameter) (Permissible Unit Shear Stress 2.00 lb/ft^2)

D50 bottom	5	in

$D50_{sides} = K_1/K_2 * (D50)_{bottom}$

K1 Ratio of shear streese on sides and bottom
Side slope of 2:1
B/d 1.75

K1	0.87

K2 Ratio of tractive force on the sides and bootm using Fig. 7-10
Angle of repose is 42°

K2	0.77

$D50_{sides}$	5.65	in

Weston & Sampson

PROJECT:
MONSON ROAD RECONSTRUCTION
WALES, MA
JOB NO: 2170841

STA40+40 Lt to STA **46+50 lt**

SWALE LINING DESIGN

	B	Base width	1	ft	
		Side Slopes	2	ft/ft	
Equation 7.12	Maximum Shear Stress				
	$\tau = \Upsilon dS$				
	Υ	Unit Weight of Water	62.4	lb/ft^3	
	d	max. dept of flow	0.35	ft	(10 year)
		From Express Calcs			
	S	avg. bed slope	0.016	ft/ft	
	τ		0.35	lb/ft^2	

Turf Establishment (Permissible Unit Shear Strees 1.0 lb/ft^2)

Weston & Sampson

PROJECT:
MONSON ROAD RECONSTRUCTION
WALES, MA
JOB NO: 2170841

STA 70+50 TO 72+75

SWALE LINING DESIGN

	B	Base width	1	ft	
		Side Slopes	2	ft/ft	
Equation 7.12	Maximum Shear Stress				
	$\tau = \Upsilon dS$				
	Υ	Unit Weight of Water	62.4	lb/ft^3	
	d	max. dept of flow	0.46	ft	(10 year)
		From Express Calcs			
	S	avg. bed slope	0.03	ft/ft	
	τ		0.86	lb/ft^2	

Turf Establishment (Permissible Unit Shear Strees 1.0 lb/ft^2)

Proposing modified rockfill to comply with MassDOT PDDG standards for a swale with 3% slope

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, May 12 2020

Sta. 11+50 to 13+50

Trapezoidal

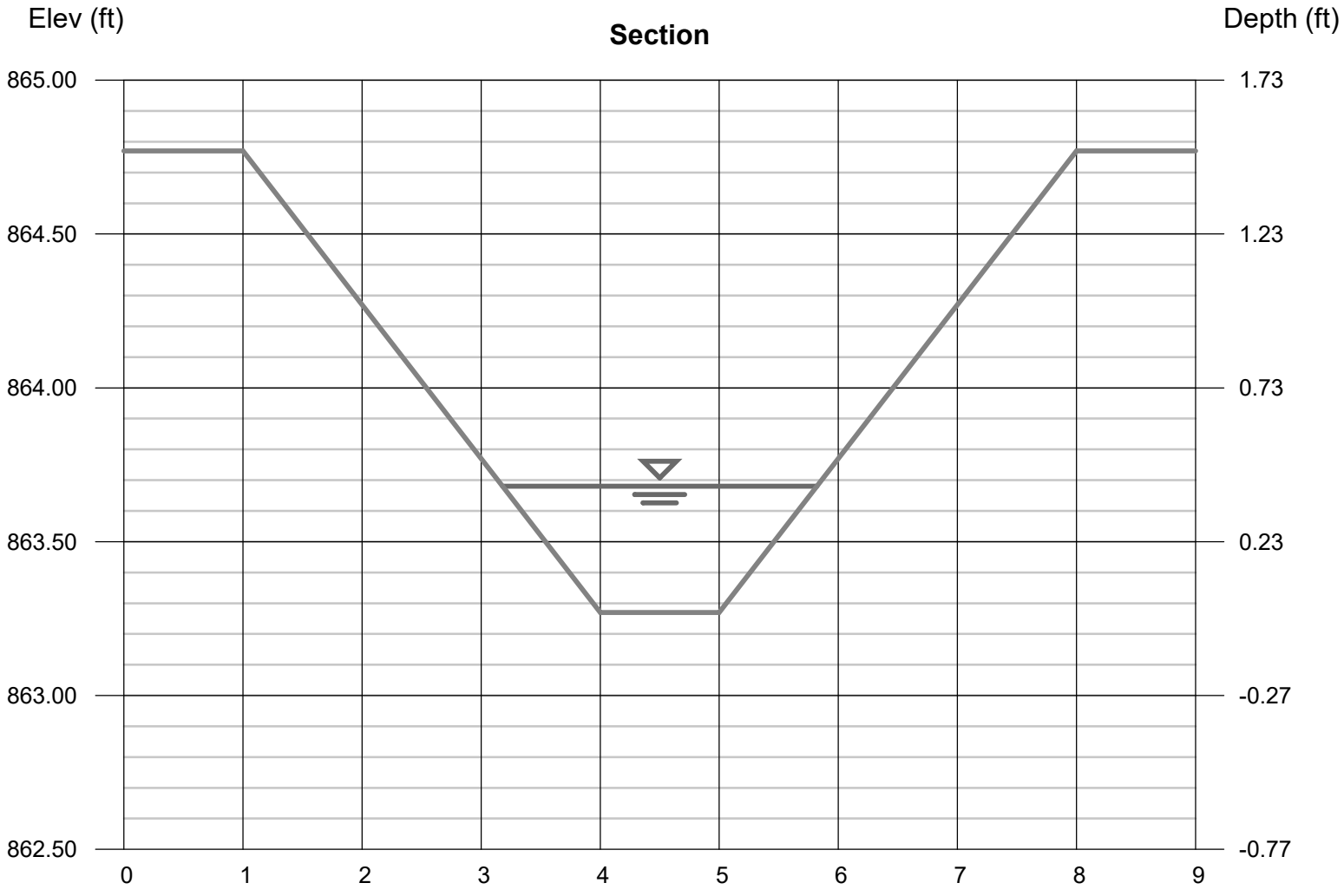
Bottom Width (ft)	= 1.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 863.27
Slope (%)	= 3.10
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.38

Highlighted

Depth (ft)	= 0.41
Q (cfs)	= 2.380
Area (sqft)	= 0.75
Velocity (ft/s)	= 3.19
Wetted Perim (ft)	= 2.83
Crit Depth, Yc (ft)	= 0.43
Top Width (ft)	= 2.64
EGL (ft)	= 0.57



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, May 12 2020

Sta. 14+50 to 17+00

Trapezoidal

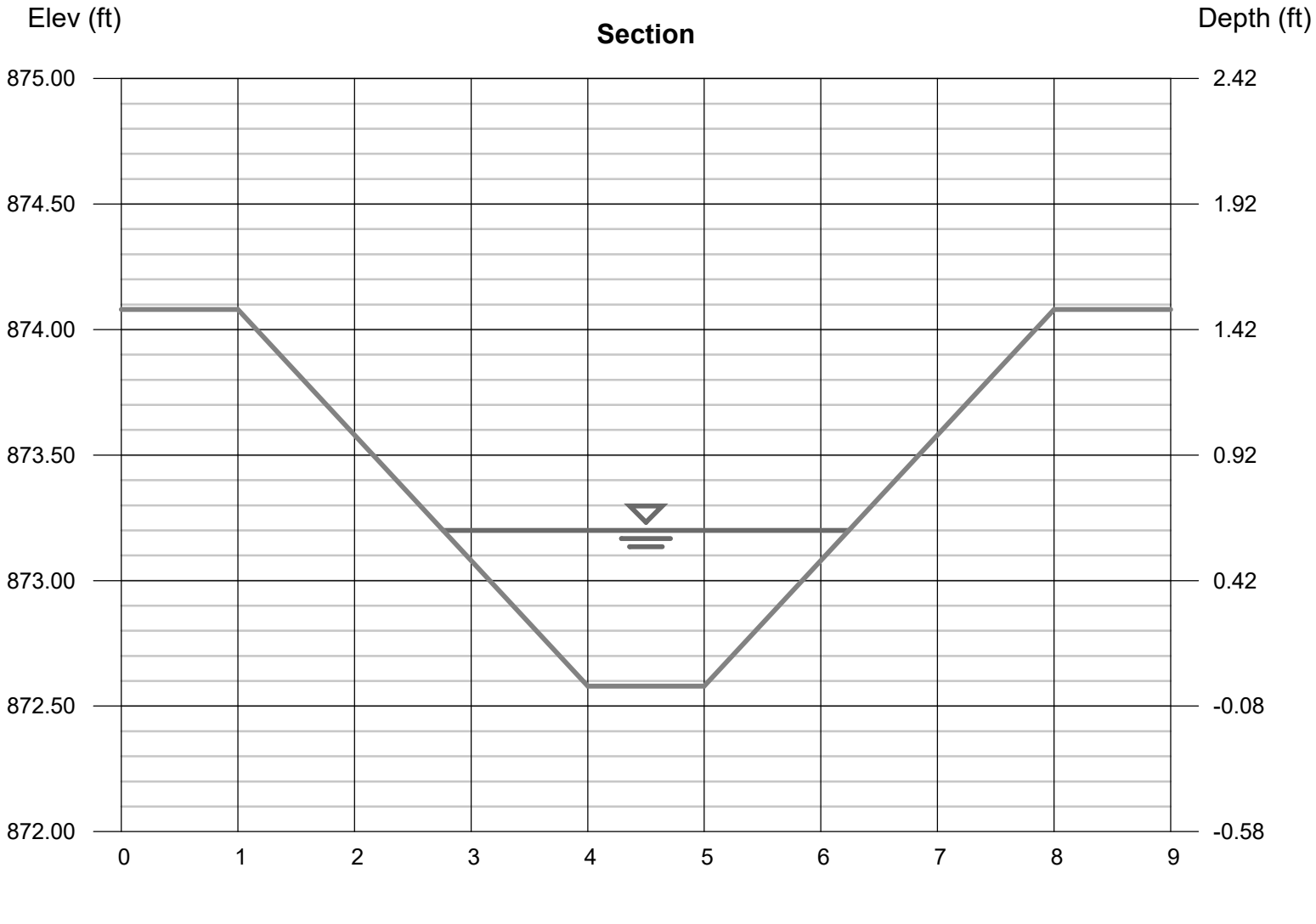
Bottom Width (ft)	= 1.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 872.58
Slope (%)	= 3.90
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.14

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 6.140
Area (sqft)	= 1.39
Velocity (ft/s)	= 4.42
Wetted Perim (ft)	= 3.77
Crit Depth, Yc (ft)	= 0.69
Top Width (ft)	= 3.48
EGL (ft)	= 0.92



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Dec 14 2021

Sta. 31+65

Trapezoidal

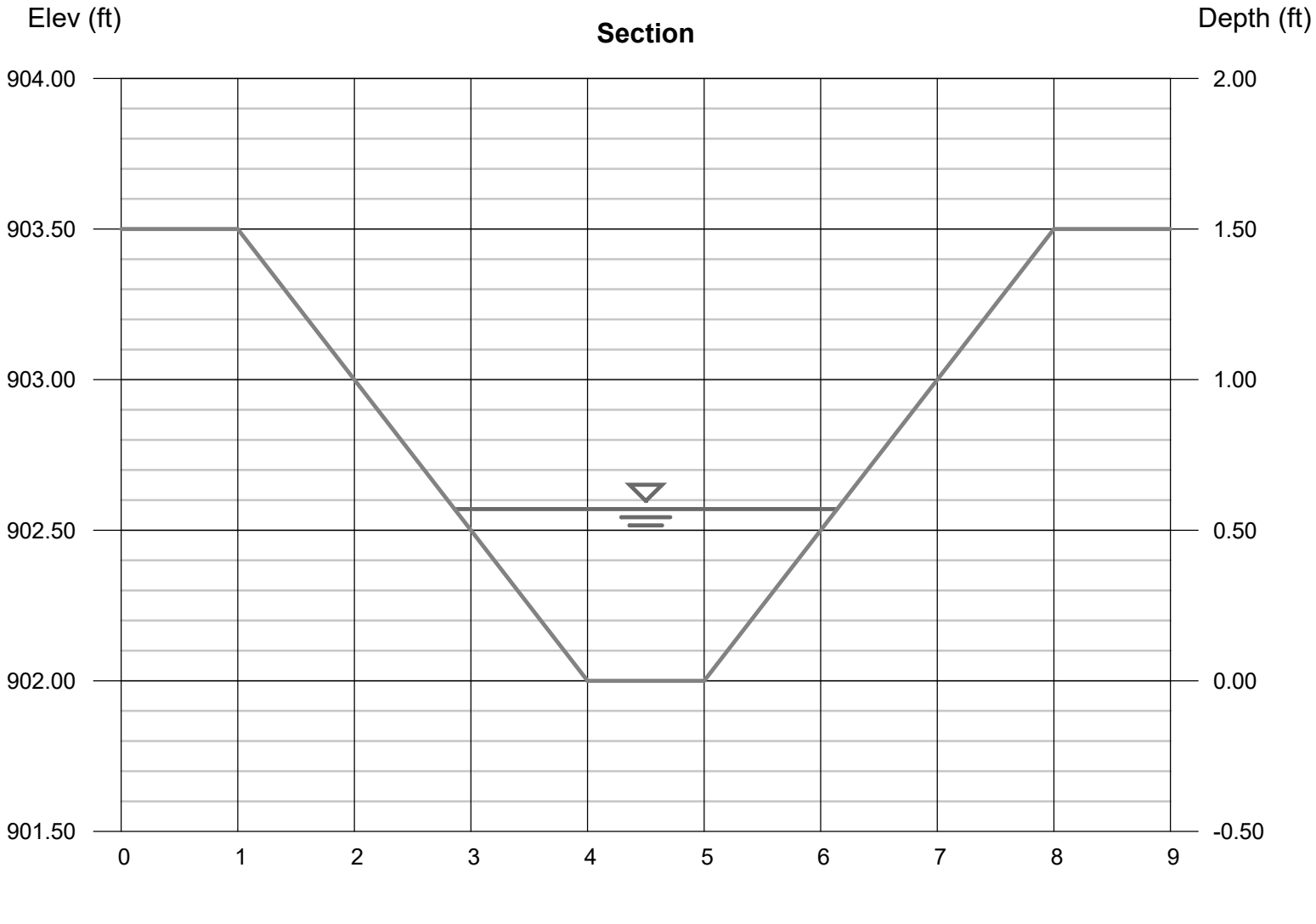
Bottom Width (ft)	= 1.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 902.00
Slope (%)	= 4.70
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.66

Highlighted

Depth (ft)	= 0.57
Q (cfs)	= 5.660
Area (sqft)	= 1.22
Velocity (ft/s)	= 4.64
Wetted Perim (ft)	= 3.55
Crit Depth, Yc (ft)	= 0.67
Top Width (ft)	= 3.28
EGL (ft)	= 0.90



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Dec 14 2021

Sta. 43+70

Trapezoidal

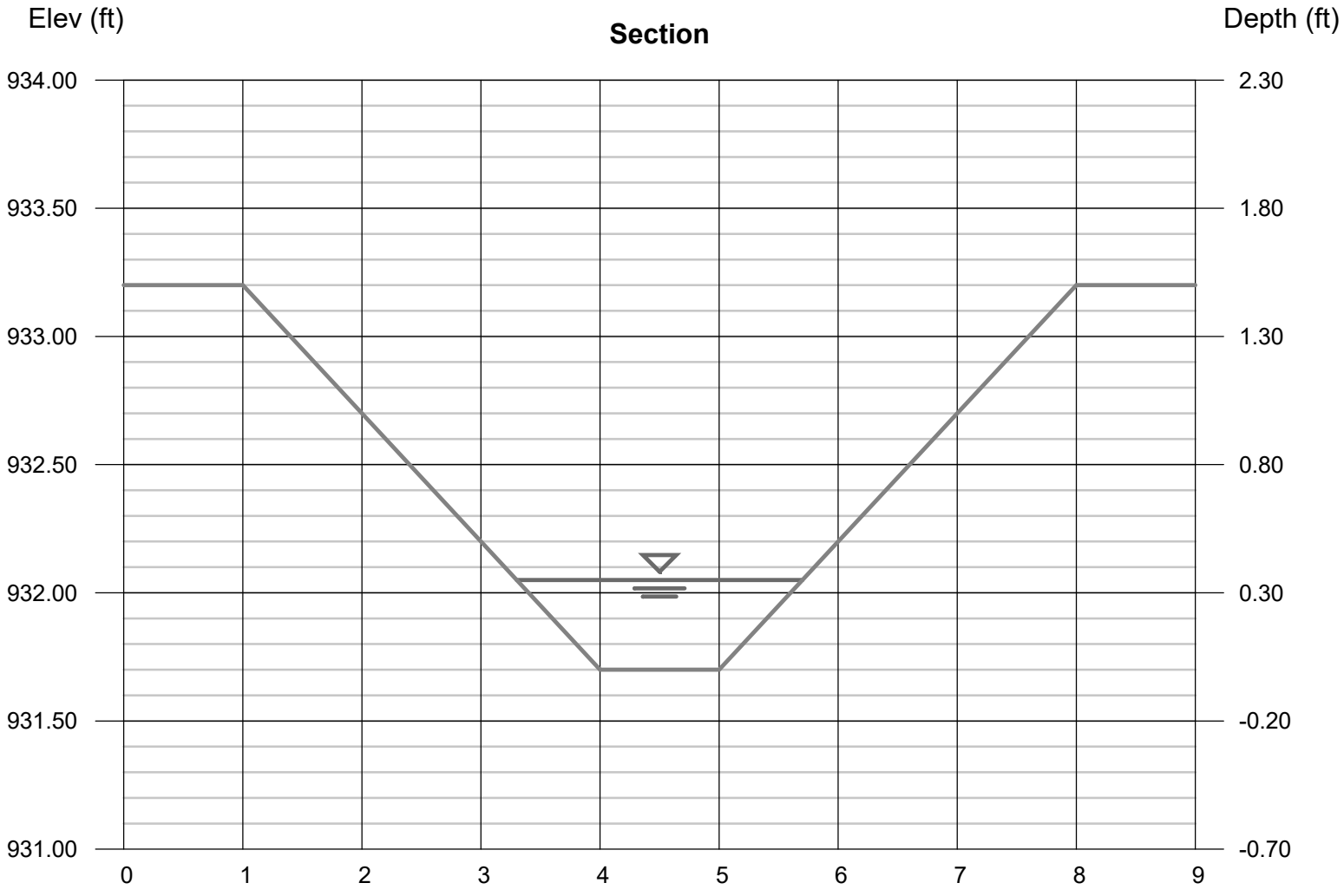
Bottom Width (ft)	= 1.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 931.70
Slope (%)	= 1.60
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.23

Highlighted

Depth (ft)	= 0.35
Q (cfs)	= 1.230
Area (sqft)	= 0.59
Velocity (ft/s)	= 2.07
Wetted Perim (ft)	= 2.57
Crit Depth, Yc (ft)	= 0.30
Top Width (ft)	= 2.40
EGL (ft)	= 0.42



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Nov 30 2023

Sta. 46+65

Triangular

Side Slopes (z:1)	= 6.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 930.00
Slope (%)	= 0.66
N-Value	= 0.033

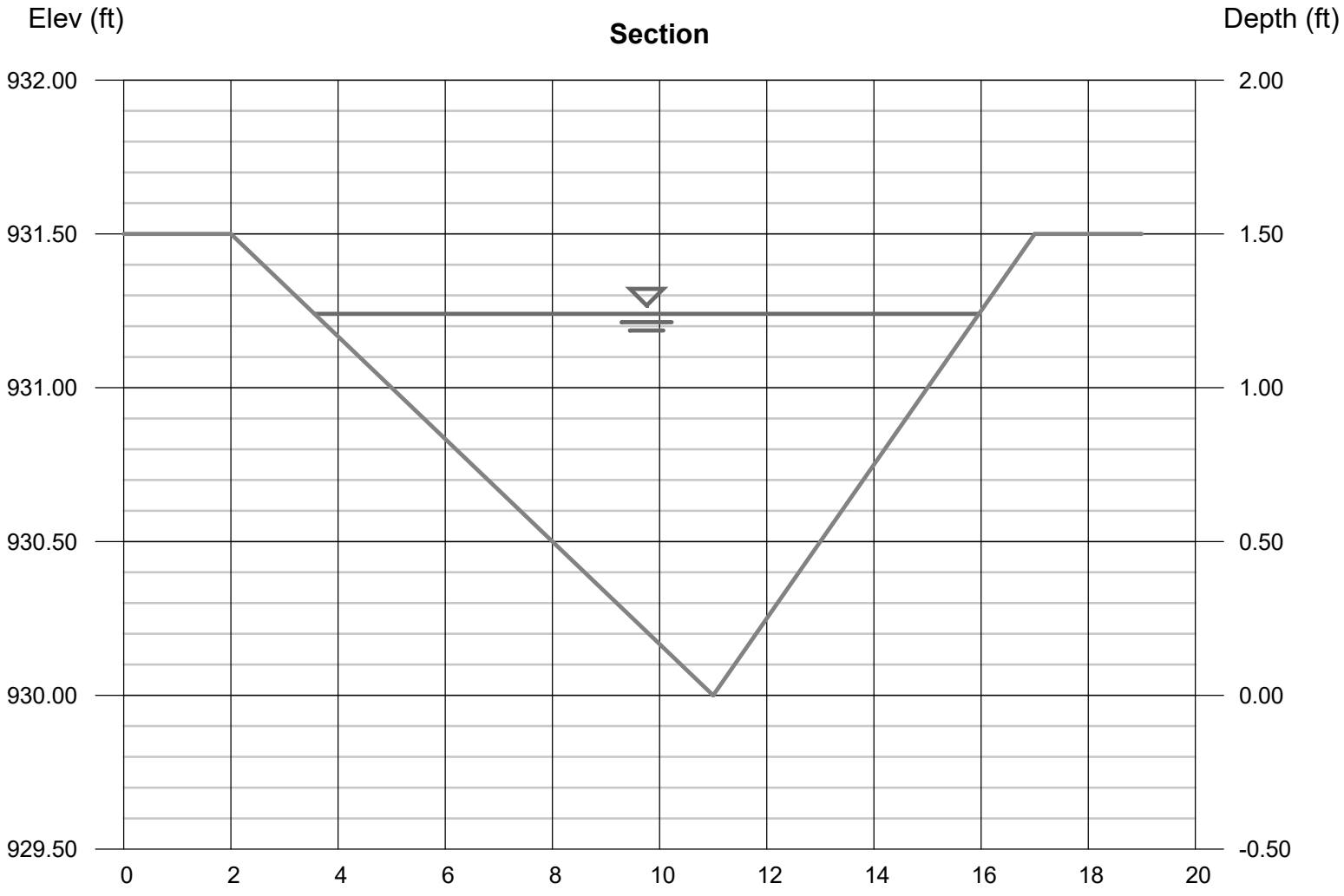
Calculations

Compute by:	Known Q
Known Q (cfs)	= 20.00

Highlighted

Depth (ft)	= 1.24
Q (cfs)	= 20.00
Area (sqft)	= 7.69
Velocity (ft/s)	= 2.60
Wetted Perim (ft)	= 12.66
Crit Depth, Yc (ft)	= 1.00
Top Width (ft)	= 12.40
EGL (ft)	= 1.35

Assuming diverted flow from Sta. 43+76 crossing - normal flow without diversion is 1.60 cfs



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Dec 14 2021

STA 72+75

Trapezoidal

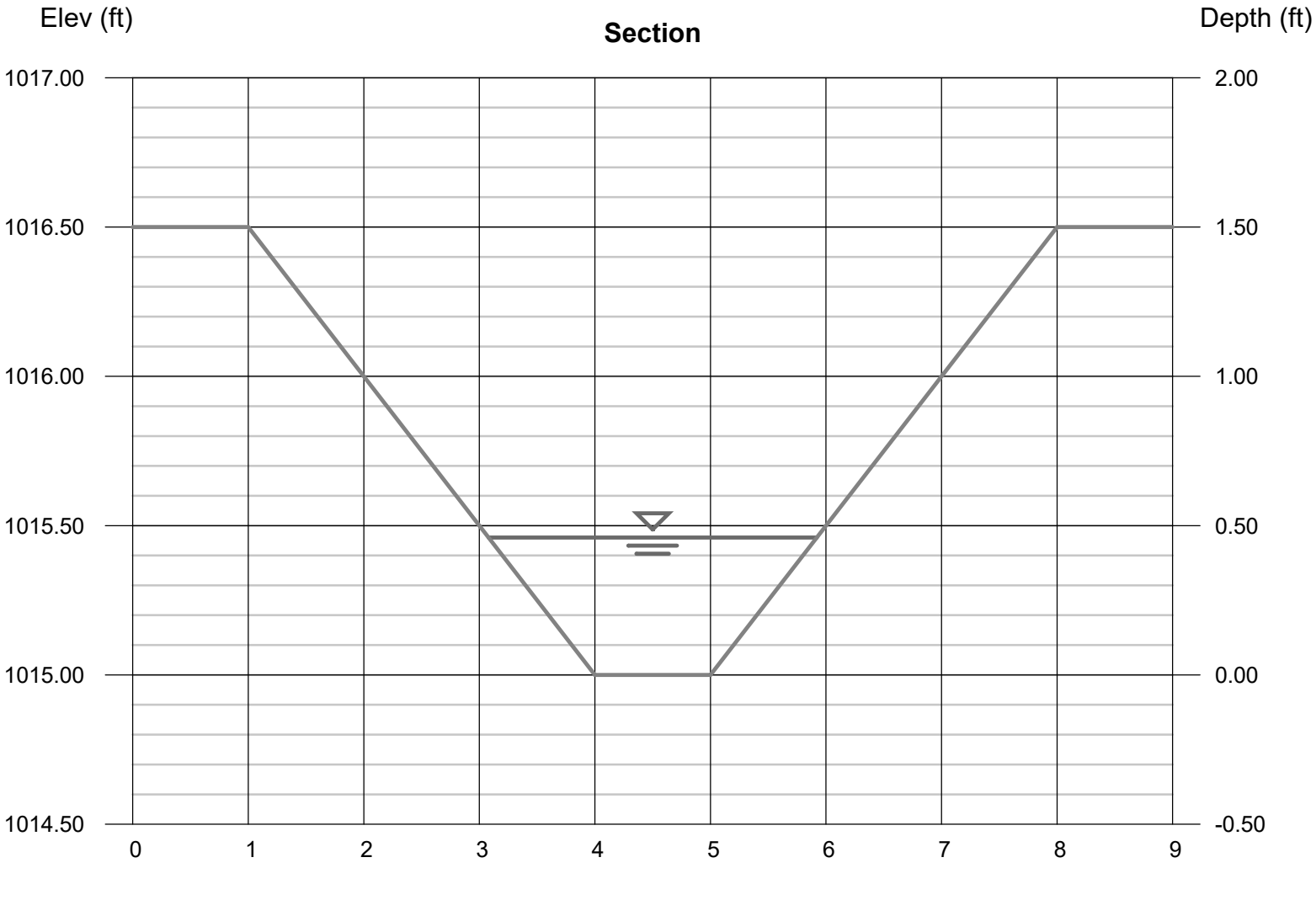
Bottom Width (ft)	= 1.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 1015.00
Slope (%)	= 3.00
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.94

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 2.940
Area (sqft)	= 0.88
Velocity (ft/s)	= 3.33
Wetted Perim (ft)	= 3.06
Crit Depth, Yc (ft)	= 0.48
Top Width (ft)	= 2.84
EGL (ft)	= 0.63



Monson Road Reconstruction
Wales, MA

Weston&Sampson ENGINEERS, INC.

Date: 4/8/2024
By: NSD
Checked By: RSV

TABLE 1

PROPOSED DRAINAGE AREA SUMMARY SHEET
HYDRAFLOW ANALYSIS

i = 7.21 for 5 min
i = 4.00 for 15 min. Tc
10-yr Storm

Area		Area (s.f)	Area (ac.)	Impervious Area (s.f)	Grass Area (s.f)	Woods Area (s.f)	C-Value	Tc (min.)	Q=CiA
Proposed Drainage System									
	STA 11+50								
Swale		146,424	**3.361**	5,227	141,197		0.32	15	4.32
	STA 15+30								
Swale		263,398	**6.047**	14,906	88,478	160,014	0.27	15	6.61
	STA 31+65								
Swale		261,651	**6.007**	16,212	18,800	226,639	0.25	15	6.02
	STA 43+70								
Swale		33,770	**0.775**	9,772	6,265	17,733	0.42	15	1.31
	STA 46+65								
Swale		48,946	**1.124**	2,570	13,201	33,175	0.26	8	1.76
	STA 72+75								
Swale		161,325	**3.704**	5,642	6,630	149,053	0.23	15	3.39

NOTES:
1) Refer to DA-1 - 3 for drainage areas.
2) C-Values were used based on Exhibit 8-8 of the MassDOT Project Development and Design Guide. Values given below.
3) Time of Concentrations (Tc) derived from Hydraflow (TR-55 Method). Refer to Tc computations included.
4) Minimum Tc used for paved areas = 5 min. and grassy areas = 10 min.

Land Cover		C
Impervious		0.9
Grass		0.3
Unimproved (Woods)		0.2

APPENDIX G

Outlet Protection

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 15+33					
Wo	pipe diameter or span	(ft)	1.5			Input
Q	pipe(design) discharge	(cfs)	9	25-yr storm		Output
TW	tailwater depth	(ft)	0.29	(HY-8)		
D	pipe rise	(ft)	1.5			
	Velocity	(ft/s)	9.86			

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.74	ft	8.92	in

Calculated Riprap Apron Dimensions

L=	4D	6.00	FT
Depth=	$3.3D_{50}$	2.45	FT
W1= 3Wo	(min.)	4.5	FT
W2=3Wo + 2/3L		11.17	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	1.5	FT
W1	4	FT
W2	12	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 22+25					
Wo	pipe diameter or span	(ft)	1.25			Input
Q	pipe(design) discharge	(cfs)	5.55	25-yr storm		Output
TW	tailwater depth	(ft)	0.1	(HY-8)		
D	pipe rise	(ft)	1.25			

Velocity	(ft/s)	5.36

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	1.44	ft	17.31	in

Calculated Riprap Apron Dimensions

L=	4D	5.00	FT
Depth=	$3.3D_{50}$	4.76	FT
W1= 3Wo	(min.)	3.75	FT
W2=3Wo + 2/3L		7.08	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	1.5	FT
W1	5	FT
W2	10	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 25+00					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	1.22	10-yr storm		Output
TW	tailwater depth	(ft)	0.1	(HY-8)		
D	pipe rise	(ft)	1			

Velocity	(ft/s)	4.53

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.26	ft	3.09	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT
Depth=	$3.3D_{50}$	0.85	FT
W1= 3Wo	(min.)	3	FT
W2=3Wo + 2/3L		5.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	7.5	FT
Depth	1.5	FT
W1	4	FT
W2	6	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 43+76	Twin 12" diameter pipes				
Wo	pipe diameter or span	(ft)	2			Input
Q	pipe(design) discharge	(cfs)	12.5	25-yr storm		Output
TW	tailwater depth	(ft)	0.32	(HY-8)		
D	pipe rise	(ft)	2			

Velocity	(ft/s)	6.27

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.71	ft	8.54	in

Calculated Riprap Apron Dimensions

L=	4D	8.00	FT
Depth=	$3.3D_{50}$	2.35	FT
W1= 3Wo	(min.)	6	FT
W2=3Wo + 2/3L		12.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	1.5	FT
W1	5	FT
W2	16	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 46+65					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	12.5	25-yr storm		Output
TW	tailwater depth	(ft)	0.94	(HY-8)		
D	pipe rise	(ft)	1			

Velocity	(ft/s)	6.75

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.61	ft	7.32	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT
Depth=	$3.3D_{50}$	2.01	FT
W1= 3Wo	(min.)	3	FT
W2=3Wo + 2/3L		9.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	1.5	FT
W1	3	FT
W2	10	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 50+55					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	2.05	25-yr storm		Output
TW	tailwater depth	(ft)	0.1	(HY-8)		
D	pipe rise	(ft)	1			
	Velocity	(ft/s)	3.5			

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.51	ft	6.18	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT
Depth=	$3.3D_{50}$	1.70	FT
W1= 3Wo	(min.)	3	FT
W2=3Wo + 2/3L		5.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	1.5	FT
W1	5	FT
W2	12	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 51+20					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	3.75	10-yr storm		Output
TW	tailwater depth	(ft)	0.1	(HY-8)		
D	pipe rise	(ft)	1			

Velocity	(ft/s)	5.83

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	1.15	ft	13.82	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT
Depth=	$3.3D_{50}$	3.80	FT
W1= 3Wo	(min.)	3	FT
W2=3Wo + 2/3L		5.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	1.5	FT
W1	5	FT
W2	12	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 73+25					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	1.58	10-yr storm		Output
TW	tailwater depth	(ft)	0.05			
D	pipe rise	(ft)	1			

Velocity	(ft/s)	3.38

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.73	ft	8.73	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT
Depth=	$3.3D_{50}$	2.40	FT
W1= 3Wo	(min.)	3	FT
W2=3Wo + 2/3L		9.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	9.5	FT
Depth	1.5	FT
W1	10	FT
W2	10	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 81+97					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	3.31	10-yr storm		Output
TW	tailwater depth	(ft)	0.1			
D	pipe rise	(ft)	1			

Velocity	(ft/s)	6.12

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.98	ft	11.70	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT
Depth=	$3.3D_{50}$	3.22	FT
W1= 3Wo	(min.)	3	FT
W2=3Wo + 2/3L		5.67	FT

Proposed Riprap Apron (Modified Rockfill)

Ls	5	FT
Depth	1.5	FT
W1	4	FT
W2	6	FT

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 82+07					
Wo	pipe diameter or span	(ft)	1.5			Input
Q	pipe(design) discharge	(cfs)	9	25-yr storm		Output
TW	tailwater depth	(ft)	0.14	(HY-8)		
D	pipe rise	(ft)	1.5			
	Velocity	(ft/s)	7.72			

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	1.54	ft	18.48	in

Calculated Riprap Apron Dimensions

L=	4D	6.00	FT	Use	10	FT
Depth=	$3.3D_{50}$	5.08	FT			
W1= 3Wo	(min.)	4.5	FT			
W2=3Wo + 2/3L		11.17	FT			

Proposed Riprap Apron (Modified Rockfill)

Ls	10	FT
Depth	2	FT
W1	5	FT
W2	14	FT

Project	Monson Road	Date:	4/8/2024
Project Number:	ENG23-0621	By:	NSD
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 85+72					
Wo	pipe diameter or span	(ft)	1			Input
Q	pipe(design) discharge	(cfs)	1.78	25-yr storm		Output
TW	tailwater depth	(ft)	0.05			
D	pipe rise	(ft)	1			
	Velocity	(ft/s)	3.96			

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.85	ft	10.24	in

Calculated Riprap Apron Dimensions

L=	4D	4.00	FT	Use	10	FT
Depth=	$3.3D_{50}$	2.81	FT			
W1= 3Wo	(min.)	3	FT			
W2=3Wo + 2/3L		9.67	FT			

Proposed Modified Rockfill Scour Hole

Ls	8	FT
Depth	2	FT
W1	4.5	FT
W2	7	FT

Dimensions based on site conditions and proposed headwall configuration

Project	Monson Road	Date:	11/30/23
Project Number:	ENG23-0621	By:	LEC
Client	Wales, MA	Checked By:	RSV

OUTLET PROTECTION

Source: FHWA HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels

Chapter 10 Riprap Basins and Aprons

Location	Sta 1+50					
Wo	pipe diameter or span	(ft)	1.5			Input
Q	pipe(design) discharge	(cfs)	1	25-yr storm		Output
TW	tailwater depth	(ft)	0.15	(HY-8)		
D	pipe rise	(ft)	1.5			
	Velocity	(ft/s)	4.96			

Riprap Diameter

D_{50}	0.2D(Q/g^0.5*D^2.5)^(4/3)*(D/TW)	0.08	ft	0.92	in

Calculated Riprap Apron Dimensions

L=	4D	6.00	FT	Use	10	FT
Depth=	$3.3D_{50}$	0.25	FT			
W1= 3Wo	(min.)	4.5	FT			
W2=3Wo + 2/3L		11.17	FT			

Proposed

Existing Wetlands to Remain. Velocity is under 5 ft/s.

ATTACHMENT D

Operation and Maintenance Plan

LONG-TERM POLLUTION PREVENTION PLAN/
OPERATION AND MAINTENANCE PLAN
Town of Wales

I. Purpose and Scope

The purpose of this plan is to provide the maintenance staff of the Town of Wales guidelines and procedures for the operation and maintenance of the drainage systems for the Monson Road Transportation Improvement Project. Checklists will be utilized during the inspection and cleaning process and kept on file in the maintenance office.

The proposed site plan includes the following stormwater structures:

- Catch Basins
- Drainage Manholes
- Drainage Swales
- Discharge Points

II. Ownership

The Town of Wales Highway Department operates and maintains Town-wide roadways and drainage systems.

III. Responsible Party

The following individual is the primary contact for the implementation of this plan.

Name: Vernon Jackson, Interim Highway Superintendent

Phone #: (413) 245-7494

IV. Schedule for Inspection and Maintenance Activities

Note: DEP's handbook represents goals for public works agencies seek to meet. However due to funding constraints and low staffing levels, it is very challenging to meet the stated frequencies. MassDOT will continue to strive to meet DEPs frequencies listed in the table below until a programmatic operation and maintenance plan is established, which will supersede this project-specific O&M plan.

A. Inspection

i. Structures, swales, and outfalls will be inspected annually for excess accumulation of sediment and debris, erosion or other problems.

ii. Deep sump catch basins will be inspected four times per year.

B. Routine and Non-Routine Maintenance

i. Structures, swales, and outfalls shall be cleaned at least once a year, at a minimum, after the snow and ice removal season and before spring rainfall events or as required due to conditions noted during inspections.

ii. Deep sump catch basins shall be cleaned four times per year, or whenever the depth of the deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

iii. Street sweeping: The roadways shall be swept once a year after the snow and ice removal season has ended and prior to spring rains.

iv. Erosion repairs will be completed on an as-needed basis.

V. Access to System

The drainage system is located within the Town right-of-way.

VI. Funding

The Highway Department maintains a budget as required to complete all highway related services. Inspection and maintenance of the systems is part of this yearly budget process.

VII. Illicit Discharges

No illicit discharges to watercourses or drainage structures are permitted in the Town of Wales.

VIII. Operation and Maintenance Log Forms

See attached sheets.

STORMWATER MANAGEMENT SYSTEM INSPECTION CHECKLIST

DATE/TIME:_____

INSPECTOR:_____

STRUCTURE	*SATISFACTORY (YES OR NO)*	*COMMENTS*	*ACTION*	*DATE COMPLETED*
STRUCTURES				

STRUCTURE	SATISFACTORY (YES OR NO)	COMMENTS	ACTION	DATE COMPLETED

STRUCTURE	*SATISFACTORY (YES OR NO)*	*COMMENTS*	*ACTION*	*DATE COMPLETED*
OUTFALLS				

STRUCTURE	*SATISFACTORY (YES OR NO)*	*COMMENTS*	*ACTION*	*DATE COMPLETED*
OUTFALLS				

ATTACHMENT E

Erosion and Sedimentation Control Plan and Pollution Prevention Plan

Erosion and Sedimentation Control Plan and Pollution Prevention Plan

For Construction Activities At:

Monson Road Transportation Improvement Project
Wales, MA

Prepared For:

Town of Wales
3 Hegan Street
Wales, MA
(413) 245-7494– Christopher Ryan

Prepared By:

Weston & Sampson Engineers, Inc.
712 Brook Street, Suite 103
Rocky Hill, CT 06067
(860) 513-1473

Site Contractor:

To Be Determined

1. Narrative

The purpose of this plan is to provide general guidelines and operation and maintenance procedures to the contractor during construction specifically with regards to erosion and sediment control.

The proposed project includes construction activities in, or close to, the limit of work includes bordering vegetated wetlands, mean annual high water and top of bank to perennial and intermittent stream). Activities includes excavation within existing pavement limits for the installation of storm drainage systems and the reconstruction of the existing paved roadways. Soils in the project area per the NRCS Web Soil Survey include:

- 307C – Paxton fine sandy loam, 8 to 15 percent slopes –Hydrologic Soil Group C
- 316B – Scituate fine sandy loam , 3 to 8 percent slopes, very stony – Hydrologic Soil Group C/D

Imported fill material will likely be limited to new road base and pipe bedding material unless excessive unsuitable materials are encountered within the paving limit.

2. Operation and Maintenance

A. The work covered by this plan consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract.

B. The requirements set forth in this plan apply to all land disturbing activities required for this project

C. All work under this Contract shall be in accordance with the Conservation Commissions' Orders of Conditions as well as all other stated requirements.

D. The proposed erosion and sediment control measures that are to be installed are located on the construction drawings.

E. A rain gauge shall be placed at the project in a workable location and monitored during rainfall periods until all disturbed areas are stabilized. In the event, there is a rainfall greater than 1/2" in a 12 hour period, all erosion control measures shall be checked and repaired as required. If no rain gauge is used, all erosion control measures shall be checked after all rainfall events. A checklist (sample provided at the end of this plan) will be filled out by the contractor each week. The contractor shall designate a party to be responsible for the maintenance of all erosion and sediment control measures for the duration of the project. Inspections shall be completed weekly or

within 24 hours of a rain event as described above. When maintenance is required it shall be completed within 24 hours of being identified.

Designated Party: _____

F. All soil erosion and sediment control measures shall be installed, maintained, and implemented as shown on the construction drawings. It is the intent of this plan that soil erosion control measures are the first to be installed and the last to be removed. Surface waters on and adjacent to the site and abutting properties are to be protected from degradation and sedimentation. If other watercourses, streams, drainage-ways or abutting properties are jeopardized by construction, it shall be the contractor's responsibility to protect those waters and properties.

G. Make all necessary repairs to erosion control facilities as soon as possible. Silt fences and straw bale barriers, temporary sediment traps, and inlet protection which accumulate sediment and debris shall be cleaned and re-set as needed.

3. Notification

The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Engineer may order stoppage of all or part of the work until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

4. Implementation

A. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer and the Conservation Commission to develop mutual understandings relative to compliance of the environmental protection program.

B. The Contractor shall submit for approval six sets of details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of wetlands and 200 feet of watercourses.

C. Once a construction schedule has been established a person shall be named and will be responsible for implementation of sediment and erosion control measures. This responsibility includes the acquisition of materials,

installation, and maintenance of erosion and sediment structures, the communication and detailed explanation to all people involved in the site work of the requirements and objective of the erosion and sediment control measures.

D. The Engineer shall be notified of any proposed alteration to the erosion and sediment control plan, prior to altering, in order to ensure the feasibility of the addition, subtraction, or change in the plan.

5. Area of Construction Activity

Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

6. Protection of Water Resources

A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.

B. Special measures should be taken to insure against spillage of any pollutants into public waters.

C. All projects that have the potential to impact critical areas shall implement a source control and pollution prevention program that includes proper management of snow and deicing chemicals. To protect critical areas, road salt must be properly stored within a Zone II or Interim Wellhead Protection Area or near an Outstanding Resource Water, Special Resource Water, shellfish growing area, bathing beach or cold-water fishery. The use of salt for the deicing of impervious surfaces must be minimized within water supply protection areas and any area near an Outstanding Resource Water, Special Resource Water, fresh water beach, or cold-water fishery.

7. Location of Storage Areas

A. The location of the Contractor's storage areas for equipment and/or materials shall be as negotiated with the Owner. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.

B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as the placement of baled hay or straw around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

C. There shall be no storage of equipment or materials in areas designated as wetlands.

D. The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

E. Storage areas in cross-country locations shall be restored to pre-construction conditions with the planting of native species of trees and shrubs.

8. Spill Prevention Measures

A. Vehicle Maintenance: Vehicles and equipment maintenance shall occur at the off-site staging area over a spill containment pallet or sufficiently impervious surface. Only minor maintenance shall be conducted. All equipment fluids generated from maintenance activities will be disposed of into designated drums stored on spill pallets inside a materials storage container. Fluids shall be removed from the site and dispose of in accordance with applicable regulations as soon as feasible. All vehicles and equipment including subcontractor vehicles shall be checked for leaking oil and fluids. Vehicles leaking fluid shall not be allowed onsite.

B. Spill Kits: Spill kits will be stored within the designated fueling area and concrete washout areas. Spill kits shall be readily available during all fueling operations. Spill kits must contain absorbent pads or other sorbent materials. Spill kits shall be inspected weekly to insure that adequate cleanup materials are on site at all times.

C. Spills: All spills will be cleaned up immediately upon discovery. Spent absorbent materials and rags will be hauled offsite immediately after the spill is cleaned up for disposal at an approved location. Spills large enough to discharge to surface water will be reported to the National Response Center at 1-800-424-8802.

D. Material safety data sheets: A material inventory and emergency contact information shall be maintained onsite.

9. Vehicle Fueling Operations

A. Several types of vehicles and equipment will be used on-site throughout the project, including graders, excavators, loaders, concrete equipment, rollers,

trucks and trailers, backhoes, and forklifts. Equipment/vehicle fueling will be performed onsite. Fueling activities are to be situated so that drainage facilities or watercourses located in the area are not at risk from potential infiltration. Fueling shall take place on an impervious surface and shall be conducted at least 100 feet from a drainage structure, wetland or watercourse. Absorbent, spill-cleanup materials and spill kits will be available at the designated fueling areas. Fuel will be delivered to the site on an as needed basis by a fuel delivery service.

B. Maintenance and Inspection: Inspect equipment/vehicle storage areas and fueling area weekly. Vehicles and equipment will be inspected on each day of use. Leaks will be repaired immediately or the problem vehicle(s) or equipment will be removed from the project site. Keep ample supply of spill-cleanup materials onsite and immediately clean up spills and dispose of materials properly.

10. Washing of Equipment and Vehicles

Washing of equipment and vehicles is prohibited. Vehicle and equipment washing shall occur off-site at a permitted facility.

11. Materials Storage and Staging Area

A. Construction equipment and maintenance materials will be stored at a designated staging area and materials storage areas. A watertight shipping container will be used to store hand tools, small parts, and other construction materials. All hazardous waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids will be stored in structurally sound and sealed containers under cover within the storage container, until such time they can be properly disposed of. Very large items, such as piping, valves, and structures, will be stored in the open in the materials storage area. Such materials will be elevated on wood blocks to minimize contact with runoff.

B. The storage areas will be inspected weekly. The storage areas will be kept clean, well-organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers and liners will be repaired or replaced as needed to maintain proper function.

C. It is not anticipated that pesticides, herbicides, insecticides, fertilizers and landscape materials will be stored on site. These materials will be delivered as needed during the installation of the limited landscaping features. If it is determined that these materials are required to be stored on site they shall be stored in the watertight shipping container, in a spill containment pallet, with a spill cleanup kit.

D. It is not anticipated that diesel fuel, oil, hydraulic fluids, other petroleum products, and other chemicals will be stored on site. These materials will be delivered as needed over the course of construction. If it is determined that these materials are required to be stored on site, they shall be stored in the watertight shipping container, in a spill containment pallet, with a spill cleanup kit.

E. All hazardous waste materials including oil filters, petroleum products, paint, and equipment maintenance fluids will be stored in structurally sound and sealed shipping containers, within a hazardous materials storage area in a designated staging area. Hazardous waste materials will be stored in appropriate and clearly marked containers and segregated from other non-waste materials. Secondary containment will be provided for all waste materials in the hazardous materials storage area and will consist of commercially available spill pallets. Additionally, all hazardous waste materials will be disposed of in accordance with federal, state, and local regulations. Hazardous waste materials will not be disposed of into the on-site dumpsters. The hazardous waste materials area will be inspected weekly and after storm events. The storage area will be kept clean, well-organized and equipped with ample cleanup supplies as appropriate for the materials being stored. Material safety datasheets, material inventory, and emergency contact numbers will be maintained on site.

F. All waste materials will be collected and disposed of into a dumpster in the designated staging area. Dumpsters will have a secure tight lid, be placed away from stormwater drains and structures, and will meet all federal, state, and local regulations. Only trash and construction debris will be placed in the dumpsters. Construction materials will not be buried on site. The dumpsters will be inspected weekly and immediately after storm events. The dumpsters will be emptied weekly, or more frequently if needed, and taken to the appropriate disposal facility.

12. Sanitary Waste

Portable toilets, located in the staging area, will be provided at the site throughout all the phases. The toilets will be located away from concentrated drainage flow paths. Sanitary waste will be collected a minimum of once a week and shall be inspected weekly for evidence of leaking holding tanks.

13. Concrete Truck Washout Procedures

A. A designated temporary, above-grade concrete washout area will be constructed at an approved onsite location. The washout area shall be constructed in a location approved by the engineer. The temporary concrete washout area will be constructed using staked hay bales with a recommended minimum length and minimum width of 10 feet, but with sufficient quantity and volume to contain all liquid and concrete waste

generated by washout operations. The washout area will be lined with plastic sheeting at least 10 mils thick and free of holes or tears.

B. Concrete pours will not be conducted during or before an anticipated storm event. Concrete mixer trucks and chutes will be washed in the designated area or concrete wastes will be properly disposed of offsite. When the temporary washout area is no longer needed for the construction project, the hardened concrete and materials used to construct the area will be removed and disposed as described below and the area will be stabilized.

C. The washout areas will be inspected weekly and each day of use to ensure that all concrete washing is being discharged into the washout area, no leaks or tears are present and to identify when concrete wastes need to be removed. The washout areas will be cleaned out once the area is filled to 75 percent of the holding capacity. Once the area's holding capacity has been reached, the concrete wastes will be allowed to harden, the concrete will be broken up, removed, and taken to the appropriate landfill for disposal. The plastic sheeting will be replaced if tears occur during removal of concrete wastes from the washout area.

14. Recycling Practices

Wood pallets, cardboard boxes, and other recyclable construction scraps will be disposed of in a separate designated dumpster for recycling. The dumpster will have a secure watertight lid, be placed away from stormwater conveyances and drains, and meet all local and state solid waste management regulations. Only solid recyclable construction scraps from the site will be deposited in the dumpster. The recycling dumpster will be inspected weekly. The recycling dumpster will be emptied when full and taken to an approved recycling center by the contractor. If recyclable construction wastes are exceeding the dumpster's capacity, the dumpsters will be emptied more frequently.

15. Construction in Areas Designated as Wetland Resources on the Drawings

A. Insofar as possible, the Contractor shall make every effort to minimize disturbance within areas designated as wetland resources. Total construction widths shall be limited to the widths shown.

B. The Contractor shall perform his work in such a way that these areas are left in the condition existing prior to construction.

C. The elevations of areas designated as wetland resources shall not be unduly disturbed by the Contractor's operations. If such disturbance does occur, the Contractor shall take all measures necessary to return these areas to the elevations which existed prior to construction.

16. Protecting and Minimizing Exposed Areas

A. The Contractor shall limit the area of land which is exposed and erodible during construction. In areas where the period of exposure will be greater than two (2) months, temporary stabilization or other protective measures shall be provided as specified.

B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to ensure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.

17. Protection of Landscape

A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.

B. Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as required.

C. Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by his blasting or other operations, the Engineer may require the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of.

D. Cultivated hedges, shrubs, and plants which could be injured by the Contractor's operations shall be protected by suitable means or shall be dug up, balled, and temporarily replanted and maintained. After construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their

growth or diminish their beauty or usefulness, they shall be replaced by items of a kind and quality at least equal to that existing at the start of the work.

18. Clearing and Grubbing

A. The Contractor shall clear and grub only the area required for construction operations, as approved by the Engineer. Removal of mature trees (4 inches or greater DBH) will not be allowed on temporary easements.

B. The Contractor shall not remove trees without permission of the Engineer.

19. Discharge of Dewatering Operations

A. Any water that is pumped and discharged as part of the Contractor's water handling shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.

B. Under no circumstances shall the Contractor discharge water to the areas designated as wetlands. When constructing in a wetlands area, the Contractor shall discharge water from dewatering operations directly to an approved filtration method before discharging to the nearest drainage system, stream, or waterway.

C. The pumped water shall be filtered through baled hay, a vegetative filter strip or a vegetated channel to trap sediment occurring as a result of the construction operations. The vegetated channel shall be constructed such that the discharge flow rate shall not exceed a velocity of more than 1 foot per second. Accumulated sediment shall be cleared from the channel periodically.

20. Dust Control

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust.

B. Per Section 9.1.2.k of the Environmental Protection Agency Construction General Permit, dust control shall be limited to the use of water only. Calcium Chloride or other techniques will not be permitted.

21. Separation and Replacement of Topsoil

Topsoil shall be carefully removed from cross-country areas where excavations are to be made, and separately stored to be used again as required. The topsoil shall be stored in an area acceptable to the Engineer and adequate measures shall be employed to prevent erosion of said material.

22. Compost Filter tubes

To trap sediment and to prevent sediment from discharging downhill, compost filter tubes shall be used where shown on the drawings. The tubes should be securely staked to prevent overturning, flotation, or displacement. All deposited sediment shall be removed periodically.

23. Sediment Fence

A. Where indicated on the drawings or where required by the Engineer, the Contractor shall erect and maintain a temporary silt fence. In areas designated as wetlands, the Contractor shall line the limits of the construction easement with a silt fence. The silt fence shall be used specifically to contain sediment from runoff water and to minimize environmental damage caused by construction.

B. The silt fence shall consist of a 3-foot wide continuous length sediment control fabric, stitched to a 22-foot wide, continuous length support netting, and stapled to pre-weathered oak posts installed as shown on the drawings. The oak posts shall be 1½-inches by 1½-inches (Minimum Dimension) by 48 inches and shall be tapered. The support netting shall be industrial strength polypropylene. The bottom edge of the sediment control fabric shall be buried as shown on the drawings. The sediment control fabric shall conform to the following properties:

Property	Value	Test Method
1. Grab Strength (lbs.)	124	ASTM D-4632
2. Elongation (%)	15%	ASTM D-4632
3. Puncture Strength (lbs.)	65	ASTM D-4833
4. Burst Strength (psi)	300	ASTM D-3786
5. Trapezoid Tear (lbs.)	60	ASTM D-4533
6. Equivalent Opening Size (U.S. Sieve)	No. 30	ASTM D-4571
7. Permittivity (sec^{-1})	0.10	ASTM D-4491
8. Water Flow Rate (gal/min/sf.)	10	ASTM D-4491
9. UV Resistance (%)	70	ASTM D-4355

C. The silt fence shall be Mirafi Envirofence manufactured by Mirafi, Inc. or approved equal.

24. Inlet Protection

A. Where indicated on the drawings or where required by the Engineer, the Contractor shall install and maintain inlet protection. At a minimum inlet protection is required on all drainage structures in the project area. The inlet protection shall be SiltSack or approved equal. The inlet protection shall be cleaned or replaced as needed to insure proper operation for the duration of construction.

EROSION CONTROL MEASURES INSPECTION AND MAINTENANCE CHECKLIST

DATE/TIME:_____

INSPECTOR:_____

MEASURE	SATISFACTORY (YES OR NO)	COMMENTS	ACTION	DATE COMPLETED
Sediment Barriers				
Inlet Protection				
Discharge Points				

A00830 -996

Proposal No. 608163-128112

POLLUTION PREVENTION MEASURES INSPECTION AND MAINTENANCE CHECKLIST

DATE/TIME:_____

INSPECTOR:_____

MEASURE	SATISFACTORY (YES OR NO)	COMMENTS	ACTION	DATE COMPLETED
Trash Dumpster with Cover				
Recycling Dumpster with Cover				
Staging Area				
Bulk Material Storage Area				
Material Storage Containers				
Fueling Area				
Equipment Storage Area				
Sanitary Facilities				
Concrete Washout Area				
Spill Kits				

Pre-Construction Notification Project Narrative
Monson Road Transportation Improvement Project

Introduction

On behalf of the Town of Wales and the Massachusetts Department of Transportation (MassDOT), Weston and Sampson is submitting this Pre-Construction Notification (PCN) for coverage under the U.S. Army Corps of Engineers Massachusetts General Permits for the Monson Road Transportation Improvement Project (the project). This application is being filed pursuant to Section 404 (33 U.S.C. 1344) of the federal Clean Water Act and its implementing regulations; as well as the Massachusetts Clean Water Act (MGL c. 21, § 26-53) for work proposed in Waters of the United States.

The purpose of the project is to make roadway, shoulder, and drainage improvements to an approximately 1.5-mile stretch of Monson Road in Wales. Currently, this section of roadway and associated culvert crossings are in poor condition with aging infrastructure and drainage issues. Stormwater collection does not meet current development standards. The existing culverts are undersized, and overtopping of the roadway occurs during large storms. Additionally, Monson Road in this area is experiencing deteriorating roadway conditions.

The project proposes several roadway improvements including full depth pavement reconstruction, new four-foot-wide shoulders along Monson Road for pedestrian and bicycle use, minor adjustments to the alignment to improve safety, and roadway drainage improvements. The project will also involve upgrades to several of the existing stream crossings along this stretch of Monson Road, as many of the culverts are undersized and do not currently meet the Massachusetts Stream Crossing Standards.

The proposed roadway improvements and stream crossing improvements will result in unavoidable impacts to Waters of the U.S., specifically within Vegetated Wetlands and land below the Ordinary High Water Mark (OHW), also defined and regulated as Bordering Vegetated Wetlands (BVW) and Land Under Water (LUW) under the Massachusetts Wetlands Protection Act (WPA). The project will also result in impacts to Bank associated with the stream crossing work.

The stream crossing work (culvert upgrades and replacements) is subject to Section 24 of the 2014 Transportation Bond Bill (approved 4/18/2014) and is therefore considered “bridge exempt.” Accordingly, the proposed stream crossing work is not subject to Section 61 and Sections 62A to 62I, inclusive, of Chapter 30 of General Laws (the Massachusetts Environmental Policy Act), Chapter 91 (Waterways Act) of the General Laws and Section 40 of Chapter 131 of the General Laws (Wetlands Protection Act). For this reason, a Notice of Intent (NOI) has been filed with the Wales Conservation Commission for the roadway work, and a 401 Water Quality Certificate (WQC) application has been filed with the Massachusetts Department of Environmental Protection (MassDEP) for the stream crossing work.

This PCN application includes all of the proposed project activities, and defines proposed impacts to Waters of the United States associated with the whole project.

The project is anticipated to be advertised for construction in August or September of 2024 with the start of construction in Mid-March of 2025. Construction of the project is anticipated to be complete by Fall of 2026.

Additional anticipated permits and regulatory reviews include:

- Massachusetts Environmental Policy Act (MEPA) Environmental Notification Form (ENF) (roadway work)
- Notice of Intent (MA Wetlands Protection Act) – Wales Conservation Commission (roadway work only)
- Massachusetts Endangered Species Act (MESA) (concurrent review with NOI application)
- 401 Water Quality Certification – MassDEP (culvert work only)

Existing Conditions

Monson Road is a two-lane, Rural Major Collector. The Project is approximately 1.5 miles long and is located in the western part of Wales, beginning at the Monson Town line and continuing east just beyond the intersection of Monson Road and Reed Hill Road. The land use within the project route includes paved roadway and associated gravel shoulders, adjacent residential properties, wetlands and undeveloped woodlands. Refer to the locus maps provided in Appendix C for a depiction of the project site.

There are a number of wetland resource areas and stream crossings located adjacent to Monson Road within the project limits, including Vegetated Wetlands, intermittent streams, and perennial streams. A wetland delineation was conducted by Weston & Sampson in October 2023 and March 2024. A wetland delineation report including mapping depicting the limits of the delineated resource areas, along with wetland determination data forms, is included in Appendix G.

Currently the existing site has an open “country” drainage system consisting of stormwater runoff that sheets off the road into undefined swales and wetlands. Cross culverts convey a mix of stormwater runoff from the road and streamflow from overland areas. Roadside sediment deposits block some of the water from sheeting off the road, which causes water to flood the road and damage the road structure. There are also minimal water quality measures. There are nine culvert crossings that convey streams and roadside ditch water under Monson Road. These water courses eventually discharge into Vinica Brook. The existing culverts are undersized, and overtopping of the roadway occurs during large storms.

The existing outfalls are in relatively stable condition; however, adjacent to the outfalls in several areas the existing banks experience significant erosion which is contributing to poor water quality within the immediately adjacent resource areas.

Nine culvert crossings convey streams (unnamed except for the crossing at Sta. 50+72 which is locally known as Dunham Brook or Schoolhouse Brook) under Monson Road from north to south, and there is one culvert crossing at Sta. 55+20 which conveys a perched wet area from south to north. The eight north to south crossings are located at Sta. 15+32, Sta. 24+92, Sta. 43+75, Sta. 46+60, Sta. 50+72, Sta. 55+00, Sta. 82+07, and Sta. 86+00-87+00 (two culverts at this location, one under Monson Road and one under Reed Hill Road). These streams eventually discharge into Vinica Brook. The culverts also convey stormwater discharge from the northern drainage swales to the southern side of Monson Road.

The site is not located within the mapped 100-year floodplain, according to the current FEMA FIRM maps (refer to Figures 3.1 through 3.4 in Appendix C).

There is a discrete area of Priority and Estimated Habitat for Rare Species mapped by the Massachusetts Natural Heritage and Endangered Species Program (NHESP) between Peck Road and Maynard Road (see Figure 4 in Appendix C). The applicant is coordinating with NHESP under the streamlined Massachusetts Endangered Species Act (MESA) review through the NOI filing for the roadway work.

Three of the stream crossings within the project corridor are designated as coldwater fisheries resources by the Massachusetts Division of Fisheries and Wildlife (MADFW) (refer to Figure 4 in Appendix C). None of the streams are mapped as Outstanding Resource Waters. The project site is not located within an Area of Critical Environmental Concern (ACEC).

The proposed work area is not within 0.25 miles up or downstream of the designated main stem of, or in tributaries within 0.25 miles of the designated main stem of a National Wild and Scenic River; in “bordering and contiguous wetlands” that are adjacent to the designated main stem of a National Wild and Scenic River; and does not have the potential to alter flows within a river within the National Wild and Scenic River System including rivers officially designated by Congress as study rivers for possible inclusion while such rivers are in official study status.

The proposed work area is not within any federal lands including National Wildlife Refuges, National Forests, National Marine Sanctuaries, National Parks, or any other areas administered by the National Park Service, U.S. Fish and Wildlife Service, or U.S. Forest Service, and USACE project lands and easements.

Stream Crossings:

There are nine locations where streams cross the proposed project area. Existing conditions information on each stream crossing is provided in Table 1 below. Six of these stream crossings (seven pipes/culverts) are proposed to be replaced due to structural deficiencies and being undersized, as discussed more in the Proposed Conditions section of this narrative.

Table 1. Summary of Existing Stream Crossings

Location (Station)	Existing Culvert	Stream Classification	Existing Bankfull Width
15+32	40 feet of 12-inch corrugated plastic pipe (CPP)	Intermittent	No bankfull indicators. Wetted width 1-2 feet.
24+92	54 feet of 30-inch PVC 49 feet of 36-inch corrugated metal pipe (CMP)	Perennial	11.5 feet
43+75	49 feet of 12-inch CMP	Perennial	No bankfull indicators. Wetted width 1-2 feet.
46+60	41 feet of 12-inch CPP	Perennial	No bankfull indicators Wetted width 1-2 feet
50+72	61 feet of 36-inch PVC lined CMP	Perennial	15.0 feet
55+00	48 feet of 12-inch CMP	Intermittent	No bankfull indicators. Wetted width 2-3 feet upstream and 5-6 feet downstream.
82+07	43 feet of 12-inch CMP	Intermittent	No bankfull indicators. Wetted width 1-2 feet.
86+00 - 87+00	54 feet of 24-inch stone box culvert 108 feet of 24-inch stone box culvert	Intermittent	10.5 feet

The following sections describe the existing conditions at each stream crossing in more detail.

Station 15+32

The westernmost stream crossing located at Station 15+32 is a small drainage swale that originates northeast of Lynch Road and flows west beneath Lynch Road, and along the north side of Monson Road before crossing south under Monson Road via the culvert. The existing culvert consists of a 12" corrugated plastic pipe (CPP). Bankfull indicators did not exist in the channel at the time of field evaluation. The channel was delineated and is depicted on the plans as bank flag series TOB C, TOB D, TOB BB, and TOB CC. Based on a site visit conducted with the U.S. Army Corps of Engineers on August 26, 2024, the reviewers determined that this channel would not be jurisdictional under Section 404 of the Clean Water Act as it is a non-relatively permanent watercourse, and does not contain definable banks.

Station 24+92

The stream crossing at Station 24+92 conveys an unnamed, perennial tributary to Vinica Brook south under Monson Road. The existing crossing consists of a 30" PVC culvert which conveys the unnamed perennial stream and an adjacent 36" CMP relief culvert for storm water whose invert is located 1 ft higher than the perennial stream culvert. The existing relief culvert is regularly dry with no flow present except for during storm events. The stream was delineated and is depicted on the plans as bank flag series TOB E and TOB F. Bankfull width was measured and determined to be approximately 11.5 feet. The stream is mapped by the Massachusetts Division of Fisheries and Wildlife (MADFW) as a coldwater fisheries resource.

Stations 43+75 and 46+60

The stream crossing located at Station 43+75 consists of an existing 12" CMP culvert which conveys an unnamed perennial stream. This existing culvert is collapsed and due to roadway flooding, the stream has split and diverted its flow path along the north side of Monson Road towards a secondary existing culvert which is a 12" CPP (Station 46+60). Bankfull indicators did not exist in the channel at the time of field evaluation. This stream was delineated and is depicted on the plans as bank flag series TOB I and TOB J. A portion of this stream is located within areas of Priority and Estimated Habitats for Rare Species mapped by the Massachusetts Natural Heritage and Endangered Species Program (NHESP).

Station 50+72

The stream crossing located at Station 50+72 consists of an existing 36" PVC line CMP culvert which conveys an unnamed, perennial tributary to Vinica Brook. Bankfull width was measured to be approximately 15.0 feet. The stream was delineated and is depicted on the plans as bank flag series TOB K and TOB L. The stream is mapped by the MADFW as a coldwater fisheries resource. This culvert is not proposed to be replaced as part of this project.

Station 55+00

The intermittent stream crossing is located just west of Maynard Road. The stream originates in a wetland south of Monson Road and flows north under Monson Road via a 12-inch CMP culvert. The stream was delineated and is depicted on the plans as bank flag series TOB M / TOB N and TOB AA / TOB BB. Bankfull indicators do not exist at this location. The typical wetted width of the channel is approximately 2 to 3 feet upstream and 5 to 6 feet downstream. Stream substrate consisted of mucky material. This stream crossing is not proposed to be replaced.

Station 82+07

The stream crossing at Station 82+07 conveys an unnamed intermittent stream south under Monson Road via a 12-inch CMP. The stream originates from a small farm/residential pond on the north side of Monson Road. The existing culvert is deteriorated and undersized. Bankfull indicators do not exist at this location. Based on observations by SLR Consulting on March 19, 2024 under normal spring flow, the typical wetted width of the channel is 1 to 2 feet, and the depth of the channel is 4 to 6 inches. The

stream was delineated and is depicted on the plans as bank flag series TOB CC and TOB DD.

Station 86+00 - 87+00
An unnamed intermittent tributary to Vinica Brook flows south under Monson Road into a small depression at the intersection of Reed Hill Road and then flows under Reed Hill Road. This easternmost stream crossing located at Stations 86+00 through 87+00 consists of two disconnected sections of culvert which convey an unnamed intermittent tributary to Vinica Brook. The upstream culvert is a 24" concrete culvert which travels beneath Monson Road and daylights briefly before entering a second 24" concrete culvert that travels beneath Reed Hill Road. This stream was delineated and is depicted on the plans as flag series TOB KK and TOB LL (on the north side of Monson Road) and flag series TOB EE and TOB FF (on the south side of Monson Road). Bankfull width was measured and is approximately 10.5 feet at this crossing. This stream is mapped by the MADFW as a coldwater fisheries resource.

It is important to note that a small, roadside drainage ditch was also GPS-located on the north side of Monson Road, adjacent to intermittent stream TOB Series KK and TOB Series LL. The ditch is depicted as Series "WET N" on the plans, but was determined to be a non-jurisdictional upgradient intermittent stream channel. The channel receives roadway runoff from Monson Road, which discharges into intermittent stream Series KK/LL. The roadside drainage ditch did not contain wetland vegetation, nor did it contain hydric soils when examined during the delineation. The channel was also dry at the time of the delineation and did not contain any standing water.

The existing stream crossings are also described further in the Maximum Extent Practicable (MEP) Analysis in Appendix I prepared by SLR International on behalf of MassDOT.

Proposed Conditions

Roadway Reconstruction:

The project consists of full depth reconstruction of Monson Road within the project limits and widening of the road from 22 feet to 28 feet (10-foot wide lanes and 4-foot wide shoulders). The 4-foot wide shoulders will allow for safer bicycle and pedestrian use. The project includes sections of bituminous curb and new guardrail with up-to-date terminals for increased safety, proper signage, and new pavement markings. In order to complete the proposed project some tree clearing will be required adjacent to the existing roadway. Limited tree and vegetation removal is proposed within wetland areas, which is being mitigated to the maximum extent practicable with the proposed wetland replication areas, as shown on the plans.

Minor horizontal and vertical alignment changes are proposed to meet the current design standards and improve sight lines. The intersection with Reed Hill Road will be realigned to improve sight lines. Superelevation is also proposed along horizontal curves. Piped

roadway drainage systems consisting of catch basins and manholes are proposed to meet the MassDOT drainage design standards and improve the existing drainage conditions.

Drainage swales are proposed in sections where there is no curbing. The swales will have a bottom width of 1 foot and side slopes of 2:1. Three swales will have grass linings, and three swales will have modified rockfill linings. In total, 57 new catch basins are proposed where no catch basins and closed drainage systems currently exist within the project limits.

Culvert Replacements:

As described above, a number of the existing culverts along the project route exhibit structural deficiencies and many are undersized. A maximum extent practicable alternatives analysis and stream geomorphic assessment were conducted to assess the conditions at each stream crossing and develop proposed solutions for crossing replacements that would improve drainage and meet the Massachusetts Stream Crossing Standards to the maximum extent practicable. The MEP analysis is included in Appendix I.

Of the nine drainage crossings, six of the crossings (seven pipes/culverts) will be replaced with upgraded sizes and/or improved materials, one culvert will be removed, and two culverts will be retained. The proposed culvert replacements are summarized in Table 2 below. The selection of each stream crossing replacement is also discussed in more detail in the Culvert Alternatives Analysis included in Appendix B.

Table 2. Summary of Proposed Culvert Replacements

Location (Station)	Existing Culvert	Proposed Culvert
15+32	40 feet of 12-inch CPP	44 feet of 18-inch RCP
24+92	54 feet of 30-inch PVC 49 feet of 36-inch CMP	31.5 feet of 9-ft 10-inch (W) x 5 feet (H) Concrete Box Culvert embedded two feet below stream with wingwalls, parapets and stream channel creation / restoration with natural streambed material
43+75	49 feet of 12-inch CMP	41 feet of twin 12-inch RCPs
46+60	41 feet of 12-inch CPP	44 feet of 12-inch RCP
82+07	43 feet of 12-inch CMP	43 feet of 18-inch RCP Concrete headwalls and endwalls
86+45	54 feet of 24-inch stone box culvert 108 feet of 24-inch stone box culvert	46.8 feet of 8 feet (W) x 4.5 feet (H) Concrete Box Culvert embedded two feet below stream with wingwalls, parapets and stream channel creation / restoration with natural streambed material

For all of the crossings the design of the replacement culverts was advanced according to and consistent with the MEP analysis (See Appendix I).

The following sections describe the proposed work at each stream crossing location. Please refer to the project plans provided in Appendix K for additional detail.

Station 15+32

Impacts to the drainage channel at this station will be for the installation of a new culvert and modified rock fill apron to replace the existing 12" CPP. The proposed crossing will consist of an 18" RCP culvert. As described above, based on a site visit conducted with the U.S. Army Corps of Engineers on August 26, 2024, the reviewers determined that this drainage channel would not be jurisdictional under Section 404 of the Clean Water Act as it is a non-relatively permanent watercourse, and does not contain definable banks. Therefore, there are no impacts to Waters of the U.S. at this crossing.

Station 24+92

The proposed work at this stream crossing includes the installation of a 9-foot 10-inch wide 5-foot high box culvert which will replace both existing culverts. Both the upstream and downstream headwalls will be removed and replaced with wingwalls. This work will result in approximately 282 SF of permanent impacts to Waters of the U.S., 341 SF of temporary impacts to Waters of the U.S., 41 SF of permanent vegetated wetland impacts, and 9 SF of vegetated wetland impacts. Natural streambed material will be placed to restore the impacted watercourse within the construction limits and the culvert will be submerged 2-feet to allow for the installation of stream bed material. The box culvert installation at this location will also result in temporary alterations to 19 LF of bank.

Station 43+75 and Station 46+60

The intention at this split stream crossing is to restore perennial stream flow to the natural channel location at Station 43+75, which was diverted to Station 46+60 due to pipe failure, to allow for a secondary intermittent stream to remain on the north side of Monson Road to handle excess stormwater. Station 43+70 is being replaced with two 12" class five RCPs given the shallow elevations of the watercourse and related roadway profile. At 46+60, the existing pipe is being replaced with one 12" class five RCP. Modified rock fill aprons will provide permanent outlet protection and reduce sediment that is discharged into the streams at both locations.

Collectively, this work to restore the perennial stream back to its pre-existing configuration which will result in 1,342 square feet of permanent impact to Waters of the U.S., 328 square feet of temporary impacts to Waters of the U.S. (related to sediment control measures), and 289 square feet of permanent impacts to Vegetated Wetlands. While the impact to LUW is fairly high, this diverted perennial watercourse along the northern side of the road didn't exist prior to the failure of the crossing at 43+75. The resulting condition will increase the amount of Waters of the U.S. (streambed) associated with the intermittent stream by approximately 391 square feet. This work will result in 299 LF of permanent impacts and 33 LF of temporary impacts to bank.

Station 82+07

The proposed project will replace the culvert with an 18" RCP with modified rock fill at the outlet and new headwalls at both the inlet and outlet. This work will result in approximately 43 SF of permanent alterations to Waters of the U.S., 88 SF of temporary alterations to Waters of the U.S. (from the dewatering activities), 75 SF of permanent alterations to Vegetated Wetlands, and 65 SF of temporary impacts to Vegetated Wetlands (from the sediment control installation). The culvert replacement will also temporarily impact 14 LF of bank.

Station 86+45

The proposed work at this crossing includes consolidating the two existing culverts between Stations 86+00 and 87+00 into a single box culvert at Station 86+45. Specifically, proposed work to this crossing includes relocating the intersection of Reed Hill Road such that only a single culvert will be needed to convey the intermittent stream. The proposed single culvert will be an 8-foot wide x 5-foot high, 47 foot long concrete box. There is currently no headwall on the upstream side, a proposed wingwall will be added. A headwall will also be incorporated into the downstream extent of the culvert as part of the Reed Hill Road relocation. This work will result in approximately 519 SF of permanent impacts to Waters of the U.S., 1,186 temporary impacts to Waters of the U.S., 248 SF of permanent impacts to Vegetated Wetlands, and 110 SF of temporary impacts to Vegetated Wetlands. The stream crossing work at this station will also result in 18 LF of permanent impacts to bank and 72 LF of temporary impacts to bank.

Stormwater Management:

As a redevelopment project, the proposed project has been designed to meet the Massachusetts Stormwater Management Standards to the maximum extent practicable.

The proposed roadway improvements include roadway widening, roadway curbing, and super elevating sections of the roadway, which results in significant drainage revisions. Piped roadway drainage systems consisting of catch basins and manholes are proposed to meet the MassDOT drainage design standards and improve the existing drainage conditions. Approximately 0.88 acres of increase in impervious surface (pavement) is proposed as part of the project. The watershed areas remain consistent with the existing drainage patterns, as only slight modifications to the existing vertical and horizontal alignments are proposed.

Drainage swales are proposed in sections where there is no curbing. The swales will have a bottom width of 1 foot and side slopes of 2:1. Three swales will have grass linings, and three swales will have modified rockfill linings. In total, 57 new catch basins are proposed where no catch basins and closed drainage systems currently exist within the project limits.

Seven closed storm sewer systems are proposed along Monson Road. These systems will outfall near the existing cross culverts or proposed drainage swales. Modified rockfill aprons are proposed at outlets that do not directly discharge into the outlet protection for the culverts.

Of the nine drainage crossings, six of the crossings (seven pipes/culverts) will be replaced with upgraded sizes and/or improved materials, one culvert will be removed, and two culverts will be retained.

Please refer to the Stormwater Management Report in Appendix J for additional information.

Construction Access and Sequencing:

During construction, Monson Road will remain open to traffic at all times since there is no convenient detour route available for traffic. The majority of the roadway and drainage work can be constructed while maintaining two-way traffic. However, at the two larger box culvert crossings, staged construction and alternating one-way traffic through the use of temporary traffic signalization will be required. Detailed staged construction and temporary control of water plans have been provided with the permit documents.

Dewatering is not anticipated as part of the roadway work, but will be required for the stream crossing activities/culvert replacements. To facilitate the culvert replacement work, flow will be diverted through cofferdams and a temporary pipe downstream, and cofferdams and pumping will be used to dewater the excavation areas. All dewatering and related earthwork shall be conducted in such a manner as to prevent siltation or contamination of the waterway. The pumping discharge shall not be allowed to enter directly into the waterway. The water from the work areas shall be pumped to a settling tank before discharging into the bypass pipe. The tank shall be constructed so as to allow for the pumped water to pass through the tank with sediments settling out before outletting to an area enclosed by hay bales. Please refer to the Water Control plan sheets in the Project Plans in Appendix K (Plan Sheets 178 and 179) for additional detail regarding dewatering.

The means and methods of construction for this project will involve the use of various heavy equipment to ensure efficient and effective execution of the roadway improvements. Key equipment that will be utilized includes excavators for full-depth road reconstruction and the culvert replacements, bulldozers for grading and earthmoving activities, and graders to achieve precise grading for the roadway base and shoulder construction. Paving machines will be used for the application of new bituminous pavement, and rollers will compact the new pavement and subgrade materials.

Backhoes will be employed for trenching and drainage system installation, while dump trucks will transport materials such as gravel, asphalt, and excavation debris. Chainsaws and wood chippers will be used for tree and vegetation removal, and concrete mixers will be used for constructing the bituminous curb and other concrete elements. A crane or large excavator will be used for installing new guardrails and other heavy precast

components, and hydroseeding equipment will be used for applying grass linings in drainage swales. Construction activities will be staged to minimize disruption to traffic and ensure safety. Traffic control measures will be implemented as necessary, including temporary signage, barriers, and flagging operations.

No long-term on-site stockpiling is planned as part of the proposed project. Materials will be brought in and taken from site on a daily basis. Short term stockpiling of materials immediately adjacent to the specific work area will be required at times.

Construction of the project is anticipated to begin in Spring of 2025 and is anticipated to continue through the Fall of 2026.

Proposed Impacts to Vegetated Wetlands and Waters of the U.S.

The project has been designed to avoid and minimize impacts to Waters of the U.S. to the maximum extent practicable through the project design including use of steeper slopes, minimizing the roadway width to the extent practicable, and placement of project features where possible to avoid fill or impacts in wetlands. The roadway design of 10-foot travel lanes and 4-foot shoulders was ultimately selected as it meets the design criteria and project goals, while limiting the increase in impervious area. Additionally, structural best management practices (BMPs) including deep sump catch basins have been incorporated into the stormwater design to reduce roadway erosion while improving stormwater quality.

Please refer to the alternatives analysis in Appendix B for additional detail regarding how this alternative was selected to balance the project purpose while minimizing impacts to Waters of the U.S.

This project proposes a total of approximately 2,186 SF of permanent impacts to Waters of the U.S. within intermittent and perennial streams, and 674 SF of permanent impacts to Vegetated Wetlands. The project will also result in 1,943 SF of temporary impacts to Waters of the U.S., and 535 SF of temporary impacts to Vegetated Wetlands.

The proposed permanent impacts to Waters of the U.S. are associated with the culvert replacements and associated headwall and rip rap apron installations. The proposed impacts to Vegetated Wetlands are associated with facilitating the culvert replacement work and the roadway reconstruction and widening. The proposed impacts to Waters of the U.S. are summarized below in Table 3.

Table 3. Summary of Proposed Impacts to Waters of the U.S.

Location (Approximate Station)	Proposed Activity	Vegetated Wetland Impact (SF)	Bank Impact (LF)	Waters of the U.S. Impact (SF)
24+92	Box culvert installation which will replace both existing culverts. Both the upstream and downstream headwalls will be removed and replaced with wingwalls	41 SF (permanent), 9 SF (temporary)	19 LF (temporary)	282 SF (permanent), 341 SF (temporary)
43+75 and 46+60	Culvert replacement, modified rockfill apron, temporary cofferdam	289 SF (permanent)	299 LF (permanent), 33 LF (temporary)	1,342 (permanent), 328 SF (temporary)
57+00	Stonewall relocation to accommodate roadway improvements; sediment control installation	291 SF (temporary)	0 LF	0 SF
58+00	Sediment control installation	6 SF (temporary)	0 LF	0 SF
82+07	Culvert replacement with modified rock fill at the outlet and new headwalls at both the inlet and outlet	75 SF (permanent), 65 SF (temporary)	14 LF (temporary)	43 SF (permanent), 88 SF (temporary
82+50	Roadway widening; sediment control installation	21 SF (permanent), 54 SF (temporary)	0 LF	0 SF
86+45	Box culvert installation, temporary cofferdam	248 SF (permanent), 110 SF (temporary)	18 LF (permanent), 72 LF (temporary)	519 SF (permanent) 1,186 SF (temporary)
CUMULATIVE		**674 SF (permanent), 535 SF (temporary)**	**317 LF (permanent), 138 LF (temporary)**	**2,186 SF (permanent), 1,943 SF (temporary)**

The proposed culvert crossing at Station 86+45 will result in the creation of new streambed within the new proposed box culvert. The proposed concrete box culvert will have 2 feet of natural streambed material placed within it. The streambed material will be a continuation of the material incorporated into the design of the resulting new upstream and downstream channels which will transition to the existing bankfull width dimensions, provide low flow channel features and significantly increase the area of new streambed (Waters of the U.S.)

associated with this watercourse. This will result in the addition of approximately 1,000 SF of new/additional streambed/Waters of the U.S. at this crossing.

Because the project will result in over 200 linear feet of impacts to bank associated with the stream crossing improvements, MassDOT plans to conduct a Stream Visual Assessment Protocol. This assessment protocol provides a basic level of stream health evaluation.

The culvert replacement work will also result in dredging below the OHW within Waters of the U.S. at some of the stream crossing locations, which is quantified below in Table 4.

Table 4. Summary of Proposed Dredge Below Ordinary High Water (Stream Crossing Work)

Location (Station)	Waterbody Type	Total Impact (SF)	Total Dredge (CY)
24+92	Perennial	613	16
82+07	Intermittent	173	3
86+00 - 87+00	Intermittent	1,517	70
CUMULATIVE		**2,303 SF**	**89 CY**

The roadway improvements will also result in impacts to Vegetated Wetlands and Waters of the U.S. The roadway work will result in 21 SF of permanent alterations and 351 SF of temporary alterations to Vegetated Wetlands as a result of roadway widening, relocation of a stone wall, and installation of sediment and erosion controls. The proposed impacts to these wetlands associated with the roadway improvements are summarized in Table 5 below.

Table 5. Summary of Impacts to Vegetated Wetlands associated with the Roadway Improvements

Location (Approximate Station)	Permanent Impact (SF)	Temporary Impact (SF)	Total Impact (SF)
57+00	0	291	291
58+00	0	6	6
82+07	21	54	75
CUMULATIVE	**21 SF**	**351 SF**	**372 SF**

The proposed roadway improvements will result in the above impacts to Vegetated Wetlands, but will not impact waterways. Impacts to waterways are associated with the stream crossing activities only, described above.

Mitigation

The proposed project has been designed to minimize impacts to resource areas to the maximum extent practicable by utilizing more narrow culvert crossings wherever possible and by reducing the amount of impervious surface being added to the roadway to the extent practicable. The roadway design includes 10-foot travel lanes and 4-foot shoulders. This required a design criteria exception to provide the 4-foot shoulders instead of 5-foot bikes lanes/shoulders or 5-foot buffered bike lanes/shoulders, which most MassDOT projects must provide in accordance with MassDOT's complete streets requirements. This limited the widening of the road to 28 feet wide instead of 30 feet or 34 feet.

The proposed impacts to Vegetated Wetlands will be mitigated through the construction of two wetland replication areas, one 217 SF replication area and one 1,204 SF replication area. The mitigation areas have been designed to provide significantly greater than 1:1 mitigation for the proposed permanent vegetated wetland impacts.

A planting schedule for the 1,204 SF wetland replication area initially depicted on Sheet 21 is provided on the Wetland Replication Area Detail plan (Sheet 180) in the plans in Appendix K. Proposed plantings include highbush blueberry (*Vaccinium corymbosum*), winterberry (*Ilex verticillata*), cinnamon fern (*Osmunda cinnamomea*), sensitive fern (*Onoclea sensibilis*), and a native wetland seed mix. The smaller 217 SF wetland replication area on Sheet 16 references the same native wetland seed mix indicated on Sheet 180 to be used for this small replication area.

Proposed temporary impacts areas within Vegetated Wetlands will be restored in situ after construction from the removal of sediment controls and restoration of these areas to pre-existing grades.

Additionally, the easternmost stream crossing will result in creation of additional streambed (Waters of the U.S.). The proposed culvert replacement will more naturally align the stream and resulting channel and will place natural streambed material within the new box culvert crossing. The streambed material will be a continuation of the material incorporated into the design of the resulting upstream and downstream channels which will transition to the existing bankfull width dimensions, provide low flow channel features and significantly increase the area of new land under water associated with this watercourse.

The project also proposes to plant 53 shade trees along the roadway corridor to provide additional mitigation for the roadway widening work. A summary of the proposed species is provided in Table 6 below. Please refer to the project plans in Appendix K for specific planting locations.

Table 6. Summary of Proposed Shade Tree Plantings along the Project Corridor

Scientific Name	Common Name	Caliper	Container	Remarks
Cercis canadensis	Eastern Redbud	2-2.5”	B&B	Single-stem
Amelanchier x grandiflora	Serviceberry	2-2.5”	B&B	Single-stem
Ulmus americana	American Elm	2-2.5”	B&B	

Additional mitigation proposed seeks to address roadside erosion. The existing roadway has significant sediment deposits and ponded areas. Pavement unraveling has led to erosion at the edge of the pavement. Curbing the proposed roadway will significantly reduce the erosion potential at the edge of the pavement and from adjacent properties.

Sediment from the roadway runoff will be trapped in the 4-foot sumps of the proposed catch basins. Natural turf will be established within the graded areas adjacent to the roadway.

Under existing conditions many areas within the limit of work are experiencing significant roadside erosion which is entering adjacent wetland resource areas. The proposed project has been designed for anticipated flows with alterations to the overall grade of the roadway and the addition of closed drainage throughout the corridor. This drainage includes 57 new deep sump catch basins and approximately 3,500 linear feet (LF) of new pipe to support the closed drainage. All discharges adjacent to wetland resources include preformed scour holes to reduce unwanted erosion.

Sediment controls (compost filter tubes or similar) will be installed between the limits of work and adjacent wetlands to protect them during construction. Sediment controls are depicted on the project plans provided in Appendix K.

Coverage under the Massachusetts General Permits

Based on the proposed scope of work and impacts to Waters of the U.S., it is anticipated that the proposed project will utilize General Permit (GP) 23 for Linear Transportation Projects and Wetland/Stream Crossings.

A PCN is required for the project under GP 23, because the following conditions apply:

1. In non-tidal waters, the combined permanent and temporary impacts are:
   a) >5,000 SF;
   c) do not meet the Massachusetts River and Stream Crossing Standards.

Compliance with the applicable general conditions in the Massachusetts General Permits is described below.

Section IV. General Conditions: 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-streamcrossing-standards/download or https://www.nae.usace.army.mil/Missions/Regulatory/StateGeneral-Permits/Massachusetts-General-Permit/. Projects that do not conform to these guidelines shall be reviewed under PCN or IP procedures.

The proposed stream crossing replacements proposed as part of this project meet the stream crossing standards to the maximum extent practicable, as described in the section below.

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.

The proposed replacement culverts are generally larger than existing conditions in order to prevent the restriction of high flows and allow for movement of aquatic life. The proposed culverts do not seek to change low flow conditions and the proposed culvert inlets have been designed to match existing conditions, except at the 24+92 and 86+45 proposed box culvert locations. At these two locations, the proposed box culvert will be submerged to receive the placement of two feet of natural streambed material and the channel/culvert crossing section design includes provisions for accommodating low flow conditions. See plans and the maximum extent practicable (MEP) alternatives analysis provided in Appendix I.

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.

As indicated above, the proposed replacement culverts are generally larger than existing conditions in order to prevent the restriction of high flows and allow for movement of aquatic life. The proposed culverts do not seek to change low flow conditions and the proposed culvert inlets have been designed to match existing conditions, except at the Sta. 24+92 and 86+45 proposed box culvert locations. At these two locations, the proposed box culvert will be submerged to receive the placement of two feet of natural streambed material and the channel/culvert crossing section design includes provisions for accommodating low flow conditions. See plans and the maximum extent practicable (MEP) alternatives analysis provided in Appendix I.

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.

Natural mixed grain-size streambed material will be utilized where possible and especially at the culvert crossings at Sta. 24+92 and 86+45. See plans and the maximum extent practicable (MEP) alternatives analysis provided in Appendix I.

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.

No work is proposed in flowing water. Diversion pumping and bypass piping will be utilized to maintain flow during construction.

Compliance with Massachusetts Stream Crossing Standards

The project has been designed to meet the stream crossing standards to the maximum extent practicable. Compliance with the stream crossing standards is discussed below. Please refer to the MEP Analysis in Appendix I for additional information about the stream crossing design that was selected for each crossing.

1. **Type of Crossing – Spans (bridges, 3-sided box culverts, open-bottom culverts or arches) are strongly preferred.**

   The two proposed box culverts at Stations 24+92 and 86+45 will be four-sided box culverts for ease of installation, but will have natural streambed material placed along the bottom of the culvert to mimic an open bottom crossing. Thus, this standard is being met to the maximum extent practicable.

   Relative to the rest of the proposed crossings at Stations 15+32, 43+75, 46+60, and 82+07, these crossings will be replaced with 12" and 18" RCPs, as described in Table 2 above. Open bottom culverts are not feasible at these locations given site constraints and the intermittent nature of the stream crossings. Additionally, the replacement pipes will not be anticipated to have an effect on wildlife habitat, nor will they create habitat fragmentation since the channels are too small to have instream habitat. Wildlife in this area would be anticipated to cross the road.

2. **Embedment – All culverts should be embedded (sunk into stream) a minimum of 2 feet, and round pipe culverts at least 25%. When embedment material includes elements >15 inches in diameter, embedment depths should be at least twice the D_{84} (particle width larger than 84% of particles) of the embedment material.**

   The two proposed box culverts will have 2-foot embedment.

   Relative to the rest of the proposed crossings at Stations 15+32, 43+75, 46+60, and 82+07, these crossings will be replaced with 12" and 18" RCPs. Due to the fact that no bankfull width indicators were observed at these crossings, the crossings have been designed to improve hydraulic capacity. It is not feasible to achieve 25% embedment with pipes of this small size.

3. **Crossing Span – Spans channel width (a minimum of 1.2 times the bankfull width of the stream).**
   This standard is met to the maximum extent practicable.

   For the crossings at Stations 24+92 and 86+45, meeting the 1.2 bankfull standard was considered, but was determined to be cost and timeline-prohibitive.

Therefore, a concrete box with a span of 9-ft 10-inches and rise of 5.0 feet with 2 feet embedment (0.85 x bankfull width) is proposed at Station 24+92, which will have many benefits of a 1.2 bankfull structure such as passing sediment, large wood, and the design flood, yet at a reduced cost.

At Station 86+45, a single concrete box with a width of 8 feet (0.8 x bankfull channel width) is proposed. The proposed stream crossing will only cross Monson Road and replace the existing pair of culverts. The proposed alignment will allow for shortening of the crossing by daylighting approximately 100 LF of the channel upstream and approximately 80 LF of the channel downstream. This will reduce the size, costs, and impacts of the proposed structure. This proposed structure will have many benefits of a 1.2 bankfull structure such as transport of sediment and large wood at a reduced cost.

Enlarging the structures at Stations 24+92 and 86+45 to approximately 0.9 times the bankfull channel width achieves many of the benefits of a larger crossing structure. Flood conveyance, sediment transport, and large wood movement will all be improved. Fish passage will be restored, and small mammals will be able to pass through the structures during low flows.

Some of the stream crossings, including those at Stations 15+32, 43+75, 46+60, and 82+07 did not exhibit strong bankfull indicators. For this reason, the proposed replacement crossings at Stations 15+32, 43+75 and 46+60 have been designed to pass the design flow through the structures. At the proposed crossing at Station 82+07, the typical wetted channel width of the channel was observed to be between 12-24 inches and the depth of the channel is 4 to 6 inches based on observations made by SLR Consulting on March 19, 2024 under normal spring flow. To meet the stream crossing standards at this location, the proposed structure was sized based on the required hydraulic capacity to convey the design flood.

4. **Openness - Openness ratio (cross-sectional area/crossing length) of at least 0.82 feet (0.25 meters). The crossing should be wide and high relative to its length.**

The proposed box culvert at Station 24+92 will exceed the required openness ratio, as the proposed culvert has an openness ratio of 0.93 feet.

The proposed box culvert at Station 86+45 meets this standard to the maximum extent practicable, but ultimately could not achieve the 0.82-foot openness ratio. Several alternative alignments were evaluated for this crossing, given the skewed alignment of the channel and multiple pipe configuration of the existing crossings.

Initially the original watercourse inlet to outlet alignment was evaluated for the new culvert. However, given the skew angle and length of culvert needed to cross the realigned intersection, to meet a maximum span width no longer than 10', the

resulting culvert opening width would be approximately 6' and well below the recommended width in the original MEP analysis. The extended length of the culvert would also negatively reduce the openness ratio.

A second alignment analysis pursued a more perpendicular crossing of Monson Road to achieve a culvert span just under 10' in length. While possible, this alternative created several sharp turns in the realigned channel both upstream and downstream of the culvert crossing which were deemed undesirable and inconsistent with the stream crossing standards, and furthermore would have increased wetland impacts and right-of-way impacts to private properties.

The third and preferred alignment for the crossing at Station 86+45 represents a balance of the two previous alternatives which strives to properly and more naturally align the stream and resulting channel trough the culvert, maximize the culvert opening width to 8', and reduce the culvert length as much as possible to maximize the resulting openness ratio. The outcome advances the design of the proposed 8' wide x 4.5' high concrete box culvert with 2' of natural streambed material placed within it. The streambed material will be a continuation of the material incorporated into the design of the resulting upstream and downstream channels which will transition to the existing bankfull width dimensions, provide low flow channel features and significantly increase the area of new land under water associated with this watercourse. Therefore, the openness ratio at Station 86+45 has been maximized to the extent practicable, based on site conditions.

Relative to the rest of the proposed crossings at Stations 15+32, 43+75, 46+60, and 82+07, these crossings will be replaced with 12" and 18" RCPs. Due to the fact that no bankfull width indicators were observed at these crossings, meet the stream crossing standards at this location, the crossings have been designed to improve hydraulic capacity.

5. **Substrate - Natural bottom substrate should be used within the crossing and it should match the upstream and downstream substrates. The substrate and design should resist displacement during floods and maintain an appropriate bottom during normal flows.**

   The two proposed box culverts will contain 2 feet of natural streambed material.

   Relative to the rest of the proposed crossings at Stations 15+32, 43+75, 46+60, and 82+07, these crossings will be replaced with 12" and 18" RCPs. Due to the size of the replacement pipes, natural bottom substrate is not proposed. The replacement pipes will not be anticipated to have an effect on habitat, nor will they create habitat fragmentation since the channels are too small to have instream habitat. Wildlife in this area would be anticipated to cross the road.

6. **Water Depth and Velocity - Water depths and velocities are comparable to those found in the natural channel at a variety of flows.**

Water depth and velocity at each stream crossing location will be comparable to those found in the natural channels. The culvert crossings have been designed to match the existing gradient of the watercourses between upstream and downstream.

Historic Resources

According to the Massachusetts Cultural Resource Information System (MACRIS), three historic properties are present adjacent to the proposed project area. MassDOT Cultural Resources Unit staff have reviewed the project under the terms of the 2004 Massachusetts Statewide Programmatic Agreement for Section 106 of the National Historic Preservation Act of 1966, and have determined that the project will have no adverse effect on any National Register listed or eligible properties.

MassDOT's Archaeologist found that the site has low archaeological sensitivity, likely as a result of past roadway, utility, and drainage construction, unfavorable conditions (slope and wetlands), and roadside development.

A copy of the Section 106 consultation information is included in Appendix E.

Rare Species

A portion of the proposed roadway work is located within NHESP-mapped Estimated Habitats of Rare Wildlife and Priority Habitats of Rare Species. As part of this proposed project, a Massachusetts Endangered Species Act (MESA) determination was previously sought and a determination was issued on February 9, 2018 which indicated that the project would not result in a prohibited Take of state-listed rare species. Since the previous submission, plans have changed and the previous determination has expired. As a result, the applicant will coordinate with NHESP through the streamlined MESA review process in conjunction with the Notice of Intent filing.

The U.S. Fish and Wildlife Service (USFWS) has developed the online Information for Planning and Consultation (IPaC) tool to help streamline the Section 7 consultation process under the Endangered Species Act of 1973 (ESA).

MassDOT conducted the Section 7 consultation and the USFWS issued a "may affect, but not likely to adversely affect" (NLAA) determination for the federally endangered Indiana bat (*Myotis sodalis*) and the federally endangered northern long-eared bat (*Myotis septentrionalis*). Because the USFWS did not notify the federal action agency or representative within 14 days of issuance of this determination, the applicant is allowed to proceed with the proposed action under the terms of the NLAA concurrence provided in the Programmatic Biological Opinion.

A copy of this correspondence is included in Appendix F of this submission.

The proposed project will not include any critical habitat proposed and designated by NOAA Fisheries based on the NOAA Fisheries National Endangered Species Act (ESA) Critical Habitat Mapper.

Conclusion

Weston and Sampson is submitting this Pre-Construction Notification on behalf of the Town of Wales and MassDOT for the Monson Road Transportation Improvement Project. The purpose of the project is to make roadway, shoulder, and drainage improvements to an approximately 1.5-mile stretch of Monson Road. Currently, this section of roadway and associated culvert crossings are in poor condition with aging infrastructure and drainage issues. Stormwater collection does not meet current development standards. The existing culverts are undersized, and overtopping of the roadway occurs during large storms. Additionally, Monson Road in this area is experiencing deteriorating roadway conditions.

The proposed project will improve drainage conditions and provide for a safer roadway while also minimizing wetlands and waterways impacts to the maximum extent practicable. Mitigation has been provided for unavoidable impacts. Therefore, the applicant respectfully requests that the United States Army Corps of Engineers find these measures adequately protective of the interests identified in the Massachusetts General Permit and issue a Pre-Construction Notification approving the work shown on the accompanying plan set.

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

PLAN AND PROFILE OF

MONSON ROAD IMPROVEMENTS

IN THE TOWN OF

WALES

HAMPDEN COUNTY

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-		
PROJECT FILE NO.	608163		

TITLE SHEET & INDEX

100% SUBMITTAL

404 ENVIRONMENTAL PERMIT PLAN SET

THESE PLANS ARE SUPPLEMENTED BY THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DATED 2024, 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	KEY PLAN
3	LEGEND, ABBREVIATIONS & GENERAL NOTES
4	TYPICAL SECTIONS
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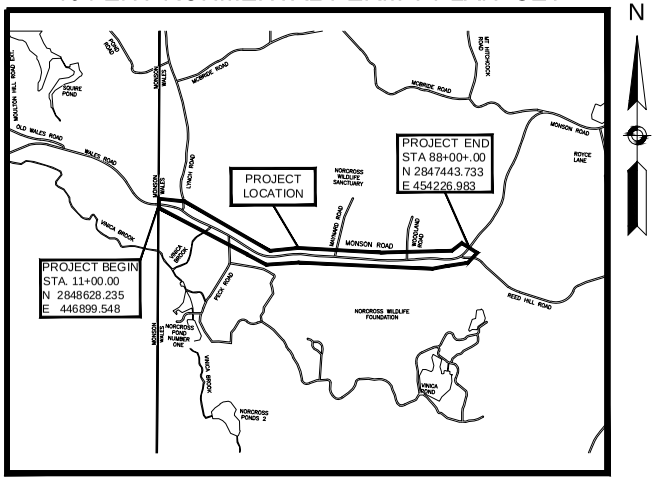
27-35	STRUCTURAL PLANS
36	CULVERT 3 CHANNEL PLAN, PROFILE AND SECTION
37-38	CULVERT 3 CHANNEL CROSS SECTIONS
39-40	TEMPORARY WATER HANDLING PLAN
41	WETLAND REPLICATION AREA DETAIL



DESIGN DESIGNATION - MONSON ROAD

DESIGN SPEED	40 MPH
ADT (2017)	660
ADT (2025)	760
K	11%
D	52%
T (PEAK HOUR)	3.0%
T (AVERAGE DAY)	3.0%
DHV	85
DDHV	45
FUNCTIONAL CLASSIFICATION	RURAL MAJOR COLLECTOR

LENGTH OF PROJECT = 7700.00 FEET = 1.458 MILES

August 2024

COMMONWEALTH OF MASSACHUSETTS
SCOTT R. BRUSO
STRUCTURAL
No. 48061
REGISTERED PROFESSIONAL ENGINEER

2024.08.09 12:45:27-04'00'

Weston & Sampson
712 Brook Street, Suite 103
Rocky Hill, CT 06067
860.513.1473
www.westonandsampson.com

DATE	DESCRIPTION	REV #

MassDOT Massachusetts Department of Transportation Highway Division

APPROVED

CHIEF ENGINEER _____ DATE _____

608163_HDI(TITLE, LEGEND, KEY & TYPICAL SECTIONS)404.DWG Plotted on 9-Aug-2024 5:04 PM

A00830 -1020

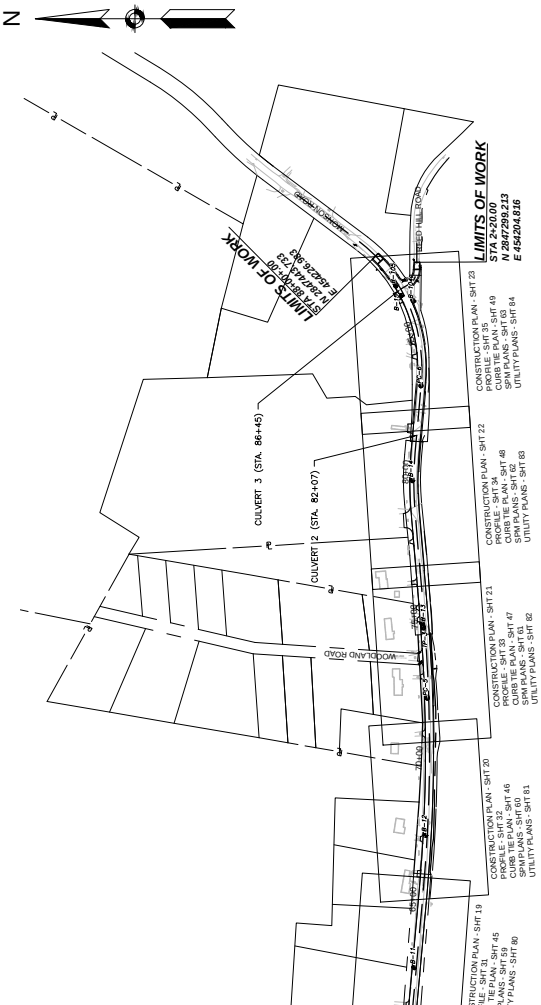
Proposal No. 608163-128112

608163_HDLTITLE, LEGEND, KEY & TYPICAL SECTIONS.DWG Plotted on 5-Aug-2024 8:17 AM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

KEY PLAN



NOTES:
1. BENCH MARK:
MAGNAIL U.P.L. LOCATED EAST OF NORTH STREET AT STATION 12+79.94 AND EL. 869'
MAGNAIL U.P.L. LOCATED WEST OF NORTH STREET AT STATION 21+37.43 AND EL. 877'
MAGNAIL U.P.L. LOCATED WEST OF NORTH STREET AT STATION 29+56.65 AND EL. 900'
BRASS RIVET LOCATED WEST OF NORTH STREET AT STATION 29+94.76 AND EL. 902'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 38+22.13 AND EL. 938'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 47+02.17 AND EL. 934'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 56+22.73 AND EL. 957'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 65+94.25 AND EL. 1007'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 74.95.16 AND EL. 1022'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 81+31.62 AND EL. 1006'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 87+02.17 AND EL. 934'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 87+05.97 AND EL. 1008'
BRASS RIVET LOCATED WEST OF NORTH STREET AT STATION 87+15.35 AND EL. 1001'

BORING LOCATIONS (FEET)

BORING	NORTHING	EASTING	STATION	OFFSET	SURFACE EL.	H.B.E.
B-1	2,848,584	447,074	12+80	22.4 RT	868.0	861.5
B-3	2,848,121	448,154	24+56	10.0 LT	877.0	865.2
B-5	2,847,780	448,792	31+69	10.8 LT	902.0	897.5
B-7	2,847,423	449,318	38+27	18.1 RT	941.0	937.0
B-9	2,847,397	450,584	51+05	9.6 LT	933.0	916.5
B-10	2,847,355	451,197	57+19	6.7 LT	956.0	951.5
B-11	2,847,315	451,727	62+51	14.1 LT	989.0	984.5
B-12	2,847,272	452,354	68+80	16.0 LT	1011.0	1007.0
B-13	2,847,294	453,969	74+48	19.4 LT	1018.0	1014.5
B-14	2,847,322	453,443	79+72	12.1 LT	1008.0	1004.5
B-15	2,847,355	454,092	86+37	6.1 LT	1002.0	998.1
B-101	2,848,099	448,135	24+85	4.2 RT	877.1	861.9
B-102	2,848,103	448,186	25+06	12.85 LT	877.5	64460
B-104	2,847,316	454,089	86+39	20.6 RT	1002.4	974.4
B-105	2,847,387	454,110	85+59	11.0 RT	1001.8	987.7

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
	CBCI	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
		CABLE MANHOLE
		DRAINAGE MANHOLE
		ELECTRIC MANHOLE
		GAS MANHOLE
		MISC MANHOLE
		SEWER MANHOLE
		TELEPHONE MANHOLE
		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
		SWAMP / MARSH
WG	WG	WATER GATE
PM	PM	PARKING METER
		OVERHEAD CABLE/WIRE
		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
		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		EROSION AND SEDIMENT CONTROL BARRIER
		TREE LINE
		LIMITS OF CLEARING AND GRUBBING
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		EDGE OF PAVEMENT
		LIMIT OF MICROMILLING AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT WETLAND BUFFER
		200 FT RIVERFRONT AREA BUFFER
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT
		SIGN AND POST
		SIGN AND DOUBLE POST

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
CBCI-DB	DOUBLE GRATE CATCH BASIN W/ 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
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
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
LB	LEACH BASIN

ABBREVIATIONS (cont.)

GENERAL

LP	LIGHT POLE
LT	LEFT
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NIC	NOT IN CONTRACT
NO.	NUMBER
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
PSB	PLANTABLE 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 WATER WAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCCE	REINFORCED CONCRETE CULVERT END
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	STA
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SW	SIDEWALK
SWTU	STORMWATER TREATMENT UNIT
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
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

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
	SL	12"-WIDE STOP LINE
	SWL	6"-WIDE SOLID WHITE LINE
	DBYL	DOUBLE YELLOW LINE (2 - 6"-WIDE YELLOW LINES)

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

LEGEND, ABBREVIATIONS & GENERAL NOTES

GENERAL NOTES:

1. TOPOGRAPHICAL INFORMATION BASED ON AN ON THE GROUND SURVEY PERFORMED BY CHAPPELL ENGINEERING ON DECEMBER 2017 AND SUPPLEMENTED BY CHAPPELL ENGINEERING IN OCTOBER 2023. WETLAND FLAGGING WAS PERFORMED BY WESTON & SAMPSON IN NOVEMBER 2020 AND REFLAGGED IN SEPTEMBER OF 2023.
2. THE HORIZONTAL COORDINATES ARE BASED ON NAD 83, THE VERTICAL DATUM IS NAVD 88.
3. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. THE CONTRACTOR SHALL DIG TEST PITS WITH THE LOCATIONS BEING APPROVED BY THE ENGINEER PRIOR TO COMMENCEMENT OF WORK TO EXACTLY LOCATE EXISTING UTILITIES.
4. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
5. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY OWNER. ANY ALTERATIONS SHALL BE INCIDENTAL TO THE PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY SUPPORT OF ALL UTILITIES TO REMAIN IN PLACE AND SHALL DESCRIBE IN WRITING, TO THE SATISFACTION OF THE ENGINEER, HIS METHOD OF TEMPORARY SUPPORT.
6. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
7. THE TERM "PROPOSED (PROP)" INDICATES WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET (R&R)".
8. ALL EXISTING STATE, COUNTY AND TOWN LOCATION LINES AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATION ARE NOT GUARANTEED.
9. ALL EXCESS MATERIAL FROM ROADWAY RECONSTRUCTION OR THE EXCAVATION PROCESS SHALL BE REUSED ON SITE OR REMOVED FROM THE SITE AND DISPOSED OF IN A LEGAL AND PROPER MANNER.
10. THE CONTRACTOR SHALL CALL DIGSAFE AT 1-888-344-7233 AT LEAST 72 HOURS, SATURDAYS, AND HOLIDAYS EXCLUDED, PRIOR TO EXCAVATING AT ANY LOCATION. A COPY OF THE DIGSAFE PROJECT REFERENCE NUMBER(S) SHALL BE GIVEN TO THE TOWN PRIOR TO EXCAVATION.
11. JOINTS BETWEEN HOT MIX ASPHALT TRENCH PAVEMENT AND SAWCUT EXISTING PAVEMENT SHALL BE SEALED WITH BITUMEN AND BACKSANDED.
12. IF DEEMED NECESSARY DUE TO THE WORK, THE CONTRACTOR SHALL COORDINATE WITH THE TOWN OF WALES HIGHWAY DEPARTMENT, THE WALES FIRE DEPARTMENT, AND THE ENGINEER FOR APPROVAL OF SHUTTING DOWN ANY EXISTING WATER MAINS AND SHALL ALSO OBTAIN APPROVAL FOR DISRUPTING ANY EXISTING SEWER FLOWS.
13. THE CONTRACTOR SHALL BE AWARE THAT ONLY TOWN PERSONNEL ARE ALLOWED TO OPERATE WATER GATES AND HYDRANTS. ANY REQUESTS TO OPERATE THE GATES SHALL BE COORDINATED THROUGH THE ENGINEER.
14. THE CONTRACTOR SHALL COORDINATE ANY WORK FOR THE PROJECT WITH ALL ADJACENT/CONCURRENT PROJECTS AND CONTRACTORS.
15. THE CONTRACTOR SHALL INSTALL PRIOR TO COMMENCEMENT OF WORK, MAINTAIN, AND REMOVE AT THE END OF THE PROJECT INLET SEDIMENT CONTROL BAGS IN ALL CATCH BASINS, WITHIN OR ADJACENT TO THE PROJECT LIMITS. THE CONTRACTOR SHALL ALSO MAINTAIN SILT FENCE AND COMPOST FILTER TUBES AS SHOWN ON THE PLANS THROUGHOUT THE DURATION OF THE PROJECT AND REMOVE AT THE END.
16. ANY GRASS AREAS DISTURBED BY THE WORK SHALL BE RESTORED WITH LOAM AND SEED.
17. ANY LANDSCAPED AREAS DISTURBED BY THE WORK SHALL BE RESTORED TO EXISTING CONDITIONS WITH EXISTING OR NEW GROUND COVER MATERIALS AS DIRECTED BY THE ENGINEER. ANY PLANTS, SHRUBS, OR FLOWERS DISTURBED BY THE WORK SHALL BE RESET TO EXISTING CONDITIONS OR REPLACED WITH NEW PLANTS, SHRUBS, OR FLOWERS AS DIRECTED BY THE ENGINEER. ALL WORK TO RESTORE LANDSCAPE AREAS, NEW GROUND COVER MATERIALS, NEW PLANTS, NEW SHRUBS, OR NEW FLOWERS REQUIRED BY THE ENGINEER SHALL BE INCIDENTAL TO THE PROJECT.
18. CONTRACTOR TO COORDINATE WITH UTILITY POLE OWNERS IN AREAS WHERE UNDERGROUND UTILITY WORK IS WITHIN CLOSE PROXIMITY AND POSSIBLE UTILITY POLE SHORING IS REQUIRED WHILE INSTALLING PROPOSED UTILITIES.
19. RAISE AND ADJUST FRAMES AND GRATES, FRAMES AND COVERS AND GATE BOXES PRIOR TO PAVEMENT OVERLAY, IF REQUIRED.
20. CONTRACTOR IS RESPONSIBLE FOR REPLACING ANY PROPERTY PINS THAT ARE DAMAGED OR DESTROYED DURING CONSTRUCTION, TO THEIR LOCATION JUST PRIOR TO CONSTRUCTION.
21. ALL TRAFFIC SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS OTHERWISE NOTED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
22. CONTRACTOR TO ESTABLISH TEMPORARY BENCHMARKS EVERY 1000 FEET BASED ON THE PERMANENT BENCHMARKS LOCATED AT STA 29+85.04, 24.73 LEFT AND STA 87+27.18, 41.17 LEFT OR AS REQUIRED BY THE ENGINEER.
23. CONTRACTOR TO PROVIDE ADDITIONAL TRAVERSE POINTS AND TRAVERSE LINES IN THE VICINITY OF EXISTING TRAVERSE POINTS WHERE THE EXISTING TRAVERSE POINT IS LOCATED IN "SOFT GROUND" OR AS REQUIRED BY THE ENGINEER.
24. ALL EXISTING STONE WALLS PROPOSED FOR RELOCATION SHALL NOT BE REMOVED FROM THE IMMEDIATE AREA SHOWN ON THE PLANS.

608163_HDI(TITLE, LEGEND, KEY & TYPICAL SECTIONS).DWG Plotted on 5-Aug-2024 8:17 AM

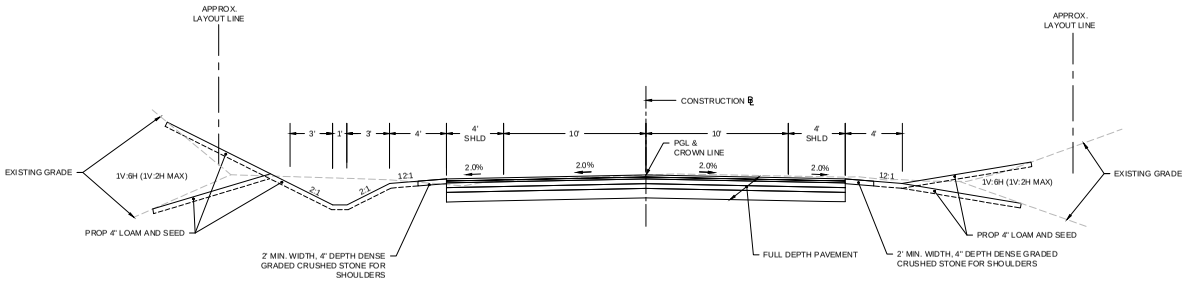
Proposal No. 608163-128112

A00830 -1022

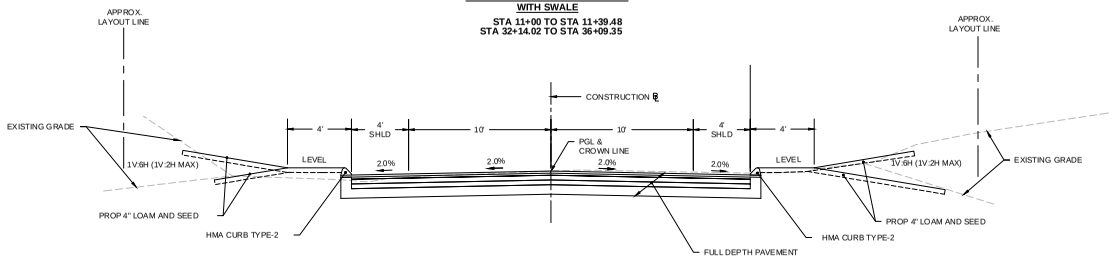
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

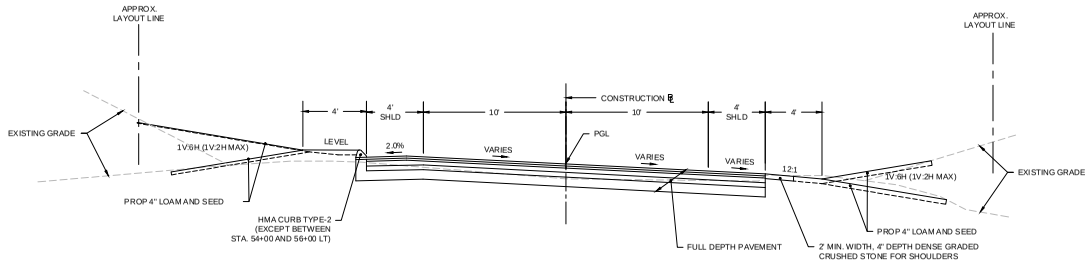
TYPICAL SECTIONS



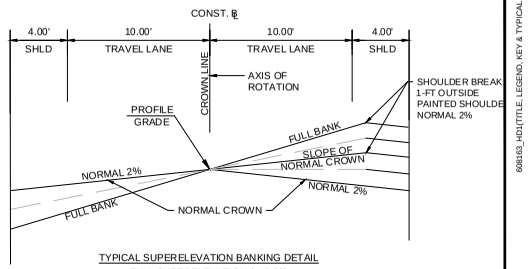
MONSON ROAD TYPICAL SECTION
WITH SWALE
STA 11+00 TO STA 11+39.48
STA 32+14.02 TO STA 36+09.35



MONSON ROAD TYPICAL SECTION
WITH CURBING
STA 22+70.43 TO STA 26+98.72
STA 57+46.79 TO STA 64+41.04
STA 75+70.50 TO STA 77+39.51



MONSON ROAD TYPICAL SECTION
FULL SUPERELEVATION AND TRANSITIONS
STA 11+39.48 TO STA 22+70.43
STA 26+98.72 TO STA 32+14.02
STA 36+09.35 TO STA 57+46.79
STA 64+41.04 TO STA 75+70.50
STA 77+39.51 TO STA 88+00



TYPICAL SUPERELEVATION BANKING DETAIL
FULL SUPERELEVATION (e=0.06)
N.T.S.

PAVEMENT NOTES

PROPOSED PAVEMENT MILLING AND OVERLAY:

1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 1.50" PAVEMENT MILLING

PROPOSED FULL DEPTH PAVEMENT:

SURFACE COURSE: 1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5).

BASE COURSE: 3.25" SUPERPAVE INTERMEDIATE COURSE 19 (SIC-19.0) PLACED IN ONE LAYER.

SUBBASE: 4" DENSE GRADED CRUSHED STONE OVER 8" GRAVEL BORROW, TYPE B.

BITUMEN FOR TACK COAT (RS-1) TO BE APPLIED AT A RATE OF 0.07 TO 0.09 GAL/SY OVER MILLED SURFACES AND 0.06 TO 0.08 GAL/SY ON BASE AND INTERMEDIATE PAVEMENT COURSES.

PROPOSED HOT MIX ASPHALT DRIVEWAY :

SURFACE COURSE: 1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 2.50" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5)

FOUNDATION: 8" GRAVEL BORROW, TYPE B

PROPOSED GRAVEL DRIVEWAY:

8" GRAVEL BORROW, TYPE B

PROPOSED CEMENT CONCRETE WALK

4" CEMENT CONCRETE OVER
8" GRAVEL BORROW, TYPE B

608163_HDI(TITLE, LEGEND, KEY & TYPICAL SECTIONS).DWG Plotted on 5-Aug-2024 8:17 AM

A00830 -1023

Proposal No. 608163-128112

HIGHWAY GUARD DETAILS

STA 14+65 TO STA 14+78 LT TANGENT END TREATMENT TL-3
STA 14+78 TO STA 16+88 LT (TL-3)
STA 14+50 TO STA 14+63 RT TANGENT END TREATMENT TL-3
STA 14+63 TO STA 16+02 RT (TL-3)

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

SEE UTILITY PLANS

404 PERMIT IMPACT NUMBERS

	W.O.T.U.S. IMPACTS			
	AREA IMPACTS	BANK IMPACTS	V.W. IMPACTS	DREDGE
PERMANENT IMPACTS	2186 SF	317 LF	674 SF	89 CY
TEMPORARY IMPACTS	1943 SF	138 LF	535 SF	N/A

(SEE INDIVIDUAL CROSSING LOCATON FOR NEW W.O.T.U.S. CREATED)

PLANT SCHEDULE

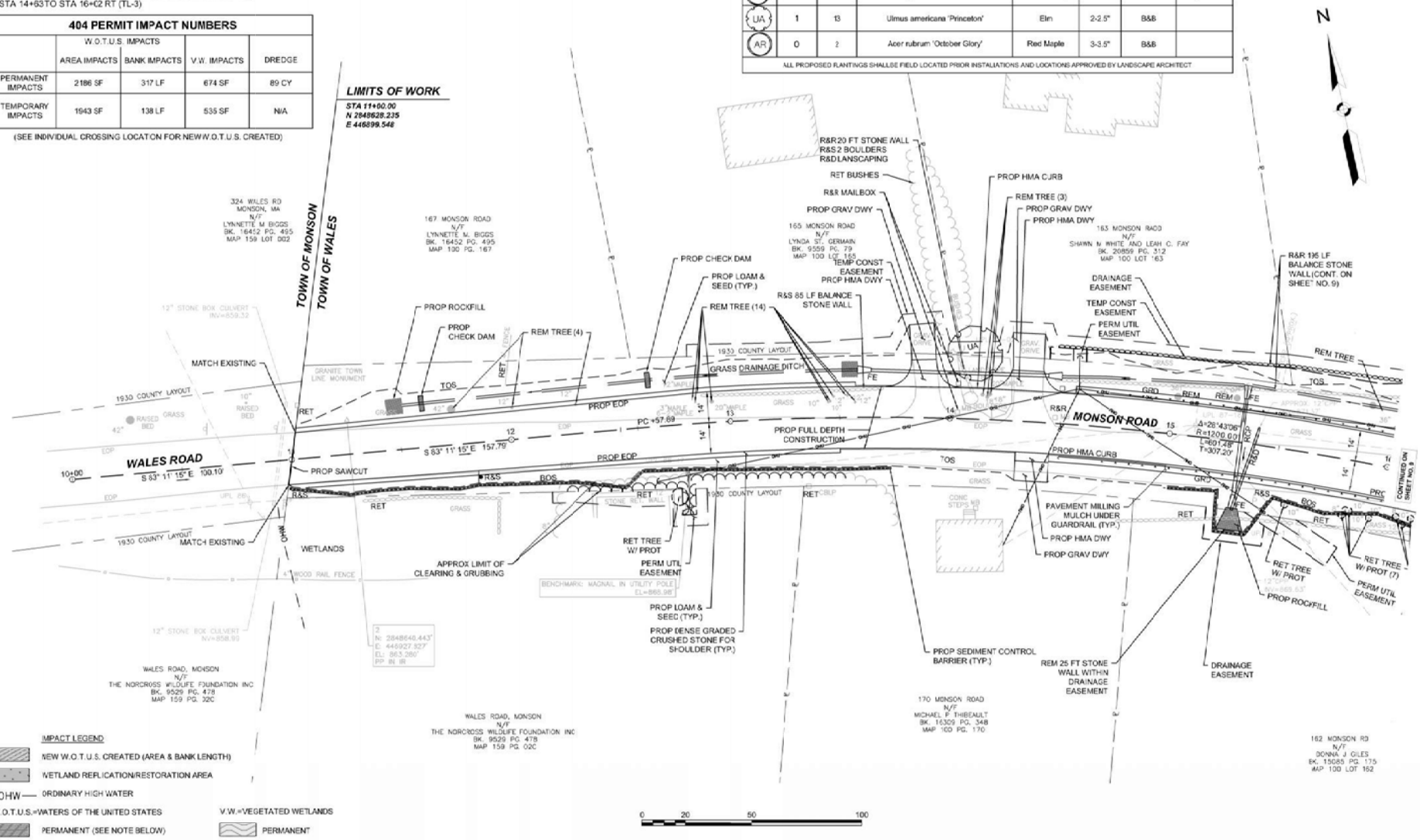
TREES	QTY (PER SHEET)	QTY (MASTER TOTAL)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	13	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	0	27	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	1	13	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	2	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(43)X		
	PROJECT FILE NO.	608163	

CONSTRUCTION PLANS



IMPACT LEGEND

NEW W.O.T.U.S. CREATED (AREA & BANK LENGTH)

WETLAND REPLICATION/RESTORATION AREA

— OHW — ORDINARY HIGH WATER

W.O.T.U.S.=WATERS OF THE UNITED STATES

PERMANENT (SEE NOTE BELOW)

TEMPORARY

V.W.=VEGETATED WETLANDS

PERMANENT

TEMPORARY

NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS

FOR PROFILE SEE SHEET NO. 22

608163_HD3(CONSTRUCTION PLANS)404.DWG Plotted on 27-Aug-2024 3:01 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

CONSTRUCTION PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	3	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	0	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	4	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

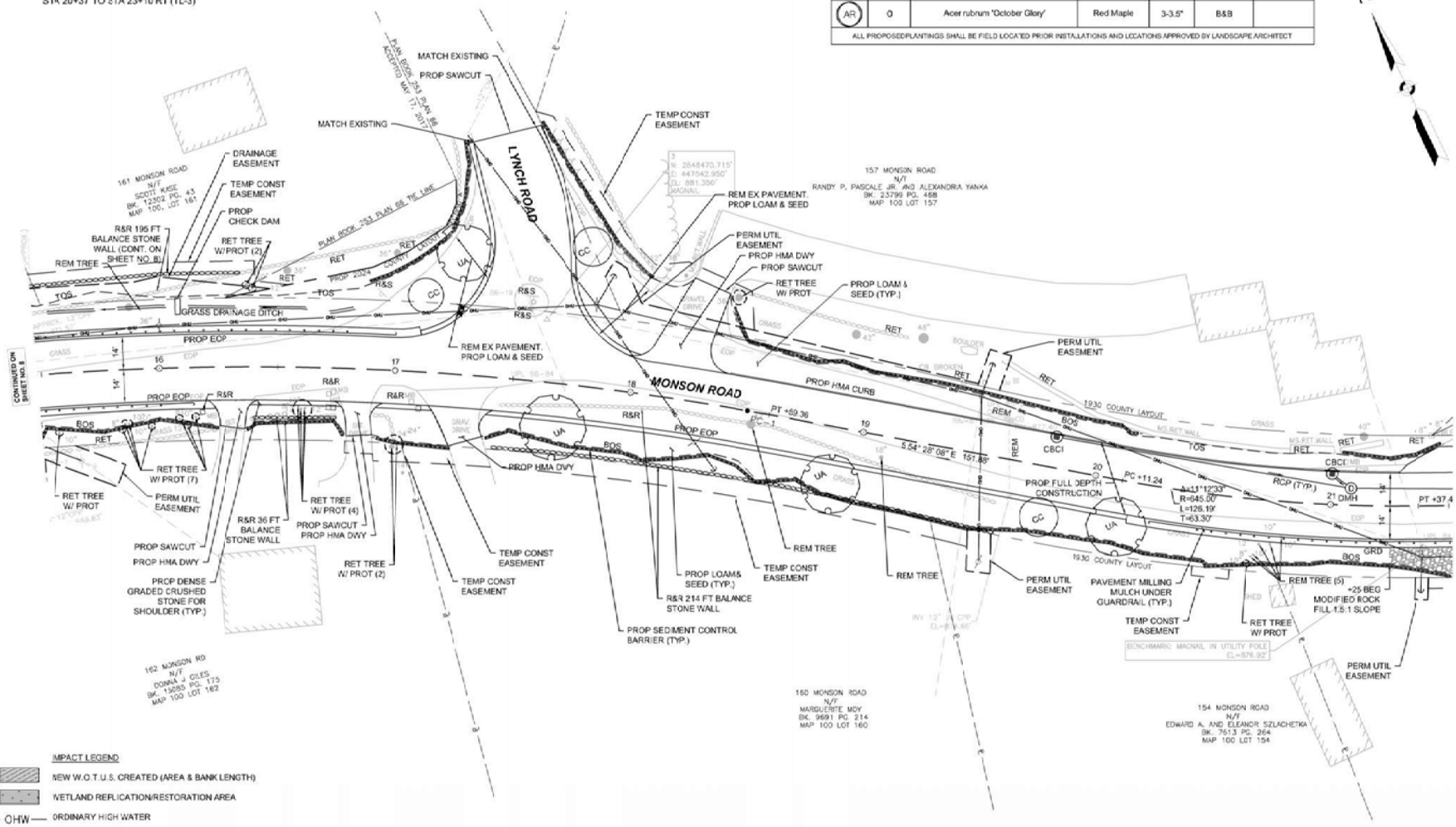
HIGHWAY GUARD DETAILS

STA 14+78 TO STA 16+88 LT (TL-3)
STA 16+88 TO STA 17+00 LT TANGENT END TREATMENT TL-3
STA 14+63 TO STA 16+02 RT (TL-3)
STA 16+02 TO STA 16+14 RT TANGENT END TREATMENT TL-3
STA 20+25 TO STA 20+37 RT TANGENT END TREATMENT TL-3
STA 20+37 TO STA 23+10 RT (TL-3)

TRAFFIC SIGNAL CONDUIT: NONE

WATER SUPPLY ALTERATIONS: NONE

DRAINAGE DETAILS: SEE UTILITY PLANS



IMPACT LEGEND

- NEW W.O.T.U.S. CREATED (AREA & BANK LENGTH)
- WETLAND REPLICATION/RESTORATION AREA
- — OHW — ORDINARY HIGH WATER

W.O.T.U.S.=WATERS OF THE UNITED STATES
- PERMANENT (SEE NOTE BELOW)
- TEMPORARY

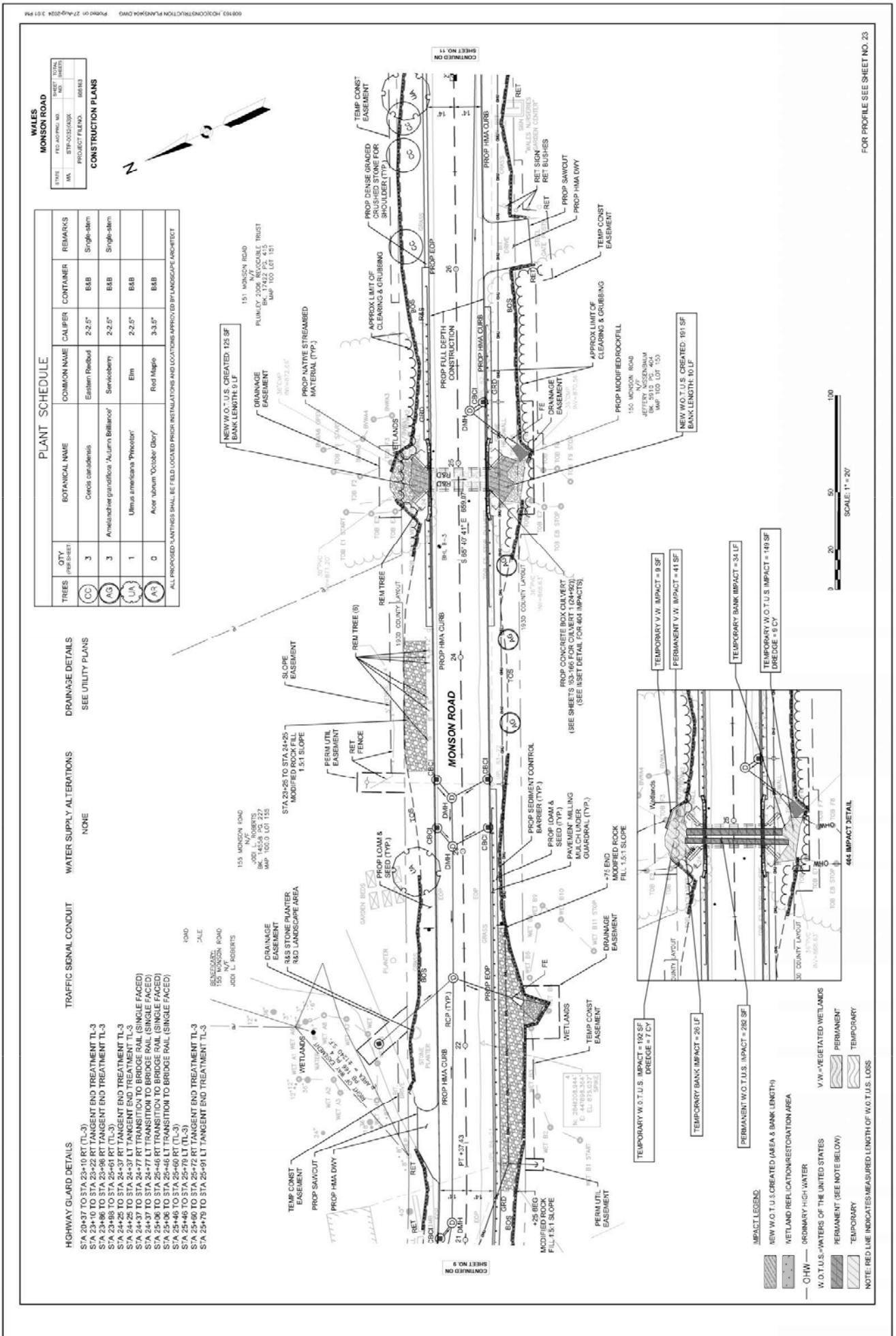
V.W.=VEGETATED WETLANDS
- PERMANENT
- TEMPORARY

NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 22

608163_HD3(CONSTRUCTION PLANS)404.DWG Plotted on 27-Aug-2024 3:01 PM


WALES
MONSON ROAD
CONSTRUCTION PLANS
PROJECT FILE NO. 608163
PLANT SCHEDULE
TREES
QTY (PER SHEET)
BOTANICAL NAME
COMMON NAME
CALIPER
CONTAINER
REMARKS
CC 3 Cercis canadensis Eastern Redbud 2-2.5" B&B Single-stem
AG 3 Amelanchier grandiflora 'Autumn Brilliance' Serviceberry 2-2.5" B&B Single-stem
UA 1 Ulmus americana 'Princeton' Elm 2-2.5" B&B
AR 0 Acer rubrum 'October Glory' Red Maple 3-3.5" B&B
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 20+37 TO STA 23+10 RT (TL-3)
STA 23+10 TO STA 23+22 RT TANGENT END TREATMENT TL-3
STA 23+86 TO STA 23+98 RT TANGENT END TREATMENT TL-3
STA 23+98 TO STA 25+01 RT (TL-3)
STA 24+25 TO STA 24+37 RT TANGENT END TREATMENT TL-3
STA 24+37 TO STA 24+77 LT TANGENT END TREATMENT TL-3
STA 24+37 TO STA 24+77 RT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 24+37 TO STA 24+77 LT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+06 TO STA 25+46 RT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+06 TO STA 25+46 LT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+46 TO STA 25+60 RT (TL-3)
STA 25+46 TO STA 25+79 LT (TL-3)
STA 25+60 TO STA 25+72 RT TANGENT END TREATMENT TL-3
STA 25+79 TO STA 25+91 LT TANGENT END TREATMENT TL-3
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
SEE UTILITY PLANS
DRAINAGE DETAILS
MONSON ROAD
PROP EOP
PROP HMA CURB
PROP FULL DEPTH CONSTRUCTION
PROP NATIVE STREAMBED MATERIAL (TYP.)
PROP DENSE GRADED CRUSHED STONE FOR SHOULDER (TYP.)
PROP HMA DWY
PROP SAWCUT
PROP CONCRETE BOX CULVERT 1 (24'x92')
(SEE SHEETS 103-166 FOR CULVERT 1 (24'x92') DETAIL FOR 404 IMPACTS)
PROP MODIFIED ROCKFILL
PROP LOAM & SEED (TYP.)
PROP SEDIMENT CONTROL BARRIER (TYP.)
PAVEMENT MILLING AND OVERLAY (TYP.)
GUARDRAIL (TYP.)
+75 END MODIFIED ROCK FILL 1.5:1 SLOPE
+25 BEG MODIFIED ROCK FILL 1.5:1 SLOPE
STA 23+25 TO STA 24+25 MODIFIED ROCK FILL 1.5:1 SLOPE
NEW W.O.T.U.S. CREATED 125 SF BANK LENGTH 9 LF
NEW W.O.T.U.S. CREATED 161 SF BANK LENGTH 10 LF
DRAINAGE EASEMENT
SLOPE EASEMENT
TEMP CONST EASEMENT
PERM UTIL EASEMENT
RET FENCE
REM TREE (6)
APPROX LIMIT OF CLEARING & GRUBBING
151 MONSON ROAD N/F PLUMLEY 2006 REVOCABLE TRUST BK 7422 PG 145 MAP 100 LOT 151
150 MONSON ROAD N/F JEFFERY NEWSOM&M BK 5910 PG 404 MAP 100 LOT 155
155 MONSON ROAD N/F JODI L ROBERTS BK 14558 PG 227 MAP 100.0 LOT 155
BENEFICIARY: 155 MONSON ROAD N/F JODI L ROBERTS
TEMPORARY W.O.T.U.S. IMPACT = 192 SF DREDGE = 7 CY
TEMPORARY BANK IMPACT = 26 LF
PERMANENT W.O.T.U.S. IMPACT = 282 SF
TEMPORARY V.W. IMPACT = 9 SF
PERMANENT V.W. IMPACT = 41 SF
TEMPORARY BANK IMPACT = 34 LF
TEMPORARY W.O.T.U.S. IMPACT = 149 SF DREDGE = 9 CY
404 IMPACT DETAIL
IMPACT LEGEND
NEW W.O.T.U.S.CREATED (AREA & BANK LENGTH)
WETLAND REPLICATION/RESTORATION AREA
OHW ORDINARY HIGH WATER
W.O.T.U.S.=WATERS OF THE UNITED STATES
V.W.=VEGETATED WETLANDS
PERMANENT (SEE NOTE BELOW)
PERMANENT
TEMPORARY
TEMPORARY
NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS
SCALE: 1" = 20'
FOR PROFILE SEE SHEET NO. 23
CONTINUED ON SHEET NO. 9
CONTINUED ON SHEET NO. 11

A00830 -1027

Proposal No. 608163-128112

HIGHWAY GUARD DETAILS
STA 42+75 TO STA 42+87 RT TANGENT END TREATMENT TL-3
STA 42+87 TO STA 43+66 RT (TL-3)

TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
NONE

DRAINAGE DETAILS
SEE UTILITY PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	2	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	0	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'Octoper Glory'	Red Maple	3-3.5"	B&B	

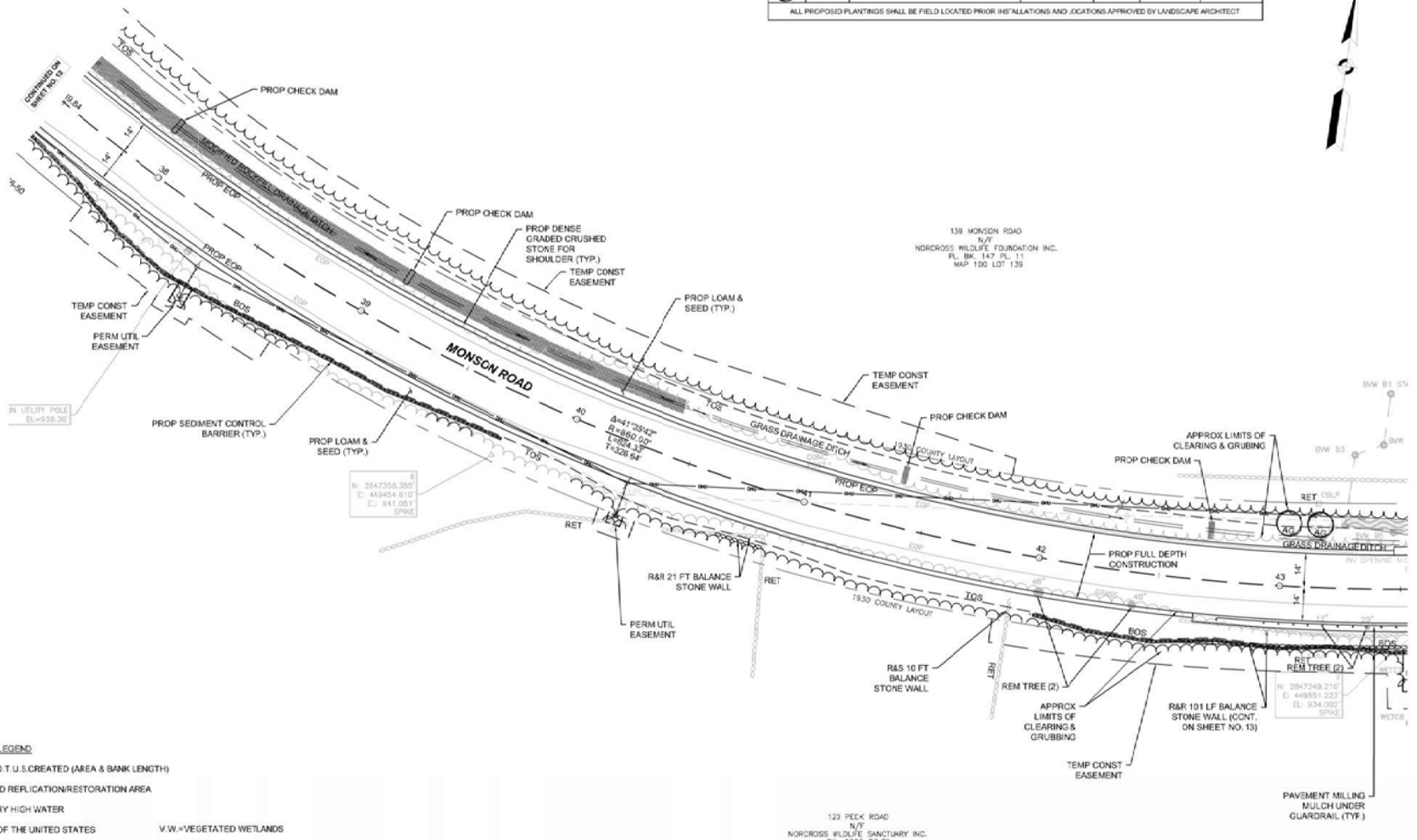
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CONSTRUCTION PLANS

N



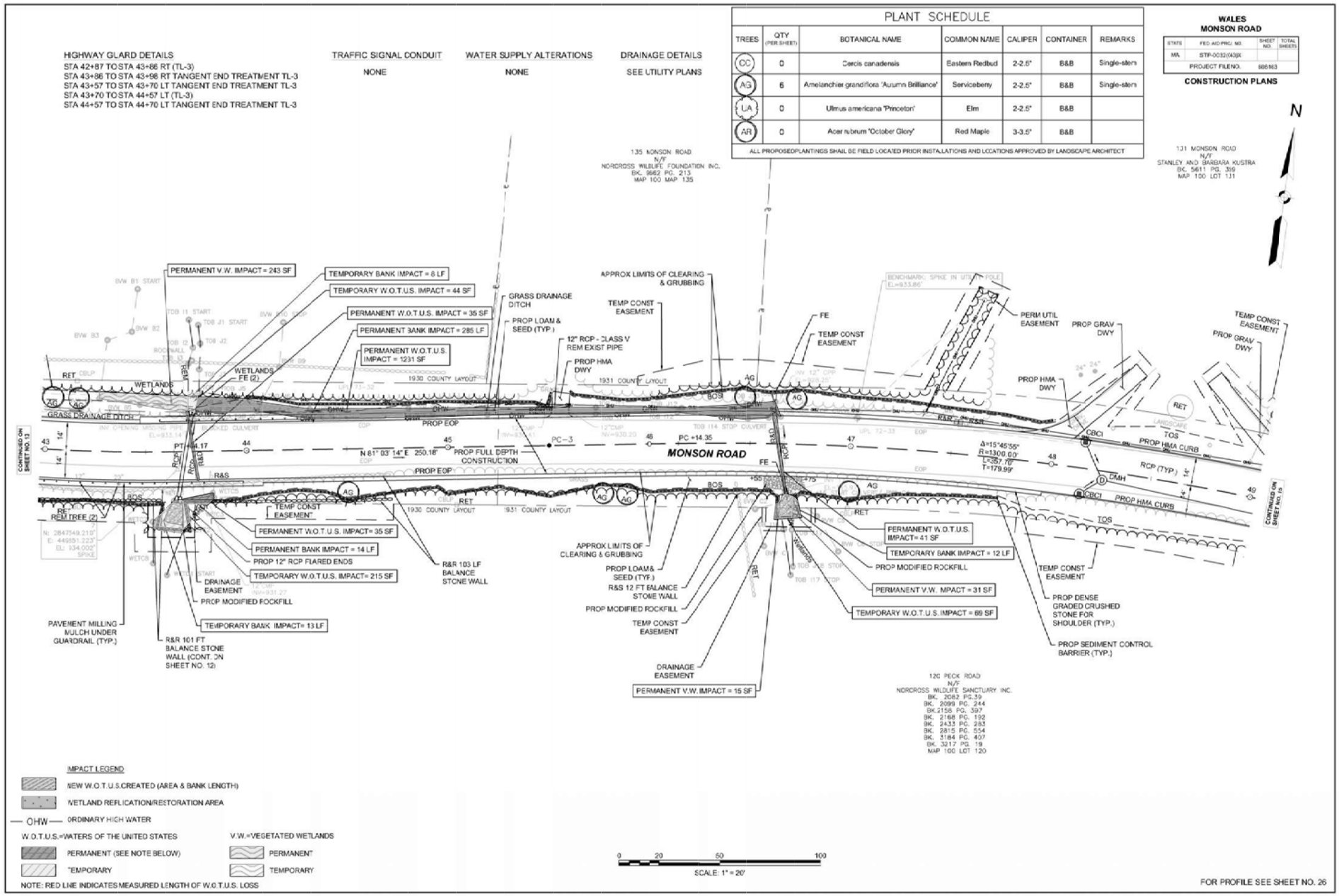
IMPACT LEGEND

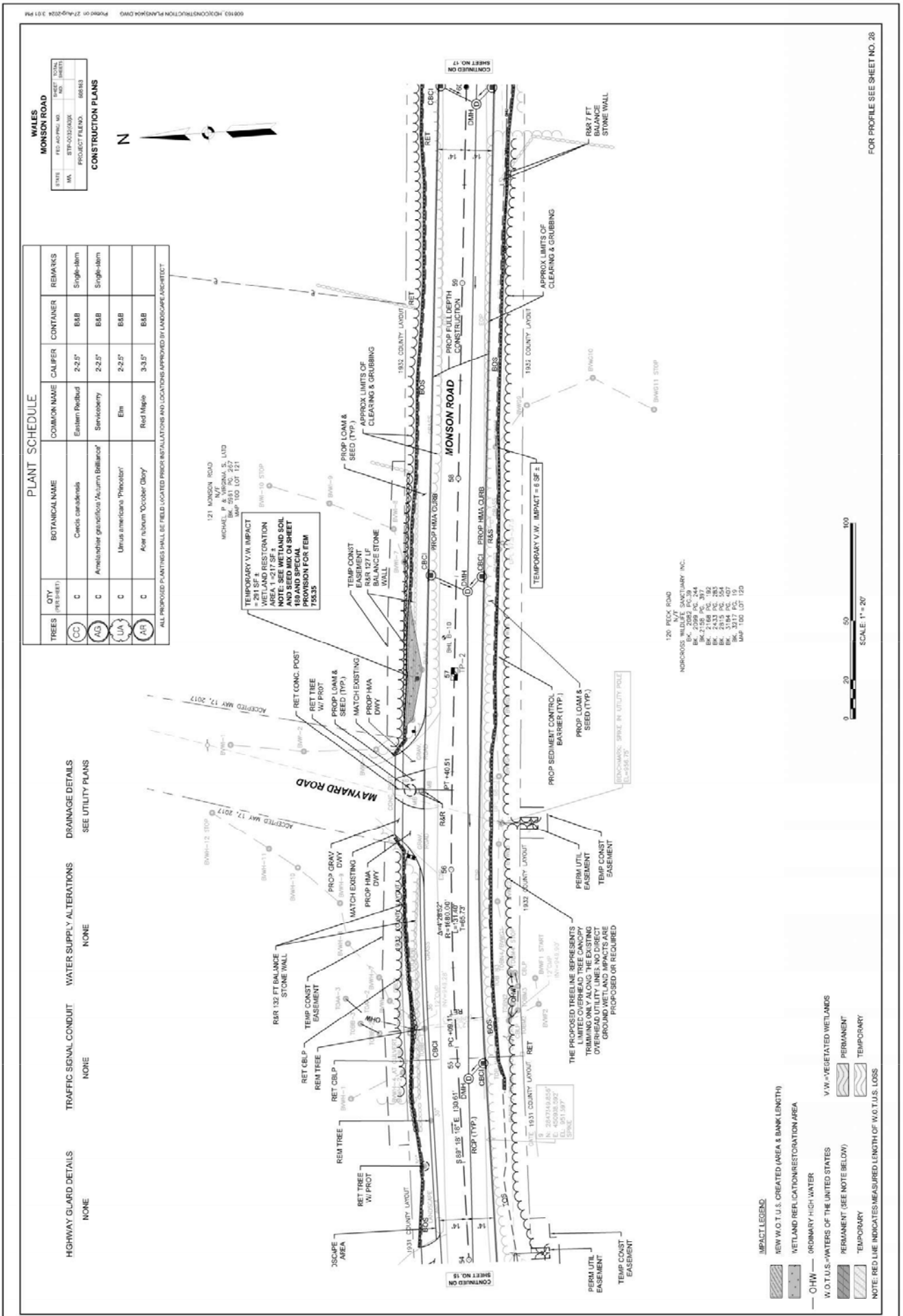
NEW W.O.T.U.S.CREATED (AREA & BANK LENGTH)
WETLAND REPLICATION/RESTORATION AREA
— OHW — ORDINARY HIGH WATER
W.O.T.U.S.=WATERS OF THE UNITED STATES
PERMANENT (SEE NOTE BELOW)
TEMPORARY
V.W.=VEGETATED WETLANDS
PERMANENT
TEMPORARY
NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS

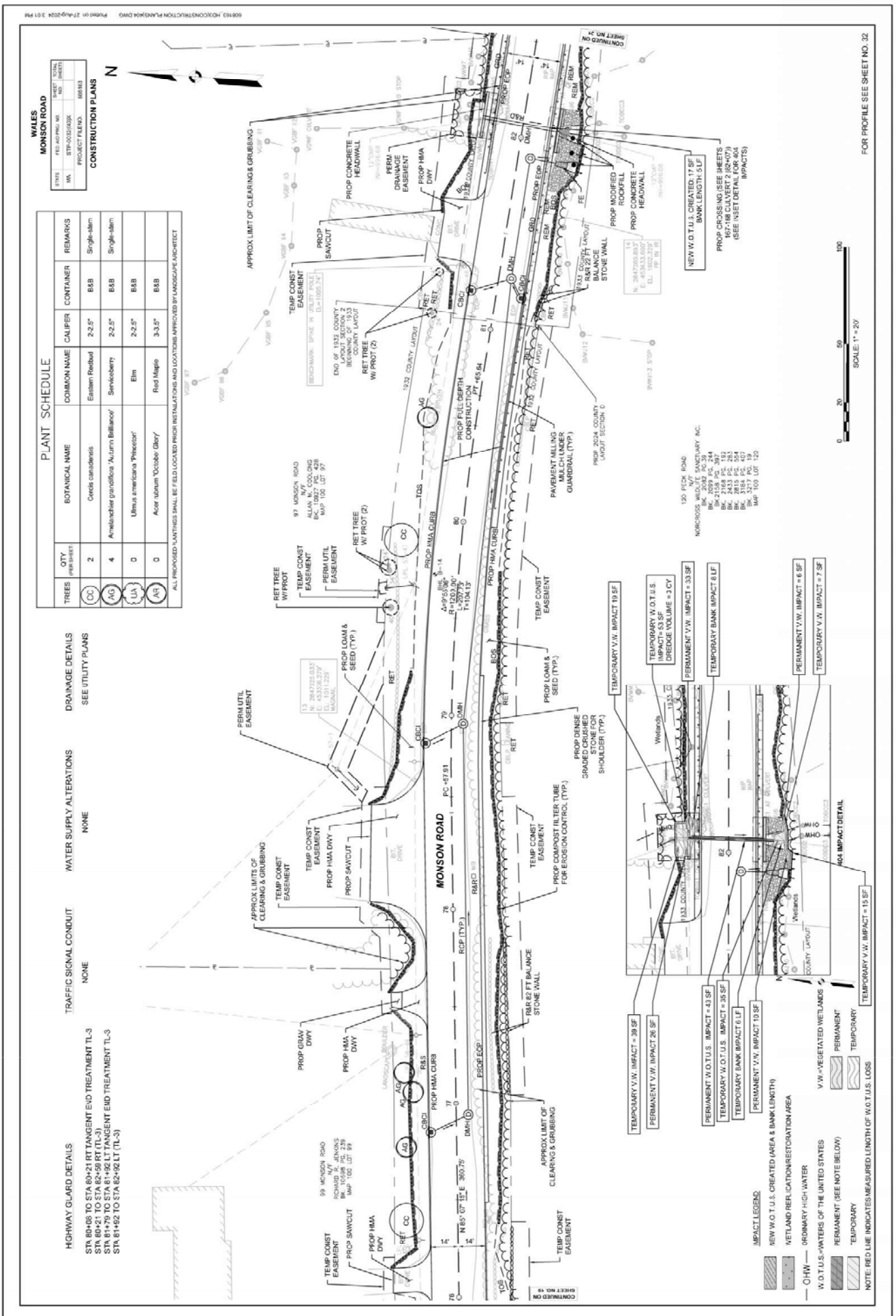
0 20 50 100
SCALE: 1" = 20'

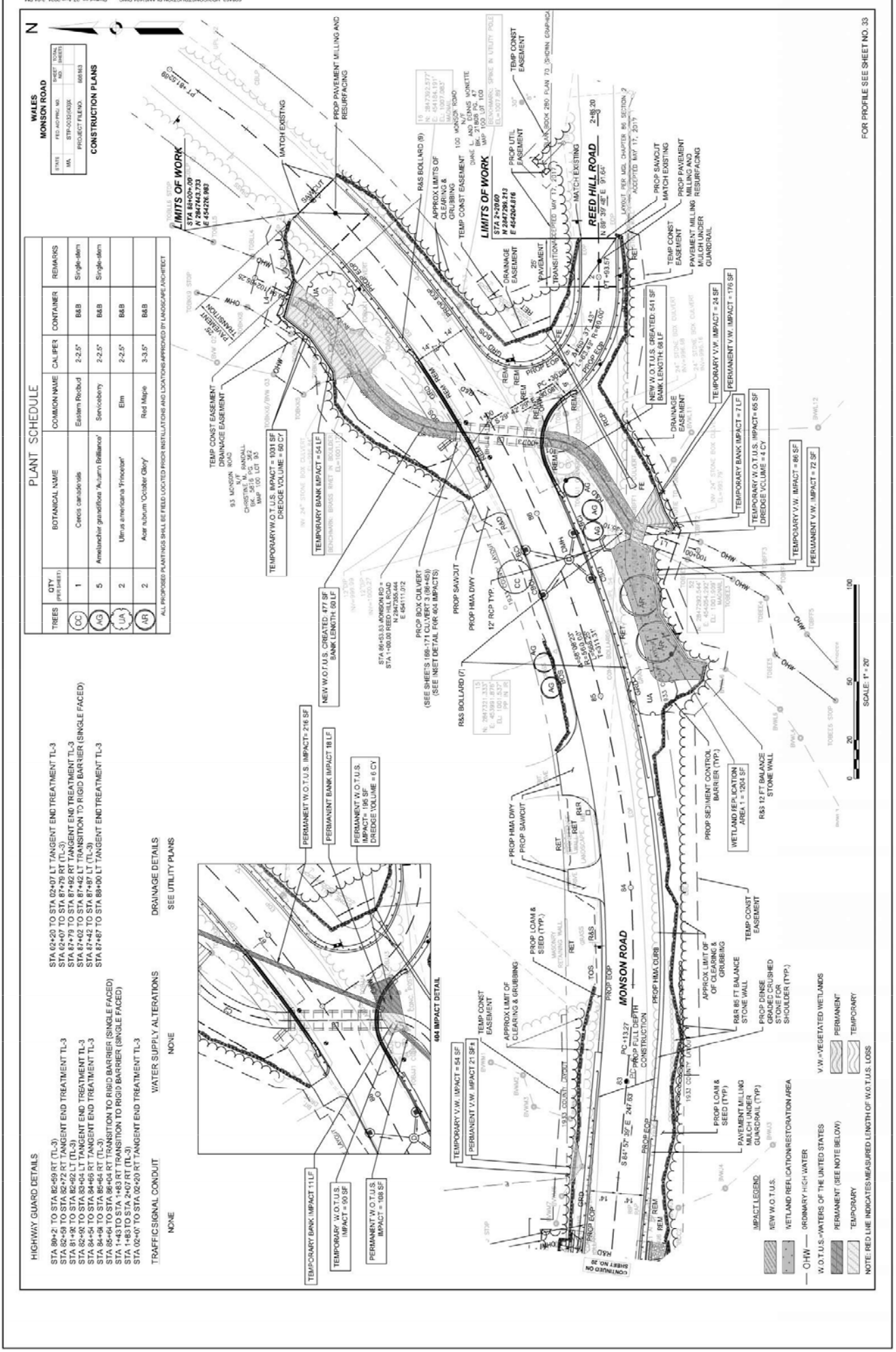
FOR PROFILE SEE SHEET NO. 26

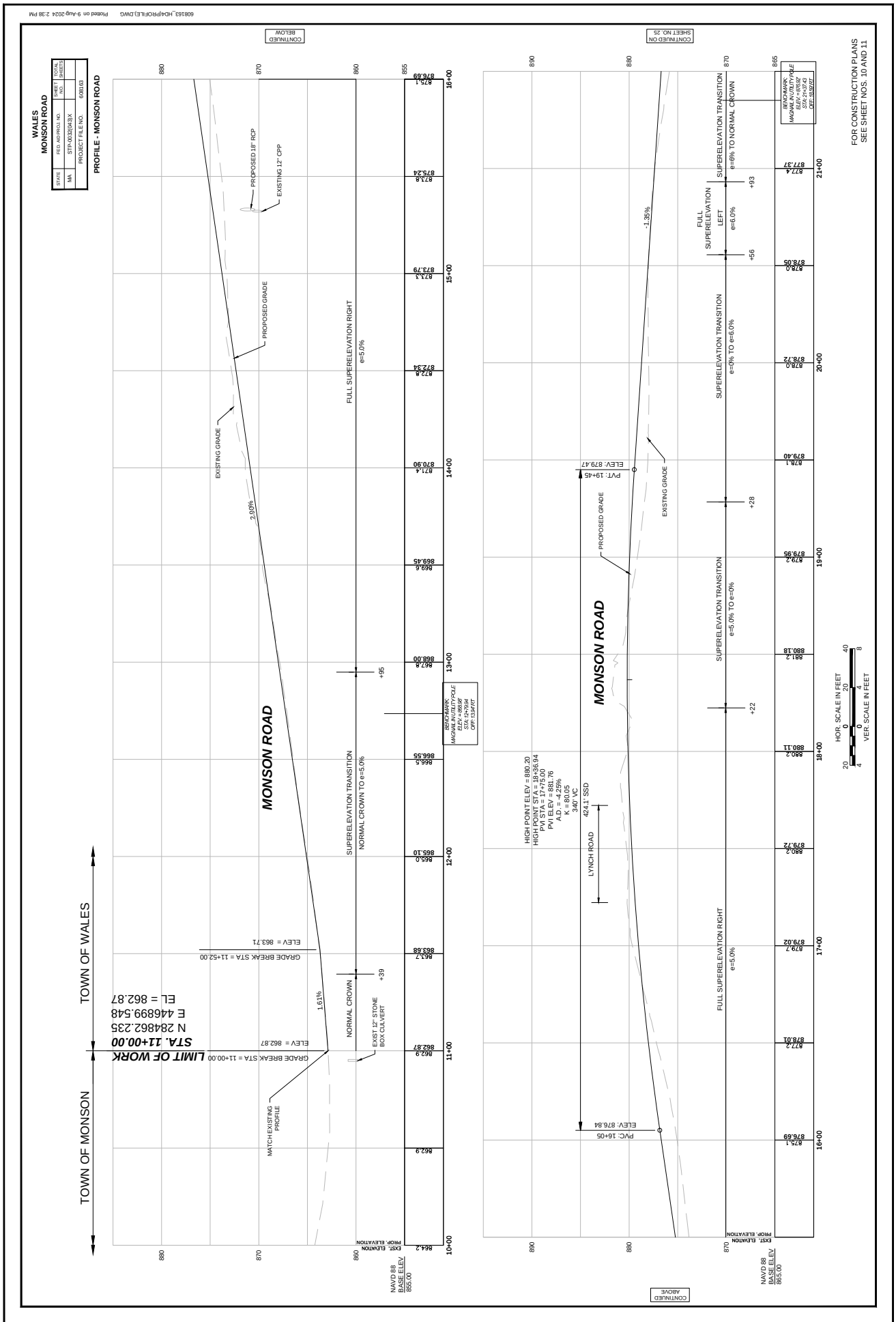
608163_HD\CONSTRUCTION PLANS\H34.DWG Plotted on 27-Aug-2024 3:01 PM

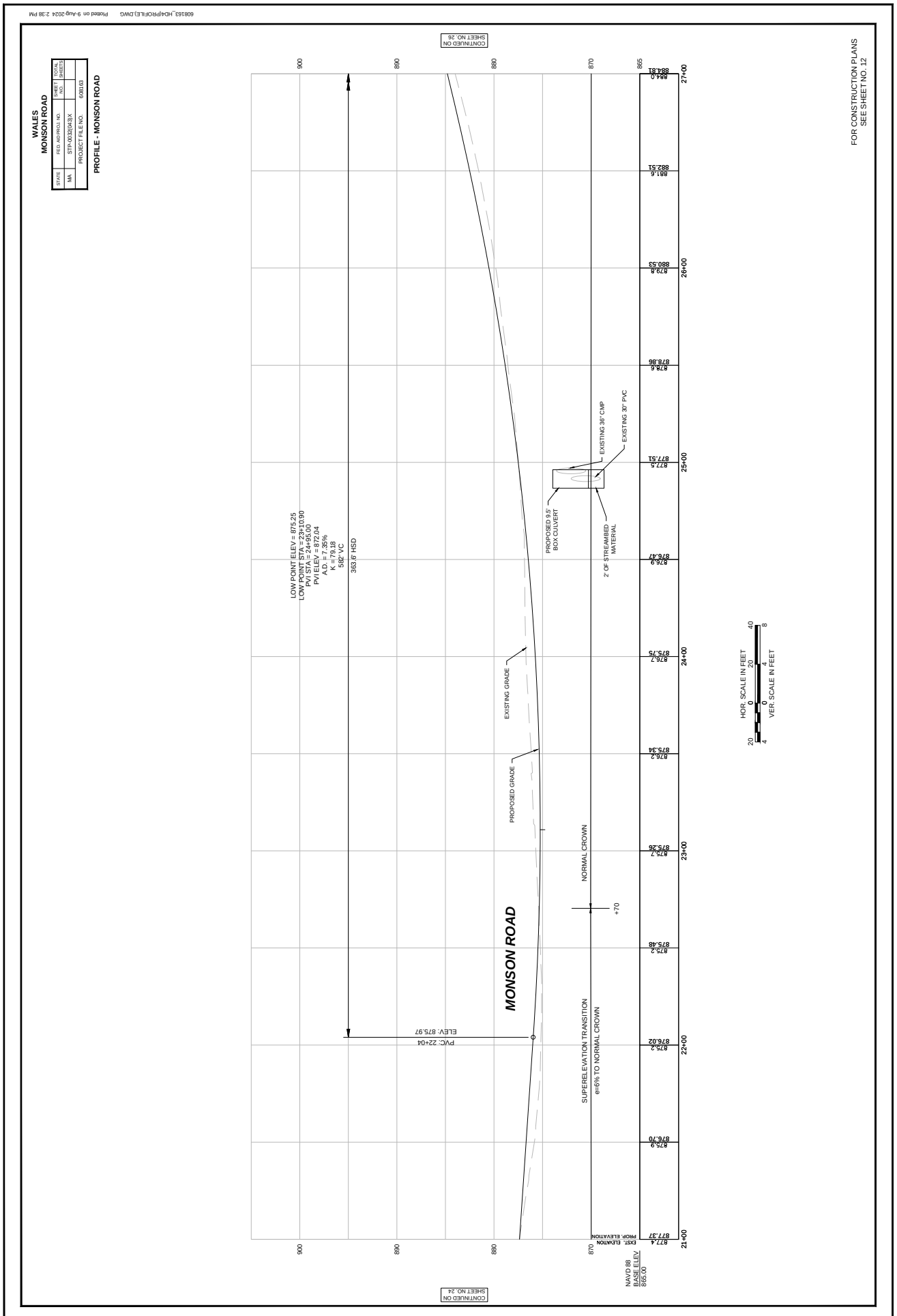

HIGHWAY GUARD DETAILS
STA 42+87 TO STA 43+86 RT (TL-3)
STA 43+86 TO STA 43+98 RT TANGENT END TREATMENT TL-3
STA 43+57 TO STA 43+70 LT TANGENT END TREATMENT TL-3
STA 43+70 TO STA 44+57 LT (TL-3)
STA 44+57 TO STA 44+70 LT TANGENT END TREATMENT TL-3
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
PLANT SCHEDULE
TREES | QTY (PER SHEET) | BOTANICAL NAME | COMMON NAME | CALIPER | CONTAINER | REMARKS
CC | 0 | Cercis canadensis | Eastern Redbud | 2-2.5" | B&B | Single-stem
AG | 6 | Amelanchier grandiflora 'Autumn Brilliance' | Serviceberry | 2-2.5" | B&B | Single-stem
UA | 0 | Ulmus americana 'Princeton' | Elm | 2-2.5" | B&B
AR | 0 | Acer rubrum 'October Glory' | Red Maple | 3-3.5" | B&B
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
WALES
MONSON ROAD
STATE | FED. AID PROJ. NO. | SHEET NO. | TOTAL SHEETS
MA | STP-0032(43)X | | |
PROJECT FILE NO. 608163
CONSTRUCTION PLANS
N
135 MONSON ROAD
N/F
NORCROSS WILDLIFE FOUNDATION INC.
BK. 9662 PG. 213
MAP 100 MAP 135
131 MONSON ROAD
N/F
STANLEY AND BARBARA KUSTRA
BK. 5611 PG. 359
MAP 100 LOT 131
PERMANENT V.W. IMPACT = 243 SF
TEMPORARY BANK IMPACT = 8 LF
TEMPORARY W.O.T.U.S. IMPACT = 44 SF
PERMANENT W.O.T.U.S. IMPACT = 35 SF
PERMANENT BANK IMPACT = 285 LF
PERMANENT W.O.T.U.S. IMPACT = 1231 SF
GRASS DRAINAGE DITCH
PROP LOAM & SEED (TYP.)
12" RCP - CLASS V REM EXIST PIPE
PROP HMA DWY
APPROX LIMITS OF CLEARING & GRUBBING
TEMP CONST EASEMENT
FE
PERM UTIL EASEMENT
PROP GRAV DWY
PROP HMA DWY
WETLANDS FE (2)
GRASS DRAINAGE DITCH
PROP EOP
PROP FULL DEPTH CONSTRUCTION
PC-3
PC +14.35
N 81° 03' 14" E 250.18'
MONSON ROAD
Δ=15°45'55"
R=1300.00'
L=357.70'
T=179.99'
PROP HMA CURB
RCP (TYP.)
TOS
CBCI
DMH
REM TREE (2)
TEMP CONST EASEMENT
PERMANENT W.O.T.U.S. IMPACT= 35 SF
PERMANENT BANK IMPACT = 14 LF
PROP 12" RCP FLARED ENDS
TEMPORARY W.O.T.U.S. IMPACT= 215 SF
DRAINAGE EASEMENT
PROP MODIFIED ROCKFILL
TEMPORARY BANK IMPACT= 13 LF
PAVEMENT MILLING MULCH UNDER GUARDRAIL (TYP.)
R&R 101 FT BALANCE STONE WALL (CONT. ON SHEET NO. 12)
R&R 103 LF BALANCE STONE WALL
APPROX LIMITS OF CLEARING & GRUBBING
PROP LOAM & SEED (TYP.)
R&S 12 FT BALANCE STONE WALL
PROP MODIFIED ROCKFILL
TEMP CONST EASEMENT
DRAINAGE EASEMENT
PERMANENT V.W. IMPACT = 15 SF
PERMANENT W.O.T.U.S. IMPACT= 41 SF
TEMPORARY BANK IMPACT = 12 LF
PROP MODIFIED ROCKFILL
PERMANENT V.W. IMPACT = 31 SF
TEMPORARY W.O.T.U.S. IMPACT = 69 SF
TEMP CONST EASEMENT
PROP DENSE GRADED CRUSHED STONE FOR SHOULDER (TYP.)
PROP SEDIMENT CONTROL BARRIER (TYP.)
120 PECK ROAD
N/F
NORCROSS WILDLIFE SANCTUARY INC.
BK. 2082 PG.39
BK. 2099 PG. 244
BK.2158 PG. 397
BK. 2168 PG. 192
BK. 2433 PG. 283
BK. 2815 PG. 554
BK. 3184 PG. 407
BK. 3217 PG. 19
MAP 100 LOT 120
CONTINUED ON SHEET NO. 13
CONTINUED ON SHEET NO. 15
IMPACT LEGEND
NEW W.O.T.U.S.CREATED (AREA & BANK LENGTH)
WETLAND REPLICATION/RESTORATION AREA
OHW ORDINARY HIGH WATER
W.O.T.U.S.=WATERS OF THE UNITED STATES
PERMANENT (SEE NOTE BELOW)
TEMPORARY
V.W.=VEGETATED WETLANDS
PERMANENT
TEMPORARY
NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS
0 20 50 100
SCALE: 1" = 20'
FOR PROFILE SEE SHEET NO. 26
608163_HD3(CONSTRUCTION PLANS)404.DWG Plotted on 27-Aug-2024 3:01 PM


WALES
MONSON ROAD
CONSTRUCTION PLANS
PLANT SCHEDULE
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
NONE
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
MAYNARD ROAD
MONSON ROAD
ACCEPTED MAY 12, 2017
TEMPORARY V.W. IMPACT = 6 SF ±
TEMPORARY V.W. IMPACT = 217 SF ±
WETLAND RESTORATION
AREA 1 =217 SF ±
NOTE: SEE WETLAND SOIL AND SEED MIX ON SHEET 18B AND SPECIAL PROVISION FOR ITEM 765.35
THE PROPOSED TREELINE REPRESENTS LIMITED OVERHEAD TREE CANOPY TRIMMING ONLY ALONG THE EXISTING OVERHEAD UTILITY LINES. NO DIRECT GROUND WETLAND IMPACTS ARE PROPOSED OR REQUIRED
IMPACT LEGEND
NEW W.O.T.U.S. CREATED (AREA & BANK LENGTH)
WETLAND REPLICATION/RESTORATION AREA
OHW — ORDINARY HIGH WATER
W.O.T.U.S.=WATERS OF THE UNITED STATES
V.W.=VEGETATED WETLANDS
PERMANENT (SEE NOTE BELOW)
PERMANENT
TEMPORARY
TEMPORARY
NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS
SCALE: 1" = 20'
FOR PROFILE SEE SHEET NO. 28


WALES
MONSON ROAD
CONSTRUCTION PLANS
PROJECT FILE NO. 608163
STP-0030(403)X
FED. AID PROJ. NO.
PLANT SCHEDULE
TREES
QTY. PER SHEET
BOTANICAL NAME
COMMON NAME
CALIPER
CONTAINER
REMARKS
Cercis canadensis
Eastern Redbud
2-2.5"
B&B
Single-stem
Amelanchier grandiflora 'Autumn Brilliance'
Serviceberry
2-2.5"
B&B
Single-stem
Ulmus americana 'Princeton'
Elm
2-2.5"
B&B
Acer rubrum 'October Glory'
Red Maple
3-3.5"
B&B
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 80+08 TO STA 80+21 RT TANGENT END TREATMENT TL-3
STA 80+21 TO STA 82+58 RT (TL-3)
STA 81+79 TO STA 81+92 LT TANGENT END TREATMENT TL-3
STA 81+92 TO STA 82+92 LT (TL-3)
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
MONSON ROAD
PROP FULL DEPTH CONSTRUCTION
PROP 2024 COUNTY LAYOUT SECTION 0
PAVEMENT MILLING MULCH UNDER GUARDRAIL (TYP.)
PROP LOAM & SEED (TYP.)
PROP HMA CURB
PROP SAWCUT
PROP HMA DWY
PROP GRAV DWY
PROP CONCRETE HEADWALL
PROP MODIFIED ROCKFILL
PROP CROSSING (SEE SHEETS 167-168 CULVERT 2 (62+07) (SEE NSET DETAIL FOR 404 IMPACTS)
NEW W.O.T.U.S. CREATED: 17 SF BANK LENGTH: 5 LF
PERM DRAINAGE EASEMENT
TEMP CONST EASEMENT
PERM UTIL EASEMENT
APPROX LIMITS OF CLEARING & GRUBBING
APPROX LIMIT OF CLEARING & GRUBBING
PROP COMPOST FILTER TUBE FOR EROSION CONTROL (TYP.)
PROP DENSE GRADED CRUSHED STONE FOR SHOULDER (TYP.)
R&R 82 FT BALANCE STONE WALL
RET TREE W/ PROT
RET TREE W/ PROT (2)
PERM UTIL EASEMENT
97 MONSON ROAD N/T ALLAN M. COOLONG BK. 10927 PG. 428 MAP 100 LOT 97
99 MONSON ROAD N/T RICHARD R. JENKINS BK. 10598 PG. 239 MAP 100 LOT 99
120 PECK ROAD N/T NORCROSS WILDLIFE SANCTUARY INC. BK. 2508 PG. 244 BK. 2508 PG. 247 BK 2158 PG. 397 BK. 2158 PG. 192 BK. 2158 PG. 193 BK. 2158 PG. 564 BK. 2815 PG. 564 BK. 3184 PG. 407 BK. 3217 PG. 133 MAP 100 LOT 120
END OF 1932 COUNTY LAYOUT SECTION 2 BEGINNING OF 1933 COUNTY LAYOUT
BENCHMARK: SPIKE IN UTILITY POLE ELEV=1005.74'
1932 COUNTY LAYOUT
1933 COUNTY LAYOUT
PROP CONST EASEMENT
TEMP CONST EASEMENT
PROP SAWCUT
PROP HMA DWY
PROP LOAM & SEED (TYP.)
PROP HMA CURB
PROP FULL DEPTH CONSTRUCTION
PT=65.64
PC=47.81
Δ=9°56'30" (Rt.)
R=120.00'
L=20.77'
T=104.13'
RCP (TYP.)
R&RC MD
R&S
PROP EOP
TOS
EOS
CBC
DMH
CC
AG
RET
BIT. DRIVE
N 65° 07' 15" E 360.75'
14'
TEMP CONST EASEMENT
PROP HMA DWY
PROP GRAV DWY
PROP SAWCUT
TEMP CONST EASEMENT
APPROX LIMITS OF CLEARING & GRUBBING
PERM UTIL EASEMENT
CONTINUED ON SHEET NO. 76
CONTINUED ON SHEET NO. 34
FOR PROFILE SEE SHEET NO. 32
SCALE: 1" = 20'
0
20
50
100
404 IMPACT DETAIL
Wetlands
1933 COUNTY LAYOUT
TEMPORARY V.W. IMPACT 19 SF
TEMPORARY W.O.T.U.S. IMPACT= 53 SF DREDGE VOLUME = 3 CY
PERMANENT V.W. IMPACT = 33 SF
TEMPORARY BANK IMPACT 6 LF
PERMANENT V.W. IMPACT = 6 SF
TEMPORARY V.W. IMPACT = 7 SF
TEMPORARY V.W. IMPACT = 39 SF
PERMANENT V.W. IMPACT 26 SF
PERMANENT W.O.T.U.S. IMPACT = 43 SF
TEMPORARY W.O.T.U.S. IMPACT = 35 SF
TEMPORARY BANK IMPACT 6 LF
PERMANENT V.W. IMPACT 10 SF
TEMPORARY V.W. IMPACT = 15 SF
IMPACT LEGEND
NEW W.O.T.U.S. CREATED (AREA & BANK LENGTH)
WETLAND REPLICATION/RESTORATION AREA
ORDINARY HIGH WATER
W.O.T.U.S.=WATERS OF THE UNITED STATES
V.W.=VEGETATED WETLANDS
PERMANENT (SEE NOTE BELOW)
PERMANENT
TEMPORARY
TEMPORARY
NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS


WALES
MONSON ROAD
CONSTRUCTION PLANS
PROJECT FILE NO. 608163
STIP-0030(493)X
FED. AID PROJ. NO.
PLANT SCHEDULE
TREES
QTY (PER SHEET)
BOTANICAL NAME
COMMON NAME
CALIPER
CONTAINER
REMARKS
Cercis canadensis
Eastern Redbud
2-2.5"
B&B
Single-stem
Amelanchier grandiflora 'Autumn Brilliance'
Serviceberry
2-2.5"
B&B
Single-stem
Ulmus americana 'Princeton'
Elm
2-2.5"
B&B
Acer rubrum 'October Glory'
Red Maple
3-3.5"
B&B
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 80+2: TO STA 82+59 RT (TL-3)
STA 82+59: TO STA 82+72 RT TANGENT END TREATMENT TL-3
STA 82+72: TO STA 82+98 RT (TL-3)
STA 82+98: TO STA 83+04 LT TANGENT END TREATMENT TL-3
STA 84+54: TO STA 84+66 RT TANGENT END TREATMENT TL-3
STA 84+66: TO STA 85+64 RT (TL-3)
STA 85+64: TO STA 86+04 RT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 1+43 TO STA 1+83 RT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 1+83 TO STA 2+07 RT (TL-3)
STA 02+0" TO STA 02+20 RT TANGENT END TREATMENT TL-3
STA 02+20 TO STA 02+07 LT TANGENT END TREATMENT TL-3
STA 02+07 TO STA 87+79 RT (TL-3)
STA 87+79 TO STA 87+92 RT TANGENT END TREATMENT TL-3
STA 87+02 TO STA 87+42 LT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 87+42 TO STA 87+87 LT (TL-3)
STA 87+87 TO STA 88+00 LT TANGENT END TREATMENT TL-3
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
LIMITS OF WORK
STA 85+09.09
N 2847143.733
E 454226.983
LIMITS OF WORK
STA 2+20.00
N 2847296.213
E 454264.816
MONSON ROAD
REED HILL ROAD
MATCH EXISTING
PROP PAVEMENT MILLING AND RESURFACING
TEMP CONST EASEMENT
DRAINAGE EASEMENT
PROP UTIL EASEMENT
PROP SAWCUT MATCH EXISTING
PAVEMENT MILLING MULCH UNDER GUARDRAIL
TEMP CONST EASEMENT DRAINAGE EASEMENT
93 MONSON ROAD N/F RANDALL CHRISTINE M. DEED BK. 5818 PG. 362 MAP 100 LOT 83
100 MONSON ROAD N/F JAMES L. AND DENIS MONETTE DEED BK. 21808 PG. 47 MAP 100 LOT 160
TEMPORARY W.O.T.U.S. IMPACT = 1031 SF DREDGE VOLUME = 60 CY
TEMPORARY BANK IMPACT = 54 LF
NEW W.O.T.U.S. CREATED: 477 SF BANK LENGTH: 60 LF
PROP BOX CULVERT (SEE SHEETS 168-171 CULVERT 3 (86+45)) (SEE INSET DETAIL FOR 404 IMPACTS)
PROP SAWCUT
PROP HMA DWY
12" RCP TYP.
R&S BOLLARD (7)
R&S BOLLARD (9)
APPROX LIMITS OF CLEARING & GRUBBING
TEMP CONST EASEMENT
NEW W.O.T.U.S. CREATED: 541 SF BANK LENGTH: 68 LF
TEMPORARY BANK IMPACT = 7 LF
TEMPORARY W.O.T.U.S. IMPACT= 65 SF DREDGE VOLUME = 4 CY
TEMPORARY V.W. IMPACT = 24 SF
PERMANENT V.W. IMPACT = 176 SF
TEMPORARY V.W. IMPACT = 86 SF
PERMANENT V.W. IMPACT = 72 SF
PERMANENT W.O.T.U.S. IMPACT= 216 SF
PERMANENT BANK IMPACT 18 LF
PERMANENT W.O.T.U.S. IMPACT= 195 SF DREDGE VOLUME = 6 CY
TEMPORARY BANK IMPACT 111 LF
TEMPORARY W.O.T.U.S. IMPACT = 90 SF
PERMANENT W.O.T.U.S. IMPACT = 108 SF
404 IMPACT DETAIL
TEMPORARY V.W. IMPACT = 54 SF
PERMANENT V.W. IMPACT 21 SF+
TEMP CONST EASEMENT
APPROX LIMIT OF CLEARING & GRUBBING
PROP LOAM & SEED (TYP.)
PROP HMA DWY
PROP SAWCUT
PROP SEDIMENT CONTROL BARRIER (TYP.)
WETLAND REPLICATION AREA 1 = 1204 SF
R&S 12 FT BALANCE STONE WALL
R&R 85 FT BALANCE STONE WALL
PROP DENSE GRADED CRUSHED STONE 6" SHOULDER (TYP.)
PROP HMA CURB
PROP EOP
PROP FULL DEPTH CONSTRUCTION
PAVEMENT MILLING MULCH UNDER GUARDRAIL (TYP.)
IMPACT LEGEND
NEW W.O.T.U.S.
WETLAND REPLICATION/RESTORATION AREA
ORDINARY HIGH WATER
W.O.T.U.S.=WATERS OF THE UNITED STATES
V.W.=VEGETATED WETLANDS
PERMANENT (SEE NOTE BELOW)
PERMANENT
TEMPORARY
TEMPORARY
NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS
CONTINUED ON SHEET NO. 28
FOR PROFILE SEE SHEET NO. 33
SCALE: 1" = 20'
0
20
50
100
N


WALES
MONSON ROAD
PROFILE - MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
CONTINUED BELOW
CONTINUED ON SHEET NO. 25
CONTINUED ABOVE
TOWN OF WALES
TOWN OF MONSON
LIMIT OF WORK
STA. 11+00.00
N 284862.235
E 446899.548
EL = 862.87
MONSON ROAD
PROPOSED 18" RCP
EXISTING 12" CPP
PROPOSED GRADE
EXISTING GRADE
FULL SUPERELEVATION RIGHT
e=5.0%
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=5.0%
NORMAL CROWN
GRADE BREAK STA = 11+52.00
ELEV = 863.71
GRADE BREAK STA = 11+00.00
ELEV = 862.87
EXIST 12" STONE BOX CULVERT
MATCH EXISTING PROFILE
BENCHMARK: MAGNAL IN UTILITY POLE
ELEV = 866.98'
STA: 12+79.94
OFF: 13.94' RT
2.90%
1.61%
-1.35%
HIGH POINT ELEV = 880.20
HIGH POINT STA = 18+36.94
PVI STA = 17+75.00
PVI ELEV = 881.76
A.D. = -4.25%
K = 80.05
340' VC
424.1' SSD
LYNCH ROAD
PVT: 19+45
ELEV: 879.47
PVC: 16+05
ELEV: 876.84
FULL SUPERELEVATION LEFT
e=6.0%
SUPERELEVATION TRANSITION
e=6% TO NORMAL CROWN
e=0% TO e=6.0%
e=5.0% TO e=0%
BENCHMARK: MAGNAL IN UTILITY POLE
ELEV = 876.92'
STA: 21+37.43
OFF: 18.92' RT
FOR CONSTRUCTION PLANS
SEE SHEET NOS. 10 AND 11
HOR. SCALE IN FEET
VER. SCALE IN FEET
NAVD 88
BASE ELEV
865.00
EXIST. ELEVATION
PROP. ELEVATION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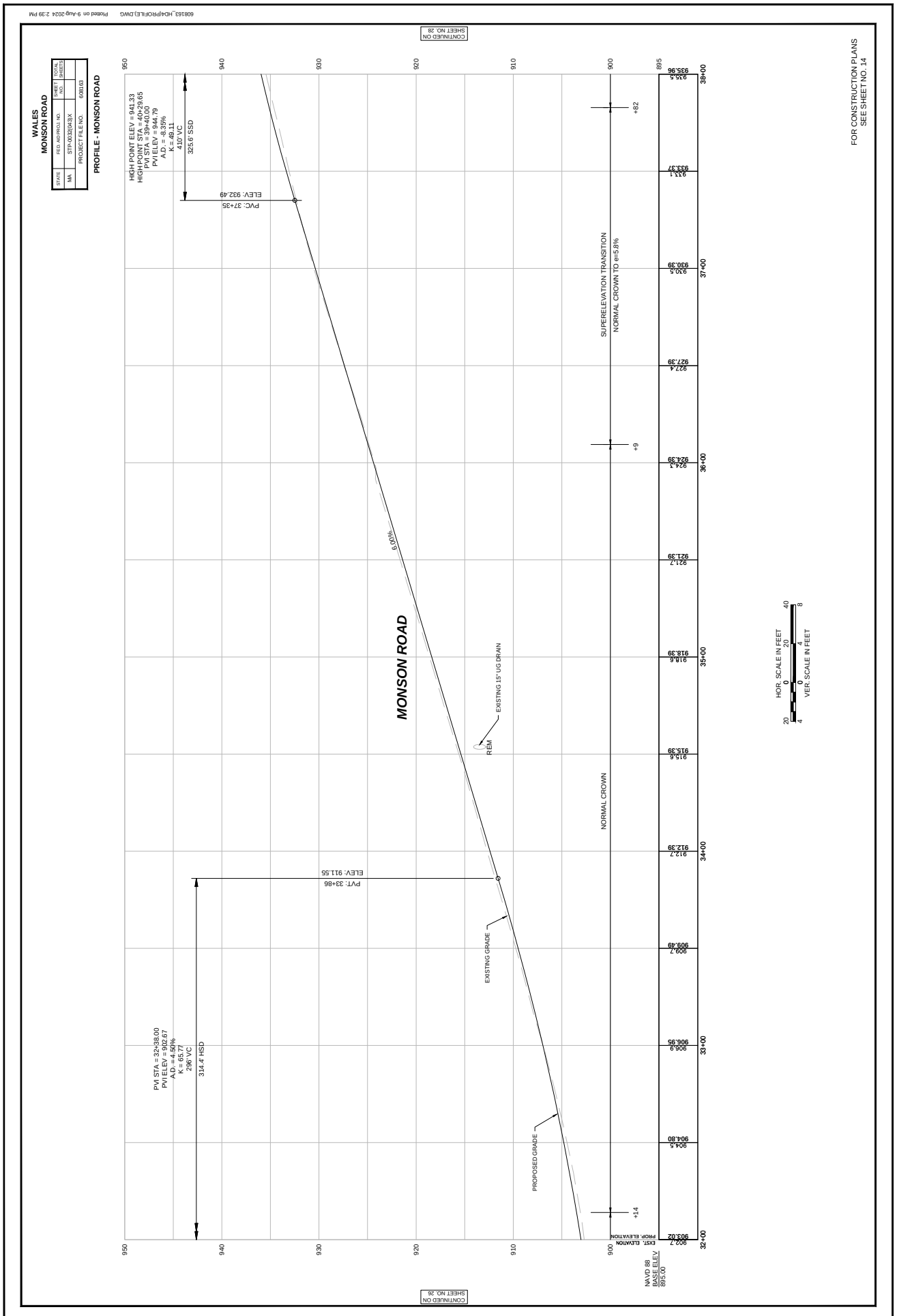
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
PROFILE - MONSON ROAD
FOR CONSTRUCTION PLANS
SEE SHEET NO. 12
CONTINUED ON SHEET NO. 24
CONTINUED ON SHEET NO. 28
MONSON ROAD
EXISTING GRADE
PROPOSED GRADE
NORMAL CROWN
+70
SUPERELEVATION TRANSITION
e=6% TO NORMAL CROWN
LOW POINT ELEV = 875.25
LOW POINT STA = 23+31.00
PVI STA = 24+95.00
PVI ELEV = 872.04
A.D. = 7.35%
K = 79.18
592' VC
363.6' HSD
PVC: 22+04
ELEV: 875.97
PROPOSED 9.5' BOX CULVERT
2' OF STREAMBED MATERIAL
EXISTING 36" CMP
EXISTING 30" PVC
HOR. SCALE IN FEET
VER. SCALE IN FEET
EXIST. ELEVATION
PROP. ELEVATION
NAVD 88 BASE FT. ELEV. 865.00
21+00
22+00
23+00
24+00
25+00
26+00
27+00
900
890
880
870
865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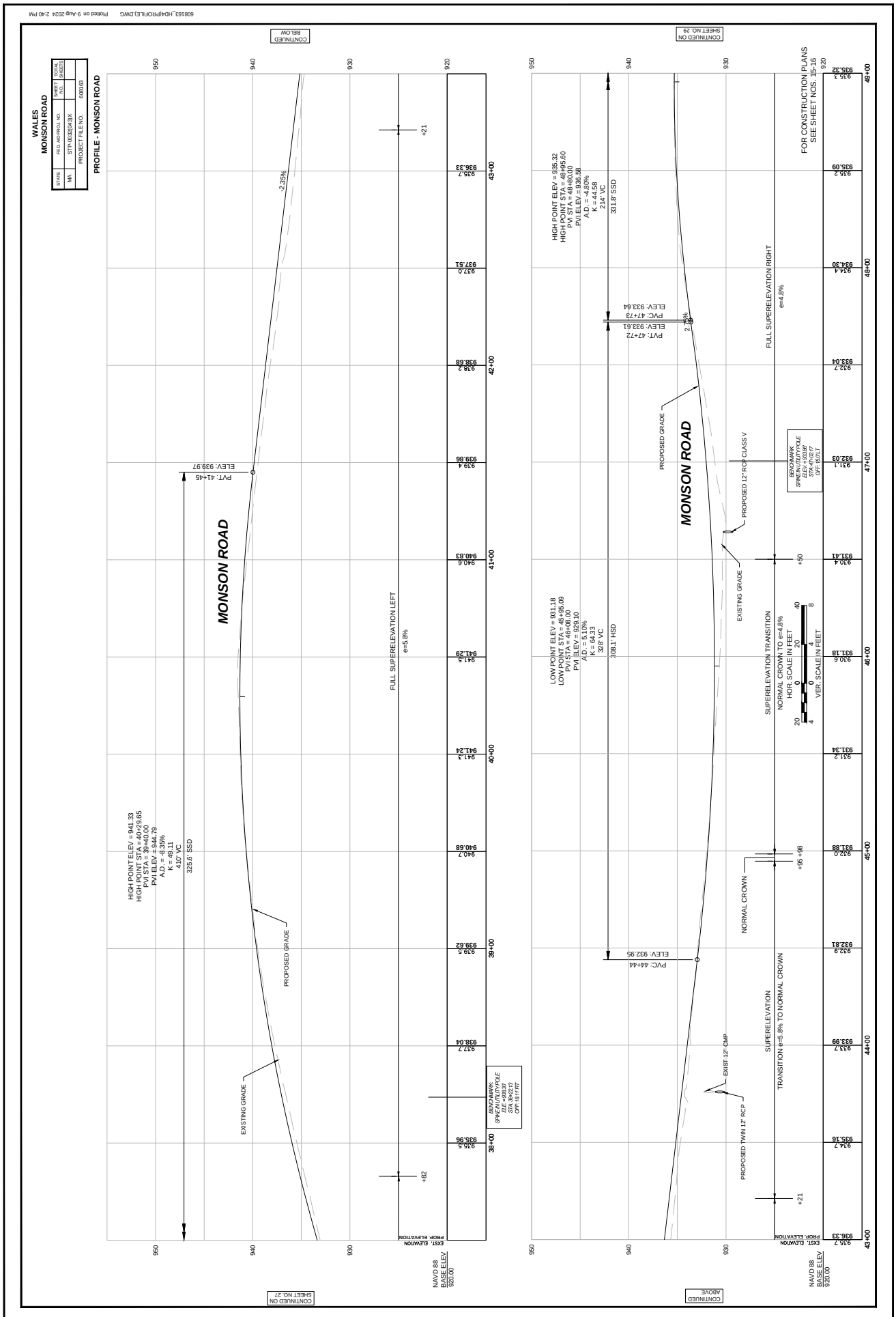
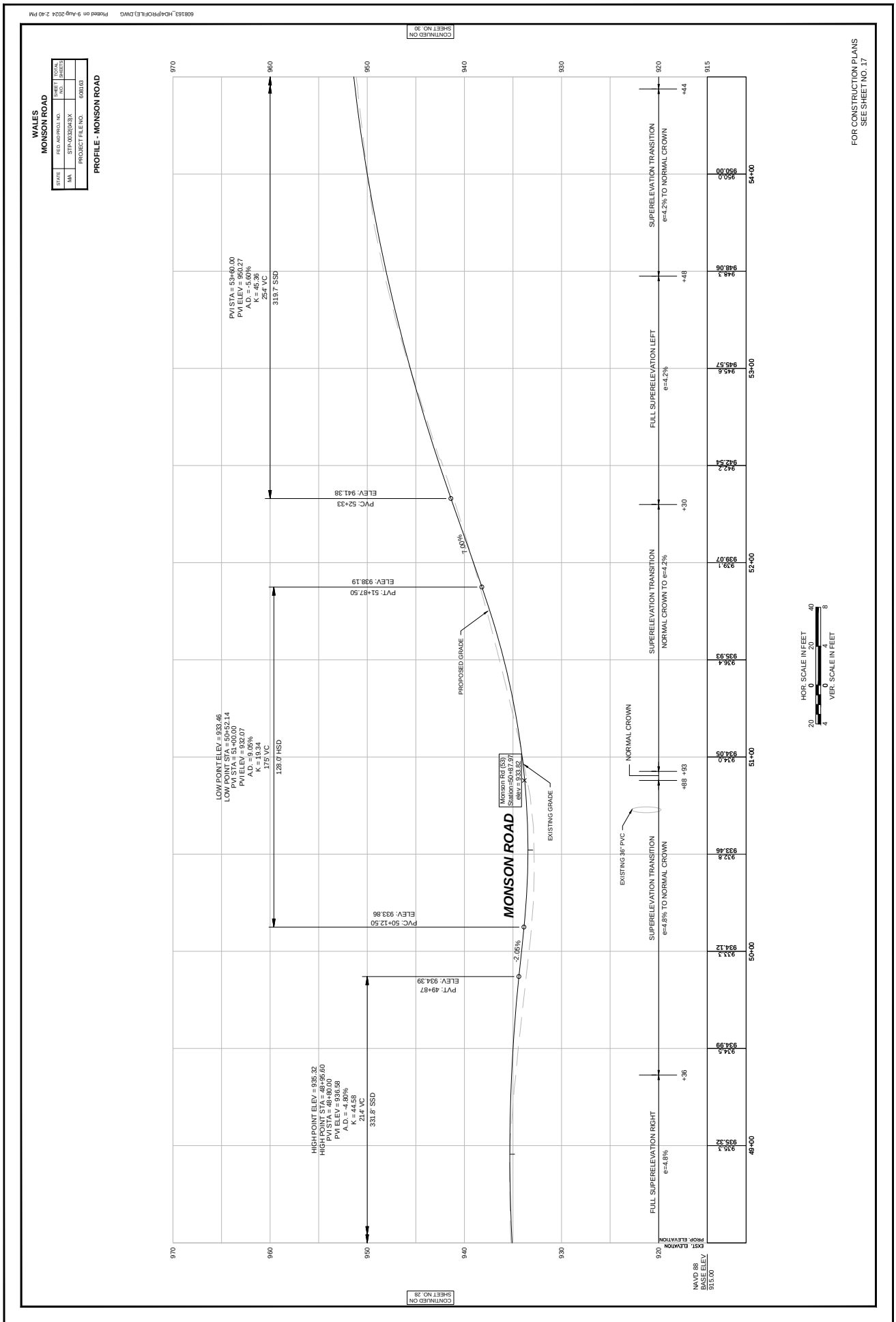
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
PROFILE - MONSON ROAD
FOR CONSTRUCTION PLANS
SEE SHEET NO. 14
CONTINUED ON SHEET NO. 28
CONTINUED ON SHEET NO. 26
MONSON ROAD
HIGH POINT ELEV = 941.33
HIGH POINT STA = 40+39.65
PVI STA = 39+40.00
PVI ELEV = 944.79
A.D. = -8.39%
K = 49.11
410' VC
325.6' SSD
PVC: 37+35
ELEV: 932.49
PVI STA = 32+38.00
PVI ELEV = 902.67
A.D. = 4.50%
K = 65.77
296' VC
314.4' HSD
PVT: 33+86
ELEV: 911.55
6.00%
REM
EXISTING 15" UG DRAIN
EXISTING GRADE
PROPOSED GRADE
NORMAL CROWN
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=5.8%
+82
+9
+14
EXIST. ELEVATION
PROP. ELEVATION
935.96
933.37
930.39
927.39
924.39
921.39
918.39
915.39
912.39
909.49
906.95
904.80
903.02
902.7
913.1
930.5
927.4
924.1
921.7
918.6
915.6
912.7
909.7
906.9
904.5
903.7
38+00
37+00
36+00
35+00
34+00
33+00
32+00
950
940
930
920
910
900
895
(NAVD 88)
BASE ELEV.
895.00
HOR. SCALE IN FEET
0
20
40
VER. SCALE IN FEET
0
4
8


WALES
MONSON ROAD
PROFILE - MONSON ROAD
MONSON ROAD
HIGH POINT ELEV = 941.33
HIGH POINT STA = 40+29.65
PVI STA = 39+40.00
PVI ELEV = 944.79
A.D. = -8.35%
K = 49.11
410' VC
325.6' SSD
PVT: 41+45
ELEV: 939.97
-2.35%
PROPOSED GRADE
EXISTING GRADE
FULL SUPERELEVATION LEFT
e=5.8%
BENCHMARK:
SPIKE IN UTILITY POLE
ELE = 938.37
STA: 38+22.13
OFF: 18.11' RT
CONTINUED BELOW
CONTINUED ON SHEET NO. 27
NAVD 88
BASE ELEV
920.00
EXIST. ELEVATION
PROP. ELEVATION
HIGH POINT ELEV = 935.32
HIGH POINT STA = 48+95.60
PVI STA = 48+80.00
PVI ELEV = 936.58
A.D. = -4.80%
K = 44.58
214' VC
331.8' SSD
PVT: 47+72
ELEV: 933.61
PVC: 47+73
ELEV: 933.64
2.75%
PVC: 44+44
ELEV: 932.95
LOW POINT ELEV = 931.18
LOW POINT STA = 45+95.09
PVI STA = 46+08.00
PVI ELEV = 929.10
A.D. = 5.10%
K = 64.33
328' VC
308.1' HSD
PROPOSED 12" RCP CLASS V
EXISTING GRADE
FULL SUPERELEVATION RIGHT
e=4.8%
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=4.8%
HOR. SCALE IN FEET
VER. SCALE IN FEET
NORMAL CROWN
SUPERELEVATION
TRANSITION e=5.8% TO NORMAL CROWN
EXIST. 12" CMP
PROPOSED TWIN 12" RCP
BENCHMARK:
SPIKE IN UTILITY POLE
ELEV. = 933.86
STA: 47+02.17
OFF: 15.07' LT
FOR CONSTRUCTION PLANS
SEE SHEET NOS. 15-16
CONTINUED ON SHEET NO. 29
CONTINUED ABOVE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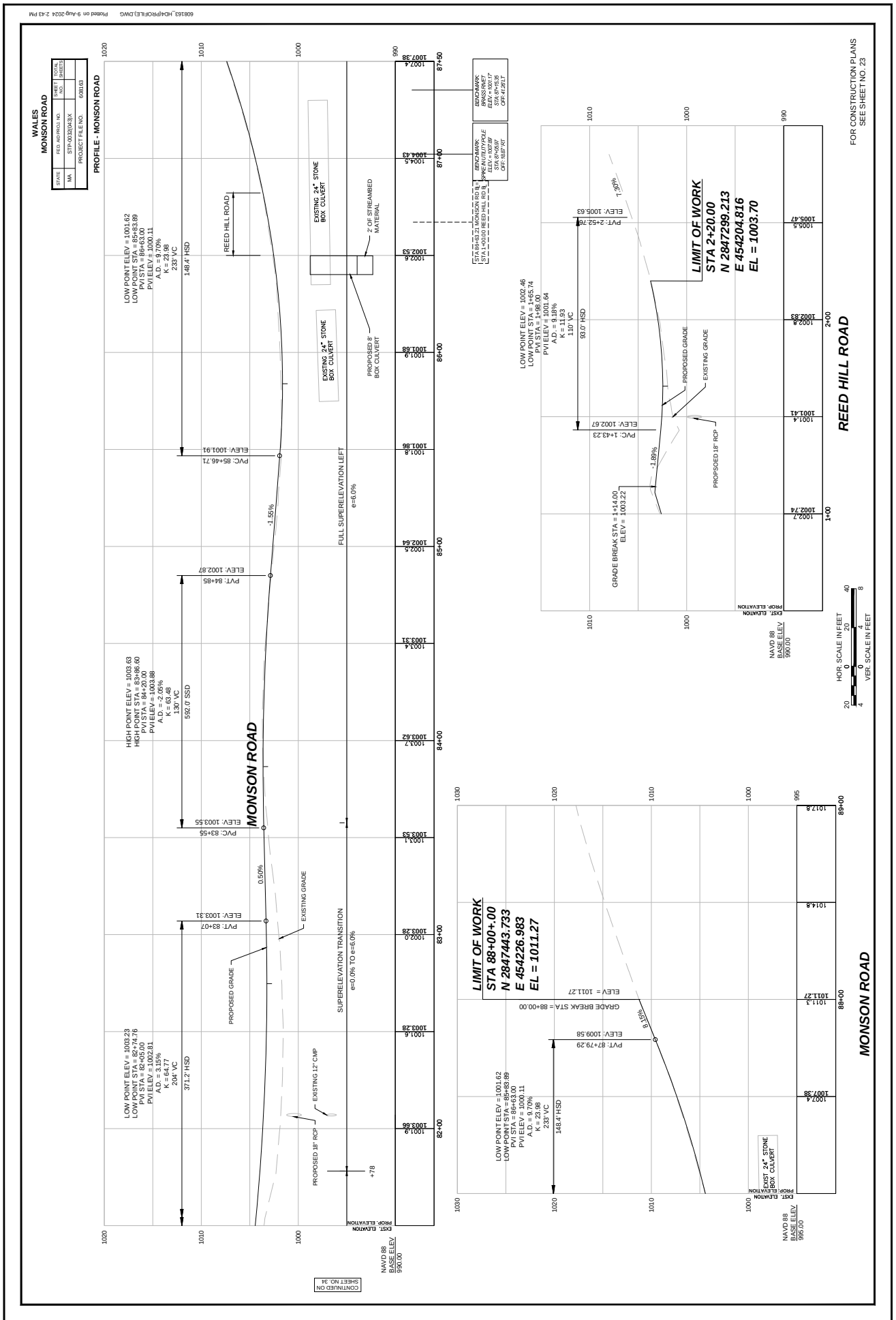
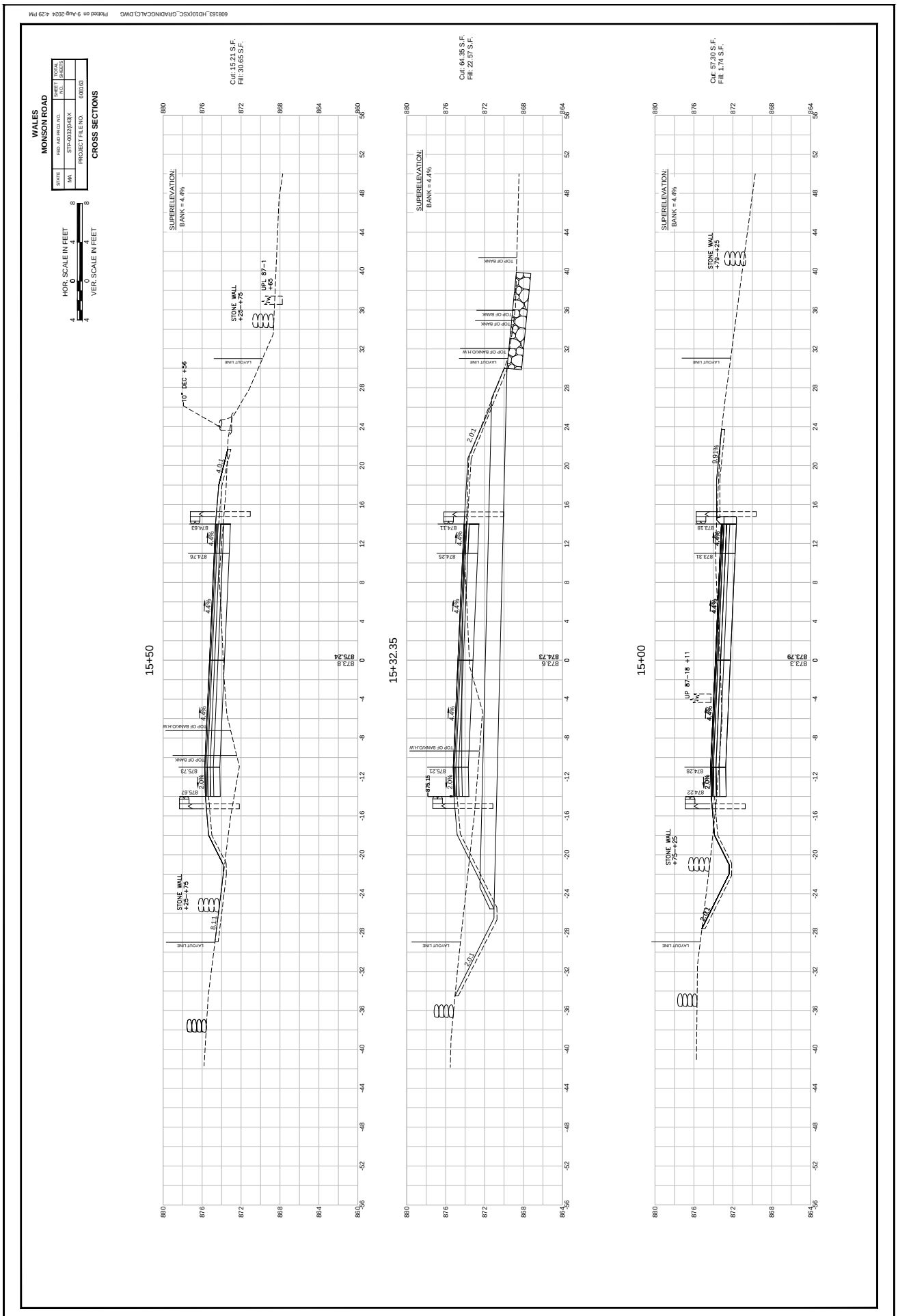
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
PROFILE - MONSON ROAD
FOR CONSTRUCTION PLANS
SEE SHEET NO. 17
CONTINUED ON SHEET NO. 30
CONTINUED ON SHEET NO. 28
MONSON ROAD
PROPOSED GRADE
EXISTING GRADE
EXISTING 36" PVC
NORMAL CROWN
Monson Rd (59)
Station=50+97.97
elev = 933.82
PVC: 50+12.50
ELEV: 933.86
PVT: 49+87
ELEV: 934.39
-2.05%
PVT: 51+87.50
ELEV: 938.19
-1.00%
PVC: 52+33
ELEV: 941.38
PVI STA = 53+60.00
PVI ELEV = 950.27
A.D. = -5.60%
K = 46.36
254' VC
319.7' SSD
LOW POINT ELEV = 933.46
LOW POINT STA = 50+52.14
PVI STA = 51+00.00
PVI ELEV = 932.07
A.D. = 9.05%
K = 19.34
175' VC
128.0' HSD
HIGH POINT ELEV = 936.32
HIGH POINT STA = 49+95.60
PVI STA = 49+80.00
PVI ELEV = 936.58
A.D. = 4.80%
K = 44.58
214' VC
331.8' SSD
SUPERELEVATION TRANSITION
e=4.2% TO NORMAL CROWN
FULL SUPERELEVATION LEFT
e=4.2%
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=4.2%
SUPERELEVATION TRANSITION
e=4.8% TO NORMAL CROWN
FULL SUPERELEVATION RIGHT
e=4.8%
+44
+48
+30
+88 +93
+36
54+00
53+00
52+00
51+00
50+00
49+00
970
960
950
940
930
920
915
950.0
948.06
945.57
942.54
939.07
935.93
934.05
933.46
934.12
934.99
935.32
EXST. ELEVATION
PROP. ELEVATION
NAVD 88
BASE ELEV
915.00
HOR. SCALE IN FEET
0
20
40
VER. SCALE IN FEET
0
4
8
20
4


608163_HDH/PROFILE).DWG Plotted on 9-Aug-2024 2:43 PM
WALES
MONSON ROAD
STATE
NA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
PROFILE - MONSON ROAD
MONSON ROAD
REED HILL ROAD
LOW POINT ELEV = 1001.62
LOW POINT STA = 85+83.89
PVI STA = 86+63.00
PVI ELEV = 1000.11
A.D. = 2.15%
K = 23.98
233' VC
148.4' HSD
REED HILL ROAD
EXISTING 24" STONE BOX CULVERT
2' OF STREAMBED MATERIAL
PROPOSED 8' BOX CULVERT
EXISTING 24" STONE BOX CULVERT
BENCHMARK
BENCHMARK #1
ELEV = 1007.38
STA 87+50.35
OFF-41.86 LT
BENCHMARK
BENCHMARK #2
ELEV = 1004.43
STA 87+05.97
OFF-188' RT
STA 89+63.21 MONSON RD ℄
STA 1+00.00 REED HILL RD ℄
HIGH POINT ELEV = 1003.63
HIGH POINT STA = 83+86.60
PVI STA = 84+20.00
PVI ELEV = 1003.88
A.D. = -2.05%
K = 287.48
130' VC
592.0' SSD
PVC: 85+46.71
ELEV: 1001.91
PVT: 84+85
ELEV: 1002.87
PVC: 83+55
ELEV: 1003.55
PVT: 83+07
ELEV: 1003.31
-1.55%
0.50%
FULL SUPERELEVATION LEFT
e=6.0%
SUPERELEVATION TRANSITION
e=0.0% TO e=6.0%
EXISTING GRADE
PROPOSED GRADE
EXISTING 12" CMP
PROPOSED 18" RCP
+78
LOW POINT ELEV = 1003.23
LOW POINT STA = 82+74.76
PVI STA = 82+05.00
PVI ELEV = 1002.81
A.D. = 3.15%
K = 64.77
204' VC
371.2' HSD
EXIST. ELEVATION
PROP. ELEVATION
NAVD 88
BASE ELEV
990.00
CONTINUED ON SHEET NO. 34
LOW POINT ELEV = 1002.46
LOW POINT STA = 1+45.74
PVI STA = 1+98.00
PVI ELEV = 1001.64
A.D. = 9.18%
K = 11.93
110' VC
93.0' HSD
PVC: 1+43.23
ELEV: 1002.67
PVT: 2+52.76
ELEV: 1005.63
7.39%
-1.89%
GRADE BREAK STA = 1+14.00
ELEV = 1003.22
PROPOSED GRADE
EXISTING GRADE
PROPSOED 18" RCP
LIMIT OF WORK
STA 2+20.00
N 2847299.213
E 454204.816
EL = 1003.70
LIMIT OF WORK
STA 88+00+.00
N 2847443.733
E 454226.983
EL = 1011.27
GRADE BREAK STA = 88+00.00
ELEV = 1011.27
PVT: 87+79.29
ELEV: 1009.58
8.15%
EXIST 24" STONE BOX CULVERT
HOR. SCALE IN FEET
VER. SCALE IN FEET
FOR CONSTRUCTION PLANS
SEE SHEET NO. 23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WALES
MONSON ROAD
CROSS SECTIONS
STATE
MA
FED. AID PROJ. NO.
STP-0132(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
HOR. SCALE IN FEET
VER. SCALE IN FEET
15+50
Cut: 15.21 S.F.
Fill: 30.65 S.F.
SUPERELEVATION:
BANK = 4.4%
STONE WALL
+25—+75
UPL 87—1
+65
10° DEC +56
LAYOUT LINE
TOP OF BANK
TOP OF BANK/O.H.W
874.63
874.76
875.73
875.67
873.8
875.24
15+32.35
Cut: 64.35 S.F.
Fill: 22.57 S.F.
SUPERELEVATION:
BANK = 4.4%
TOP OF BANK
TOP OF BANK
TOP OF BANK/O.H.W
LAYOUT LINE
874.11
874.25
875.21
876.15
873.6
874.73
15+00
Cut: 57.30 S.F.
Fill: 1.74 S.F.
SUPERELEVATION:
BANK = 4.4%
STONE WALL
+79—+25
LAYOUT LINE
873.18
873.31
874.28
874.22
873.3
873.79
UP 87—18
+11
STONE WALL
+75—+25

608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 3:57 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
4 0 4 8
VER. SCALE IN FEET
4 0 4 8

Cut: 33.06 S.F.
Fill: 27.18 S.F.

25+50

878.6
878.86

Cut: 121.15 S.F.
Fill: 0.00 S.F

25+00

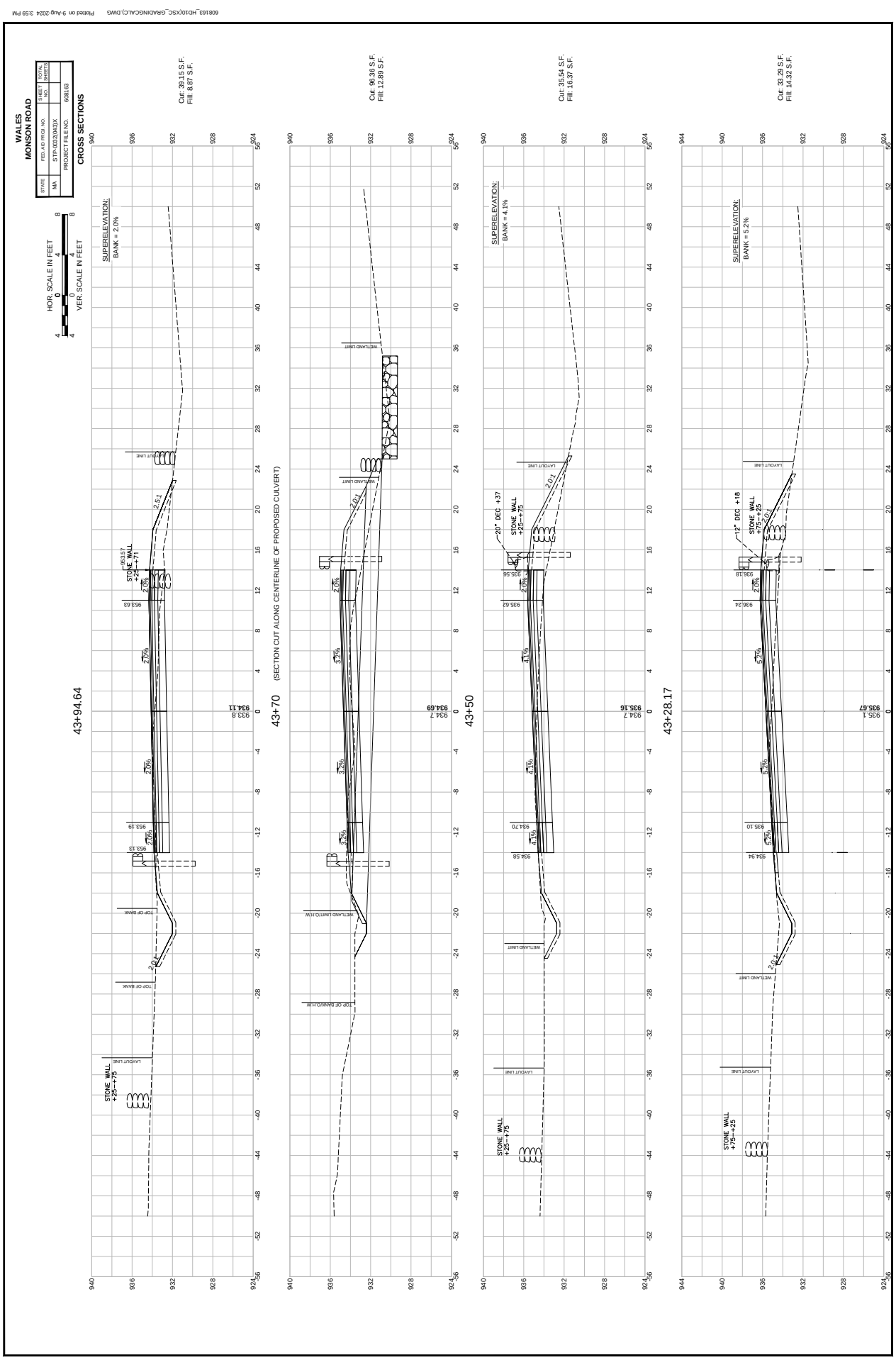
877.5
877.51

EXIST. STONE HEADWALL
+77'—+07'

24° DEC +77

24+91.52

877.4
877.33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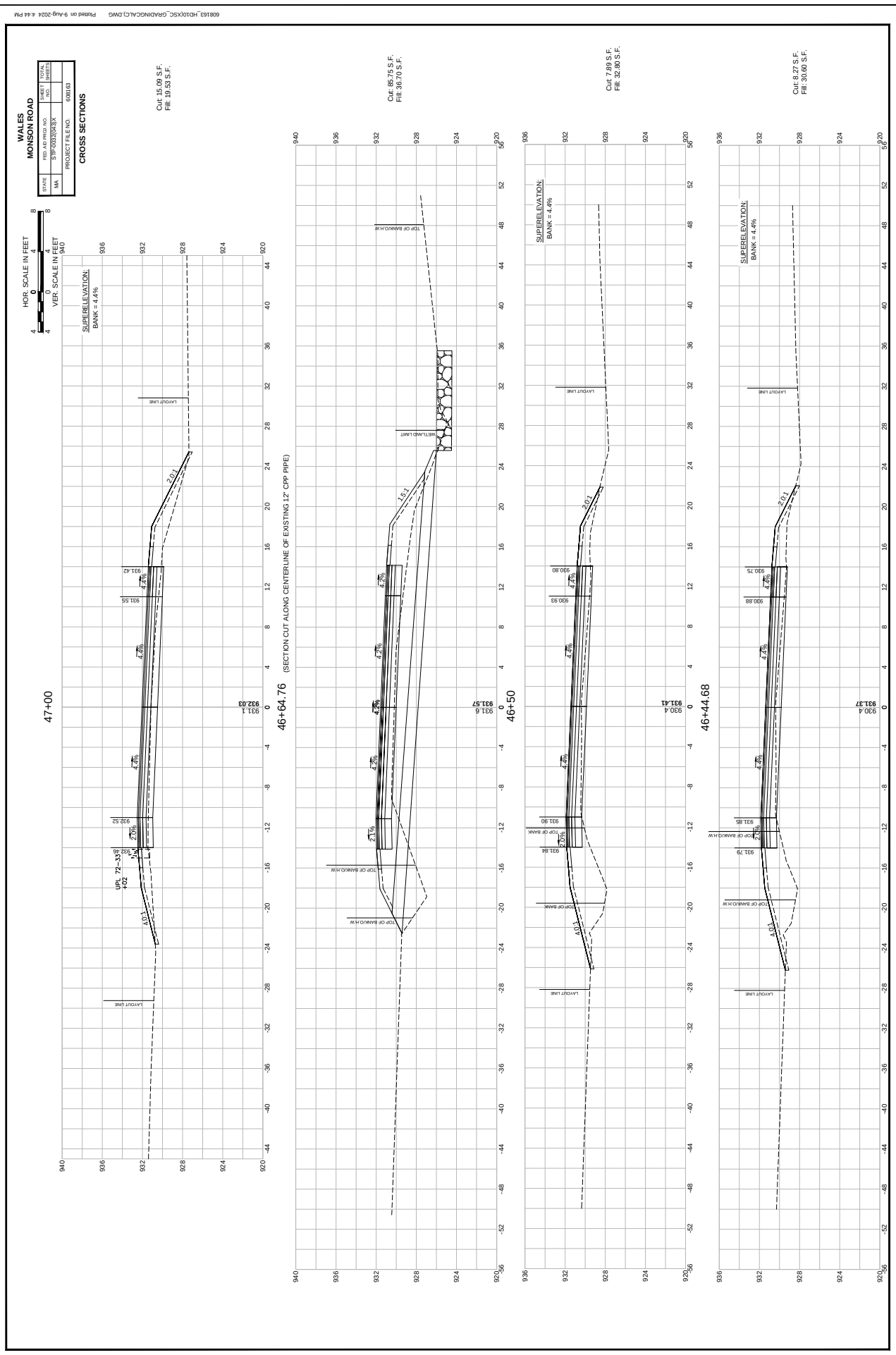
WALES
MONSON ROAD
CROSS SECTIONS
STATE
MA
FED. AID PROJ. NO.
STP-003(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
HOR. SCALE IN FEET
VER. SCALE IN FEET
43+94.64
Cut: 39.15 S.F.
Fill: 8.87 S.F.
43+70
(SECTION CUT ALONG CENTERLINE OF PROPOSED CULVERT)
Cut: 96.36 S.F.
Fill: 12.89 S.F.
43+50
Cut: 35.54 S.F.
Fill: 16.37 S.F.
43+28.17
Cut: 33.29 S.F.
Fill: 14.32 S.F.
SUPERELEVATION:
BANK = 2.0%
SUPERELEVATION:
BANK = 4.1%
SUPERELEVATION:
BANK = 5.2%
STONE WALL
+25--+75
STONE WALL
+75--+25
20° DEC +37
12° DEC +18
LAYOUT LINE
TOP OF BANK
WETLAND LIMIT
WETLAND LIMIT/O.H.W
TOP OF BANK/O.H.W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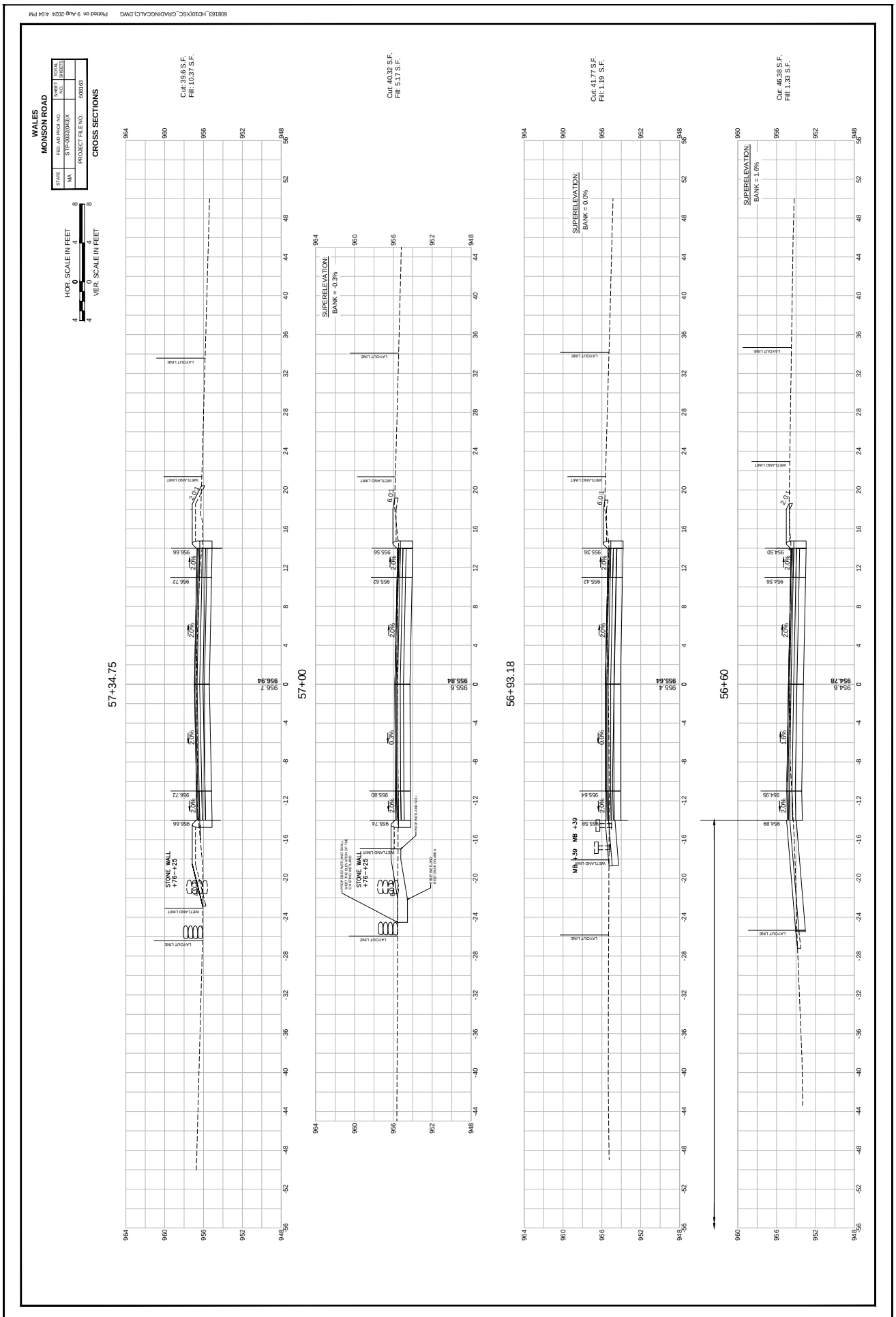
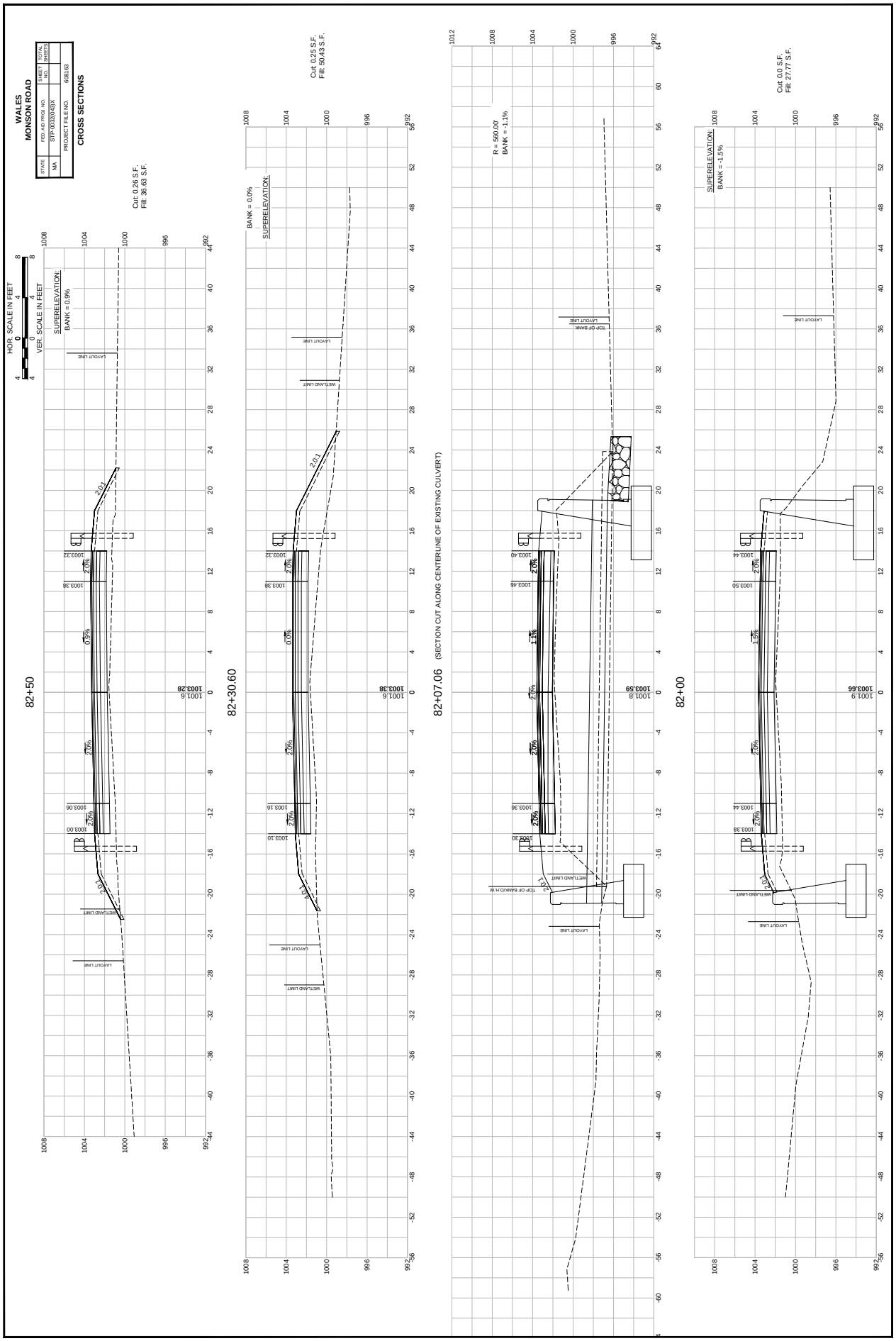
WALES
MONSON ROAD
STATE: MA
FED. AID PROJ. NO.: STP-0083(008)X
PROJECT FILE NO.: 608163
SHEET NO.: 1
TOTAL SHEETS: 1
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
47+00
46+64.76
(SECTION CUT ALONG CENTERLINE OF EXISTING 12" CPP PIPE)
46+50
46+44.68
Cut: 15.09 S.F.
Fill: 19.53 S.F.
Cut: 85.75 S.F.
Fill: 36.70 S.F.
Cut: 7.89 S.F.
Fill: 32.80 S.F.
Cut: 8.27 S.F.
Fill: 30.60 S.F.
SUPERELEVATION:
BANK = 4.4%
LAYOUT LINE
TOP OF BANK/O.H.W
TOP OF BANK
WETLAND LIMIT
UPL 72+33
+02
2.0:1
1.5:1
4.4%
2.0%


608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 4:04 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0003(004)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 39.6 S.F.
Fill: 10.37 S.F.
57+34.75
Cut: 40.32 S.F.
Fill: 5.17 S.F.
57+00
SUPERELEVATION:
BANK = -0.3%
Cut: 41.77 S.F.
Fill: 1.19 S.F.
56+93.18
SUPERELEVATION:
BANK = 0.0%
Cut: 46.38 S.F.
Fill: 1.33 S.F.
56+60
SUPERELEVATION:
BANK = 1.6%
LAYOUT LINE
WETLAND LIMIT
STONE WALL
+76 – +25
MB +39
MB +39


608163_HD10\XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 4:25 PM
WALES
MONSON ROAD
CROSS SECTIONS
STATE: MA
FED. AID PROJ. NO.: STP-0032(043)X
PROJECT FILE NO.: 608163
SHEET NO.
TOTAL SHEETS
HOR. SCALE IN FEET
VER. SCALE IN FEET
82+50
Cut: 0.26 S.F.
Fill: 36.63 S.F.
SUPERELEVATION:
BANK = 0.0%
82+30.60
Cut: 0.25 S.F.
Fill: 50.43 S.F.
82+07.06
(SECTION CUT ALONG CENTERLINE OF EXISTING CULVERT)
R = 560.00'
BANK = -1.1%
82+00
Cut: 0.0 S.F.
Fill: 27.77 S.F.
BANK = -1.5%
LAYOUT LINE
WETLAND LIMIT
TOP OF BANK
TOP OF BANK/O.H.W

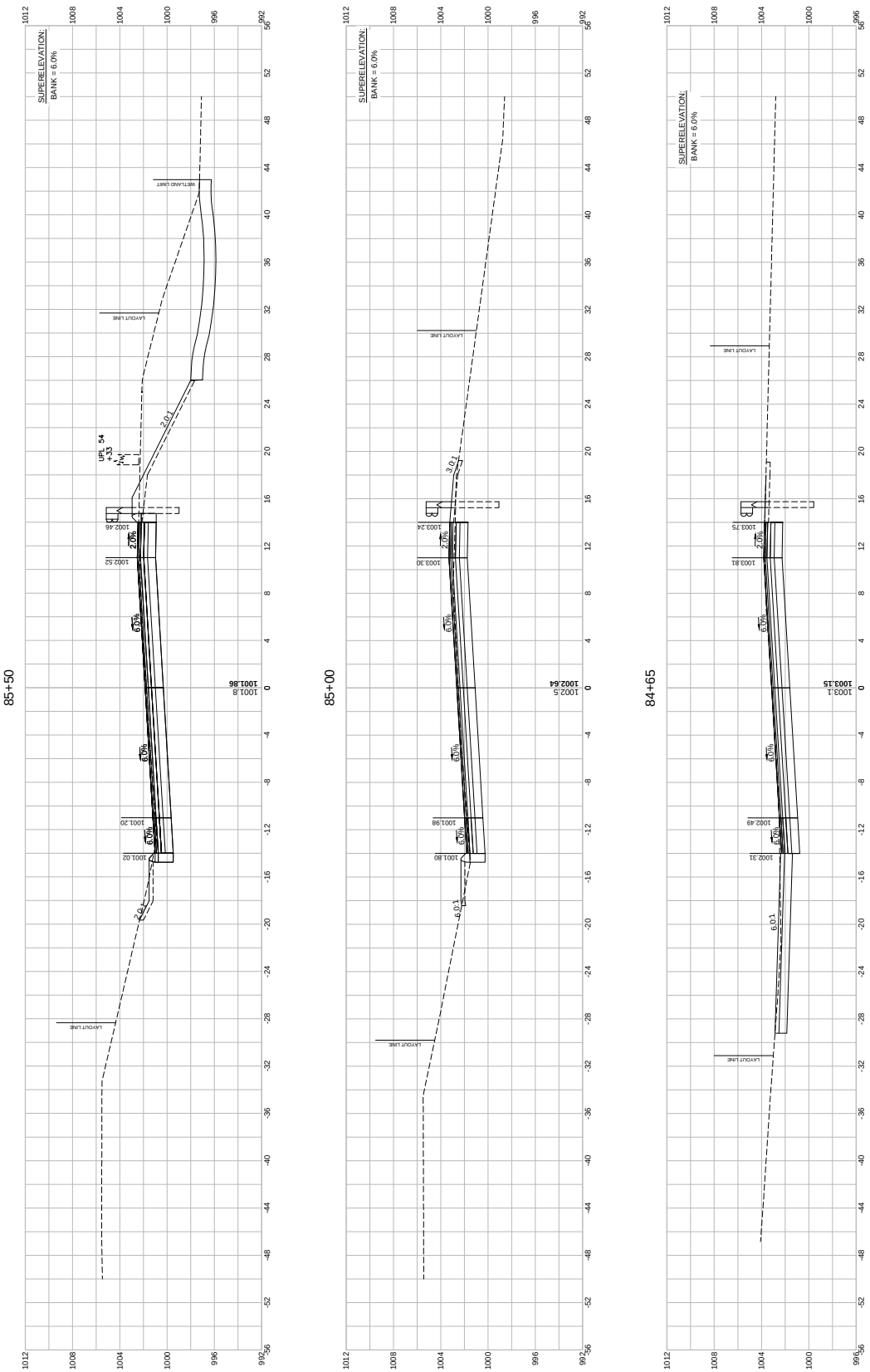
608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 4:15 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	S-TP-0032(043)X	4	
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 4:27 PM

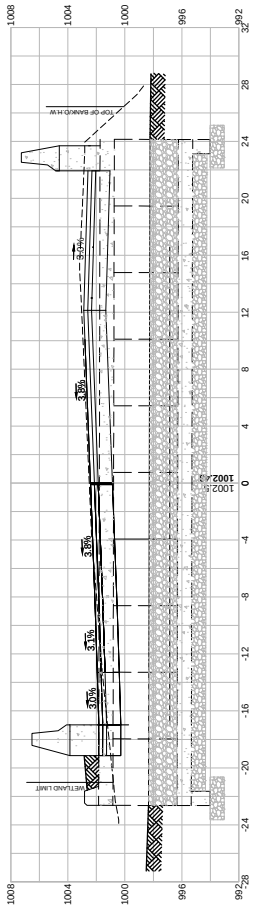
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8

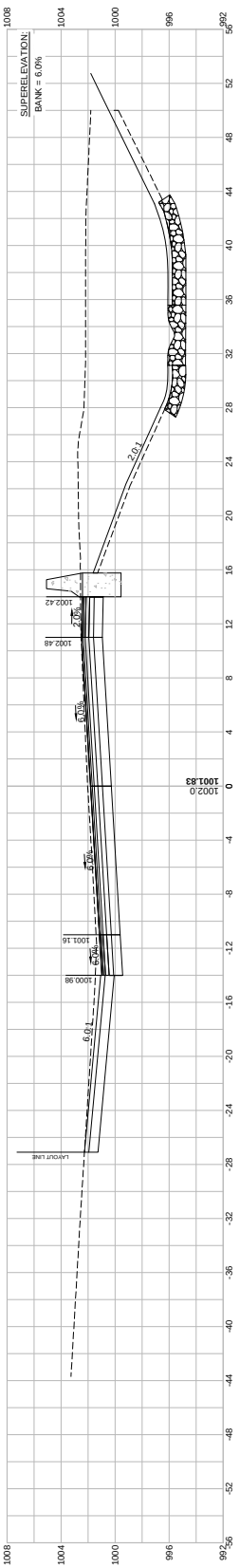
86+45.09 (SECTION CUT ALONG CENTERLINE OF EXISTING CULVERT)



86+15

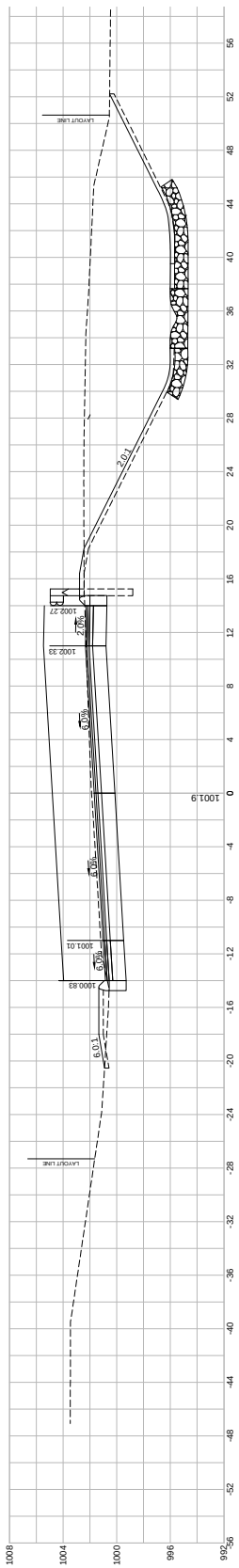
SUPERELEVATION:
BANK = 6.0%

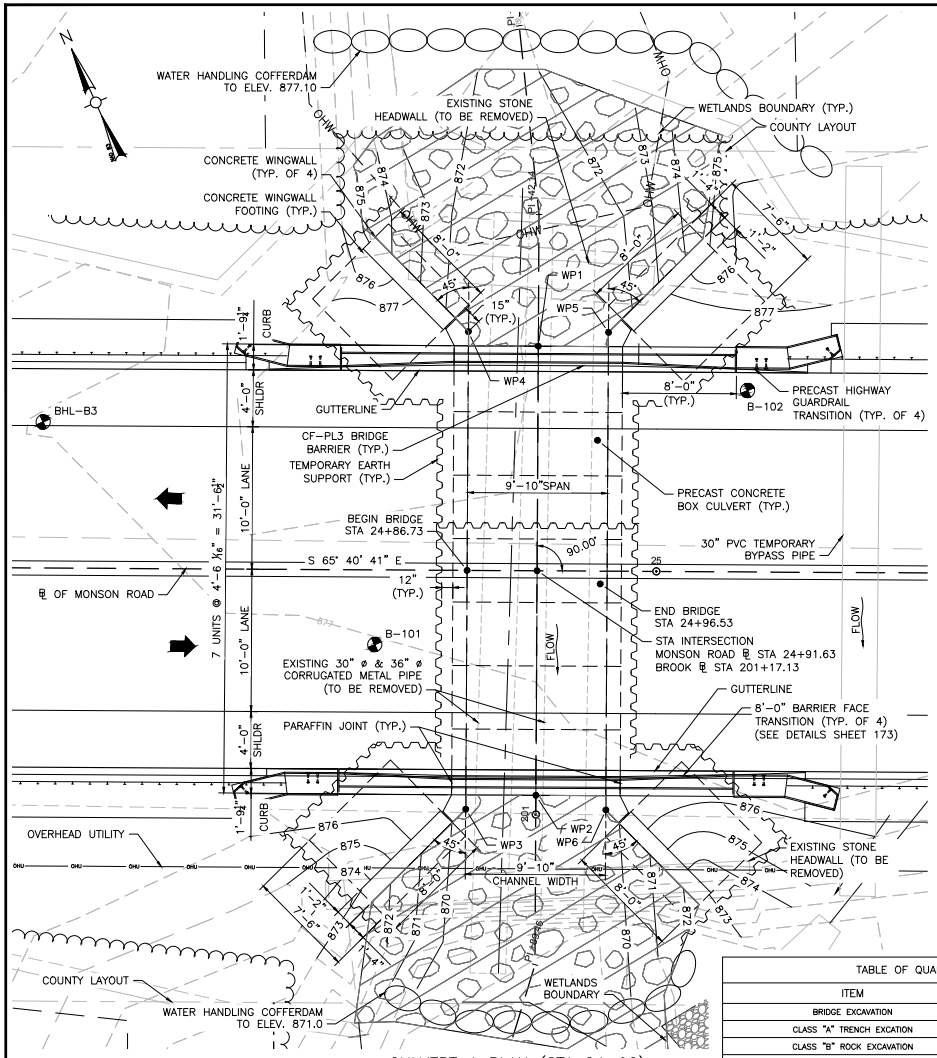
Cut: 238.87 S.F.
Fill: 0.0 S.F.



86+00

Cut: 202.10 S.F.
Fill: 4.42 S.F.





CULVERT 1 PLAN (STA 24+92)
SCALE: 1" = 4'

WORKING POINTS		
POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2848111.9174	448173.3849
2	2848083.1730	448160.3979
3	2848084.2791	448155.5221
4	2848114.8452	448169.3343
5	2848110.8082	448178.2683
6	2848080.2408	448164.4559

NOTES:

1. THE FACTORED BEARING PRESSURE = 2.06 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 5.04 KSF.
   FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS 9TH EDITION, 2020, FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 21+38± (RT) MAGNAIL IN UTILITY POLE: EL. 876.92 FT

BENCHMARK STA 29+60± (RT) MAGNAIL IN UTILITY POLE: EL. 900.23 FT

BENCHMARK STA 29+90± (LT) MAGNAIL BRASS RIVET: EL. 901.72 FT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

5000 PSI, ¾", 685 HP CEMENT CONCRETE.....CF-PL3 BARRIER CURB, TRANSITION BARRIER CURB

5000 PSI, 1½", 660 CEMENT CONCRETE.....WINGWALLS

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	443
CLASS "A" TRENCH EXCATION	C.Y.	69
CLASS "B" ROCK EXCAVATION	C.Y.	30
NATURAL STREAMBED MATERIAL	C.Y.	26
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	300
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	18
PRECAST GUARDRAIL HIGHWAY TRANSITION	EA.	4
5000 PSI, ¾", 685 HP CEMENT CONCRETE	C.Y.	27
5000 PSI, 1½", 660 CEMENT CONCRETE	C.Y.	27
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	17050
DAMPPROOFING	S.F.	1244
PRECAST CONCRETE BOX CULVERT – SITE 1	L.S.	1
TEMPORARY SUPPORT OF EARTH	L.S.	1
CONTROL OF WATER – STRUCTURE NO. 1	L.S.	1

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 1 KEY PLAN AND NOTES

TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	0.903
DESIGN FLOOD DISCHARGE (C.F.S.)	123
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	6.32
DESIGN FLOOD ELEVATION (FEET, NAVD)	873.95
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	174
BASE FLOOD ELEVATION (FEET, NAVD)	874.72
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	43
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	7.72
DESIGN FLOOD ELEVATION (FEET, NAVD)	876.1

608163_HD11\STRUCTURAL PLAN.DWG Plotted on 9-Aug-2024 3:13 PM

A00830 -1046

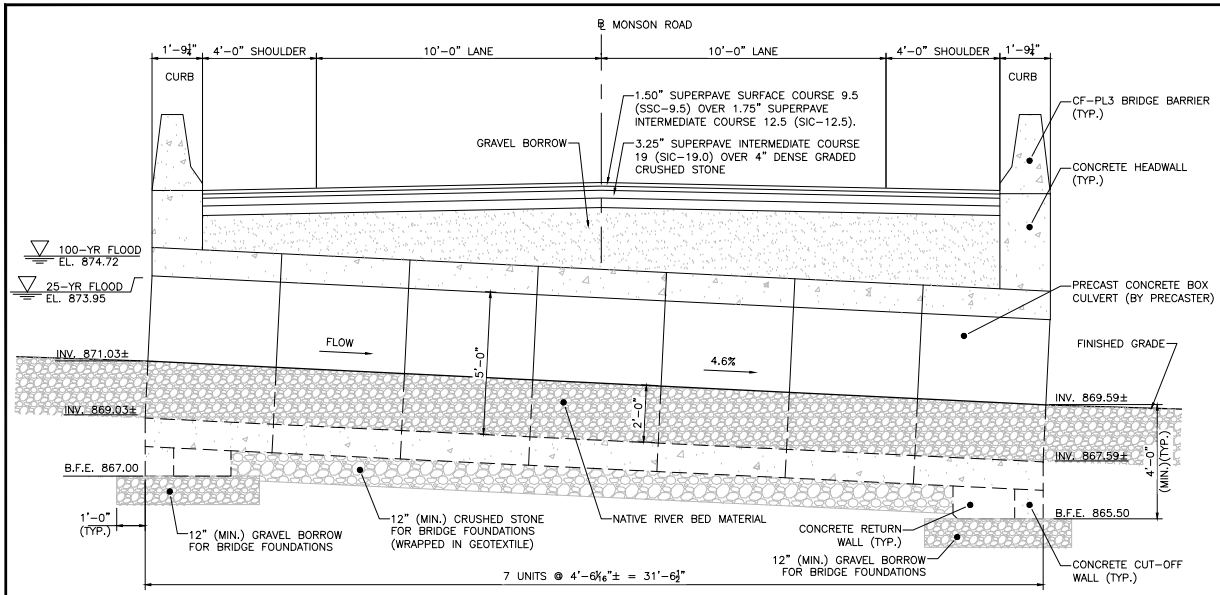
Proposal No. 608163-128112

608163_HD11\STRUCTURAL PLAN.DWG Plotted on 9-Aug-2024 3:14 PM

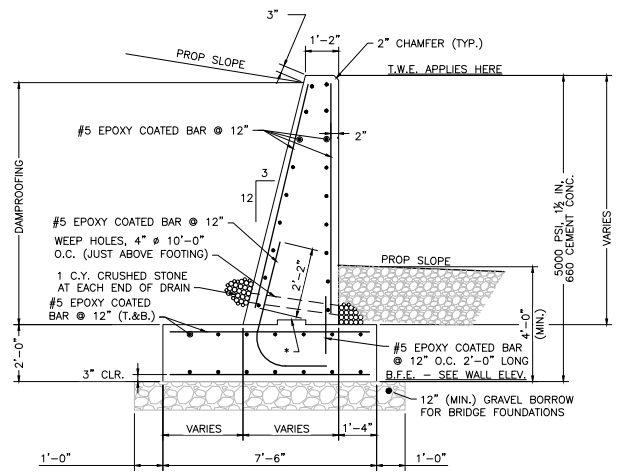
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 1 SECTION & DETAILS



CULVERT 1 LONGITUDINAL SECTION
SCALE: ½" = 1'-0"



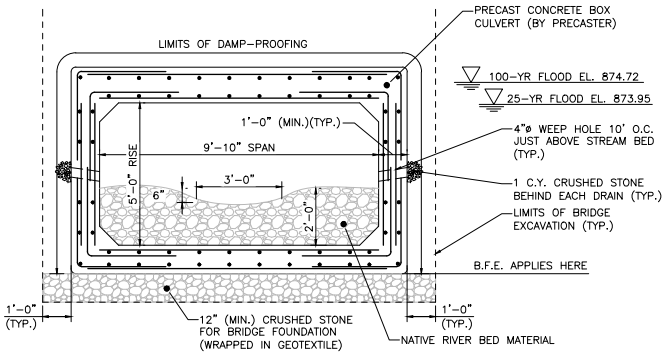
WINGWALL TYPICAL SECTION
SCALE: ½" = 1'-0"

PRECAST BOX CULVERT NOTES:

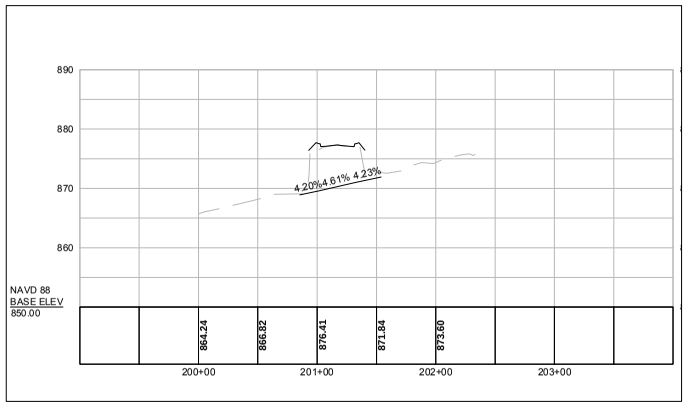
1. THE SECTION IS A PRECAST BOX CULVERT TO BE MONOLITHICALLY CAST OF REINFORCED CONCRETE. THE INSIDE SHALL BE SMOOTH AS TO NOT RESTRICT FLOW.
2. THE INTERNAL DIMENSIONS OF THE BOX CULVERT AT THIS SITE ARE 9'-10" WIDE, 5'-0" HIGH AND A MINIMUM 10" SLAB AND WALL THICKNESS.
3. DESIGN CRITERIA:
   - 3.1. DESIGN SHALL BE IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIAL (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS (AASHTO 9th EDITION) FOR HL-93 LOADING.
   - 3.2. STEEL REINFORCEMENT SHALL BE GRADED CONFORMING TO AASHTO M31.
   - 3.3. MINIMUM 5000 PSI CEMENT CONCRETE STRENGTH @ 28 DAYS.
   - 3.4. CONCRETE COVER FOR REINFORCING STEEL BARS SHALL BE 2 INCHES.

REFERENCE NOTES:

1. FOR CULVERT 1 HEADWALL ELEVATIONS, SEE SHEET NO. 167.
2. FOR CULVERT 1 WINGWALL ELEVATIONS, SEE SHEET NO. 168.
3. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, AND WINGWALL DETAILS, SEE SHEET NO. 174.



CULVERT 1 TRANSVERSE SECTION
SCALE: ½" = 1'-0"



NOTES:

1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 2.06 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 5.04 KSF.
   FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

608163_HD11(STRUCTURAL PLAN).DWG Plotted on 9-Aug-2024 3:15 PM

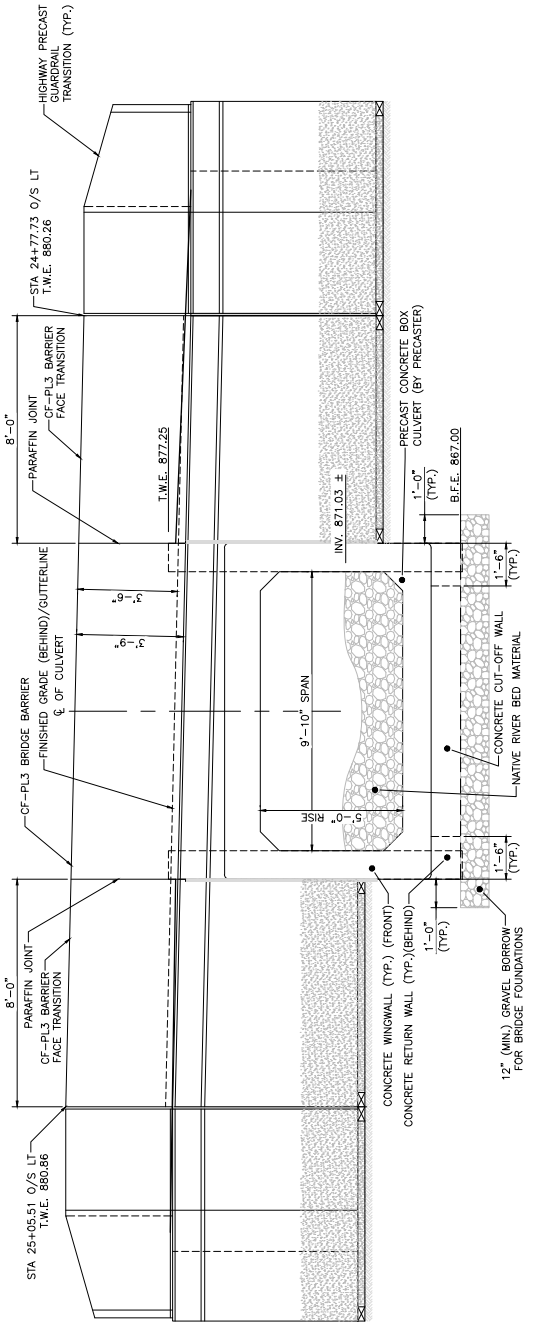
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

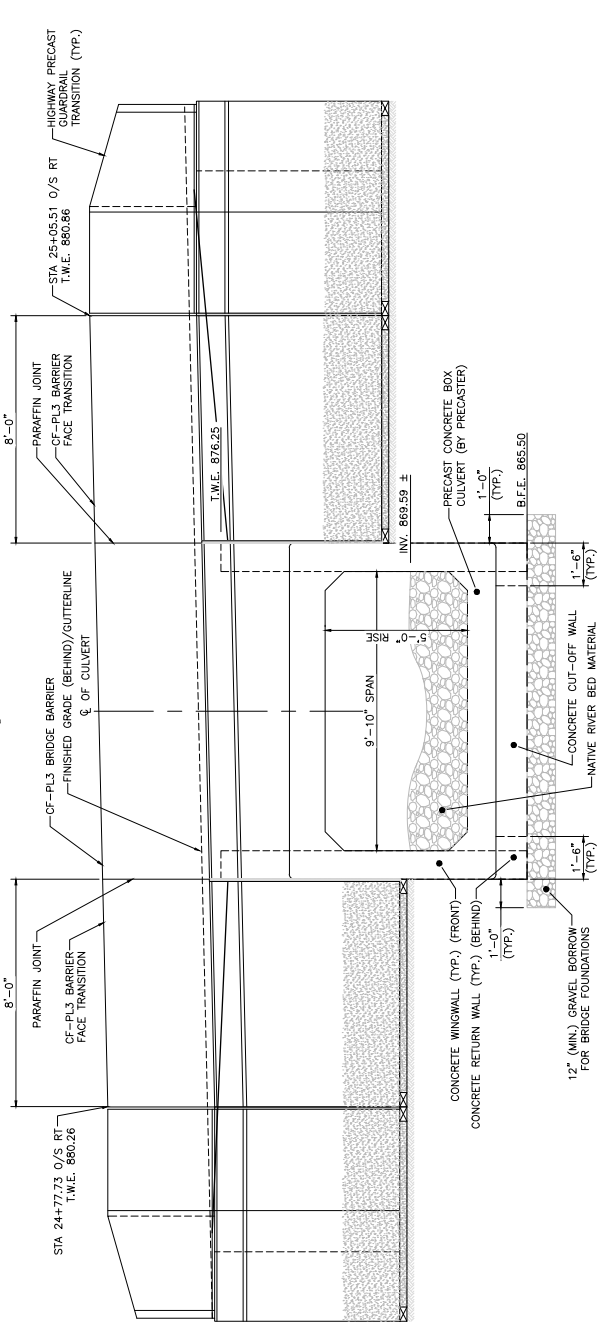
CULVERT 1 HEADWALL ELEVATIONS

REFERENCE NOTES:

1. FOR CULVERT 1 WINGWALL ELEVATIONS, SEE SHEET NO. 168
2. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, PARAFFIN JOINT DETAILS AND WINGWALL DETAILS, SEE SHEET NO. 174.



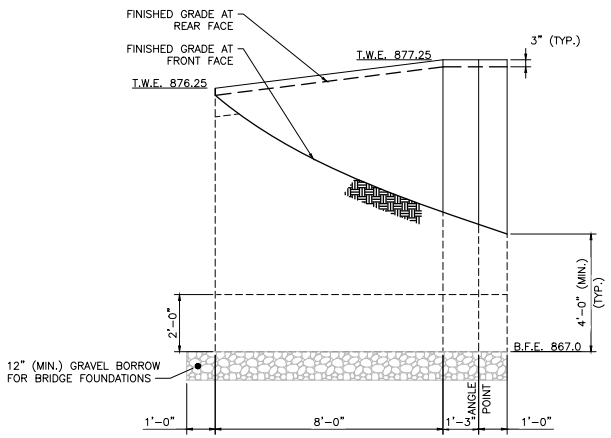
CULVERT 1 INLET ELEVATION
SCALE: ½" = 1'-0"



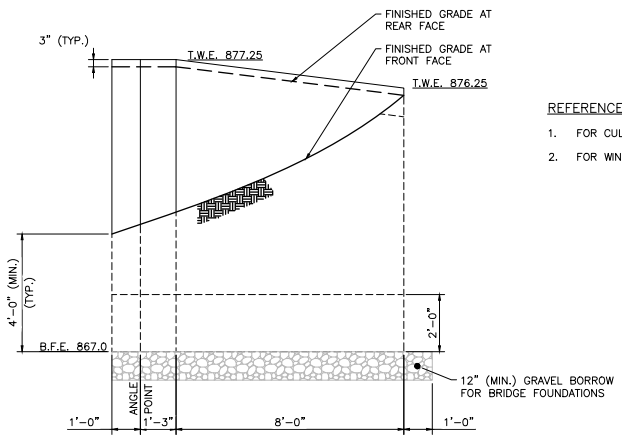
CULVERT 1 OUTLET ELEVATION
SCALE: ½" = 1'-0"

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

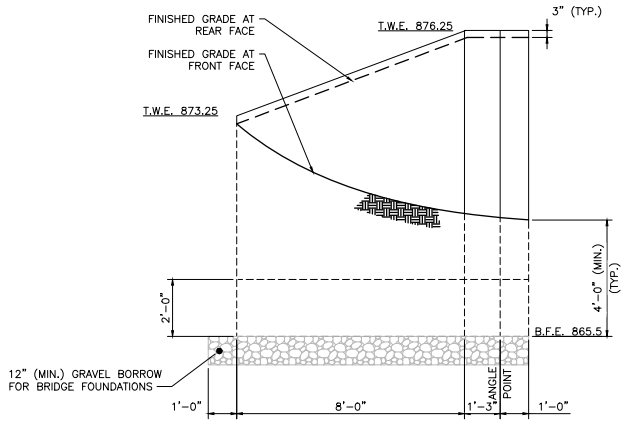
CULVERT 1 WINGWALL ELEVATIONS



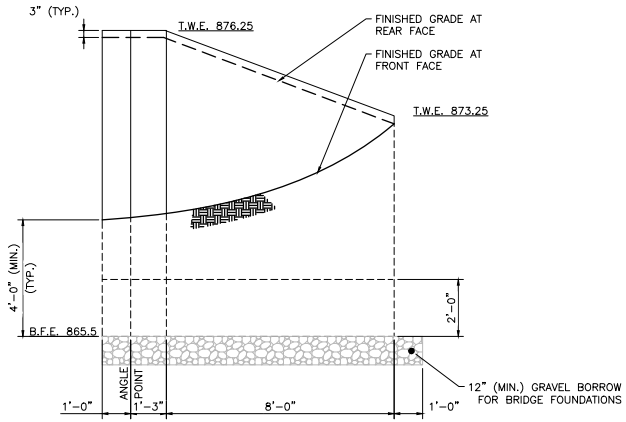
NORTHEAST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



NORTHWEST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



SOUTHWEST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



SOUTHEAST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"

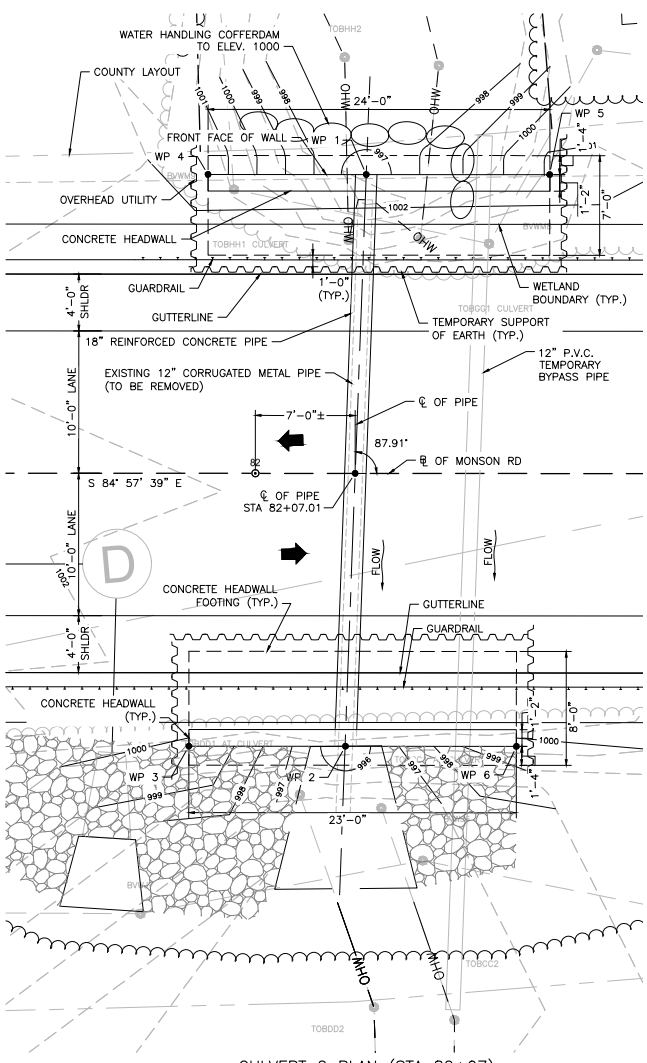
REFERENCE NOTES:

1. FOR CULVERT 1 WINGWALL SECTION, SEE SHEET NO. 166.
2. FOR WINGWALL DETAILS, SEE SHEET NO. 174.

608163_HD11\STRUCTURAL PLAN.DWG Plotted on 9-Aug-2024 3:16 PM

A00830 -1049

Proposal No. 608163-128112



CULVERT 2 PLAN (STA 82+07)

SCALE: 1" = 4'

NOTES:

1. THE FACTORED BEARING PRESSURE = 2.18 KSF AT THE INLET HEADWALL AND 2.64 KSF AT THE OUTLET HEADWALL AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 5.35 KSF AT THE INLET HEADWALL AND 5.52 KSF AT THE OUTLET HEADWALL. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 81+25± (LT) SPIKE IN UTILITY POLE: EL. 1005.74

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

5000 PSI, 1½", 660 CEMENT CONCRETE.....HEADWALLS

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING PIPES.
4. INSTALL THE PROPOSED PIPE & HEADWALLS.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE PROPOSED CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

TABLE OF QUANTITIES

ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	167
CLASS "A" TRENCH EXCAVATION	C.Y.	11
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	150
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	20
5000 PSI 1½" 660 CEMENT CONCRETE	C.Y.	52
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	10010
DAMPPROOFING	S.F.	426
TEMPORARY SUPPORT OF EARTH	L.S.	1
CONTROL OF WATER – STRUCTURE NO. 2	L.S.	1

WORKING POINTS

POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2847313.7204	453680.2286
2	2847273.8336	453675.2733
3	2847274.8008	453664.3163
4	2847314.6939	453669.1581
5	2847312.5891	453693.0567
6	2847272.7828	453687.1995

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 2 KEY PLAN AND NOTES

TRAFFIC DATA

	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA

DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA

DRAINAGE AREA (SQ. MILES)	10.24
DESIGN FLOOD DISCHARGE (C.F.S.)	9
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	0.14
DESIGN FLOOD ELEVATION (FEET, NAVD)	996.14
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	9
BASE FLOOD ELEVATION (FEET, NAVD)	999.20
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA

DESIGN FLOOD DISCHARGE (C.F.S.)	5
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	6.70
DESIGN FLOOD ELEVATION (FEET, NAVD)	998.46

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A00830 -1050

Proposal No. 608163-128112

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 2 WALL DETAILS

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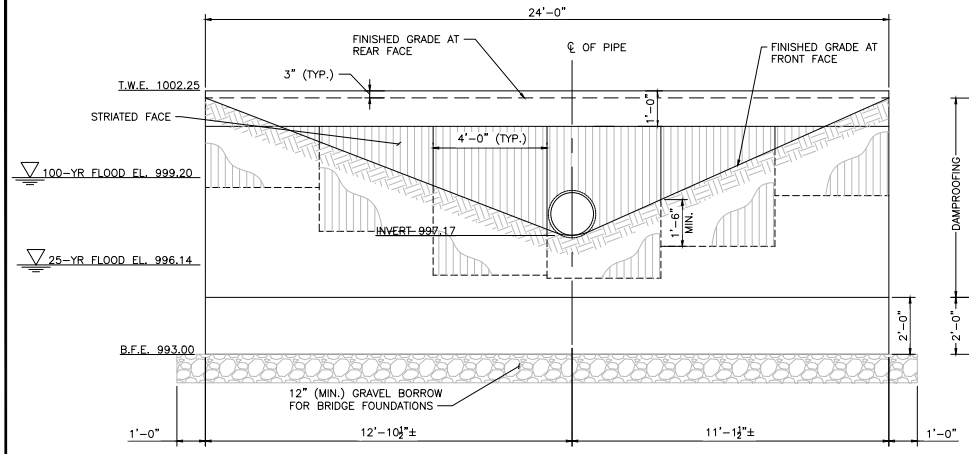
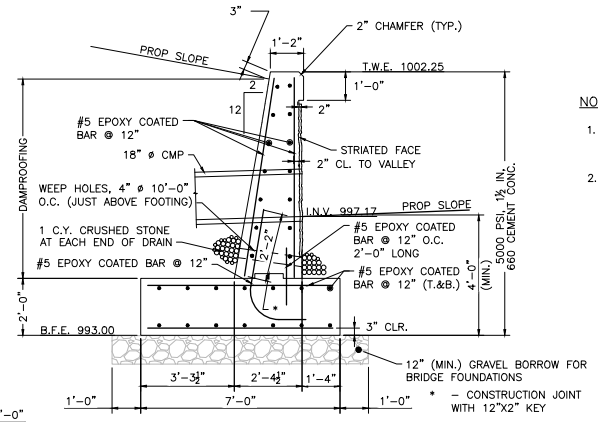


NORTH INLET HEADWALL ELEVATION
SCALE: ½" = 1'-0"

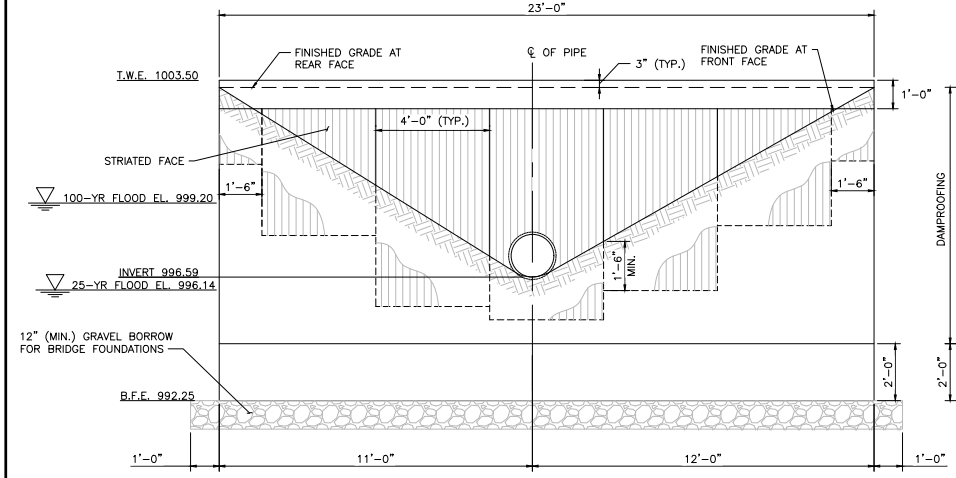


NORTH INLET HEADWALL SECTION
SCALE: ½" = 1'-0"

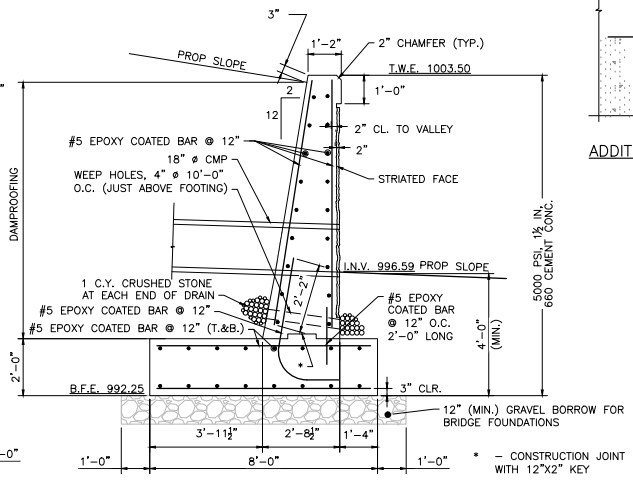
NOTES:

1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 2.18 KSF AT THE INLET HEADWALL AND 2.64 KSF AT THE OUTLET HEADWALL AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

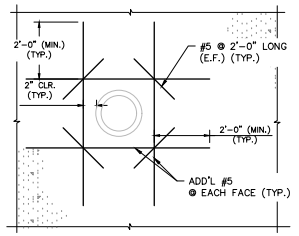
   FACTORED BEARING RESISTANCE = 5.35 KSF AT THE INLET HEADWALL AND 5.52 KSF AT THE OUTLET HEADWALL. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.



SOUTH OUTLET HEADWALL ELEVATION
SCALE: ½" = 1'-0"



SOUTH OUTLET HEADWALL SECTION
SCALE: ½" = 1'-0"



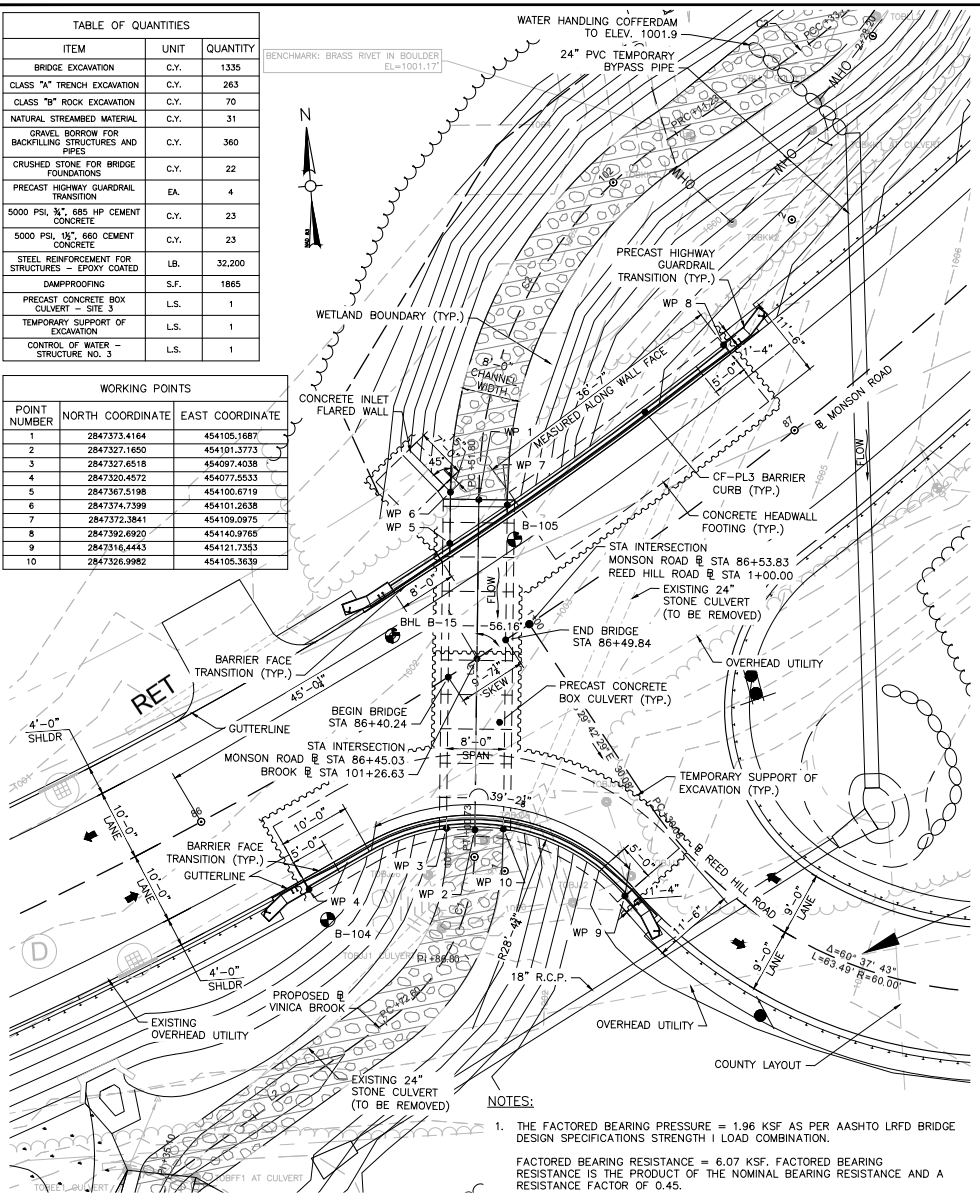
ADDITIONAL REINFORCEMENT AT PIPE
SCALE: ½" = 1'-0"

REFERENCE NOTES:

1. FOR STRIATION DETAILS, SEE SHEET NO. 174.

TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	1335
CLASS "A" TRENCH EXCAVATION	C.Y.	263
CLASS "B" ROCK EXCAVATION	C.Y.	70
NATURAL STREAMBED MATERIAL	C.Y.	31
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	360
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	22
PRECAST HIGHWAY GUARDRAIL TRANSITION	EA.	4
5000 PSI, ¾", 685 HP CEMENT CONCRETE	C.Y.	23
5000 PSI, 1½", 660 CEMENT CONCRETE	C.Y.	23
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	32,200
DAMPPROOFING	S.F.	1865
PRECAST CONCRETE BOX CULVERT – SITE 3	L.S.	1
TEMPORARY SUPPORT OF EXCAVATION	L.S.	1
CONTROL OF WATER – STRUCTURE NO. 3	L.S.	1

WORKING POINTS		
POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2847373.4164	454105.1687
2	2847327.1650	454101.3773
3	2847327.6518	454097.4038
4	2847320.4572	454077.5533
5	2847367.5198	454100.6719
6	2847374.7399	454101.2638
7	2847372.3841	454109.0975
8	2847392.6920	454140.9765
9	2847316.4443	454121.7353
10	2847326.9982	454105.3639



CULVERT 3 PLAN (STA 86+45)

SCALE: 1" = 8'

NOTES:

1. THE FACTORED BEARING PRESSURE = 1.96 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 6.07 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 87+10± (RT) SPIKE IN UTILITY POLE: EL. 1007.89 FT

BENCHMARK STA 87+20± (LT) BRASS RIVET: EL. 1001.17 FT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

5000 PSI, ¾", 685 HP CEMENT CONCRETE.....CF-PL3 BARRIER CURB AND TRANSITION BARRIER CURB

5000 PSI, 1½", 660 CEMENT CONCRETE.....HEADWALLS

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 3 KEY PLAN AND NOTES

TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	0.33
DESIGN FLOOD DISCHARGE (C.F.S.)	52
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	3.22
DESIGN FLOOD ELEVATION (FEET, NAVD)	998.40
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	73
BASE FLOOD ELEVATION (FEET, NAVD)	998.77
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	18
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	8.91
DESIGN FLOOD ELEVATION (FEET, NAVD)	1001.42

608163_HD11(STRUCTURAL PLAN).DWG Plotted on 9-Aug-2024 3:19 PM

A00830 -1052

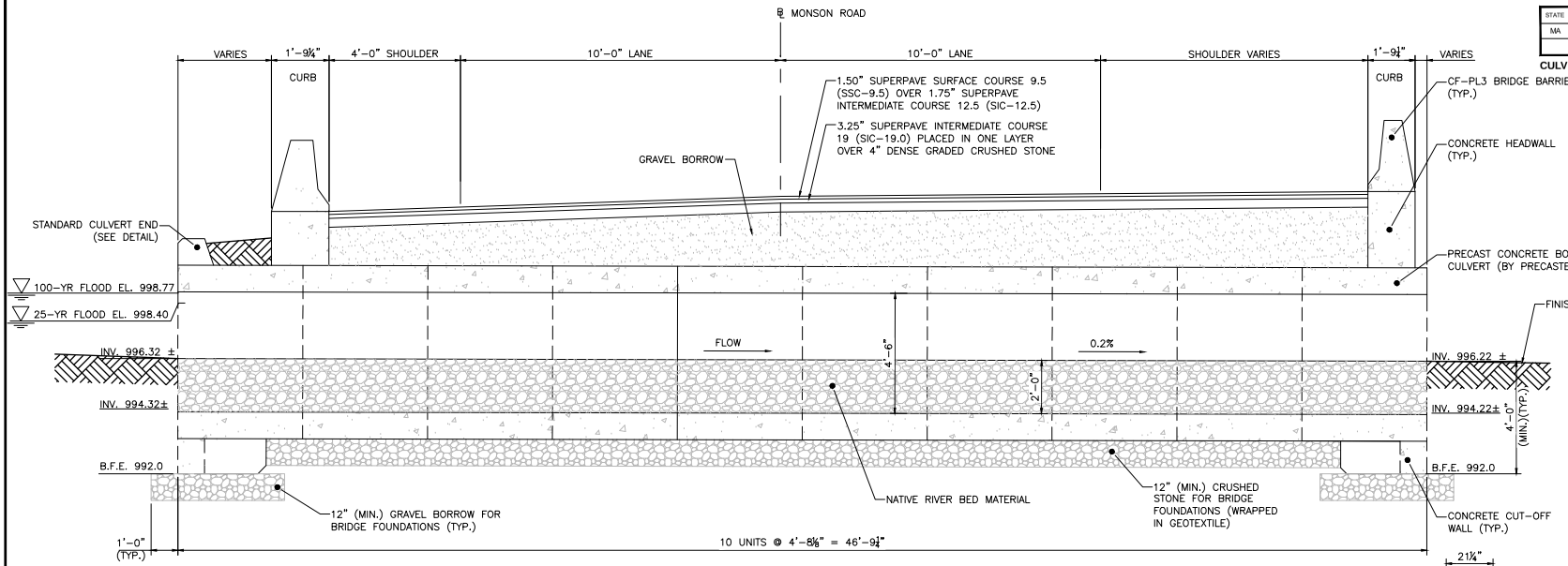
Proposal No. 608163-128112

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

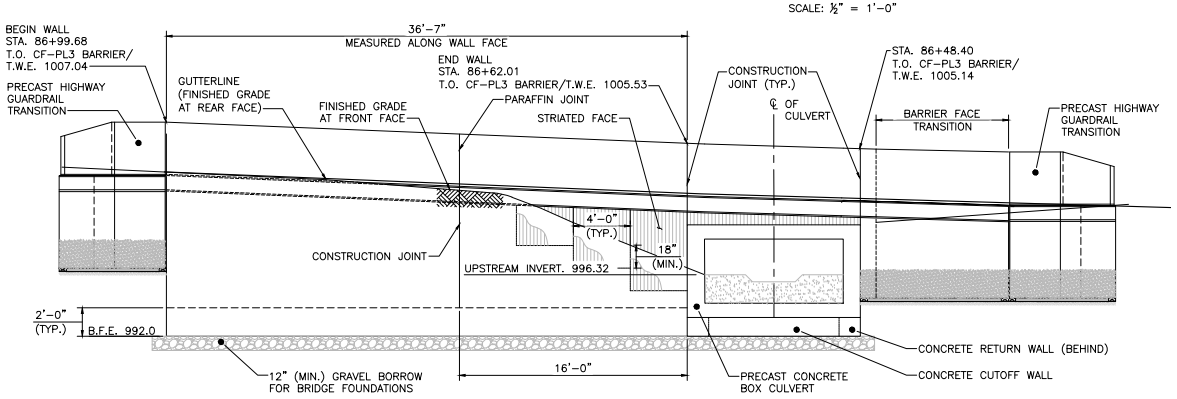
CULVERT 3 SECTION AND DETAILS

608163_HD11\STRUCTURAL PLAN.DWG Plotted on 9-Aug-2024 3:21 PM



CULVERT 3 LONGITUDINAL SECTION – ALONG STREAM BASELINE

SCALE: ½" = 1'-0"



CULVERT 3 INLET NORTH ELEVATION

SCALE: ¼" = 1'-0"

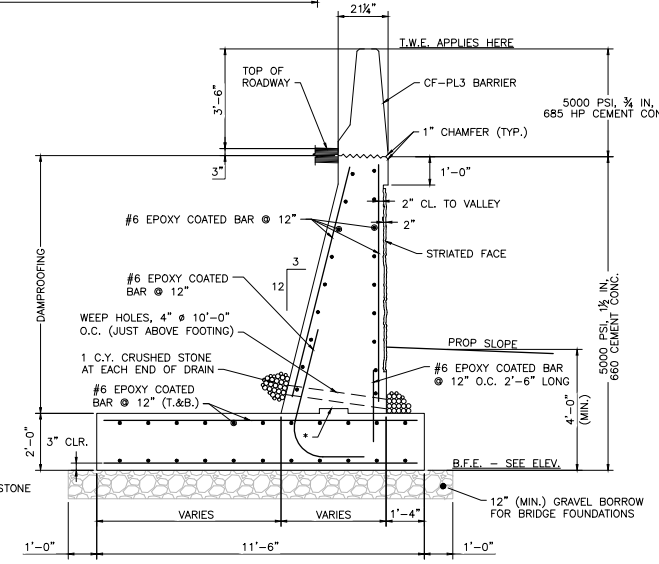
REFERENCE NOTES:

1. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, CONCRETE END WALL DETAIL, PARAFFIN JOINT DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 174.

NOTES:

1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 1.96 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 6.07 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

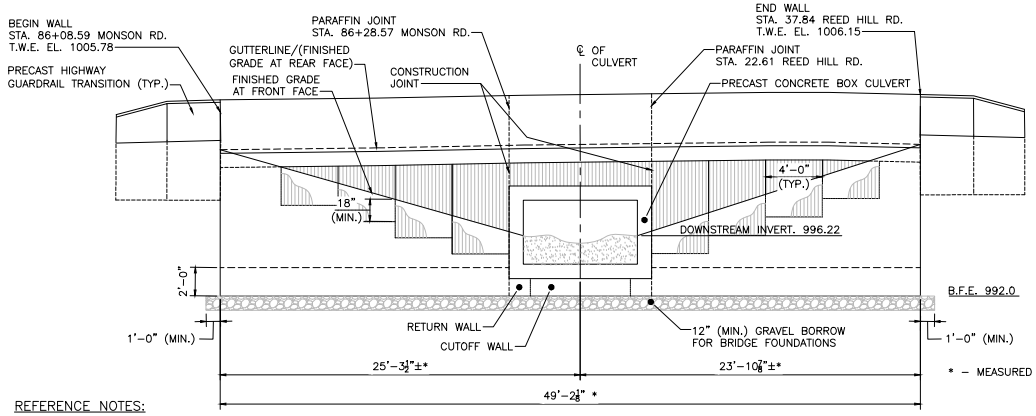


* – CONSTRUCTION JOINT WITH 12"x2" KEY

RETAINING WALL SECTION

SCALE: ½" = 1'-0"

Proposal No. 608163-128112



CULVERT 3 OUTLET/SOUTH ELEVATION

SCALE: ¼" = 1'-0"

* – MEASURED ALONG WALL FACE

REFERENCE NOTES:

1. FOR CONCRETE HEADWALL DETAILS, CUT–OFF AND RETURN WALL DETAILS, STRIATION DETAILS, CONCRETE END WALL DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 172.

PRECAST BOX CULVERT NOTES:

1. THE SECTION IS A PRECAST BOX CULVERT TO BE MONOLITHICALLY CAST OF REINFORCED CONCRETE. THE INSIDE SHALL BE SMOOTH AS TO NOT RESTRICT FLOW.
2. THE INTERNAL DIMENSIONS OF THE BOX CULVERT AT THIS SITE ARE 8'–0" WIDE, 4'–6" HIGH AND A MINIMUM 10" SLAB AND WALL THICKNESS.
3. DESIGN CRITERIA:
   - 3.1. DESIGN SHALL BE IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIAL (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS (9th EDITION) FOR HL–93 LOADING.
   - 3.2. STEEL REINFORCEMENT SHALL BE GRADED CONFORMING TO AASHTO M31.
   - 3.3. MINIMUM 5000 PSI CEMENT CONCRETE STRENGTH @ 28 DAYS.
   - 3.4. CONCRETE COVER FOR REINFORCING STEEL BARS SHALL BE 2 INCHES.

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
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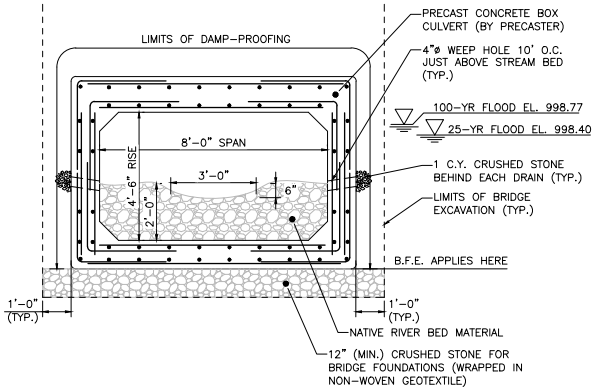
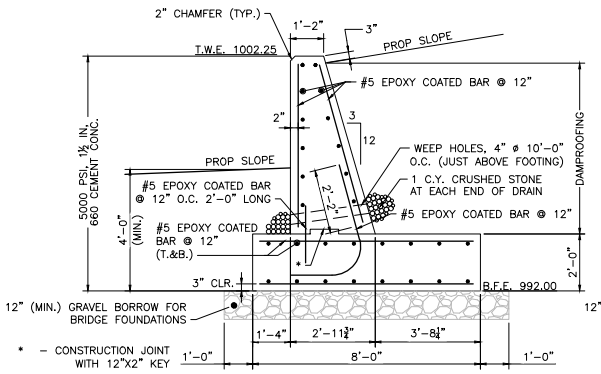
CULVERT 3 WALL ELEVATION AND DETAILS

608163_HD11\STRUCTURAL PLAN.DWG Plotted on 9-Aug-2024 3:24 PM



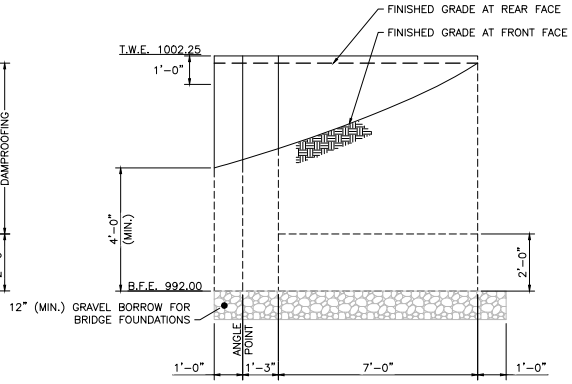
CULVERT 3 TRANSVERSE SECTION

SCALE: ½" = 1'-0"



CULVERT 3 INLET FLARED WALL – SECTION

SCALE: ½" = 1'-0"



CULVERT 3 INLET FLARED WALL – ELEVATION

SCALE: ½" = 1'-0"

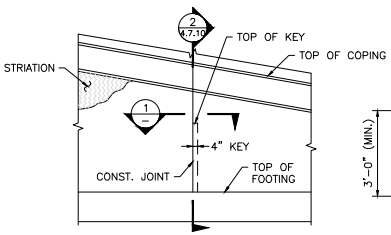
NOTES:

1. INSTALL 4" WEEP HOLES @ 10'–0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 1.90 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 5.27 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

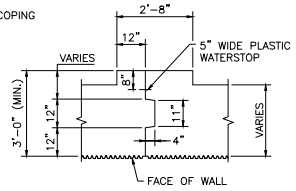
REFERENCE NOTES:

1. FOR CONCRETE HEADWALL DETAILS, CUT–OFF AND RETURN WALL DETAILS, STRIATION DETAILS, CONCRETE END WALL DETAIL, PARAFFIN JOINT DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 174.



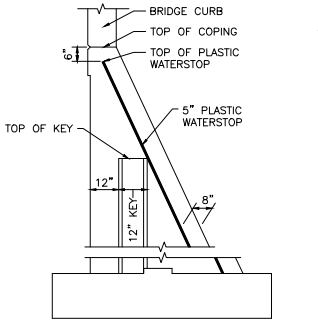
WALL ELEVATION AT CONSTRUCTION JOINT

SCALE: ½" = 1'-0"



SECTION 1

SCALE: ½" = 1'-0"

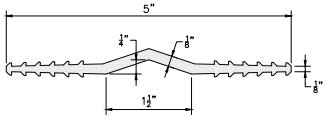


NOTE:

REINFORCEMENT SHALL BE CONTINUOUS THROUGH CONSTRUCTION JOINTS.

SECTION 2

SCALE: ½" = 1'-0"



5" WATERSTOP

FULL SIZE

A00830 -1054

Proposal No. 608163-128112

608163_HD12\WATER HANDLING1.DWG Plotted on 6-Aug-2024 1:19 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

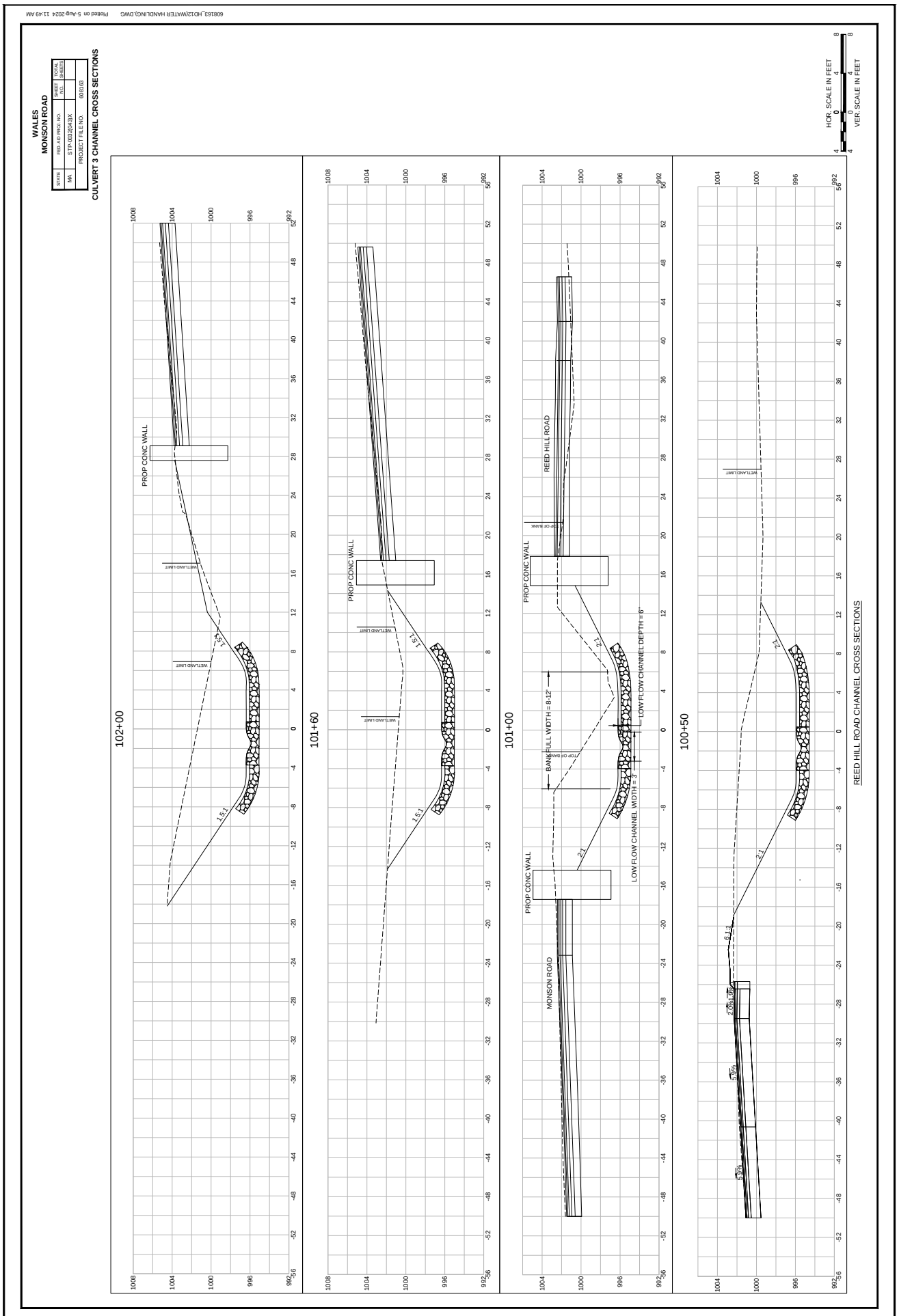
CULVERT 3 CHANNEL PLAN, PROFILE AND SECTION

SCALE: 1" = 20'

CULVERT 3 CHANNEL PLAN

CULVERT 3 CHANNEL PROFILE

CULVERT 3 CHANNEL TYPICAL SECTION


608163_HD12\WATER HANDLING.DWG Plotted on 5-Aug-2024 11:49 AM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
CULVERT 3 CHANNEL CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
102+00
101+60
101+00
100+50
PROP CONC WALL
WETLAND LIMIT
1.5:1
REED HILL ROAD
TOP OF BANK
BANK FULL WIDTH = 8-12'
LOW FLOW CHANNEL DEPTH = 6"
LOW FLOW CHANNEL WIDTH = 3'
2:1
MONSON ROAD
REED HILL ROAD CHANNEL CROSS SECTIONS

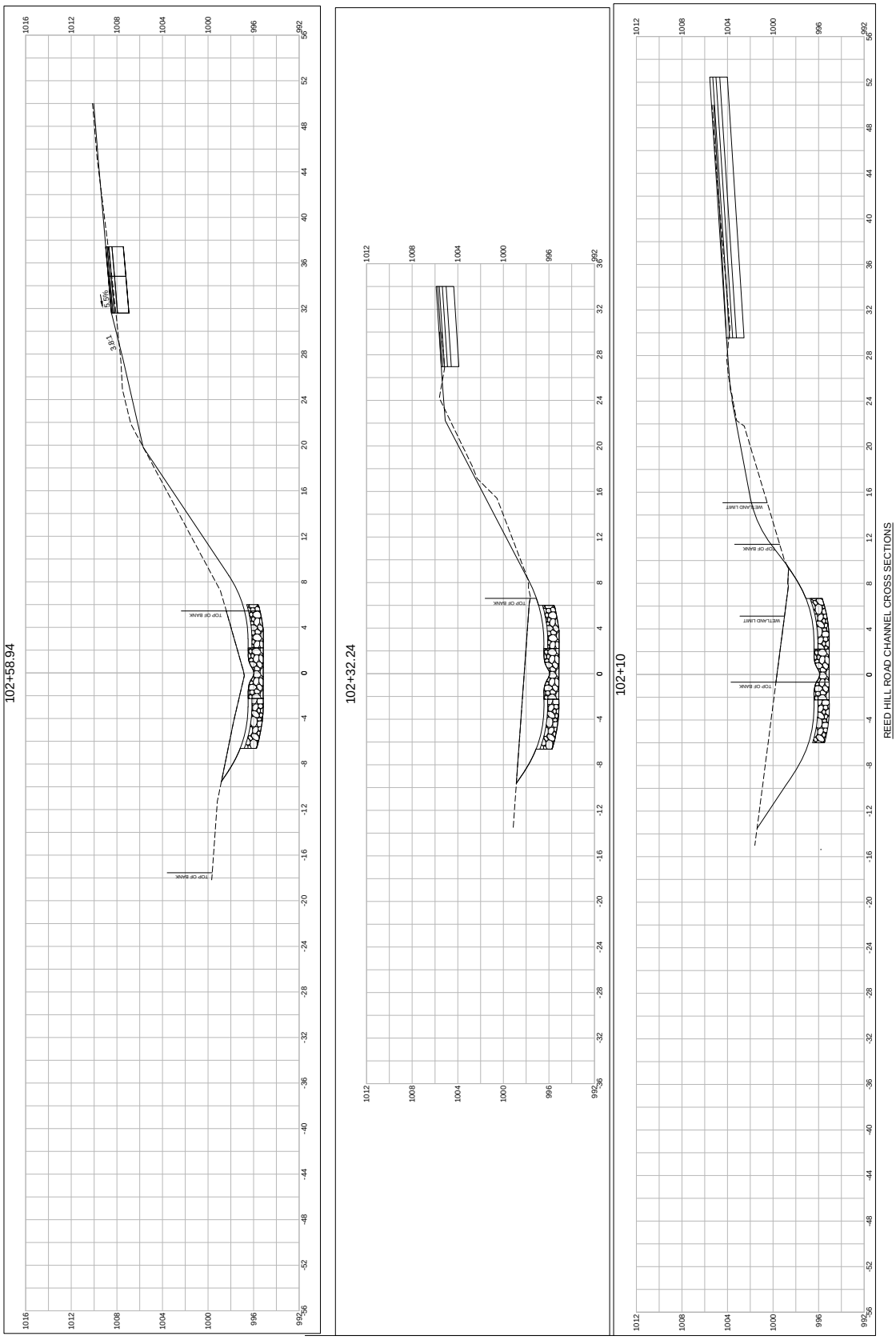
608163_HD12\WATER HANDLING.DWG Plotted on 5-Aug-2024 11:50 AM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

CULVERT 3 CHANNEL CROSS SECTIONS

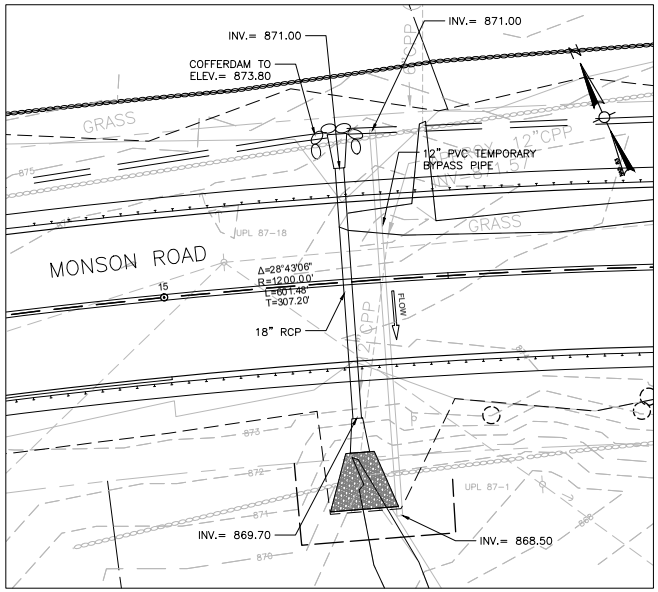
HOR. SCALE IN FEET
4 0 4 8
VER. SCALE IN FEET
4 0 4 8



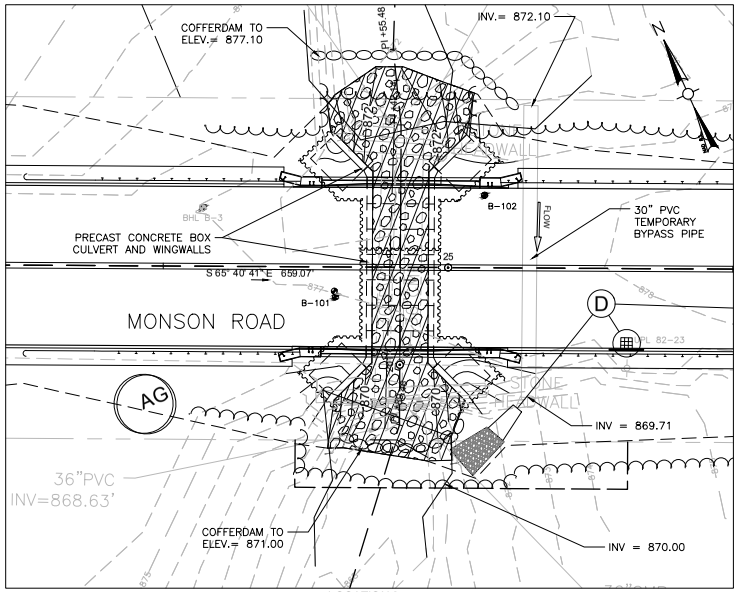
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

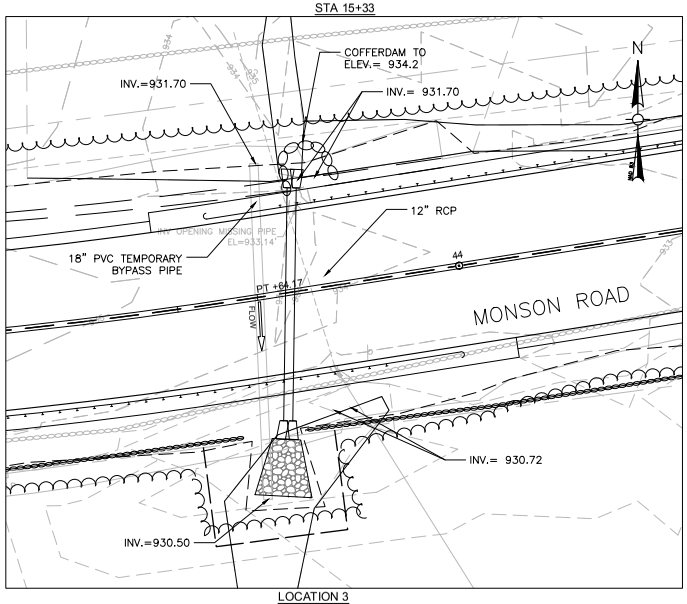
CONTROL OF WATER PLANS



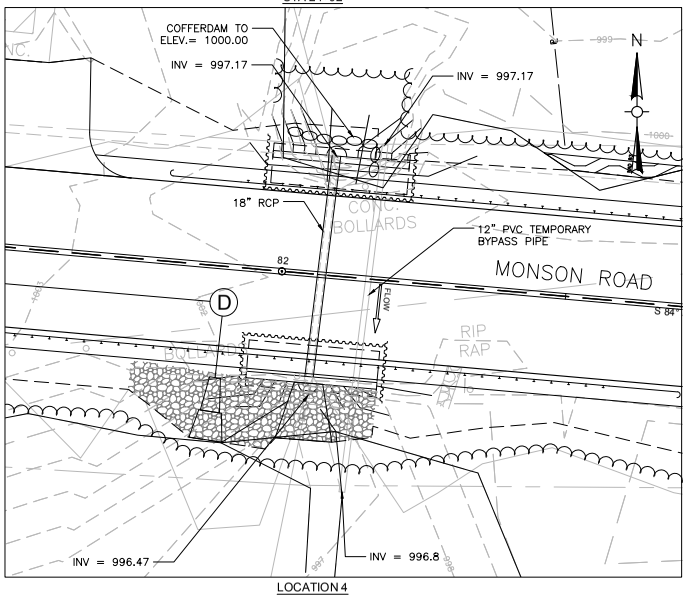
LOCATION 1
STA 15+33



LOCATION 2
STA 24+92



LOCATION 3
STA 43+76



LOCATION 4
STA 82+07

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE FOR CULVERTS:

PLANS AND CALCULATIONS FOR ALL SANDBAGGING, DIKES,OPTIONAL SHEETING AND OTHER WATER CONTROL MEASURES SHALL BE DEVELOPED BY THE CONTRACTOR. THESE PLANS AND CALCULATIONS SHALL BE PREPARED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS AND SHALL BE SUBMITTED FOR APPROVAL OF THE ENGINEER PRIOR TO THE START OF CONSTRCUTION.

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE AND INVERT ELEVATIONS) AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE. SEE PLAN FOR HEIGHT OF COFFERDAM.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE FOR CULVERTS AND END WALLS

PLANS AND CALCULATIONS FOR ALL SANDBAGGING, DIKES,OPTIONAL SHEETING AND OTHER WATER CONTROL MEASURES SHALL BE DEVELOPED BY THE CONTRACTOR. THESE PLANS AND CALCULATIONS SHALL BE PREPARED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS AND SHALL BE SUBMITTED FOR APPROVAL OF THE ENGINEER PRIOR TO THE START OF CONSTRCUTION.

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE) AND INSTALL THE COFFERDAMS IN THE STREAM ON BOTH ENDS OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND ENDWALLS.
4. INSTALL THE NEW CULVERT.
5. INSTALL THE END WALLS.
6. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT. RECONFIGURE THE COFFERDAMS AROUND THE SIDE THAT WILL BE CONSTRUCTED NEXT.
7. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
8. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

0 10 20 30 40
SCALE: 1" = 10'

608163_HD12\WATER HANDLING.DWG Plotted on 5-Aug-2024 11:52 AM

A00830 -10538

Proposal No. 608163-128112

608163_HD12\WATER HANDLING1.DWG Plotted on 8-Aug-2024 9:29 AM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

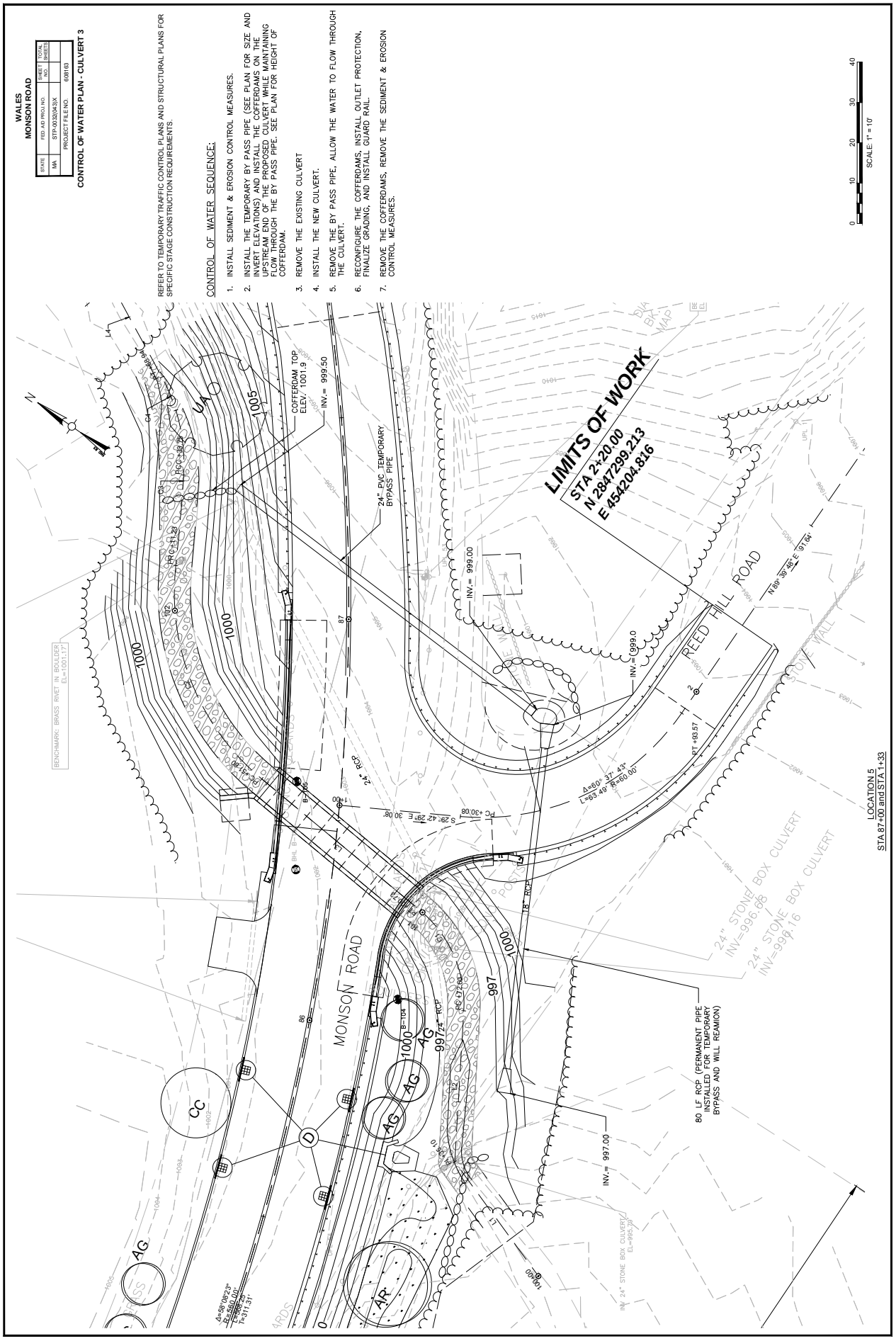
CONTROL OF WATER PLAN - CULVERT 3

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE AND INVERT ELEVATIONS) AND INSTALL COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE. SEE PLAN FOR HEIGHT OF COFFERDAM.
3. REMOVE THE EXISTING CULVERT
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

SCALE: 1" = 10'

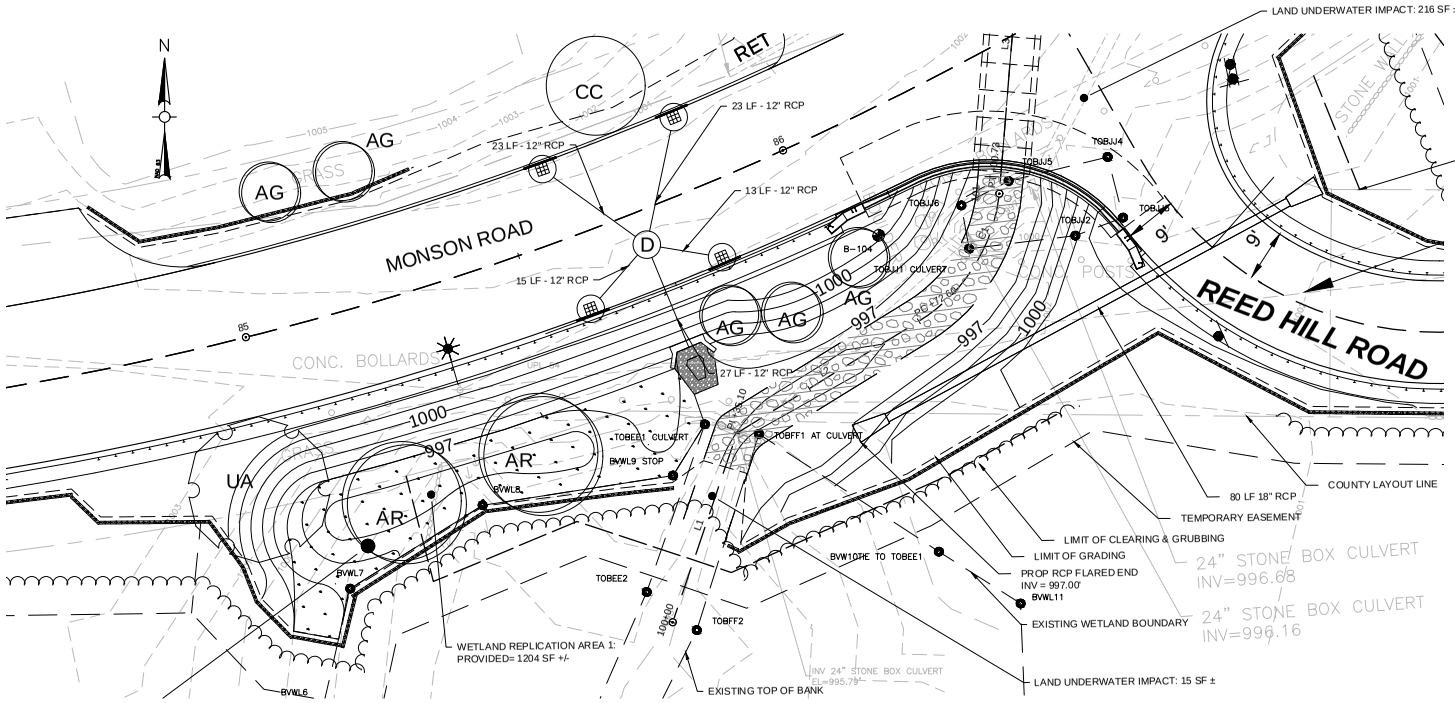


608163_HD13\WETLAND REPLICATION).DWG Plotted on 9-Aug-2024 3:42 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ.NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

WETLAND REPLICATION AREA DETAIL



WETLAND REPLICATION AREA 1 GRADING PLAN

0 10 20 30 40

SCALE: 1" = 10'

WETLAND SEED MIX - OBLIGATE MIX

BOTANICAL

GRASS	COMMON NAME	%PLS BY WEIGHT
CAREX VULPINOIDEA	FOX SEDGE	26.50%
CAREX LURIDA	SHALLOW SEDGE	15.00%
SAPERGANIUM EURYCARPUM	GIANT BUR REED ECO PA	10.00%
CAREX LUPULINA	HOP SEDGE	7.00%
CAREX CRINITA	FRINGED SEDGE	6.00%
SCIRPUS CYPERINUS	WOOLGRASS	4.00%
JUNCUS EFFUSUS	SOFT RUSH	3.00%
CAREX COMOSA	BEAREDED SEDGE	3.00%
SCIRPUS ATROVIRENS	GREEN BULRUSH	3.00%
SPARGANIUM AMERICANUM	BURRWEED	2.50%
SCIRPUS VALIDUS	BULRUSH, SOFT-STEM	2.00%
CAREX STRICTA	TUSSOCK SEDGE	1.00%
GLYCERIA CANADENISIS	MANNA GRASS	1.00%
		86.00%
VERBENA HASTATA	BLUE VERVAIN	4.00%
ASTER PUNICEUS	ASTER - SWAMP	2.00%
EUPATORIUM MACULATUM	JOE-PYE WEED	1.50%
EUPATORIUM PERFOLIATUM	BONESET	2.00%
IRIS VERSICOLOR	BLUE FLAG IRIS	2.00%
ALISMA SUBCORDATUM	MUD PLAINTAIN	1.00%
VERONIA NOVEBORACENSIS	NEW YORK IRONWEED	1.00%
BUDENS CERNUA	NODDING BURR MARIGOLD	1.00%
SOLIDAGO PATULA	ROUGHLEAF GOLDENROD	0.50%
MIMULUS RINGENS	MONKEY FLOWER	0.50%
CHELONE GLABRA	WHITE TURTLEHEAD	0.50%
		14.00%
		100.00%

SEED RATING:
SPECIES ECOTYPE SHALL BE AS NATIVE TO NEW ENGLAND REGION AS POSSIBLE. APPLY THIS MIX AT 20 LBS PLS/ACRE.

WETLAND REPLACEMENT AREA 1 NOTES:

1. A WETLAND SCIENTIST SHALL BE PROVIDED ON-SITE TO MONITOR CONSTRUCTION OF THE WETLAND MITIGATION AREA TO ENSURE COMPLIANCE WITH THE MITIGATION PLAN.
2. AT LEAST 12 INCHES OF NATURAL OR MANMADE WETIAND SOIL SHALL BE INSTALLED IN THE WETLAND REPLICATION AREA.
3. ONLY PLANT MATERIALS NATIVE AND INDIGENOUS TO THE REGION SHALL BE USED. SPECIES NOT SPECIFIED IN THE REPLICATION PLAN SHALL NOT BE USED WITHOUT WRITTEN APPROVAL FROM THE REGULATORY AUTHORITIES. PLANT SPECIES ON THE INVASIVE SPECIES PLANT LIST IN THE CORPS MITIGATION INTRODUCTION: PERFORMANCE STANDARDS AND SUPPLEMENTARY INFORMATION DATED 2/21/01 SHALL NOT BE USED IN AND WITHIN 100 FEET OF MITIGATION SITES.
4. A SUPPLY OF DEAD AND DYING WOODY DEBRIS SHALL COVER between 5%-20% OF THE GROUND THROUGHOUT THE MITIGATION SITE AFTER THE COMPLETION OF CONSTRUCTION OF THE MITIGATION SITE. THESE MATERIALS SHOULD NOT INCLUDE INVASIVE SPECIES.
5. TEMPORARY DEVICES AND STRUCTURES TO CONTROL EROSION AND SEDIMENTATION IN AND AROUND MITIGATION SITES SHALL BE DISASSEMBLED AND PROPERLY DISPOSED OF NO LATER THAN NOVEMBER 1 THREE FULL GROWING SEASON AFTER PLANTING. SEDIMENT COLLECTED BY THESE DEVICES SHALL BE REMOVED AND PROPERLY DISPOSED OF IN A MANNER THAT PREVENT ITS EROSION AND TRANSPORT TO A WATERWAY OR WETLAND.

WETLAND REPLICATION AREA 1 PLANTING PLAN

SHRUBS
HIGHBUSH BLUEBERRY (VACCINIUM CORYMBOSUM): 4 PLANTS, SPACED 10 FEET ON CENTER MINIMUM
WINTERBERRY (ILEX VERTICILLATE): 4 PLANTS, SPACED 10 FEET ON CENTER MINIMUM

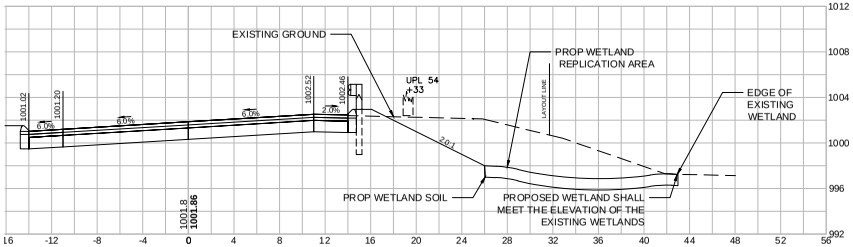
FERNS
CINNAMON FERN (OSMUNDA CINNAMOMEA): 50 PLANTS, SPACED 2 FEET ON CENTER, PUT IN CLUSTERS OF AT LEAST 5 TOGETHER IN SAME AREA TO PROVIDE A NATURAL PATTERN.
SENSITIVE FERN (ONOCLEA SENSIBILIS): 50 PLANTS, SPACED 2 FEET ON CENTER, PUT IN CLUSTERS OF AT LEAST 5 TOGETHER IN SAME AREA TO PROVIDE A NATURAL PATTERN.

SEED MIX
IN WETLAND REPLICATION AREA: SEE WETLAND SEED - OBLIGATE MIX - THIS SHEET (SAME MIX TO BE USED ON PLAN SHEET 16 FOR WETLAND RESTORATION AREA 1)

FOR ALL AREA OUTSIDE AND ADJACENT TO WETLAND RESTORATION AND/OR REPLICATION AREAS PROVIDE PART SHADE ROADSIDE SEED MIX AS INDICATED ON CONSTRUCTION DETAIL SHEET 84.

TREES
OCTOBER GLORY (ACER RUBRUM): 2 TREES SPACED 25 FEET ON CENTER, WITH A 3 INCH TO 3.5 INCH CALIPER, TO PROVIDE A NATURAL PATTERN.
PRINCTON (ULMUS AMERICANA): 1 TREE WITH A 2 INCH TO 2.5 INCH CALIPER.

85+50



WETLAND REPLICATION AREA CROSS SECTION

Weston & Sampson

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Wetland Delineation Report

October 2023
Updated August 2024

Monson Road
Wales, MA

Wetland Delineation Conducted By:
Devin Herrick, CWS on 10/31/2023

Delineation Report Reviewed By:
Megan Kearns, PWS

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APPENDICES

Appendix A ....ACOE Wetland Determination Data Forms

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1.0 SITE DESCRIPTION

On October 31, 2023 and March 17, 2024, the presence of wetland resources was investigated on Monson Road, in Wales, MA on a section of road approximately 1.5 miles in length. The western limit of investigation terminated at the intersection with Lynch Road while the eastern limit terminated at the intersection with Reed Hill Road. The area under consideration is in a rural community within a topographically variable landscape composed of glacial till transected by numerous streams running with north/south trajectories. Please see Figure 1.1-1.6 (Wetlands Field Map) and Figure 2 (USGS Topographic Map) attached to this report for the investigation area.

Wetland resource areas including bordering vegetated wetlands (BVW), isolated wetlands (IW), perennial streams, intermittent streams and a pond were identified and flagged in the field using pink flagging by a Weston & Sampson employee who is trained in the wetland delineation process using the Massachusetts Department of Environmental Protection (MassDEP) and the US Army Corps of Engineers methodologies. A further description of these wetland resource areas is presented in the following sections.

2.0 DELINEATION OF WETLAND RESOURCES

2.1 Site Observations

The Weston & Sampson wetland scientist, trained in the ACOE Wetland Delineation Manual and Massachusetts Department of Environmental Protection (MassDEP) Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetland Protection Act guidance document, observed the following protected wetland resources at the site:

- Bordering Vegetated Wetlands (BVW)
- Isolated Vegetated Wetland (IW)
- Bank – Perennial Stream
- Bank – Intermittent Stream
- Bank – Non-Jurisdictional Intermittent Stream

Field data were recorded on U.S. Army Corps of Engineers (ACOE) Wetland Determination Data Forms which are included in Appendix A.

2.2 Wetland Delineation Methodology

A wetland delineation assessment was conducted in accordance with the Massachusetts Wetland Protection Act Regulations (310 CMR 10.55(2)(c)), Massachusetts Department of Environmental Protection (MassDEP) Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands (Second Edition, September 2022), and ACOE Wetland Manual (Technical Report Y-87-1).

The bordering vegetated wetlands (BVW) delineation methodology included the characterization of vegetation, hydrologic conditions, and soil in both wetland and upland areas to identify the transitional area, which was used as the wetland limit. Pink flags with distinct flag numbers were left in the field to show wetland resource area limits.

Vegetation, hydrology and soils were assessed in both wetland and upland areas to accurately place the wetland limits at each site. The percentage of vegetative species was estimated by creating sample plots. Sample plot radius for trees, saplings, shrubs, groundcover and woody vine strata was 30', 15', 15', 5' and 30', respectively. After creating the sample plot areas, the percent basal area coverage of

each species within the monitoring plot was recorded. Using these field observations, the percent dominance of each species within its stratum was calculated. The 50/20 Rule was then used to determine dominance. Dominant species were considered the most abundant plant species (when ranked in descending order of abundance and cumulatively totaled) that immediately exceeds 50% of the total dominance measure (basal area) for the stratum, plus any additional species comprising 20% or more of the total dominance measure for the stratum. Once the dominant species were determined, they were treated equally to determine the presence of hydrophytic vegetation. If the number of dominant species with a Wetland Indicator Status of FAC (excluding FAC-), FACW or OBL is greater than, or equal to, the number of remaining dominant species, the area was considered a jurisdictional wetland resource area based on vegetation.

A soil sample from each wetland sample plot were also taken. Each soil sample goes to a depth of at least 12-24 inches. The soil was characterized to determine if the soil sample was considered a hydric (wetland) soil. Soil samples, including mottles, were characterized based on color using Munsell Soil-Color charts as a color reference.

The general area was then assessed for hydrologic conditions, including, but not limited to, site inundation, depth to free water, depth of soil saturation, water marks, drift lines, sediment deposits, water stained leaves.

2.3 Bordering Vegetated Wetlands (BVW)

A total of sixteen BVW series were delineated at the site. The limits of the BVW resource areas were determined by locating the transitional areas between wetlands and uplands vegetation, soils and hydrologic conditions. Wetland flags left in the field included:

- BVW-A1 through BVW-A6 (Bordering Vegetated Wetland “A” Series)
- BVW-B1 through BVW-B10 (Bordering Vegetated Wetland “B” Series)
- BVW-C1 through BVW-C6 (Bordering Vegetated Wetland “C” Series)
- BVW-D1 through BVW-D4 (Bordering Vegetated Wetland “D” Series)
- BVW-E1 through BVW-E6 (Bordering Vegetated Wetland “E” Series)
- BVW-F1 through BVW-F3 (Bordering Vegetated Wetland “F” Series)
- BVW-G1 through BVW-G11 (Bordering Vegetated Wetland “G” Series)

- BVW-H1 through BVW-H12 (Bordering Vegetated Wetland “H” Series)
- BVW-I1 through BVW-I10 (Bordering Vegetated Wetland “I” Series)
- BVW-J1 through BVW-J13 (Bordering Vegetated Wetland “J” Series)
- BVW-K1 through BVW-K4 (Bordering Vegetated Wetland “K” Series)
- BVW-L1 through BVW-L15 (Bordering Vegetated Wetland “L” Series)
- BVW-M1 through BVW-M10 (Bordering Vegetated Wetland “M” Series)
- BVW-O1 through BVW-O3 (Bordering Vegetated Wetland “O” Series)
- BVW-AA1 through BVW-AA4 (Bordering Vegetated Wetland “AA” Series)
- BVW-BB1 through BVW-BB4 (Bordering Vegetated Wetland “BB” Series)

Dominant vegetation within this resource area included red maple (*Acer rubrum*), winterberry (*Ilex verticillate*), crested fern (*Dryopteris cristata*), sensitive fern (*Onoclea sensibilis*), and riverbank grape (*Vitis riparia*), all species that thrive in wet conditions. Soils within the BVW were considered sandy mucky mineral. Other indicators of wetland hydrology included surface water, water-stained leaves, drainage patterns, highwater table and saturation.

Dominant upland vegetation next to this BVW included red oak (*Quercus rubra*) and Japanese barberry (*Berberis thunbergii*). Soil in the upland area consisted of dry sandy loam, with no evidence of mottling or hydrology within the top 12 inches.

BVWs are subject to a 100-foot buffer under the Massachusetts Wetland Protection Act per 310 CMR 10.02(2)(b).

2.4 Isolated Vegetated Wetland (IW)

Two isolated wetlands were delineated at the site. The limit of the IW resource area was determined by locating the transitional area between wetland and upland vegetation, soils and hydrologic conditions. Vegetation, hydrology and soils were assessed in the same manner as described above for identifying BVW. Wetland flags left in the field included:

- WET-A1 through WET-A10 (Isolated Wetland “A” Series)
- WET-B1 through WET-B11 (Isolated Wetland “B” Series)

Dominant vegetation within this resource area included reed canary grass (*Phalaris arundinacea*), rough-leaved goldenrod (*Solidago patula*), and grass-leaved goldenrod (*Euthamia graminifolia*), all species that thrive in wet conditions. Soils within the wetland limits were considered sandy loam (sandy redox). Indicators of wetland hydrology included surface water, soil saturation, and oxidized rhizospheres.

Dominant upland vegetation next to this isolated wetland included red oak (*Quercus rubra*). Soil in the upland area consisted of dry sandy loam. No indicators of wetland hydrology were observed.

The Massachusetts Wetland Protection Act does not protect isolated vegetated wetlands.

2.4 Bank

Water bodies, including perennial streams, intermittent streams, ponds and lakes, have banks which are protected by the Massachusetts Wetland Protection Act. Bank is a wetland resource area defined by 310 CMR 10.54(2)(a) as "the portion of land surface which normally abuts and confines a water body. It occurs between a waterbody and a vegetated bordering wetland and adjacent floodplain, or, in absence of these, it occurs between a waterbody and an upland." Vegetated banks provide valuable functions such as flood control, stormwater prevention, fisheries protection, and water quality protection. The limit of this resource area is identified by Top of Bank (TOB) which is located at the first observable break in slope or the Mean Annual Flood Level (MAFL), whichever is lower. TOB is easily identified in the field so that indicator was utilized for this wetland delineation.

Perennial Stream Banks

Three perennial streams were identified within the investigation area. All three of these perennial streams are unnamed. These streams are shown as perennial on the current United States Geographical Survey (USGS) map which classifies them as perennial per 310 CMR 10.58 (2)(a)(1)(b-c). The boundaries of the perennial streams were identified by the first observable break in slope (TOB). Wetland flags left in the field included:

- TOB-E1 through TOB-E8 (Perennial Stream Bank "E" Series)
- TOB-F1 through TOB-F9 (Perennial Stream Bank "F" Series)
- TOB-I1 through TOB-I17 (Intermittent Stream Bank "I" Series)
- TOB-J1 through TOB-J18 (Intermittent Stream Bank "J" Series)

- WET-C1 through WET-C8 (Perennial Stream Bank “C” Series)
- TOB-K1 through TOB-K6 (Perennial Stream Bank “K” Series)
- TOB-L1 through TOB-L6 (Perennial Stream Bank “L” Series)

Perennial streams are subject to a 200-foot Riverfront Area under the Massachusetts Wetland Protection Act per 301 CMR 10.58(2)(a)(2)(c).

Intermittent Stream Banks (Jurisdictional)

Five jurisdictional intermittent streams were identified within the investigation area. Four of these intermittent streams are unnamed and not shown on the current United States Geographical Survey (USGS) map. The easternmost intermittent stream is shown on the current United States Geographical Survey (USGS) map and called Vinica Brook. These intermittent streams have a watershed size less than 0.5 square miles in size according to USGS Stream Stats which classifies the streams as intermittent per 310 CMR 10.58 (2)(a)(1)(b-c). The boundaries of the intermittent streams were identified in the field by the first observable break in slope (TOB). Wetland flags left in the field included:

- TOB-A1 through TOB-A5 (Intermittent Stream Bank “A” Series)
- TOB-B1 through TOB-B5 (Intermittent Stream Bank “B” Series)
- TOB-C1 through TOB-C5 (Intermittent Stream Bank “C” Series)
- TOB-D1 through TOB-D5 (Intermittent Stream Bank “D” Series)
- TOB-CC1 through TOB-CC3 (Intermittent Stream Bank “CC” Series)
- TOB-DD1 through TOB-DD3 (Intermittent Stream Bank “DD” Series)
- TOB-GG1 through TOB-GG2 (Intermittent Stream Bank “GG” Series)
- TOB-HH1 through TOB-HH2 (Intermittent Stream Bank “HH” Series)
- TOB-AA1 through TOB-AA3_March 2024 (Intermittent Stream Bank “AA” Series)
- TOB-BB1 through TOB-BB15_March 2024 (Intermittent Stream Bank “BB” Series)
- TOB-CC1 through TOB-CC16_March 2024 (Intermittent Stream Bank “CC” Series)
- TOB-KK1 through TOB-KK9 (Intermittent Stream Bank “KK” Series)
- TOB-LL1 through TOB-LL6 (Intermittent Stream Bank “LL” Series)
- TOB-EE1 through TOB-EE6 (Intermittent Stream Bank “EE” Series)
- TOB-FF1 through TOB-FF6 (Intermittent Stream Bank “FF” Series)
- TOB-M1 through TOB-M4 (Intermittent Stream Bank “M” Series)

- TOB-N1 through TOB-N4 (Intermittent Stream Bank “N” Series)
- TOB-AA1 through TOB-AA3 (Intermittent Stream Bank “AA” Series)
- TOB-BB1 through TOB-BB3 (Intermittent Stream Bank “BB” Series)
- TOB-JJ1 through TOB-JJ6 (Intermittent Stream Bank “JJ” Series)

Intermittent stream banks are subject to a 100-foot buffer under the Massachusetts Wetland Protection Act per 310 CMR 10.02(2)(b).

The westernmost stream crossing is a small drainage swale that originates northeast of Lynch Road and flows west beneath Lynch Road, and along the north side of Monson Road before crossing south under Monson Road via the culvert. Bankfull indicators did not exist in the channel at the time of field evaluation. The channel was delineated and is depicted on the plans as bank flag series TOB C, TOB D, TOB BB, and TOB CC. Based on a site visit conducted with the U.S. Army Corps of Engineers on August 26, 2024, the reviewers determined that this channel would not be jurisdictional under Section 404 of the Clean Water Act as it is a non-relatively permanent watercourse, and does not contain definable banks.

Intermittent Stream Banks (Non-Jurisdictional)

Three intermittent streams were identified within the investigation area which do originate within a wetland resource area. Per 310 CMR 10.04 Stream means “*a body of running water, including brooks and creeks, which moves in a definite channel in the ground due to a hydraulic gradient, and which flows within, into or out of an Area Subject to Protection under M.G.L. c. 131, § 40. A portion of a stream may flow through a culvert or beneath a bridge. Such a body of running water which does not flow throughout the year (i.e., which is intermittent) is a stream except for that portion upgradient of all bogs, swamps, wet meadows and marshes*”. Since these streams are located upgradient of any wetland there are non-jurisdictional. Wetland flags left in the field included:

- TOB-G1 through TOB-G2 (Intermittent Stream Bank “G” Series)
- TOB-H1 through TOB-H2 (Intermittent Stream Bank “H” Series)
- WET-N1 through WET-N8 (Intermittent Stream Bank “N” Series)
- TOB-DD1 through TOB-DD2_March 2024 (Intermittent Stream Bank “DD” Series)
- TOB-EE1 through TOB-EE2_March 2024 (Intermittent Stream Bank “EE” Series)

Pond Bank

A single unnamed pond was located within the investigation area. According to the Massachusetts Wetland Protection Act a pond is defined as “any body of fresh water with a surface area observed or recorded within the last ten years of at least 10,000 square feet”. Based on aerial imagery the unnamed pond identified on site is approximately 14,000 SF. According to the Massachusetts Wetland Protection Act “ponds may be either naturally occurring or human made by impoundment, excavation or otherwise”. Wetland flags left in the field included:

- TOB-II1 through TOB-II3 (Pond Bank “II” Series)

Pond banks are subject to a 100-foot buffer under the Massachusetts Wetland Protection Act per 310 CMR 10.02(2)(b).

2.5 Other Protected Areas

Weston & Sampson created environmental resources maps (see Figure 4) of the site to determine the presence of other protected areas. The data source of these map layers was the Massachusetts Geographic Information System (MassGIS). These areas included:

- NHESP Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Certified and Potential Vernal Pools
- Areas of Critical Environmental Concern (ACEC)
- Outstanding Resource Waters (ORW)
- Coldwater Fisheries
- Article 97 Land

Wetland resources identified in the field were also added to these maps. Based on the MassGIS information, a portion of the investigation area is located within NHESP Priority Habitats of Rare Species, and NHESP Estimated Habitat of Rare Wildlife. Additionally, the three perennial streams identified on site are shown as coldwater fisheries.

FEMA Flood Insurance Rate Maps (FIRM) were created online from the FEMA website to determine if there is a 100-year flood zone at the site. See Figure 3 for FIRM map. Based on FEMA flood maps the investigation area is not located within the 100-year flood zone.

3.0 SUMMARY

On October 31, 2023 and March 17, 2024, the presence of wetland resources was investigated on Monson Road, in Wales, MA. Wetland resource areas including bordering vegetated wetlands (BVW), isolated wetlands (IW), perennial streams, intermittent streams and a pond were identified and flagged in the field.

Additional environmental mapping was conducted using MassGIS data layers and FEMA FIRM mapping. This additional mapping indicates that a portion of the investigation area is located within NHESP Priority Habitats of Rare Species, and NHESP Estimated Habitat of Rare Wildlife. Additionally, the three perennial streams identified on site are shown as coldwater fisheries.

4.0 REFERENCES

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Legend

- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

2

1,000 500 0 1,000 Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

FIGURE 1.1
MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

A00830 -1074

Proposal No. 608163-128112

2

100 50 0 100 Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.2
MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

A00830 -1075

Proposal No. 608163-128112

2

100 50 0 100
Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.3
MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

A00830 -1076

Proposal No. 608163-128112

2

100 50 0 100 Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.4
MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

A00830 -1077

Proposal No. 608163-128112

2

100 50 0 100 Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

FIGURE 1.5
MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

A00830 -1078

Proposal No. 608163-128112

2

100 50 0 100 Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Wetland Flags
- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- USGS Perennial Stream
- USGS Intermittent Stream

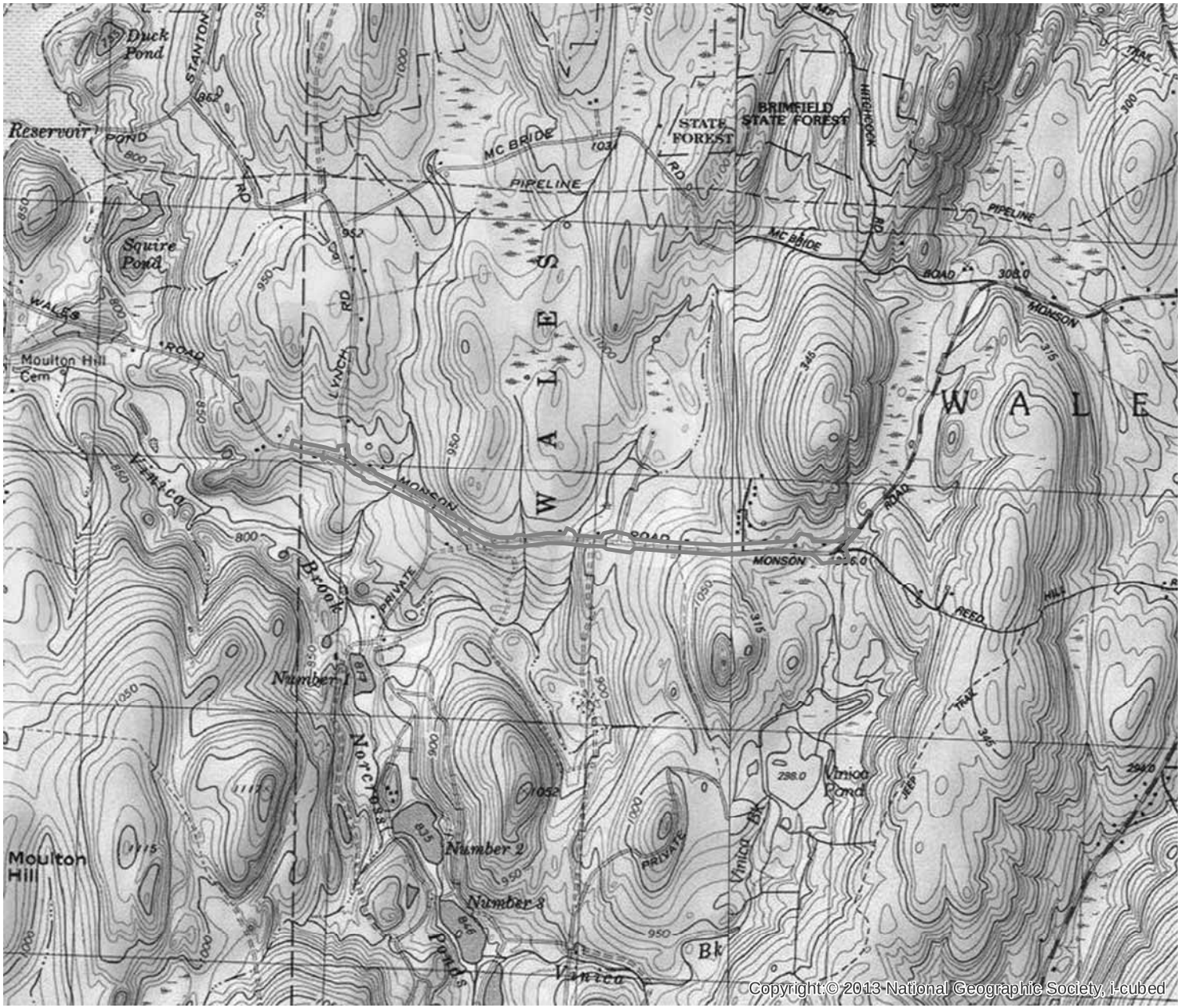
FIGURE 1.6
MONSON ROAD
WALES MA

WETLANDS FIELD MAP

Weston & Sampson

A00830 - 1079

Proposal No. 608163-128112



2

1,000 500 0 1,000
Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

Investigation Area

FIGURE 2

MONSON ROAD
WALES MA

USGS TOPOGRAPHIC MAP

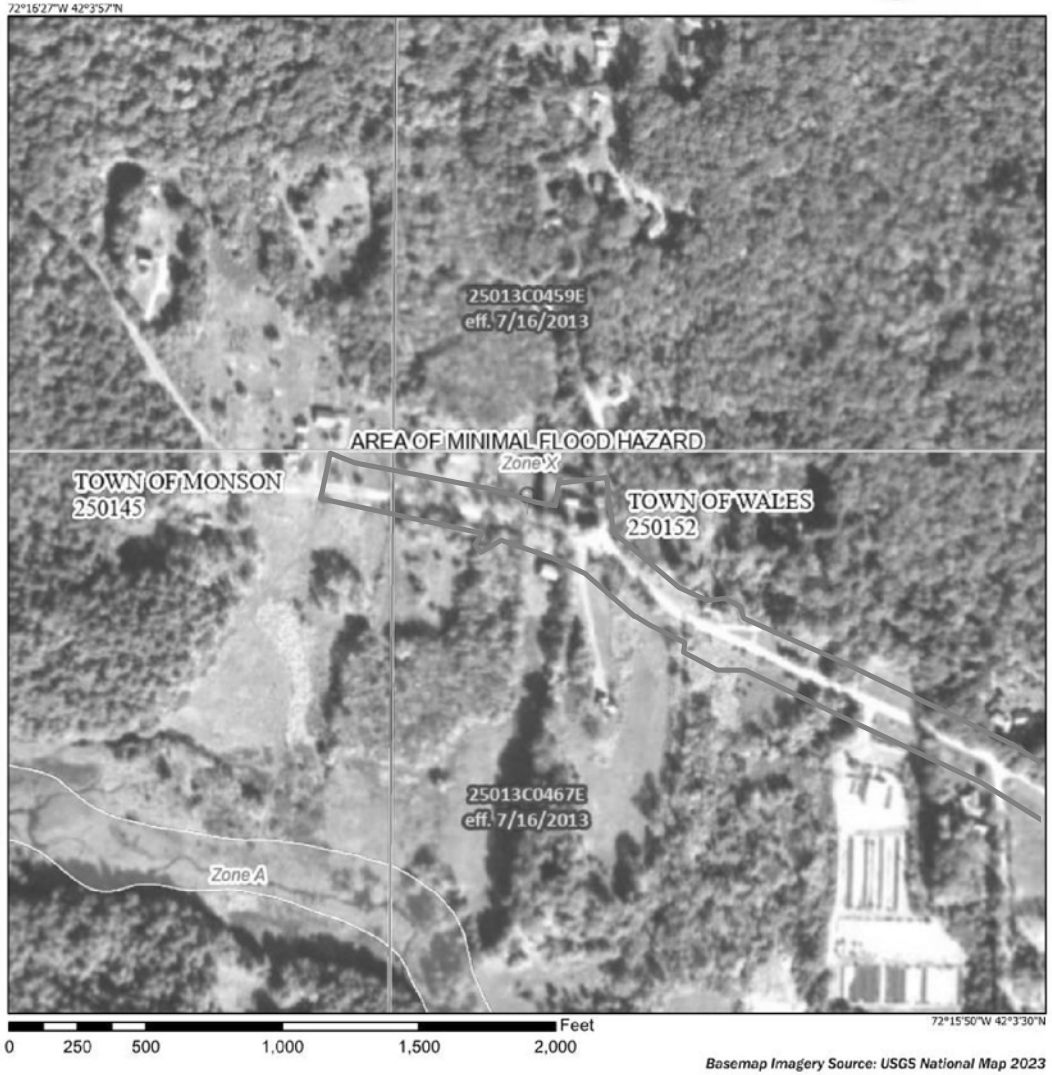
Weston & Sampson

A00830 - 1080

Proposal No. 608163-128112

National Flood Hazard Layer FIRMette

FEMA



Basemap Imagery Source: USGS National Map 2023

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 1/24/2024 at 5:14 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.

Legend

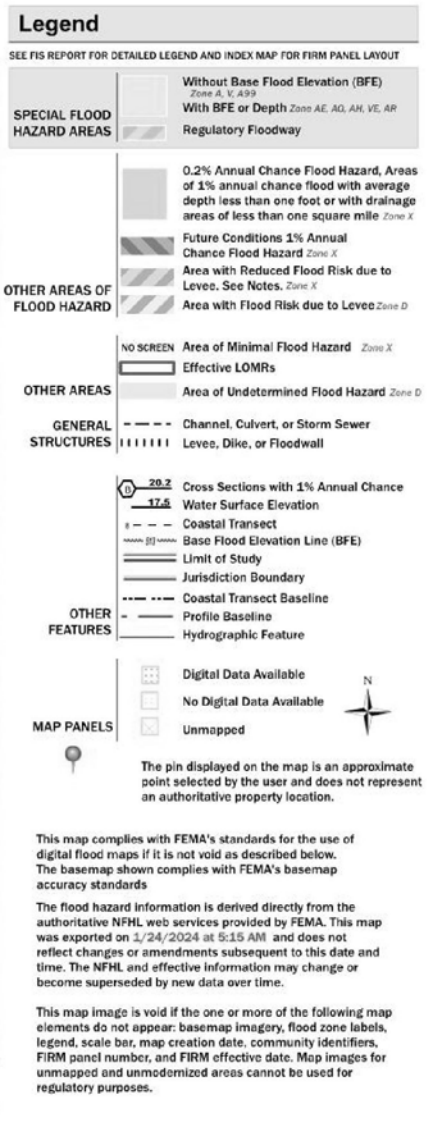
Investigation Area

FIGURE 3.1

MONSON ROAD
WALES MA

FEMA MAP

Weston & Sampson



Legend

Investigation Area

FIGURE 3.2

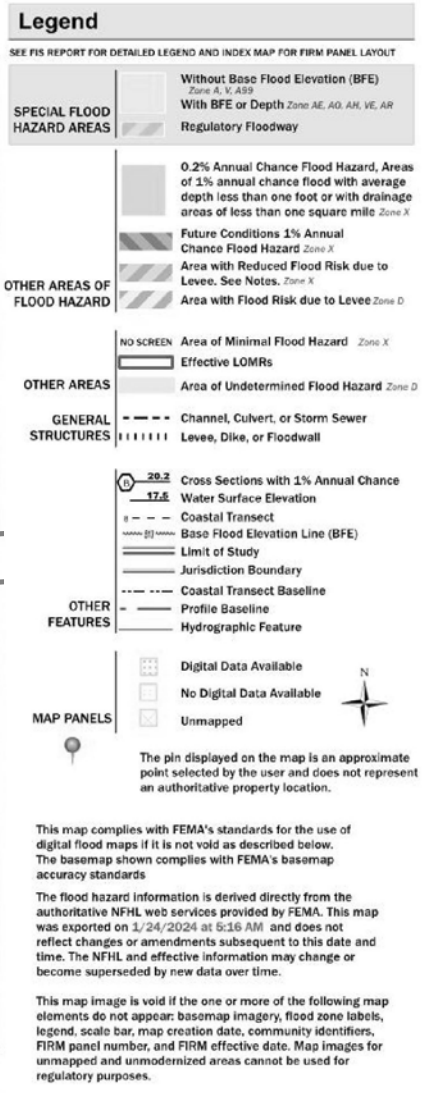
MONSON ROAD
WALES MA

FEMA MAP

Weston & Sampson

A00830 -1082

Proposal No. 608163-128112



Legend

Investigation Area

FIGURE 3.3

MONSON ROAD
WALES MA

FEMA MAP

Weston & Sampson

A00830 -1083

Proposal No. 608163-128112

National Flood Hazard Layer FIRMette

FEMA

72°14'59"W 42°3'45"N

72°14'21"W 42°3'19"N

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

Basemap Imagery Source: USGS National Map 2023

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/24/2024 at 5:16 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.

Legend

Investigation Area

FIGURE 3.4

MONSON ROAD
WALES MA

FEMA MAP

Weston & Sampson

Path: \\wse03.local\WSE\Projects\MA\Wales, MA\2170841 Monson Rd Reconstruction\Permits\Wetland Delineation_2023\GIS\Maps\Environmental Receptor.mxd **User:** Herrick.Devin **Saved:** 4/15/2024 4:07:31 AM **Opened:** 4/15/2024 4:07:54 AM

Legend

- Bank - Pond
- Bank - Intermittent Streams
- Bank - Perennial Streams
- Bank - Non Jurisdictional Intermittent Stream
- Bordering Vegetated Wetlands
- Isolated Wetlands
- Investigation Area
- MassDOT Roads
- ACECs
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- Cold Water Fisheries
- Public Water Supply Contributor
- ORW for ACEC
- ORW for both Water Supply and Other
- Article 97 Land
- Community Groundwater Source

2

1,000 500 0 1,000 Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

FIGURE 4

MONSON ROAD
WALES MA

ENVIRON. RESOURCES MAP

Weston & Sampson

A00830 -1085

Proposal No. 608163-128112

APPENDIX A

ACOE Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-A16 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills, ground moraines, drumlins Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 30.71" N Long: 72° 15' 19.2" W Datum: NAD 1983

Soil Map Unit Name: Paxton fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X 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)
- X 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)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-A16 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	90	Yes	FAC
2. green ash (*Fraxinus pennsylvanica*)	10	No	FACW
3. white pine (*Pinus Strobus*)	10	No	FACU
4. shagbark hickory (*Carya ovata*)	10	No	FACU
5.			
6.			
7.			
	120	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. common winterberry (*Ilex verticillata*)	80	Yes	FACW
2. Japanese barberry (*Berberis thunbergii*)	15	No	FACU
3.			
4.			
5.			
6.			
7.			
	95	= Total Cover	
Herb Stratum (Plot size: 5 feet)			
1. crested fern (*Dryopteris cristata*)	30	Yes	FACW
2. sensitive fern (*Onoclea sensibilis*)	20	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50	= Total Cover	
Woody Vine Stratum (Plot size: 30 feet)			
1. riverbank grape (*Vitis riparia*)	10	Yes	FAC
2.			
3.			
4.			
	10	= 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: 5 (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	140	x 2 =	280
FAC species	100	x 3 =	300
FACU species	35	x 4 =	140
UPL species		x 5 =	
Column Totals:	275 (A)		720 (B)

Prevalence Index = B/A = 2.61

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-A16 (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 - 8	10YR 2/1	90	10YR 5/2 & 2.5YR 2.5/4	10	C/D	M	sandy muck	could not get below 8" due to stones

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

Soils were saturated. Could not sample below 8 inches as materials were very stoney.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-A16 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills, ground moraines, drumlins Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 30.71" N Long: 72° 15' 19.2" W Datum: NAD 1983

Soil Map Unit Name: Paxton fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-A16 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red oak (Quercus rubra)	70	Yes	FACU
2. white pine (*Pinus Strobus*)	20	No	FACU
3. shagbark hickory (*Carya ovata*)	20	No	FACU
4.			
5.			
6.			
7.			
	110	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 feet)			
1. Japanese barberry (*Berberis thunbergii*)	15	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	

Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	

Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species	125	x 4 =	500
UPL species		x 5 =	
Column Totals:	125 (A)		500 (B)

Prevalence Index = B/A = 5.0

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-A16 (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 - 14	10YR 4/3	100					sandy loam	soils moist to dry

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-B1 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Marshes, depressions, kettles, bogs, swamps Local relief (concave, convex, none): Concave

Slope (%): 0 - 1 Lat: 42° 3' 30.23" N Long: 72° 14' 43.53" W Datum: NAD 1983

Soil Map Unit Name: Freetown muck NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X 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)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-B1 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	70	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	70	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. common winterberry (*Ilex verticillata*)	30	Yes	FACW
2. highbush blueberry (*Vaccinium corymbosum*)	30	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	60	= Total Cover	
Herb Stratum (Plot size: 5 feet)			
1. unidentified sedge	60	Yes	
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60	= Total Cover	
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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 60	x 2 = 120
FAC species 70	x 3 = 210
FACU species	x 4 =
UPL species	x 5 =
Column Totals: 130 (A)	330 (B)

Prevalence Index = B/A = 2.54

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-B1 (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 2/1	100					muck	saturated soils

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-B1 (up)

Investigator(s): Nathaniel Parker Section, Township, Range:

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 30.23" N Long: 72° 14' 43.53" W Datum: NAD 1983

Soil Map Unit Name: Gloucester gravelly fine sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-B1 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer rubrum*)	60	Yes	FAC
2. shagbark hickory (*Carya ovata*)	40	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	100	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 feet)			
1. Japanese barberry (*Berberis thunbergii*)	15	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	

Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	

Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	60	x 3 =	180
FACU species	55	x 4 =	220
UPL species		x 5 =	
Column Totals:	115 (A)		400 (B)

Prevalence Index = B/A = 3.47

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-B1 (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 - 14	10YR 3/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-C1 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range:

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 32.21" N Long: 72° 14' 44.56" W Datum: NAD 1983

Soil Map Unit Name: Gloucester gravelly fine sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X 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)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-C1 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	60	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	60	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. mulitflora rose (Rosa multiflora)	20	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	20	= Total Cover	
Herb Stratum (Plot size: 5 feet)			
1. broad-leaved cattail (*Typha latifolia*)	10	Yes	OBL
2. sensitive fern (*Onoclea sensibilis*)	15	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	25	= Total Cover	
Woody Vine Stratum (Plot size: 30 feet)			
1. riverbank grape (*Vitis riparia*)	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: 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	10	x 1 =	10
FACW species	15	x 2 =	30
FAC species	70	x 3 =	210
FACU species	20	x 4 =	80
UPL species		x 5 =	
Column Totals:	115 (A)		330 (B)

Prevalence Index = B/A = 2.87

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-C1 (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					sandy muck	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-C1 (up)

Investigator(s): Nathaniel Parker Section, Township, Range:

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 32.21" N Long: 72° 14' 44.56" W Datum: NAD 1983

Soil Map Unit Name: Gloucester gravelly fine sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-C1 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	30	Yes	FAC
2. red oak (*Quercus rubra*)	40	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	70	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	

Herb Stratum (Plot size: 5 feet)			
1. manicured lawn	60		
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60	= Total Cover	

Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	30	x 3 =	90
FACU species	40	x 4 =	160
UPL species		x 5 =	
Column Totals:	70 (A)		250 (B)

Prevalence Index = B/A = 3.57

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-C1 (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 3/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-D5 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range:

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 31.03" N Long: 72° 14' 39.5" W Datum: NAD 1983

Soil Map Unit Name: Gloucester gravelly fine sandy loam NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No _____ Hydric Soil Present? Yes X No _____ Wetland Hydrology Present? Yes X No _____	**Is the Sampled Area within a Wetland?** **Yes** X **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)
- X 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)
- X 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 X No _____ Depth (inches): 0

Water Table Present? Yes X No _____ Depth (inches): 6

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: BVW-D5 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	70	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	70	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. highbush blueberry (*Vaccinium corymbosum*)	15	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	
Herb Stratum (Plot size: 5 feet)			
1. crested fern (*Dryopteris cristata*)	15	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	15	= Total Cover	
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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 30	x 2 = 60
FAC species 70	x 3 = 210
FACU species	x 4 =
UPL species	x 5 =
Column Totals: 100 (A)	270 (B)

Prevalence Index = B/A = 2.7

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-D5 (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					saturated loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-D5 (up)

Investigator(s): Nathaniel Parker Section, Township, Range:

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 31.03" N Long: 72° 14' 39.5" W Datum: NAD 1983

Soil Map Unit Name: Gloucester gravelly fine sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-D5 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer rubrum*)	40	Yes	FAC
2. red oak (*Quercus rubra*)	60	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	100	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 feet)			
1. Japanese barberry (*Berberis thunbergii*)	100	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	100	= Total Cover	

Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	

Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	40	x 3 =	120
FACU species	160	x 4 =	640
UPL species		x 5 =	
Column Totals:	200 (A)		760 (B)

Prevalence Index = B/A = 3.8

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-D5 (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 - 14	10YR 3/2	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-E1 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range:

Landform (hillslope, terrace, etc.): Hills, ground moraines, drumlins Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 32.76" N Long: 72° 15' 35.47" W Datum: NAD 1983

Soil Map Unit Name: Paxton fine sandy loam NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X Surface Water (A1)
- X Water-Stained Leaves (B9)
- High Water Table (A2)
- Aquatic Fauna (B13)
- X Saturation (A3)
- Marl Deposits (B15)
- Water Marks (B1)
- Hydrogen Sulfide Odor (C1)
- Sediment Deposits (B2)
- Oxidized Rhizospheres on Living Roots (C3)
- Drift Deposits (B3)
- Presence of Reduced Iron (C4)
- Algal Mat or Crust (B4)
- Recent Iron Reduction in Tilled Soils (C6)
- Iron Deposits (B5)
- Thin Muck Surface (C7)
- Inundation Visible on Aerial Imagery (B7)
- Other (Explain in Remarks)
- Sparsely Vegetated Concave Surface (B8)

Secondary Indicators (minimum of two required)

- Surface Soil Cracks (B6)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 2
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-E1 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	70	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	70	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	
Herb Stratum (Plot size: 5 feet)			
1. crested fern (*Dryopteris cristata*)	15	Yes	FACW
2. sensitive fern (*Onoclea sensibilis*)	10	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	25	= Total Cover	
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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	25	x 2 =	50
FAC species	70	x 3 =	210
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	95 (A)		260 (B)

Prevalence Index = B/A = 2.74

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-E1 (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 3/2	95	10YR 5/6	5	C/CS		sandy loam	saturated

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: BVW-E1 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills, ground moraines, drumlins Local relief (concave, convex, none): Linear, convex

Slope (%): 8 - 15 Lat: 42° 3' 32.76" N Long: 72° 15' 35.47" W Datum: NAD 1983

Soil Map Unit Name: Paxton fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: BVW-E1 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	30	Yes	FAC
2. red oak (*Quercus rubra*)	60	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	90	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	

Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	

Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	30	x 3 =	90
FACU species	60	x 4 =	240
UPL species		x 5 =	
Column Totals:	90 (A)		330 (B)

Prevalence Index = B/A = 3.67

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BVW-E1 (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 3/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: WA-B1 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range:

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 3 - 8 Lat: 42° 3' 41.54" N Long: 72° 16' 0.47" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X Surface Water (A1)
- X Water-Stained Leaves (B9)
- High Water Table (A2)
- Aquatic Fauna (B13)
- X Saturation (A3)
- Marl Deposits (B15)
- Water Marks (B1)
- Hydrogen Sulfide Odor (C1)
- Sediment Deposits (B2)
- Oxidized Rhizospheres on Living Roots (C3)
- Drift Deposits (B3)
- Presence of Reduced Iron (C4)
- Algal Mat or Crust (B4)
- Recent Iron Reduction in Tilled Soils (C6)
- Iron Deposits (B5)
- Thin Muck Surface (C7)
- Inundation Visible on Aerial Imagery (B7)
- Other (Explain in Remarks)
- Sparsely Vegetated Concave Surface (B8)

Secondary Indicators (minimum of two required)

- Surface Soil Cracks (B6)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 3
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: WA-B1 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer Rubrum*)	50	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	50	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. silky dogwood (*Cornus amomum*)	40	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	40	= Total Cover	
Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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 40	x 2 = 80
FAC species 50	x 3 = 150
FACU species	x 4 =
UPL species	x 5 =
Column Totals: 90 (A)	230 (B)

Prevalence Index = B/A = 2.56

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-B1 (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 - 5	10YR 2/2	100					sandy muck	could not get below 5" due to stones

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

Soils were saturated. Could not sample below 5 inches as materials were very stony.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: WA-B1 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, convex

Slope (%): 3 - 8 Lat: 42° 3' 41.54" N Long: 72° 15' 0.47" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: WA-B1 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. black cherry (*Prunus serotina*)	20	Yes	FACU
2. white pine (*Pinus Strobus*)	10	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	30	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 feet)			
1. Japanese barberry (*Berberis thunbergii*)	10	Yes	FACU
2. American red raspberry (*Rubus idaeus*)	15	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	25	= Total Cover	

Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	

Woody Vine Stratum (Plot size: 30 feet)			
1. American bittersweet (*Celastrus scandens*)	15	Yes	FACU
2.			
3.			
4.			
	15	= 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: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species	70	x 4 =	280
UPL species		x 5 =	
Column Totals:	70 (A)		280 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-B1 (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 3/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

Materials stony below 10 inches.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: WA-C4 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, concave

Slope (%): 3 - 8 Lat: 42° 3' 39.5" N Long: 72° 16' 0.64" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WA-C4 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. reed canarygrass (*Phalaris arundinacea*)	80	Yes	FACW
2. rough-leaved goldenrod (*Solidago patula*)	20	No	OBL
3. grass-leaved goldenrod (*Euthamia graminifolia*)	20	No	FAC
4. broadleaf cattail (*Typha latiifolia*)	20	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	140 = Total Cover		
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
	= 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: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	40	x 1 =	40
FACW species	80	x 2 =	160
FAC species	20	x 3 =	60
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	140 (A)		260 (B)

Prevalence Index = B/A = 1.86

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-C4 (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					sandy muck	saturated

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: WA-C4 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, concave

Slope (%): 3 - 8 Lat: 42° 3' 39.5" N Long: 72° 16' 0.64" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: WA-C4 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. white pine (*Pinus strobus*)	15	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. unidentified upland grass	90	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
	90	= Total Cover	
Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species	15	x 4 =	60
UPL species	90	x 5 =	450
Column Totals:	105 (A)		510 (B)

Prevalence Index = B/A = 4.86

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-C4 (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 - 14	10YR 3/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: WA-A3 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, concave

Slope (%): 3 - 8 Lat: 42º 3' 44.81" N Long: 72º 16' 13.87" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X 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)
- X 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 X	No _____	Depth (inches): 0
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: WA-A3 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. reed canarygrass (*Phalaris arundinacea*)	60	Yes	FACW
2. rough-leaved goldenrod (*Solidago patula*)	20	Yes	OBL
3. grass-leaved goldenrod (*Euthamia graminifolia*)	20	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
	= 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	20	x 1 =	20
FACW species	60	x 2 =	120
FAC species	20	x 3 =	60
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	100 (A)		200 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-A3 (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	98	2.5YR 3/6	2	CS	PL	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: WA-A3 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, concave

Slope (%): 3 - 8 Lat: 42° 3' 44.81" N Long: 72° 16' 13.87" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: WA-A3 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. red oak (*Quercus rubra*)	20	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	20	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. unidentified upland grass	90	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
	90	= Total Cover	
Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
		= 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: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species	20	x 4 =	80
UPL species	90	x 5 =	450
Column Totals:	110 (A)		530 (B)

Prevalence Index = B/A = 4.82

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-A3 (up)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 14	10YR 2/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: IW-B6 (wet)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, concave

Slope (%): 3 - 8 Lat: 42° 3' 43.76" N Long: 72° 16' 14.55" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	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)
- X 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)
- X 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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: IW-B6 (wet)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. reed canarygrass (*Phalaris arundinacea*)	70	Yes	FACW
2. rough-leaved goldenrod (*Solidago patula*)	20	No	OBL
3. grass-leaved goldenrod (*Euthamia graminifolia*)	20	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	110 = Total Cover		
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
	= 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: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	70	x 2 =	140
FAC species	20	x 3 =	60
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	110 (A)		220 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ 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 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** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: IW-B6 (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	98	2.5YR 3/6	2	CS	PL	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- X 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 (TF2)
- ___ 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** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Monson Road Improvement Project City/County: Wales/Hampden Sampling Date: 11/24/2020

Applicant/Owner: Town of Wales State: MA Sampling Point: IW-B6 (up)

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hills Local relief (concave, convex, none): Linear, concave

Slope (%): 3 - 8 Lat: 42° 3' 43.76" N Long: 72° 16' 14.55" W Datum: NAD 1983

Soil Map Unit Name: Scituate fine sandy loam NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: IW-B6 (up)

Tree Stratum (Plot size: 30 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	15 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 feet)			
1. unidentified upland grass	90	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
	90 = Total Cover		
Herb Stratum (Plot size: 5 feet)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		
Woody Vine Stratum (Plot size: 30 feet)			
1.			
2.			
3.			
4.			
	= 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	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species 90	x 5 = 450
Column Totals: 90 (A)	450 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: IW-B6 (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 - 14	10YR 2/3	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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 (TF2)
- ___ 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** X

Remarks:

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

PLAN AND PROFILE OF

MONSON ROAD IMPROVEMENTS

IN THE TOWN OF

WALES

HAMPDEN COUNTY

100% SUBMITTAL

404 ENVIRONMENTAL PERMIT PLAN SET

WALES
MONSON ROAD

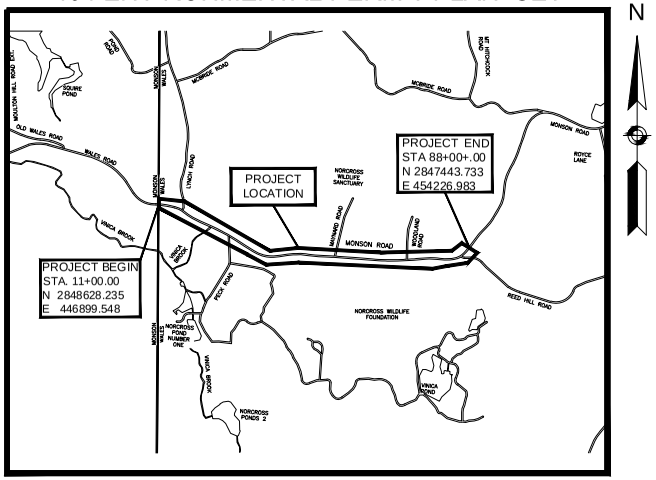
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-		
PROJECT FILE NO.	608163		

TITLE SHEET & INDEX

THESE PLANS ARE SUPPLEMENTED BY THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DATED 2024, 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	KEY PLAN
3	LEGEND, ABBREVIATIONS & GENERAL NOTES
4	TYPICAL SECTIONS
5-12	CONSTRUCTION PLANS
13-18	PROFILES
19-26	CROSS SECTIONS
27-35	STRUCTURAL PLANS
36	CULVERT 3 CHANNEL PLAN, PROFILE AND SECTION
37-38	CULVERT 3 CHANNEL CROSS SECTIONS
39-40	TEMPORARY WATER HANDLING PLAN
41	WETLAND REPLICATION AREA DETAIL



2000 0 2000 4000

DESIGN DESIGNATION - MONSON ROAD

DESIGN SPEED	40 MPH
ADT (2017)	660
ADT (2025)	760
K	11%
D	52%
T (PEAK HOUR)	3.0%
T (AVERAGE DAY)	3.0%
DHV	85
DDHV	45
FUNCTIONAL CLASSIFICATION	RURAL MAJOR COLLECTOR

LENGTH OF PROJECT = 7700.00 FEET = 1.458 MILES

August 2024

COMMONWEALTH OF MASSACHUSETTS
SCOTT R. BRUSO
STRUCTURAL
No. 48061
REGISTERED PROFESSIONAL ENGINEER

2024.08.09 12:45:27-04'00'

Weston & Sampson
712 Brook Street, Suite 103
Rocky Hill, CT 06067
860.513.1473
www.westonandsampson.com

DATE	DESCRIPTION	REV #

MassDOT Massachusetts Department of Transportation Highway Division

APPROVED

CHIEF ENGINEER DATE

608163_HDI(TITLE, LEGEND, KEY & TYPICAL SECTIONS)404.DWG Plotted on 9-Aug-2024 5:04 PM

A00830 -1141

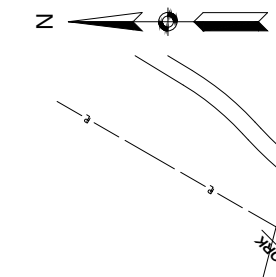
Proposal No. 608163-128112

608163_HDLTITLE, LEGEND, KEY & TYPICAL SECTIONS.DWG Plotted on 5-Aug-2024 8:17 AM

WALES
MONSON ROAD

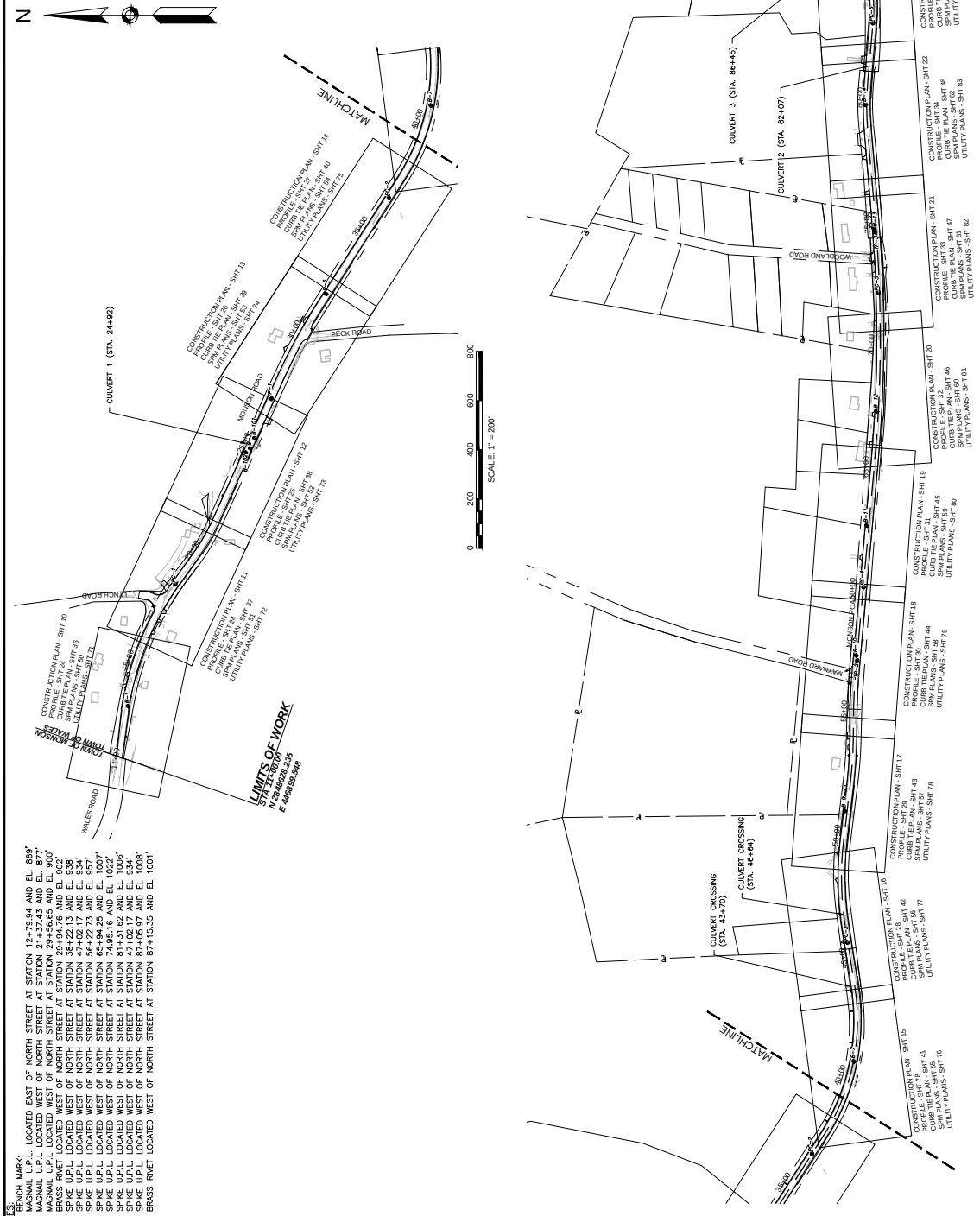
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

KEY PLAN



BORING LOCATIONS (FEET)					
BORING	NORTHING	EASTING	STATION	OFFSET	SURFACE EL.	H.B.E.
B-1	2,848,584	447,074	12+80	22.4 RT	868.0	861.5
B-3	2,848,121	448,154	24+56	10.0 LT	877.0	865.2
B-5	2,847,780	448,792	31+69	10.8 LT	902.0	897.5
B-7	2,847,423	449,318	38+27	18.1 RT	941.0	937.0
B-9	2,847,397	450,584	51+05	9.6 LT	933.0	916.5
B-10	2,847,355	451,197	57+19	6.7 LT	956.0	951.5
B-11	2,847,315	451,727	62+51	14.1 LT	989.0	984.5
B-12	2,847,272	452,354	68+80	16.0 LT	1011.0	1007.0
B-13	2,847,294	453,969	74+48	19.4 LT	1018.0	1014.5
B-14	2,847,322	453,443	79+72	12.1 LT	1008.0	1004.5
B-15	2,847,355	454,092	86+37	6.1 LT	1002.0	998.1
B-101	2,848,099	448,135	24+85	4.2 RT	877.1	861.9
B-102	2,848,103	448,186	25+06	12.85 LT	877.5	64.60
B-104	2,847,316	454,089	86+39	20.6 RT	1002.4	974.4
B-105	2,847,307	454,110	85+59	11.0 RT	1001.8	987.7

NOTES:
1. BENCH MARK:
MAGNAIL U.P.L. LOCATED EAST OF NORTH STREET AT STATION 12+79.94 AND EL. 869'
MAGNAIL U.P.L. LOCATED WEST OF NORTH STREET AT STATION 21+37.43 AND EL. 877'
MAGNAIL U.P.L. LOCATED WEST OF NORTH STREET AT STATION 29+56.65 AND EL. 900'
BRASS RIVET LOCATED WEST OF NORTH STREET AT STATION 29+94.76 AND EL. 902'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 38+22.13 AND EL. 938'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 47+02.17 AND EL. 934'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 56+22.73 AND EL. 957'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 65+94.25 AND EL. 1007'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 74.95.16 AND EL. 1022'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 81+31.62 AND EL. 1006'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 87+02.17 AND EL. 934'
SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 87+05.97 AND EL. 1008'
BRASS RIVET LOCATED WEST OF NORTH STREET AT STATION 87+15.35 AND EL. 1001'



GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
	CBCI	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
		CABLE MANHOLE
		DRAINAGE MANHOLE
		ELECTRIC MANHOLE
		GAS MANHOLE
		MISC MANHOLE
		SEWER MANHOLE
		TELEPHONE MANHOLE
		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
		SWAMP / MARSH
WG	WG	WATER GATE
PM	PM	PARKING METER
		OVERHEAD CABLE/WIRE
		CURBING
100 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
x	x	CHAIN LINK OR METAL FENCE
		WOOD FENCE
		EROSION AND SEDIMENT CONTROL BARRIER
		TREE LINE
		LIMITS OF CLEARING AND GRUBBING
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		EDGE OF PAVEMENT
		LIMIT OF MICROMILLING AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT WETLAND BUFFER
		200 FT RIVERFRONT AREA BUFFER
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT
		SIGN AND POST
		SIGN AND DOUBLE POST

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
CBCI-DB	DOUBLE GRATE CATCH BASIN W/ 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
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
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
LB	LEACH BASIN

ABBREVIATIONS (cont.)

GENERAL

LP	LIGHT POLE
LT	LEFT
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NIC	NOT IN CONTRACT
NO.	NUMBER
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
PSB	PLANTABLE 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 WATER WAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCCE	REINFORCED CONCRETE CULVERT END
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	STA
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SW	SIDEWALK
SWTU	STORMWATER TREATMENT UNIT
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
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

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
	SL	12"-WIDE STOP LINE
	SWL	6"-WIDE SOLID WHITE LINE
	DBYL	DOUBLE YELLOW LINE (2 - 6"-WIDE YELLOW LINES)

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

LEGEND, ABBREVIATIONS & GENERAL NOTES

GENERAL NOTES:

1. TOPOGRAPHICAL INFORMATION BASED ON AN ON THE GROUND SURVEY PERFORMED BY CHAPPELL ENGINEERING ON DECEMBER 2017 AND SUPPLEMENTED BY CHAPPELL ENGINEERING IN OCTOBER 2023. WETLAND FLAGGING WAS PERFORMED BY WESTON & SAMPSON IN NOVEMBER 2020 AND REFLAGGED IN SEPTEMBER OF 2023.
2. THE HORIZONTAL COORDINATES ARE BASED ON NAD 83, THE VERTICAL DATUM IS NAVD 88.
3. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. THE CONTRACTOR SHALL DIG TEST PITS WITH THE LOCATIONS BEING APPROVED BY THE ENGINEER PRIOR TO COMMENCEMENT OF WORK TO EXACTLY LOCATE EXISTING UTILITIES.
4. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
5. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY OWNER. ANY ALTERATIONS SHALL BE INCIDENTAL TO THE PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY SUPPORT OF ALL UTILITIES TO REMAIN IN PLACE AND SHALL DESCRIBE IN WRITING, TO THE SATISFACTION OF THE ENGINEER, HIS METHOD OF TEMPORARY SUPPORT.
6. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
7. THE TERM "PROPOSED (PROP)" INDICATES WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET (R&R)".
8. ALL EXISTING STATE, COUNTY AND TOWN LOCATION LINES AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATION ARE NOT GUARANTEED.
9. ALL EXCESS MATERIAL FROM ROADWAY RECONSTRUCTION OR THE EXCAVATION PROCESS SHALL BE REUSED ON SITE OR REMOVED FROM THE SITE AND DISPOSED OF IN A LEGAL AND PROPER MANNER.
10. THE CONTRACTOR SHALL CALL DIGSAFE AT 1-888-344-7233 AT LEAST 72 HOURS, SATURDAYS, AND HOLIDAYS EXCLUDED, PRIOR TO EXCAVATING AT ANY LOCATION. A COPY OF THE DIGSAFE PROJECT REFERENCE NUMBER(S) SHALL BE GIVEN TO THE TOWN PRIOR TO EXCAVATION.
11. JOINTS BETWEEN HOT MIX ASPHALT TRENCH PAVEMENT AND SAWCUT EXISTING PAVEMENT SHALL BE SEALED WITH BITUMEN AND BACKSANDED.
12. IF DEEMED NECESSARY DUE TO THE WORK, THE CONTRACTOR SHALL COORDINATE WITH THE TOWN OF WALES HIGHWAY DEPARTMENT, THE WALES FIRE DEPARTMENT, AND THE ENGINEER FOR APPROVAL OF SHUTTING DOWN ANY EXISTING WATER MAINS AND SHALL ALSO OBTAIN APPROVAL FOR DISRUPTING ANY EXISTING SEWER FLOWS.
13. THE CONTRACTOR SHALL BE AWARE THAT ONLY TOWN PERSONNEL ARE ALLOWED TO OPERATE WATER GATES AND HYDRANTS. ANY REQUESTS TO OPERATE THE GATES SHALL BE COORDINATED THROUGH THE ENGINEER.
14. THE CONTRACTOR SHALL COORDINATE ANY WORK FOR THE PROJECT WITH ALL ADJACENT/CONCURRENT PROJECTS AND CONTRACTORS.
15. THE CONTRACTOR SHALL INSTALL PRIOR TO COMMENCEMENT OF WORK, MAINTAIN, AND REMOVE AT THE END OF THE PROJECT INLET SEDIMENT CONTROL BAGS IN ALL CATCH BASINS, WITHIN OR ADJACENT TO THE PROJECT LIMITS. THE CONTRACTOR SHALL ALSO MAINTAIN SILT FENCE AND COMPOST FILTER TUBES AS SHOWN ON THE PLANS THROUGHOUT THE DURATION OF THE PROJECT AND REMOVE AT THE END.
16. ANY GRASS AREAS DISTURBED BY THE WORK SHALL BE RESTORED WITH LOAM AND SEED.
17. ANY LANDSCAPED AREAS DISTURBED BY THE WORK SHALL BE RESTORED TO EXISTING CONDITIONS WITH EXISTING OR NEW GROUND COVER MATERIALS AS DIRECTED BY THE ENGINEER. ANY PLANTS, SHRUBS, OR FLOWERS DISTURBED BY THE WORK SHALL BE RESET TO EXISTING CONDITIONS OR REPLACED WITH NEW PLANTS, SHRUBS, OR FLOWERS AS DIRECTED BY THE ENGINEER. ALL WORK TO RESTORE LANDSCAPE AREAS, NEW GROUND COVER MATERIALS, NEW PLANTS, NEW SHRUBS, OR NEW FLOWERS REQUIRED BY THE ENGINEER SHALL BE INCIDENTAL TO THE PROJECT.
18. CONTRACTOR TO COORDINATE WITH UTILITY POLE OWNERS IN AREAS WHERE UNDERGROUND UTILITY WORK IS WITHIN CLOSE PROXIMITY AND POSSIBLE UTILITY POLE SHORING IS REQUIRED WHILE INSTALLING PROPOSED UTILITIES.
19. RAISE AND ADJUST FRAMES AND GRATES, FRAMES AND COVERS AND GATE BOXES PRIOR TO PAVEMENT OVERLAY, IF REQUIRED.
20. CONTRACTOR IS RESPONSIBLE FOR REPLACING ANY PROPERTY PINS THAT ARE DAMAGED OR DESTROYED DURING CONSTRUCTION, TO THEIR LOCATION JUST PRIOR TO CONSTRUCTION.
21. ALL TRAFFIC SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS OTHERWISE NOTED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
22. CONTRACTOR TO ESTABLISH TEMPORARY BENCHMARKS EVERY 1000 FEET BASED ON THE PERMANENT BENCHMARKS LOCATED AT STA 29+85.04, 24.73 LEFT AND STA 87+27.18, 41.17 LEFT OR AS REQUIRED BY THE ENGINEER.
23. CONTRACTOR TO PROVIDE ADDITIONAL TRAVERSE POINTS AND TRAVERSE LINES IN THE VICINITY OF EXISTING TRAVERSE POINTS WHERE THE EXISTING TRAVERSE POINT IS LOCATED IN "SOFT GROUND" OR AS REQUIRED BY THE ENGINEER.
24. ALL EXISTING STONE WALLS PROPOSED FOR RELOCATION SHALL NOT BE REMOVED FROM THE IMMEDIATE AREA SHOWN ON THE PLANS.

608163_HDI(TITLE, LEGEND, KEY & TYPICAL SECTIONS).DWG Plotted on 5-Aug-2024 8:17 AM

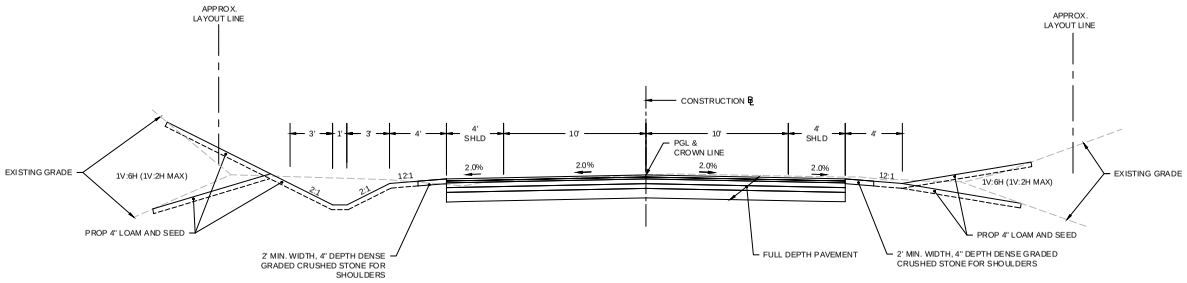
A00830 -1143

Proposal No. 608163-128112

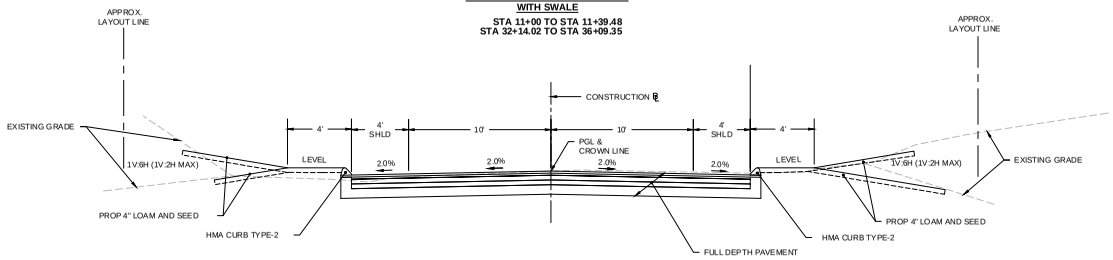
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

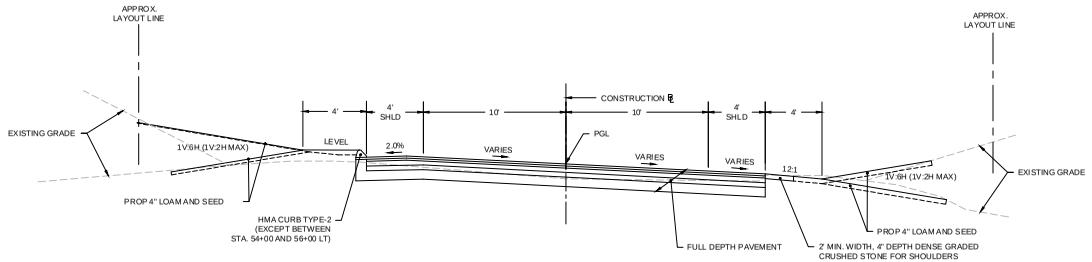
TYPICAL SECTIONS



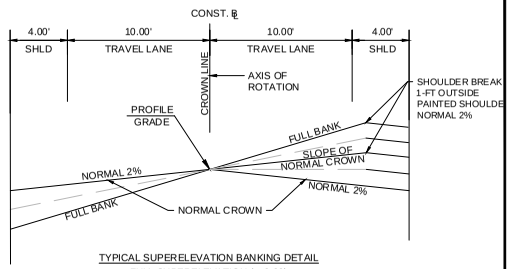
MONSON ROAD TYPICAL SECTION
WITH SWALE
STA 11+00 TO STA 11+39.48
STA 32+14.02 TO STA 36+09.35



MONSON ROAD TYPICAL SECTION
WITH CURBING
STA 22+70.43 TO STA 26+98.72
STA 57+46.79 TO STA 64+41.04
STA 75+70.50 TO STA 77+39.51



MONSON ROAD TYPICAL SECTION
FULL SUPERELEVATION AND TRANSITIONS
STA 11+39.48 TO STA 22+70.43
STA 26+98.72 TO STA 32+14.02
STA 36+09.35 TO STA 57+46.79
STA 64+41.04 TO STA 75+70.50
STA 77+39.51 TO STA 88+00



TYPICAL SUPERELEVATION BANKING DETAIL
FULL SUPERELEVATION (e=0.06)
N.T.S.

PAVEMENT NOTES

PROPOSED PAVEMENT MILLING AND OVERLAY:

1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 1.50" PAVEMENT MILLING

PROPOSED FULL DEPTH PAVEMENT:

SURFACE COURSE:	1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5).
BASE COURSE:	3.25" SUPERPAVE INTERMEDIATE COURSE 19 (SIC-19.0) PLACED IN ONE LAYER.
SUBBASE:	4" DENSE GRADED CRUSHED STONE OVER 8" GRAVEL BORROW, TYPE B.
	BITUMEN FOR TACK COAT (RS-1) TO BE APPLIED AT A RATE OF 0.07 TO 0.09 GAL/SY OVER MILLED SURFACES AND 0.06 TO 0.08 GAL/SY ON BASE AND INTERMEDIATE PAVEMENT COURSES.

PROPOSED HOT MIX ASPHALT DRIVEWAY :

SURFACE COURSE:	1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 2.50" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5)
FOUNDATION:	8" GRAVEL BORROW, TYPE B

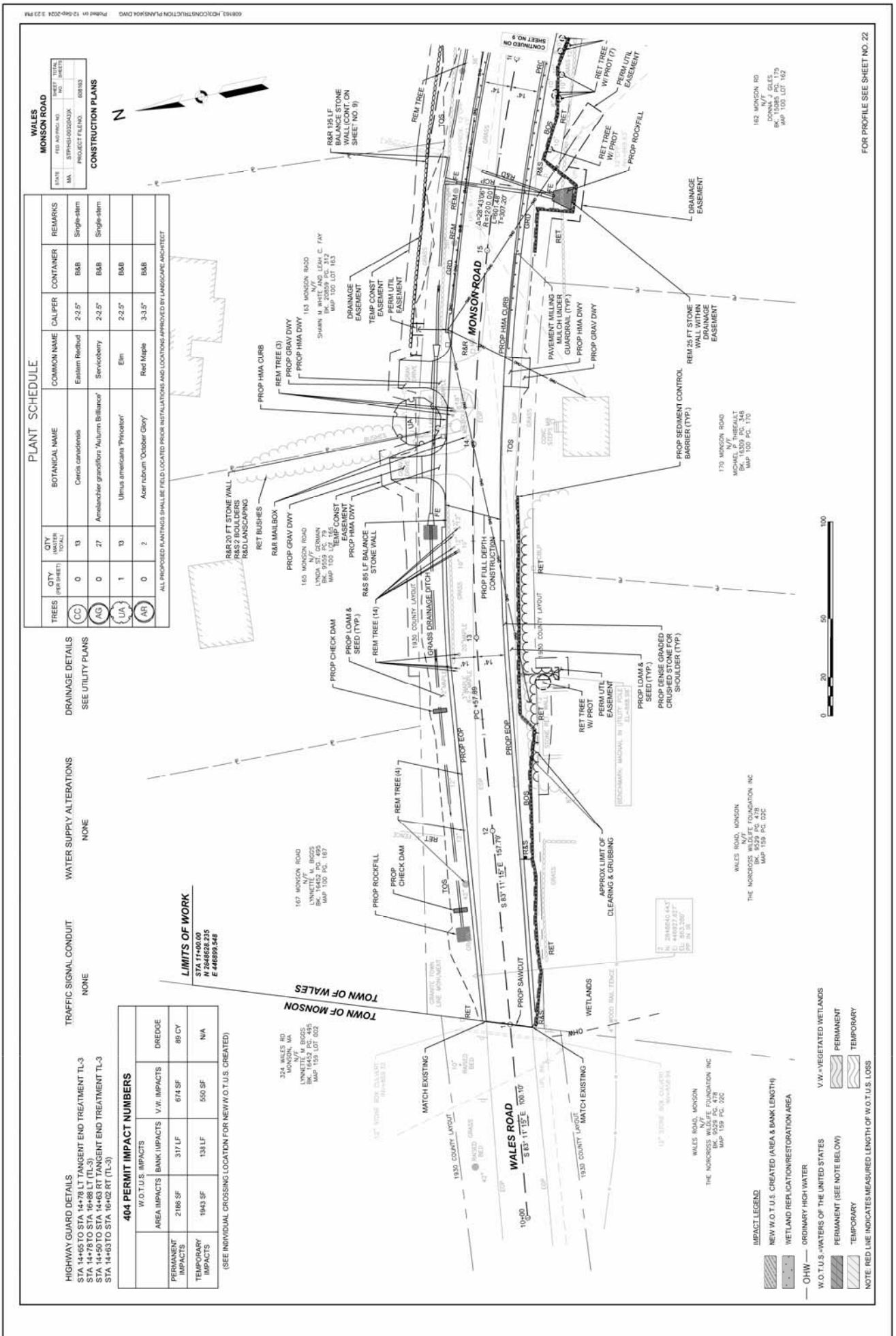
PROPOSED GRAVEL DRIVEWAY:

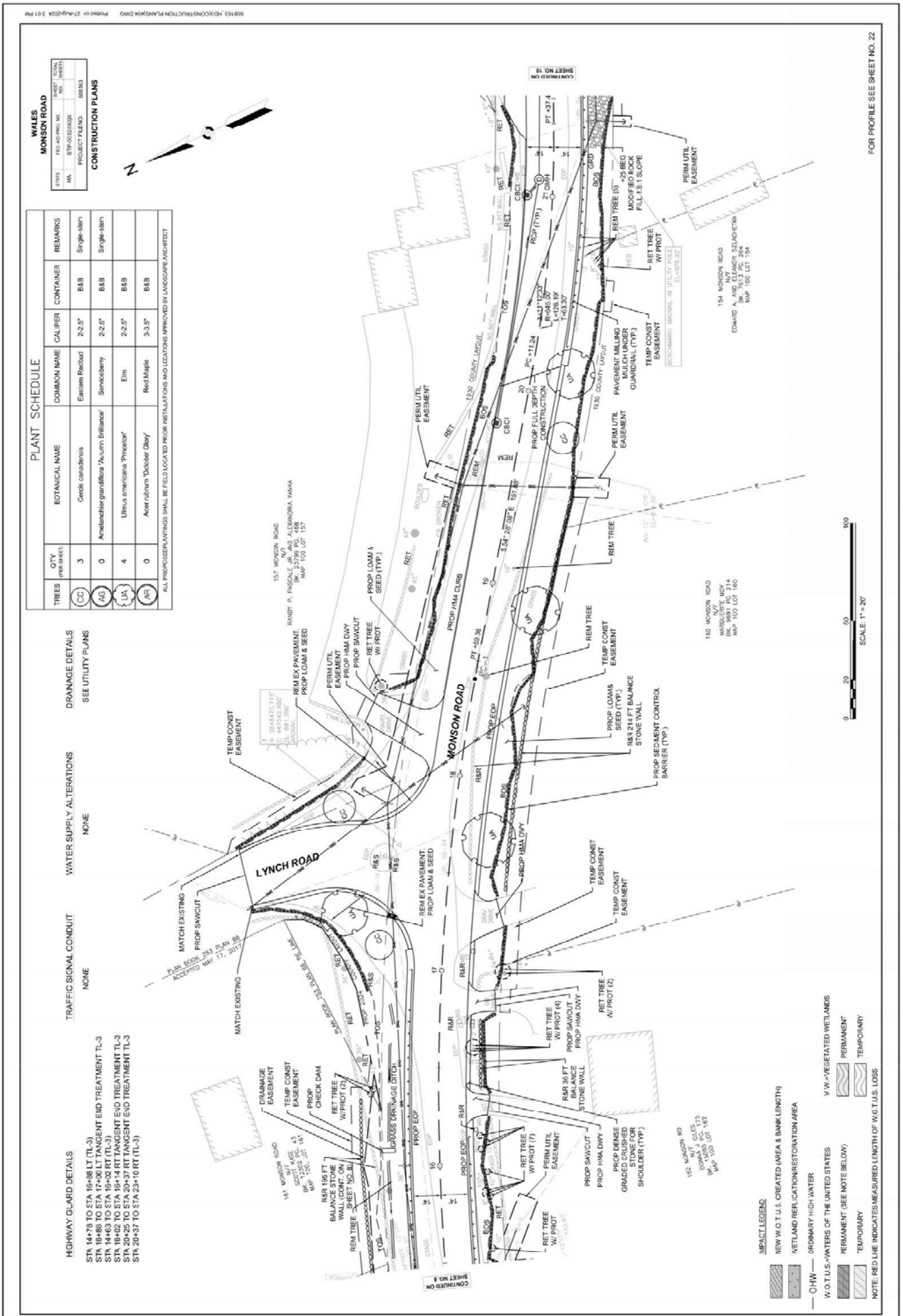
8" GRAVEL BORROW, TYPE B

PROPOSED CEMENT CONCRETE WALK

4" CEMENT CONCRETE OVER
8" GRAVEL BORROW, TYPE B

608163_HDI(TITLE, LEGEND, KEY & TYPICAL SECTIONS).DWG Plotted on 5-Aug-2024 8:17 AM


WALES
MONSON ROAD
CONSTRUCTION PLANS
PLANT SCHEDULE
TREES
QTY (PER SHEET)
QTY (MASTER TOTAL)
BOTANICAL NAME
COMMON NAME
CALIPER
CONTAINER
REMARKS
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
Cercis canadensis
Eastern Redbud
2-2.5"
B&B
Single-stem
Amelanchier grandiflora 'Autumn Brilliance'
Serviceberry
2-2.5"
B&B
Single-stem
Ulmus americana 'Princeton'
Elm
2-2.5"
B&B
Acer rubrum 'October Glory'
Red Maple
3-3.5"
B&B
404 PERMIT IMPACT NUMBERS
W.O.T.U.S. IMPACTS
AREA IMPACTS
BANK IMPACTS
V.P. IMPACTS
DREDGE
PERMANENT IMPACTS
TEMPORARY IMPACTS
(SEE INDIVIDUAL CROSSING LOCATION FOR NEW W.O.T.U.S. CREATED)
HIGHWAY GUARD DETAILS
STA 14+65 TO STA 14+78 LT TANGENT END TREATMENT TL-3
STA 14+78 TO STA 16+88 LT (TL-3)
STA 14+50 TO STA 14+63 RT TANGENT END TREATMENT TL-3
STA 14+63 TO STA 16+02 RT (TL-3)
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
LIMITS OF WORK
STA 11+00.00
N 2466287.335
E 446899.548
TOWN OF MONSON
TOWN OF WALES
WALES ROAD
MONSON ROAD
IMPACT LEGEND
NEW W.O.T.U.S. CREATED (AREA & BANK LENGTH)
WETLAND REPLICATION/RESTORATION AREA
OHW — ORDINARY HIGH WATER
W.O.T.U.S. =WATERS OF THE UNITED STATES
V.W. =VEGETATED WETLANDS
PERMANENT (SEE NOTE BELOW)
PERMANENT
TEMPORARY
TEMPORARY
NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS
FOR PROFILE SEE SHEET NO. 22
CONTINUED ON SHEET NO. 9
R&R 20 FT STONE WALL
R&S 2 BOULDERS
R&D LANDSCAPING
RET BUSHES
R&R MAILBOX
PROP GRAV DWY
PROP HMA DWY
PROP HMA CURB
REM TREE (3)
REM TREE (14)
REM TREE (4)
R&S 85 LF BALANCE STONE WALL
R&R 135 LF BALANCE STONE WALL (CONT. ON SHEET NO. 9)
TEMP CONST EASEMENT
PERM UTIL EASEMENT
DRAINAGE EASEMENT
PROP CHECK DAM
PROP LOAM & SEED (TYP.)
GRASS DRAINAGE DITCH
PROP FULL DEPTH CONSTRUCTION
PROP ROCKFILL
PROP SAWCUT
PROP EOP
PROP DENSE GRADED CRUSHED STONE FOR SHOULDER (TYP.)
APPROX LIMIT OF CLEARING & GRUBBING
MATCH EXISTING
1930 COUNTY LAYOUT
RET TREE W/ PROT
RET TREE W/ PROT (7)
PROP ROCKFILL
PAVEMENT MILLING AND OVERLAY
GUARDRAIL (TYP.)
PROP SEDIMENT CONTROL BARRIER (TYP.)
REM 25 FT STONE WALL WITHIN DRAINAGE EASEMENT
167 MONSON ROAD N/F LYNNETTE M. BIGGS BK. 11452 PG. 495 MAP 100 PG. 167
165 MONSON ROAD N/F LYNDA ST. GERMAIN BK. 9559 PG. 79 MAP 100 LOT 165
153 MONSON ROAD N/F SHAWN M. WHITE AND LEAH C. FAY BK. 20859 PG. 312 MAP 100 LOT 163
324 WALES RD MONSON, MA N/F LYNNETTE M. BIGGS BK. 11452 PG. 495 MAP 159 LOT 002
THE NORCROSS WILDLIFE FOUNDATION INC BK. 9529 PG. 478 MAP 159 PG. 02C
170 MONSON ROAD N/F MICHAEL P. THIBEAULT BK. 15309 PG. 348 MAP 100 PG. 170
162 MONSON RD N/F DONNA J. GILES BK. 13085 PG. 175 MAP 100 LOT 162
WETLANDS
WALES ROAD, MONSON
0 20 50 100


WALES
MONSON ROAD
CONSTRUCTION PLANS
PROJECT FILE NO. 608163
STP-0030(493)X
FED. AID PROJ. NO.
PLANT SCHEDULE
TREES
QTY (PER SHEET)
BOTANICAL NAME
COMMON NAME
CAL/PER
CONTAINER
REMARKS
Cercis canadensis
Eastern Redbud
2-2.5"
B&B
Single-stem
Amelanchier grandiflora 'Autumn Brilliance'
Serviceberry
2-2.5"
B&B
Single-stem
Ulmus americana 'Princeton'
Elm
2-2.5"
B&B
Acer rubrum 'October Glory'
Red Maple
3-3.5"
B&B
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 14+78 TO STA 16+88 LT (TL-3)
STA 16+88 TO STA 17+00 LT TANGENT END TREATMENT TL-3
STA 14+63 TO STA 16+02 RT (TL-3)
STA 16+02 TO STA 16+14 RT TANGENT END TREATMENT TL-3
STA 20+25 TO STA 20+37 RT TANGENT END TREATMENT TL-3
STA 20+37 TO STA 23+10 RT (TL-3)
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
MONSON ROAD
LYNCH ROAD
MATCH EXISTING
PROP SAWCUT
PLAN BOOK 243 PLAN 88 ACCEPTED MAY 17, 2017
TEMP CONST EASEMENT
REM EX PAVEMENT PROP LOAM & SEED
PERM UTIL EASEMENT
PROP HMA DWY
PROP SAWCUT
RET TREE W/ PROT
PROP LOAM & SEED (TYP.)
PROP HMA CURB
REM TREE
PROP EOP
R&R
R&S
PROP SEDIMENT CONTROL BARRIER (TYP.)
R&R 214 FT BALANCE STONE WALL
PROP DENSE GRADED CRUSHED STONE FOR SHOULDER (TYP.)
PROP CHECK DAM
GRASS DRAINAGE DITCH
DRAINAGE EASEMENT
R&R 106 FT BALANCE STONE WALL (CONT. ON SHEET NO. 8)
R&R 36 FT BALANCE STONE WALL
PROP FULL DEPTH CONSTRUCTION
PAVEMENT MILLING MULCH UNDER GUARDRAIL (TYP.)
MODIFIED ROCK FILL 1.5:1 SLOPE
PERM UTIL EASEMENT
TEMP CONST EASEMENT
REM TREE (6)
RET TREE W/ PROT
157 MONSON ROAD N/F RANDY P. PASCALE JR. AND ALEXANDRIA YANYA BK. 23799 PG. 488 MAP 100 LOT 157
160 MONSON ROAD N/F MARGUERITE MOY BK. 9691 PG. 214 MAP 100 LOT 166
154 MONSON ROAD N/F EDWARD A. AND ELEANOR SZLACHETKA BK. 7613 PG. 264 MAP 100 LOT 154
161 MONSON ROAD N/F KASE 42 SCOTT BK. 5352 PG. 161 MAP 100, LOT 161
162 MONSON RD N/F GILES DONALD BK. 5365 PG. 172 MAP 100, LOT 162
CONTINUED ON SHEET NO. 8
CONTINUED ON SHEET NO. 10
FOR PROFILE SEE SHEET NO. 22
SCALE: 1" = 20'
IMPACT LEGEND
NEW W.O.T.U.S. CREATED (AREA & BANK LENGTH)
WETLAND REPLICATION/RESTORATION AREA
OHW ORDINARY HIGH WATER
W.O.T.U.S.=WATERS OF THE UNITED STATES
V.W.=VEGETATED WETLANDS
PERMANENT (SEE NOTE BELOW)
PERMANENT
TEMPORARY
TEMPORARY
NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS

A00830 -1147

Proposal No. 608163-128112

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CONSTRUCTION PLANS

608163_HDX\CONSTRUCTION PLANS\634.DWG Plotted on 27-Aug-2024 3:01 PM

HIGHWAY GUARD DETAILS

STA 20+37 TO STA 23+10 RT (TL-3)
STA 23+10 TO STA 23+22 RT TANGENT END TREATMENT TL-3
STA 23+86 TO STA 23+96 RT TANGENT END TREATMENT TL-3
STA 23+98 TO STA 25+61 RT (TL-3)
STA 24+25 TO STA 24+37 RT TANGENT END TREATMENT TL-3
STA 24+25 TO STA 24+37 LT TANGENT END TREATMENT TL-3
STA 24+37 TO STA 24+77 RT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 24+37 TO STA 24+77 LT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+06 TO STA 25+46 RT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+06 TO STA 25+46 LT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+46 TO STA 25+60 RT (TL-3)
STA 25+46 TO STA 25+79 LT (TL-3)
STA 25+60 TO STA 25+72 RT TANGENT END TREATMENT TL-3
STA 25+79 TO STA 25+91 LT TANGENT END TREATMENT TL-3

TRAFFIC SIGNAL CONDUIT

WATER SUPPLY ALTERATIONS

NONE

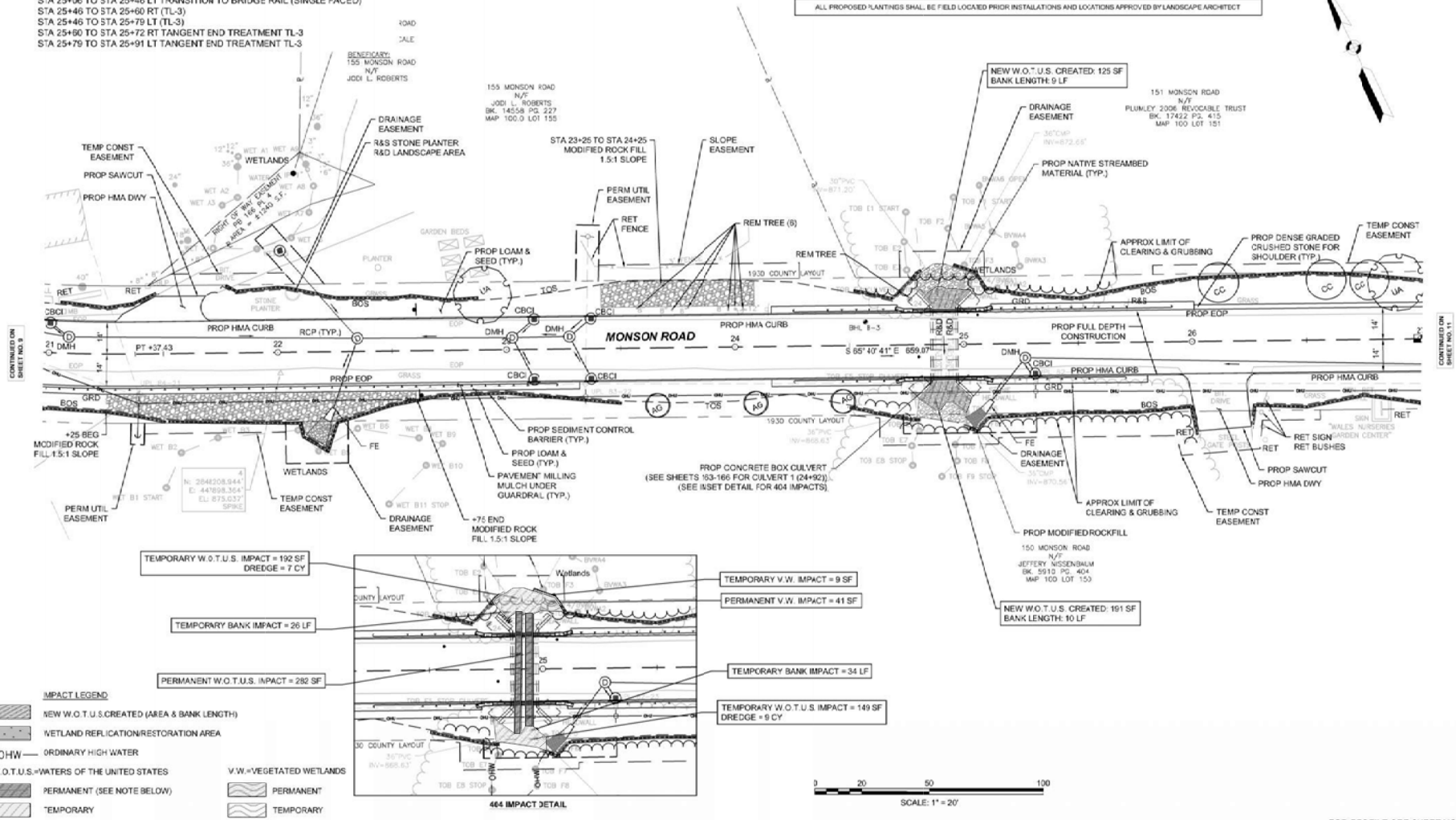
DRAINAGE DETAILS

SEE UTILITY PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	3	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	3	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	1	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT



IMPACT LEGEND

- NEW W.O.T.U.S.CREATED (AREA & BANK LENGTH)
- WETLAND REPLICATION/RESTORATION AREA
- OHW — ORDINARY HIGH WATER
- W.O.T.U.S.=WATERS OF THE UNITED STATES
- PERMANENT (SEE NOTE BELOW)
- TEMPORARY
- V.W.=VEGETATED WETLANDS
- PERMANENT
- TEMPORARY

NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 23

HIGHWAY GUARD DETAILS
STA 42+75 TO STA 42+87 RT TANGENT END TREATMENT TL-3
STA 42+87 TO STA 43+66 RT (TL-3)

TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
NONE

DRAINAGE DETAILS
SEE UTILITY PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	2	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	0	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'Octoper Glory'	Red Maple	3-3.5"	B&B	

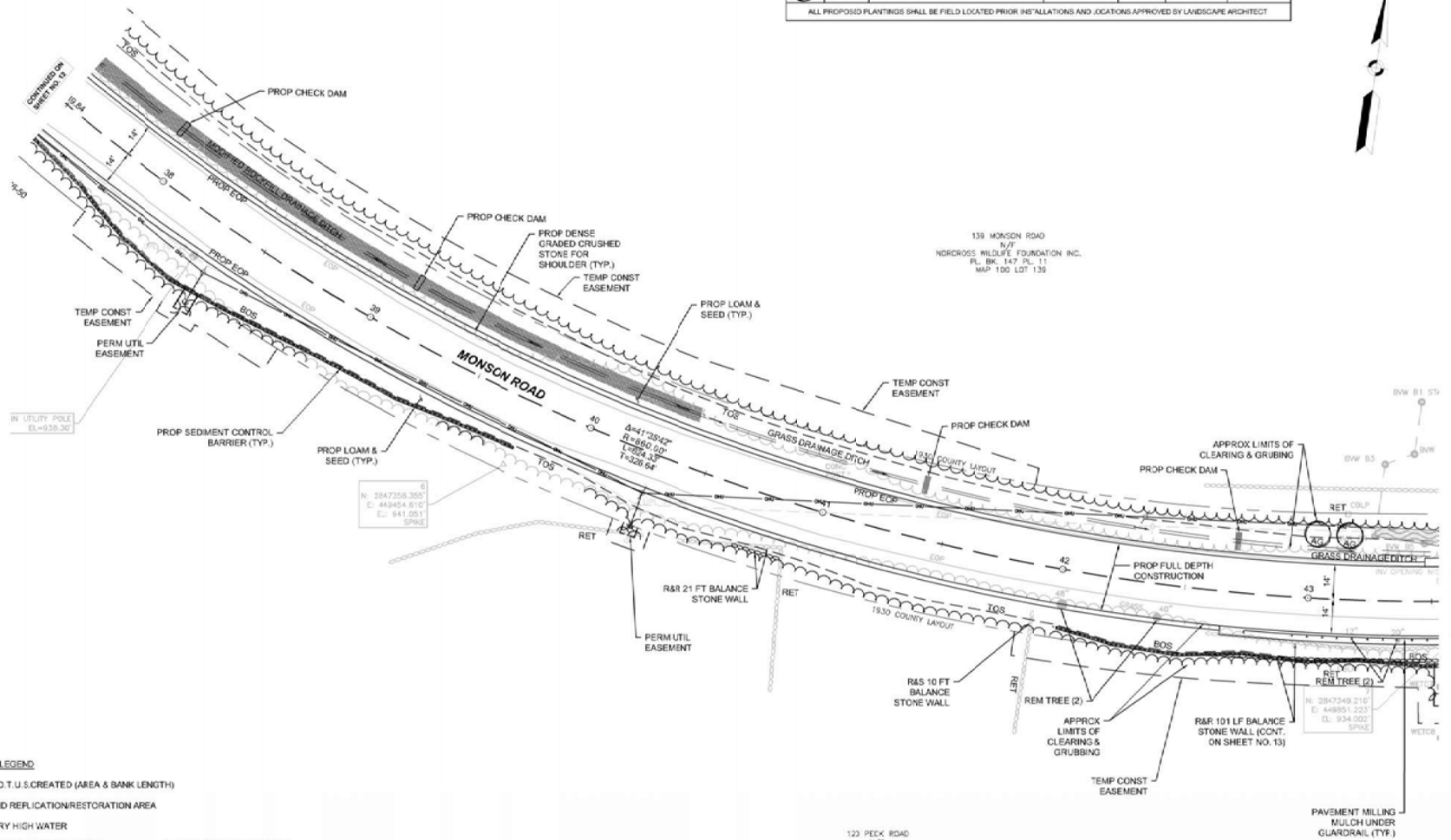
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CONSTRUCTION PLANS

N



IMPACT LEGEND

NEW W.O.T.U.S.CREATED (AREA & BANK LENGTH)
WETLAND REPLICATION/RESTORATION AREA
— OHW — ORDINARY HIGH WATER
W.O.T.U.S.=WATERS OF THE UNITED STATES
PERMANENT (SEE NOTE BELOW)
TEMPORARY
V.W.=VEGETATED WETLANDS
PERMANENT
TEMPORARY
NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS

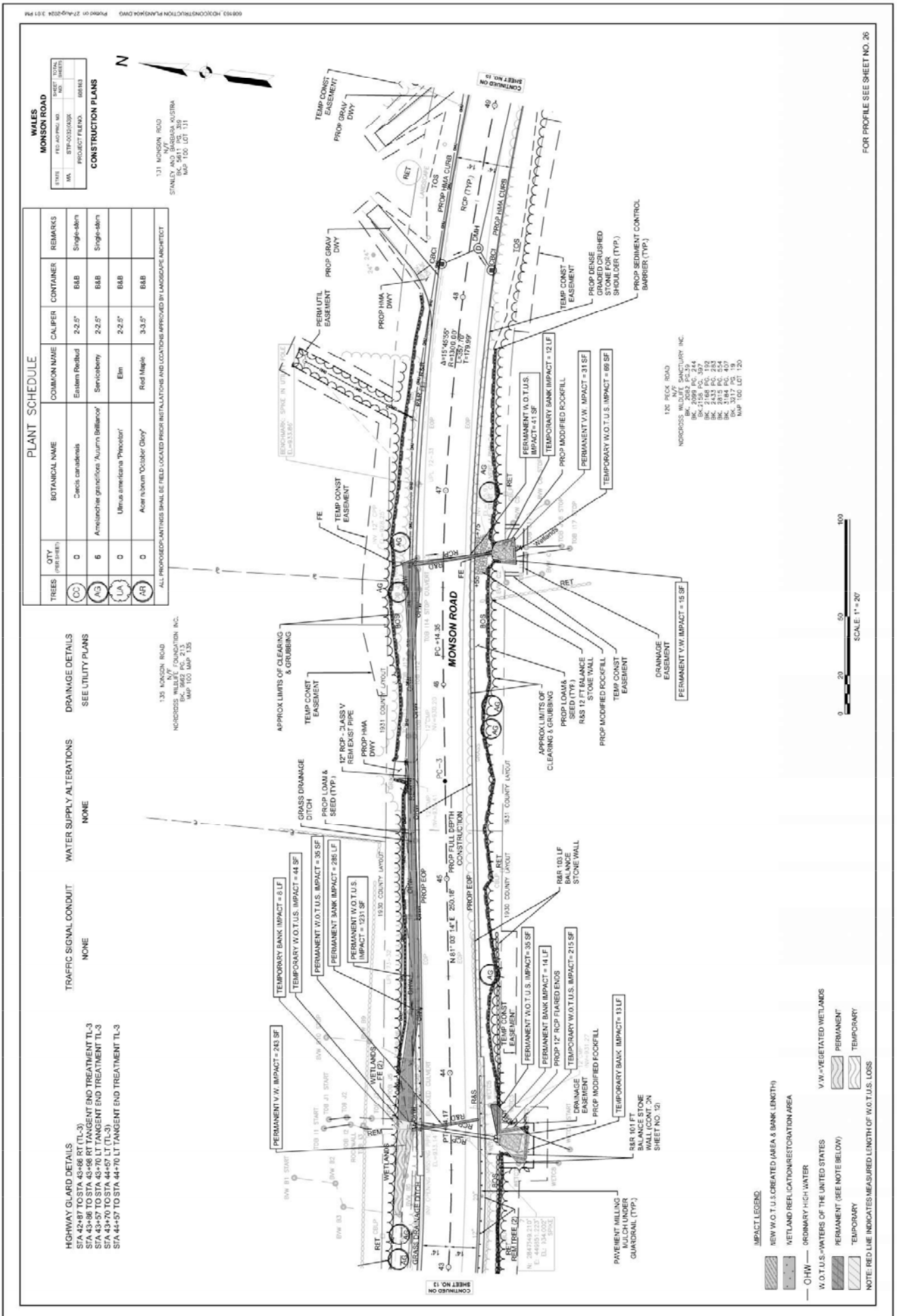
0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 26

608163_HDX\CONSTRUCTION PLANS\H34.DWG Plotted on 27-Aug-2024 3:01 PM

A00830 -1148

Proposal No. 608163-128112



TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	6	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	0	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0033(003)X		
	PROJECT FILE NO.	608163	

HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS
NONE	NONE	NONE	SEE UTILITY PLANS

PLANT SCHEDULE

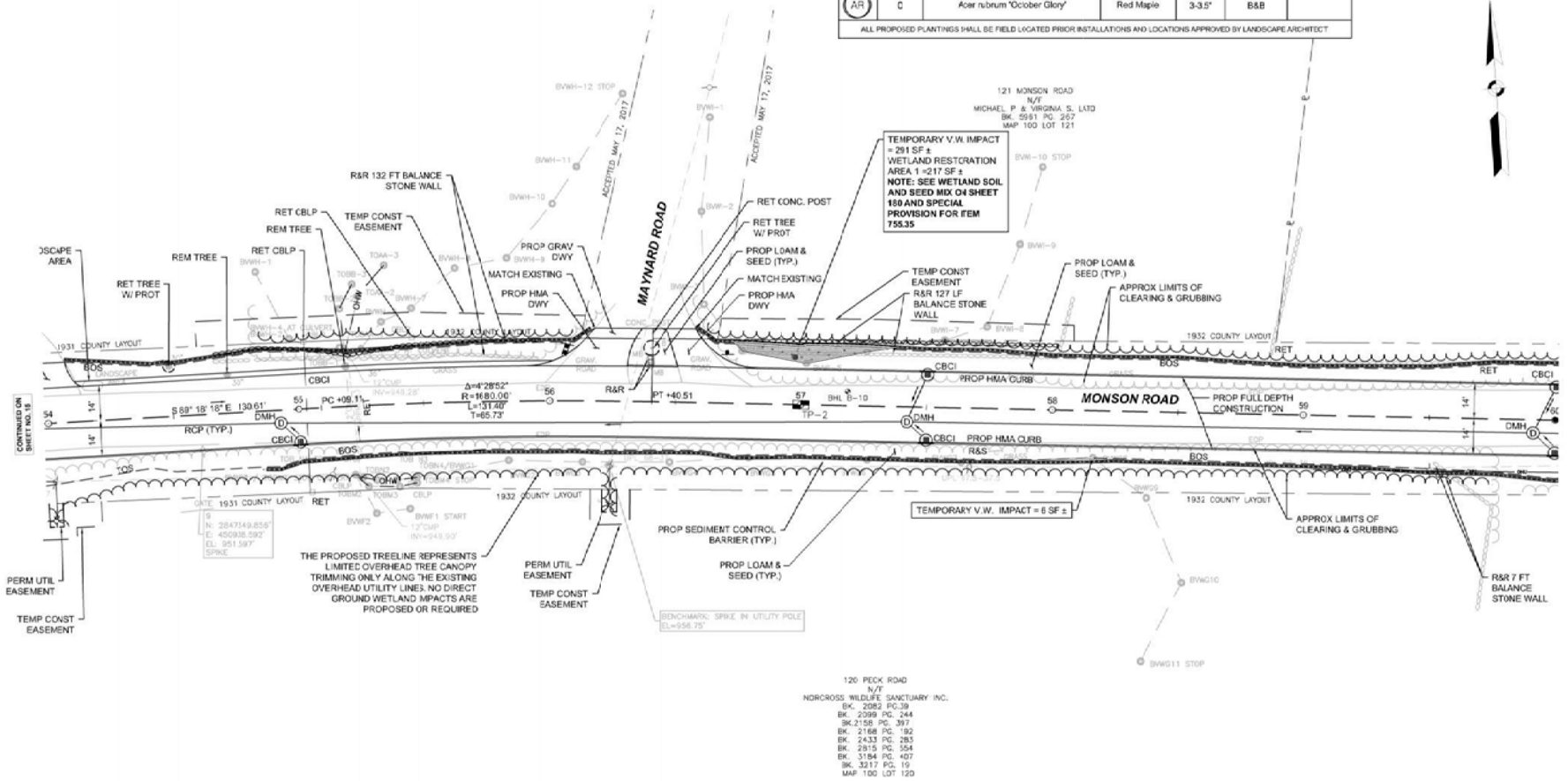
TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	0	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	0	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

CONSTRUCTION PLANS



IMPACT LEGEND

- NEW W.O.T.U.S. CREATED (AREA & BANK LENGTH)
- WETLAND REPLICATION/RESTORATION AREA
- — OHW — ORDINARY HIGH WATER

W.O.T.U.S.=WATERS OF THE UNITED STATES
- PERMANENT (SEE NOTE BELOW)
- TEMPORARY

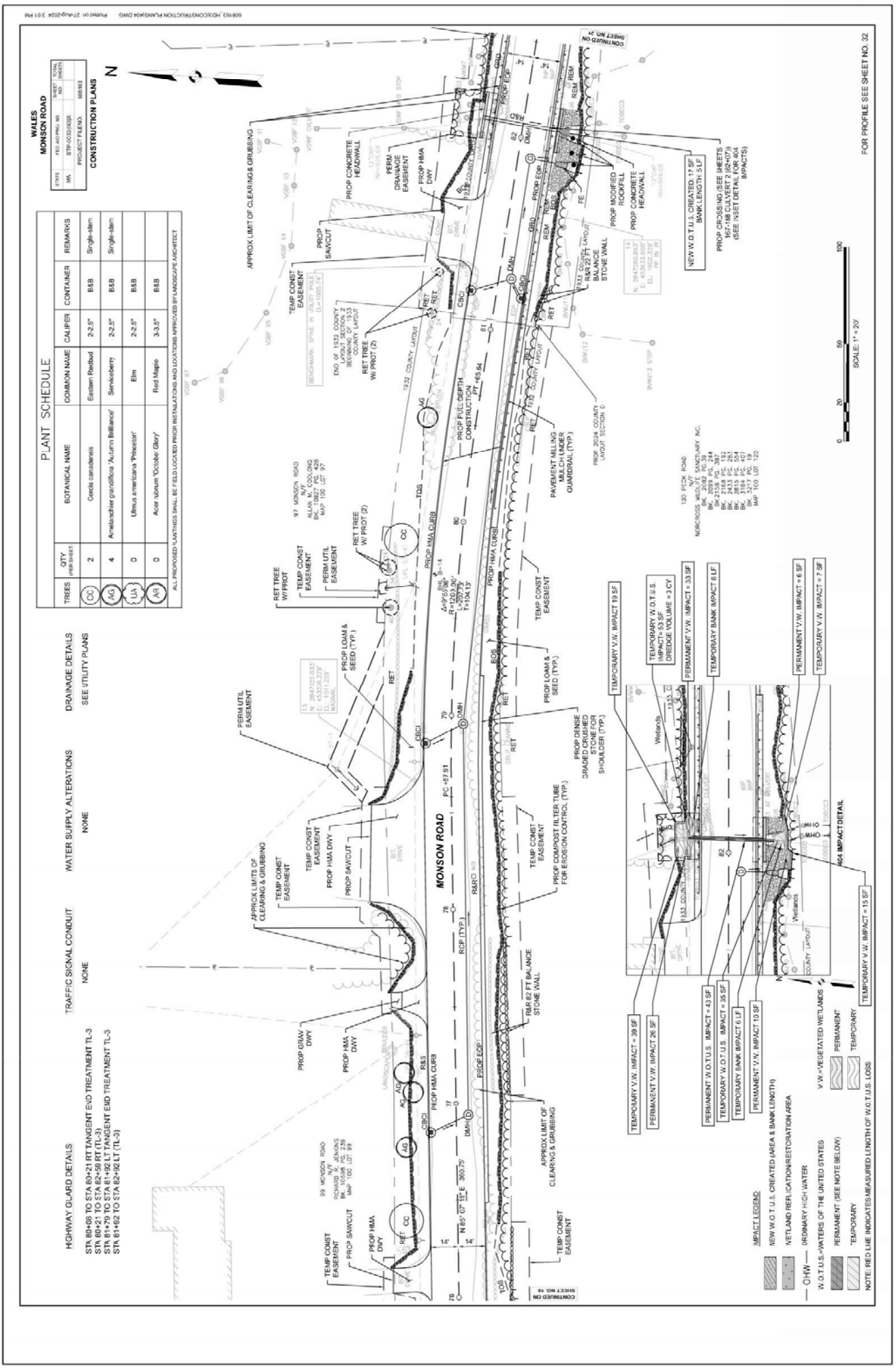
V.W.=VEGETATED WETLANDS
- PERMANENT
- TEMPORARY

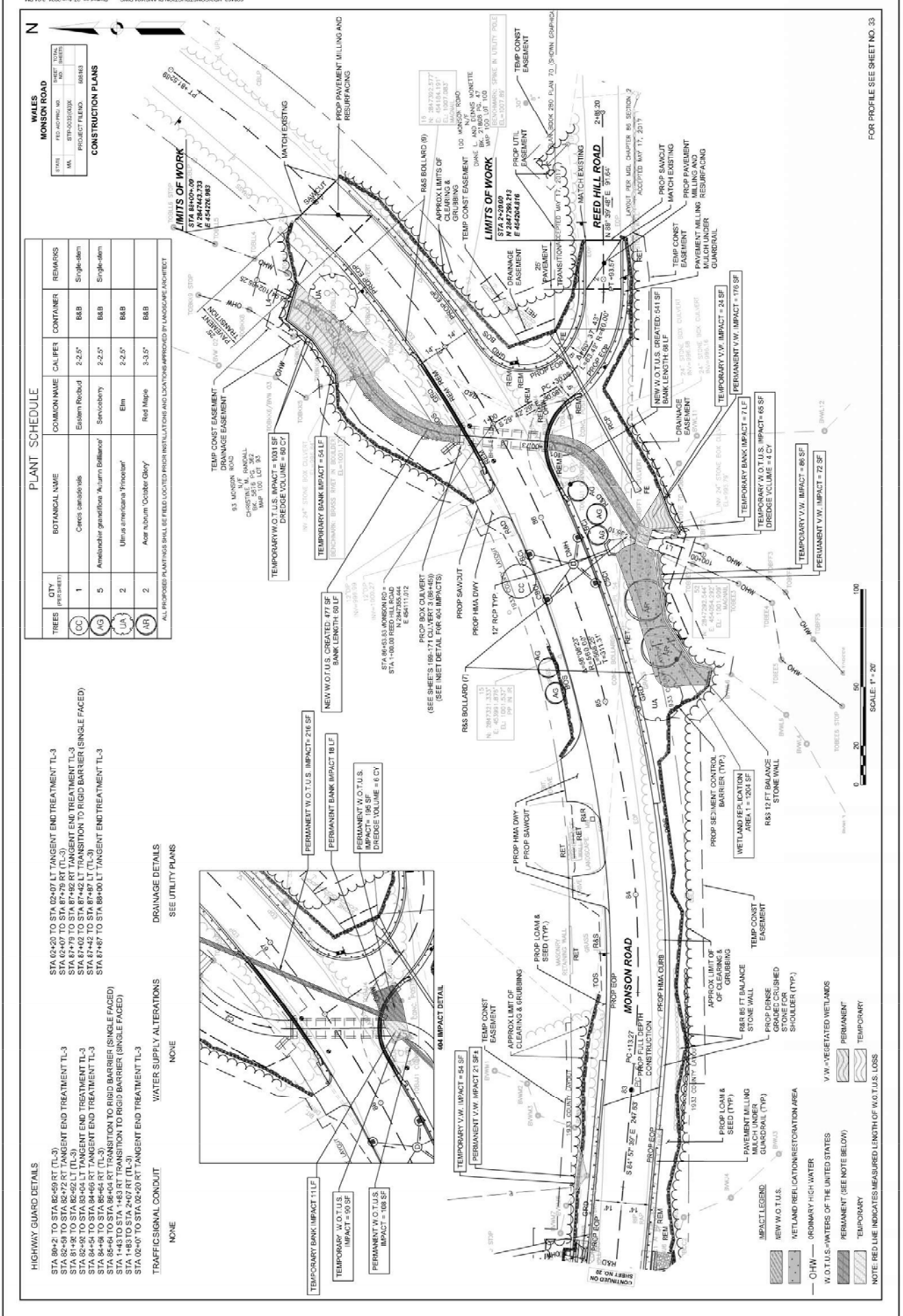
NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS

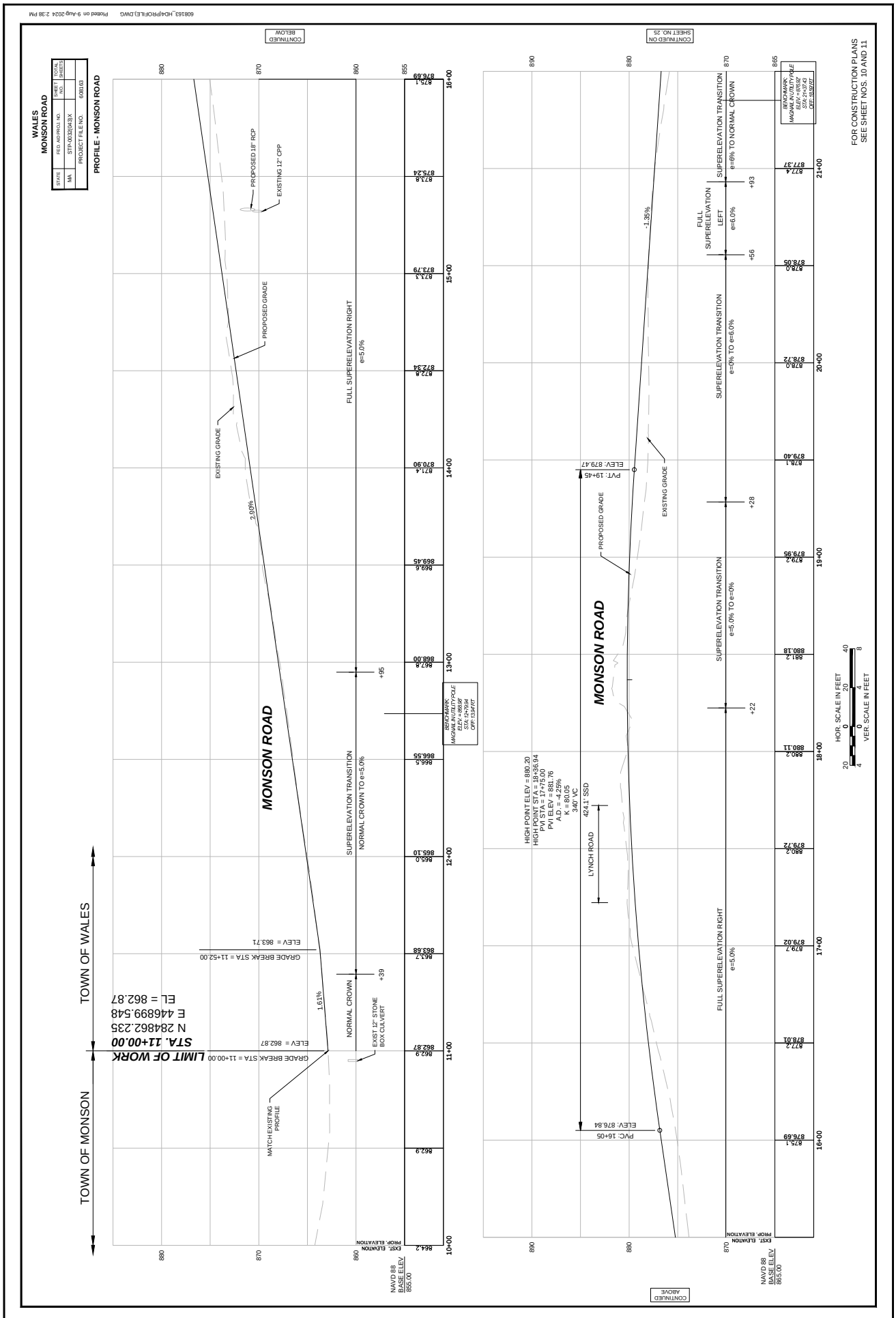
0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 28

608163_HD3(CONSTRUCTION PLANS)404.DWG Posted on 27-Aug-2024 3:01 PM


WALES
MONSON ROAD
CONSTRUCTION PLANS
PROJECT FILE NO. 608163
STP-0030(493)X
FED. AID PROJ. NO.
PLANT SCHEDULE
TREES
QTY. PER SHEET
BOTANICAL NAME
COMMON NAME
CALIPER
CONTAINER
REMARKS
Cercis canadensis
Eastern Redbud
2-2.5"
B&B
Single-stem
Amelanchier grandiflora 'Autumn Brilliance'
Serviceberry
2-2.5"
B&B
Single-stem
Ulmus americana 'Princeton'
Elm
2-2.5"
B&B
Acer rubrum 'October Glory'
Red Maple
3-3.5"
B&B
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 80+08 TO STA 80+21 RT TANGENT END TREATMENT TL-3
STA 80+21 TO STA 82+58 RT (TL-3)
STA 81+79 TO STA 81+92 LT TANGENT END TREATMENT TL-3
STA 81+92 TO STA 82+92 LT (TL-3)
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
MONSON ROAD
PROP FULL DEPTH CONSTRUCTION
PROP LOAM & SEED (TYP.)
PROP HMA CURB
PROP HMA DWY
PROP SAWCUT
PROP GRAV DWY
PROP CONCRETE HEADWALL
PROP MODIFIED ROCKFILL
PROP CROSSING (SEE SHEETS 167-168 CULVERT 2 (62+07) (SEE NSET DETAIL FOR 404 IMPACTS)
NEW W.O.T.U.S. CREATED: 17 SF BANK LENGTH: 5 LF
PERM DRAINAGE EASEMENT
PERM UTIL EASEMENT
TEMP CONST EASEMENT
APPROX LIMITS OF CLEARING & GRUBBING
APPROX LIMIT OF CLEARING & GRUBBING
PAVEMENT MILLING MULCH UNDER GUARDRAIL (TYP.)
PROP DENSE GRADED CRUSHED STONE FOR SHOULDER (TYP.)
PROP COMPOST FILTER TUBE FOR EROSION CONTROL (TYP.)
R&R 82 FT BALANCE STONE WALL
RET TREE W/ PROT
RET TREE W/ PROT (2)
TEMPORARY V.W. IMPACT 19 SF
TEMPORARY V.W. IMPACT = 39 SF
PERMANENT V.W. IMPACT 26 SF
TEMPORARY W.O.T.U.S. IMPACT= 53 SF DREDGE VOLUME = 3 CY
PERMANENT V.W. IMPACT = 33 SF
TEMPORARY BANK IMPACT 6 LF
PERMANENT W.O.T.U.S. IMPACT = 43 SF
TEMPORARY W.O.T.U.S. IMPACT = 35 SF
TEMPORARY BANK IMPACT 6 LF
PERMANENT V.W. IMPACT 10 SF
PERMANENT V.W. IMPACT = 6 SF
TEMPORARY V.W. IMPACT = 7 SF
TEMPORARY V.W. IMPACT = 15 SF
404 IMPACT DETAIL
IMPACT LEGEND
NEW W.O.T.U.S. CREATED (AREA & BANK LENGTH)
WETLAND REPLICATION/RESTORATION AREA
ORDINARY HIGH WATER
W.O.T.U.S.=WATERS OF THE UNITED STATES
V.W.=VEGETATED WETLANDS
PERMANENT (SEE NOTE BELOW)
PERMANENT
TEMPORARY
TEMPORARY
NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS
CONTINUED ON SHEET NO. 32
CONTINUED ON SHEET NO. 34
FOR PROFILE SEE SHEET NO. 32
SCALE: 1" = 20'
0
20
50
100
N


WALES
MONSON ROAD
CONSTRUCTION PLANS
PLANT SCHEDULE
TREES
QTY (PER SHEET)
BOTANICAL NAME
COMMON NAME
CALIPER
CONTAINER
REMARKS
Cercis canadensis
Eastern Redbud
2-2.5"
B&B
Single-stem
Amelanchier grandiflora 'Autumn Brilliance'
Serviceberry
2-2.5"
B&B
Single-stem
Ulmus americana 'Princeton'
Elm
2-2.5"
B&B
Acer rubrum 'October Glory'
Red Maple
3-3.5"
B&B
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTILLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT
HIGHWAY GUARD DETAILS
STA 80+2: TO STA 82+59 RT (TL-3)
STA 82+58 TO STA 82+72 RT TANGENT END TREATMENT TL-3
STA 82+72 TO STA 82+92 RT (TL-3)
STA 82+98 TO STA 83+04 LT TANGENT END TREATMENT TL-3
STA 84+54 TO STA 84+66 RT TANGENT END TREATMENT TL-3
STA 84+68 TO STA 85+64 RT (TL-3)
STA 85+64 TO STA 86+04 RT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 1+43 TO STA 1+83 RT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 1+83 TO STA 2+07 RT (TL-3)
STA 02+0" TO STA 02+20 RT TANGENT END TREATMENT TL-3
STA 02+20 TO STA 02+07 LT TANGENT END TREATMENT TL-3
STA 02+07 TO STA 87+79 RT (TL-3)
STA 87+79 TO STA 87+92 RT TANGENT END TREATMENT TL-3
STA 87+02 TO STA 87+42 LT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 87+42 TO STA 87+87 LT (TL-3)
STA 87+87 TO STA 88+00 LT TANGENT END TREATMENT TL-3
TRAFFIC SIGNAL CONDUIT
NONE
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
SEE UTILITY PLANS
404 IMPACT DETAIL
PERMANENT W.O.T.U.S. IMPACT= 216 SF
PERMANENT BANK IMPACT 18 LF
PERMANENT W.O.T.U.S. IMPACT= 195 SF DREDGE VOLUME = 6 CY
TEMPORARY BANK IMPACT 111 LF
TEMPORARY W.O.T.U.S. IMPACT = 90 SF
PERMANENT W.O.T.U.S. IMPACT = 108 SF
NEW W.O.T.U.S. CREATED: 477 SF BANK LENGTH: 60 LF
TEMP CONST EASEMENT DRAINAGE EASEMENT
93 MONSON ROAD N/F RANDALL CHRISTINE M. BK. 5818 PG. 362 MAP 100 LOT 83
TEMPORARY W.O.T.U.S. IMPACT = 1031 SF DREDGE VOLUME = 60 CY
TEMPORARY BANK IMPACT = 54 LF
PROP BOX CULVERT (SEE SHEETS 168-171 CULVERT 3 (86+45)) (SEE INSET DETAIL FOR 404 IMPACTS)
STA 86+53.83 MONSON RD = STA 1+00.00 REED HILL ROAD N 2947,000.644 E 454111.012
PROP SAWCUT
PROP HMA DWY
12" RCP TYP.
R&S BOLLARD (7)
NEW W.O.T.U.S. CREATED: 541 SF BANK LENGTH: 68 LF
TEMPORARY W.O.T.U.S. IMPACT= 65 SF DREDGE VOLUME = 4 CY
TEMPORARY BANK IMPACT = 7 LF
TEMPORARY V.W. IMPACT = 176 SF
PERMANENT V.W. IMPACT = 24 SF
TEMPORARY V.W. IMPACT = 86 SF
PERMANENT V.W. IMPACT = 72 SF
TEMPORARY V.W. IMPACT = 54 SF
PERMANENT V.W. IMPACT 21 SF+
WETLAND REPLICATION AREA 1 = 1204 SF
R&S 12 FT BALANCE STONE WALL
PROP SEDIMENT CONTROL BARRIER (TYP.)
APPROX LIMIT OF CLEARING & GRUBBING
TEMP CONST EASEMENT
R&R 85 FT BALANCE STONE WALL
PROP DENSE GRADED CRUSHED STONE FOR SHOULDER (TYP.)
PROP HMA CURB
PROP LOAM & SEED (TYP.)
PAVEMENT MILLING MULCH UNDER GUARDRAIL (TYP.)
MONSON ROAD
REED HILL ROAD
LIMITS OF WORK
STA 89+00.00
N 2947143.733
E 454126.983
STA 2+20.00
N 2947296.213
E 454264.816
MATCH EXISTING
PROP PAVEMENT MILLING AND RESURFACING
TEMP CONST EASEMENT
PROP UTIL EASEMENT
DRAINAGE EASEMENT
25' PAVEMENT TRANSITION
PROP SAWCUT MATCH EXISTING
PAVEMENT MILLING MULCH UNDER GUARDRAIL
APPROX LIMITS OF CLEARING & GRUBBING
TEMP CONST EASEMENT
100 MONSON ROAD N/F DANIEL L. AND DENIS MONETTE BK. 21805 PG. 47 MAP 100 LOT 163
IMPACT LEGEND
NEW W.O.T.U.S.
WETLAND REPLICATION/RESTORATION AREA
ORDINARY HIGH WATER
W.O.T.U.S.=WATERS OF THE UNITED STATES
V.W.=VEGETATED WETLANDS
PERMANENT (SEE NOTE BELOW)
PERMANENT
TEMPORARY
TEMPORARY
NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS
CONTINUED ON SHEET NO. 28
FOR PROFILE SEE SHEET NO. 33
SCALE: 1" = 20'
0
20
50
100
N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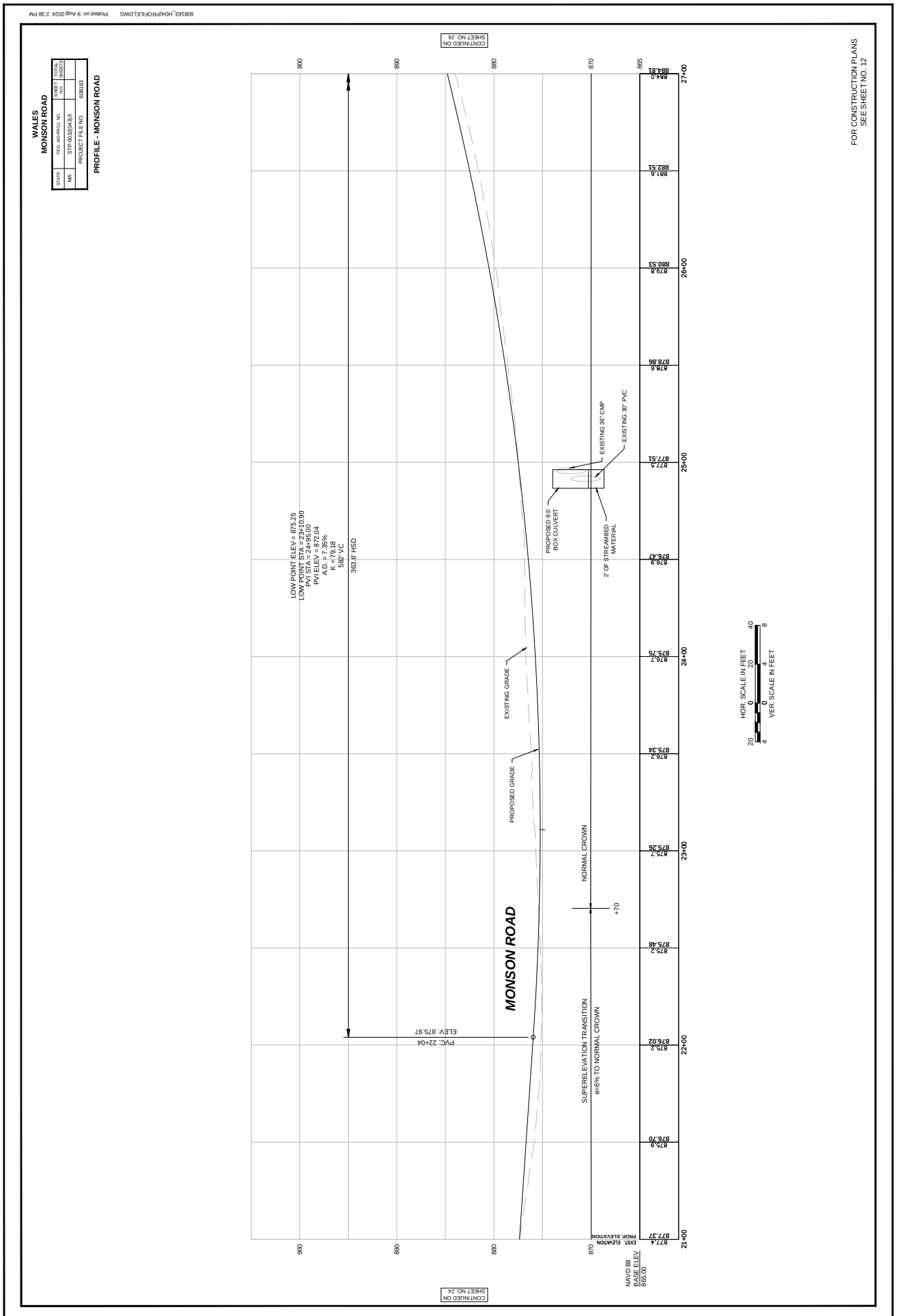
WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
STP-0032(043)X
PROJECT FILE NO.
608163
PROFILE - MONSON ROAD
CONTINUED BELOW
CONTINUED ON SHEET NO. 25
CONTINUED ABOVE
FOR CONSTRUCTION PLANS
SEE SHEET NOS. 10 AND 11
TOWN OF WALES
TOWN OF MONSON
LIMIT OF WORK
STA. 11+00.00
N 284862.235
E 446899.548
EL = 862.87
MONSON ROAD
PROPOSED 18" RCP
EXISTING 12" CPP
PROPOSED GRADE
EXISTING GRADE
FULL SUPERELEVATION RIGHT
e=5.0%
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=5.0%
NORMAL CROWN
EXIST 12" STONE BOX CULVERT
MATCH EXISTING PROFILE
GRADE BREAK STA = 11+00.00
ELEV = 862.87
GRADE BREAK STA = 11+52.00
ELEV = 863.71
2.90%
1.61%
BENCHMARK: MAGNAL IN UTILITY POLE
ELEV = 866.98'
STA: 12+79.94
OFF: 13.94' RT
HIGH POINT ELEV = 880.20
HIGH POINT STA = 18+36.94
PVI STA = 17+75.00
PVI ELEV = 881.76
A.D. = -4.25%
K = 80.05
340' VC
424.1' SSD
LYNCH ROAD
PVC: 16+05
ELEV: 876.84
PVT: 19+45
ELEV: 879.47
-1.35%
FULL SUPERELEVATION LEFT
e=6.0%
SUPERELEVATION TRANSITION
e=6% TO NORMAL CROWN
e=0% TO e=6.0%
e=5.0% TO e=0%
BENCHMARK: MAGNAL IN UTILITY POLE
ELEV = 876.92'
STA: 21+37.43
OFF: 18.92' RT
HOR. SCALE IN FEET
VER. SCALE IN FEET
NAVD 88 BASE ELEV 855.00
NAVD 88 BASE ELEV 865.00
EXIST. ELEVATION
PROP. ELEVATION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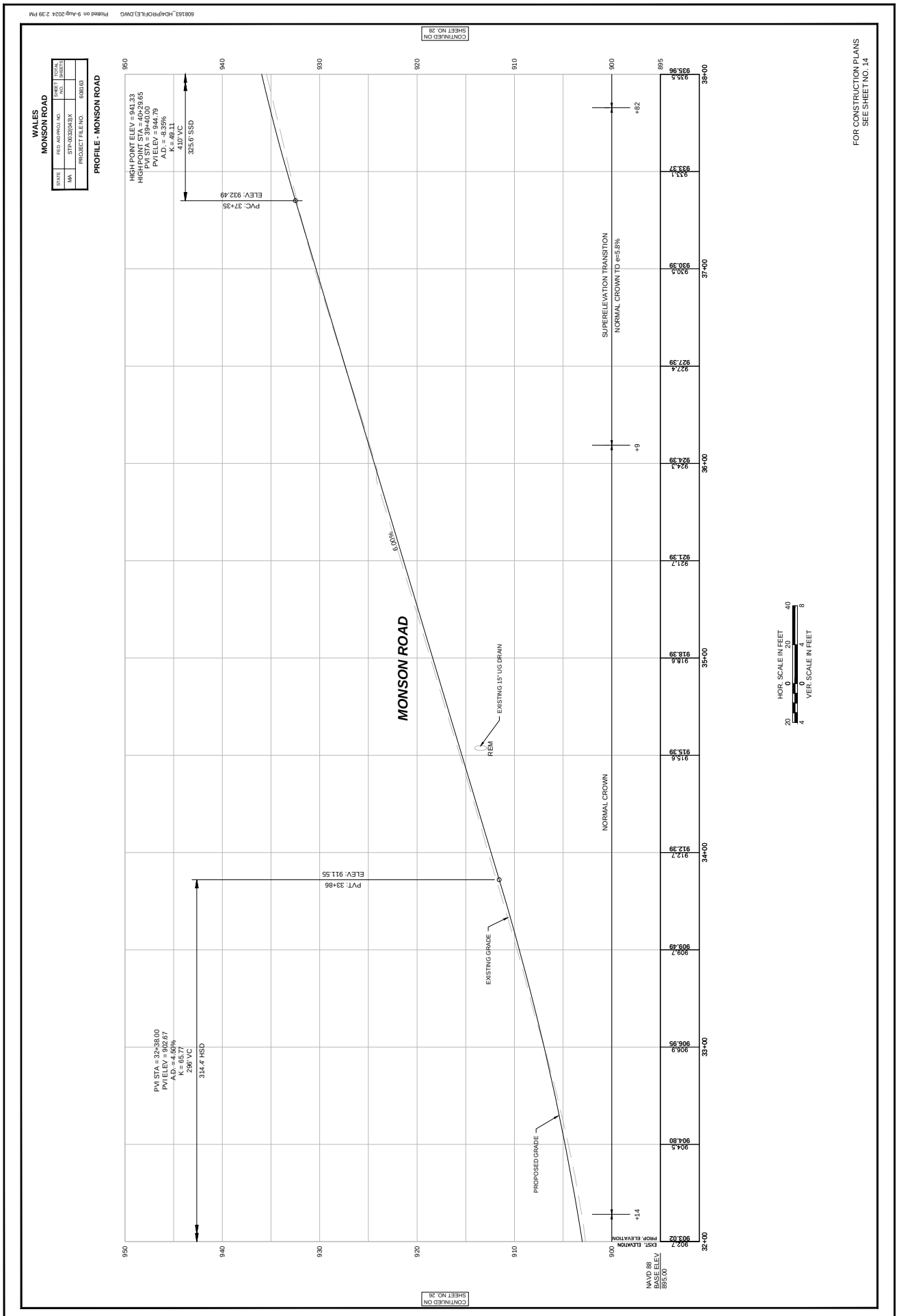
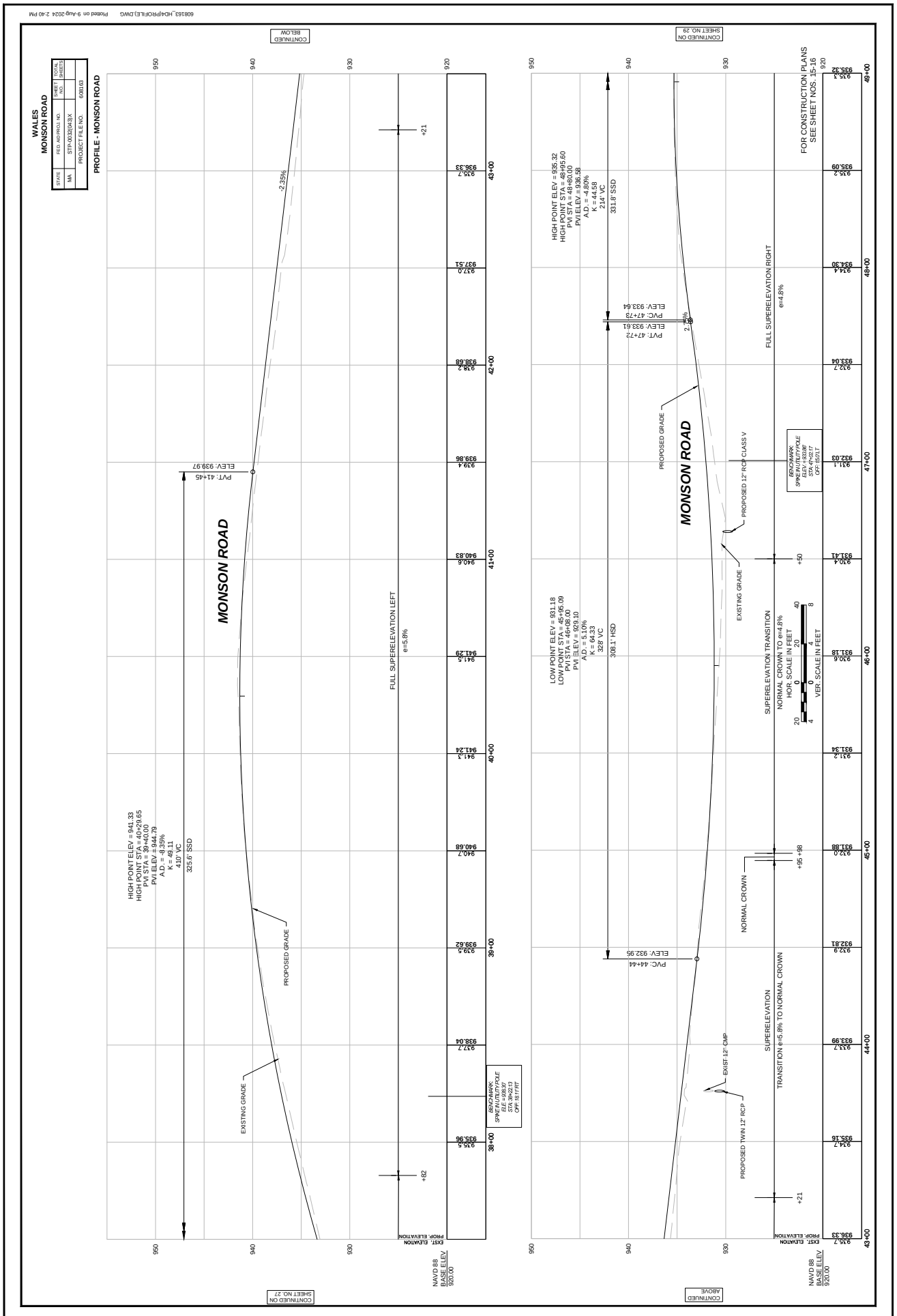
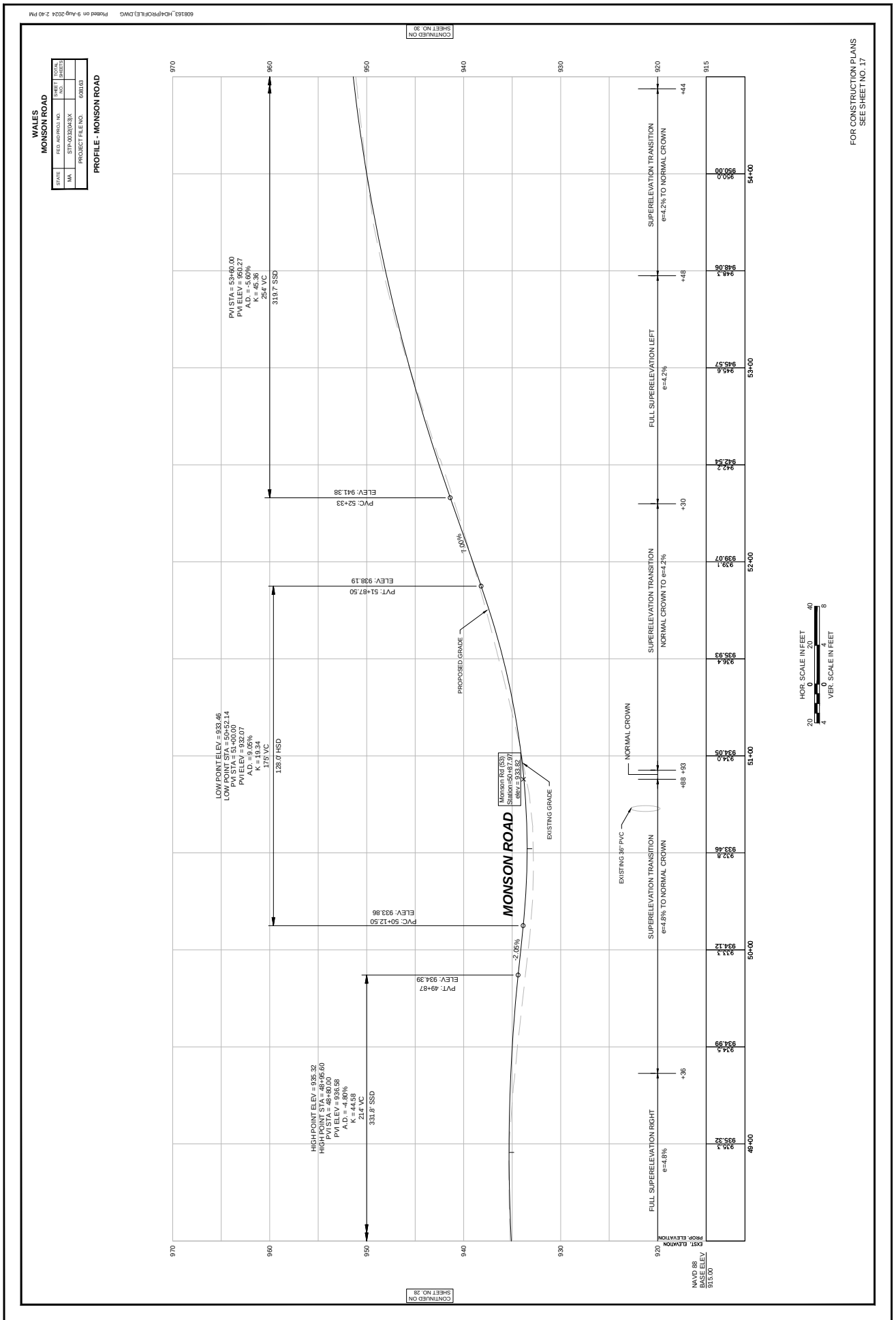
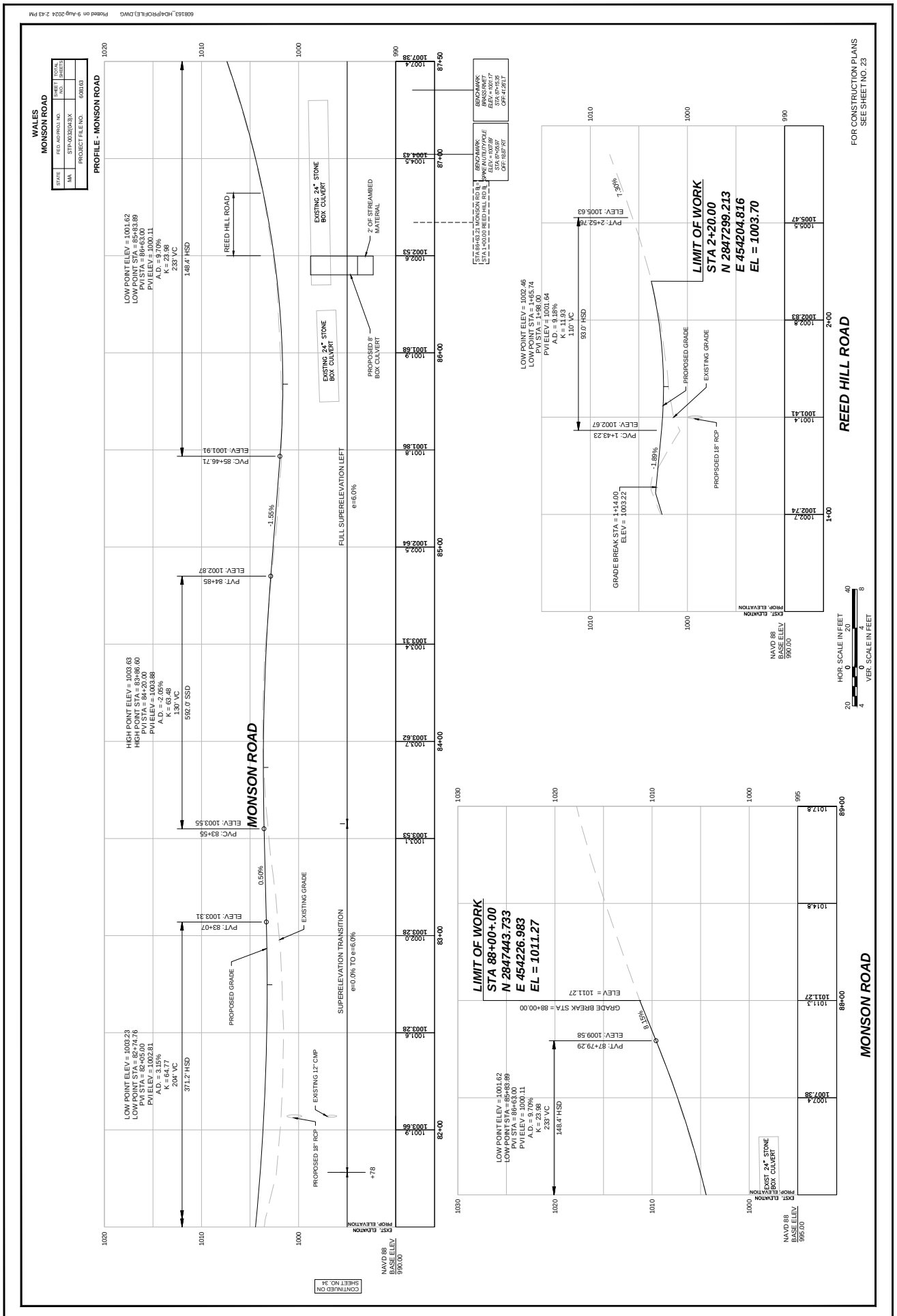
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
PROFILE - MONSON ROAD
FOR CONSTRUCTION PLANS
SEE SHEET NO. 12
CONTINUED ON SHEET NO. 24
CONTINUED ON SHEET NO. 28
MONSON ROAD
EXISTING GRADE
PROPOSED GRADE
NORMAL CROWN
+70
SUPERELEVATION TRANSITION
e=6% TO NORMAL CROWN
LOW POINT ELEV = 875.25
LOW POINT STA = 23+31.00
PVI STA = 24+95.00
PVI ELEV = 872.04
A.D. = 7.35%
K = 79.18
592' VC
363.6' HSD
PVC: 22+04
ELEV: 875.97
PROPOSED 9.5' BOX CULVERT
2' OF STREAMBED MATERIAL
EXISTING 36" CMP
EXISTING 30" PVC
HOR. SCALE IN FEET
VER. SCALE IN FEET
EXST. ELEVATION
PROP. ELEVATION
NAVD 88
BASE ELEV.
865.00
884.81
884.0
882.51
881.6
880.53
879.8
878.86
878.6
877.51
877.5
876.47
876.9
875.75
876.7
875.34
876.2
875.26
875.7
875.48
875.2
876.02
875.2
876.70
875.9
877.37
877.4
21+00
22+00
23+00
24+00
25+00
26+00
27+00
900
890
880
870
865
20
4
0
4
20
40
8


608163_HDA\PROFILE).DWG Plotted on 9-Aug-2024 2:39 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
PROFILE - MONSON ROAD
FOR CONSTRUCTION PLANS
SEE SHEET NO. 14
CONTINUED ON SHEET NO. 28
CONTINUED ON SHEET NO. 28
MONSON ROAD
HIGH POINT ELEV = 941.33
HIGH POINT STA = 40+29.65
PVI STA = 39+40.00
PVI ELEV = 944.79
A.D. = -8.39%
K = 49.11
410' VC
325.6' SSD
PVC: 37+35
ELEV: 932.49
PVI STA = 32+38.00
PVI ELEV = 902.67
A.D. = 4.50%
K = 65.77
296' VC
314.4' HSD
PVT: 33+86
ELEV: 911.55
6.00%
REM
EXISTING 15" UG DRAIN
EXISTING GRADE
PROPOSED GRADE
NORMAL CROWN
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=5.8%
+82
+9
+14
EXIST. ELEVATION
PROP. ELEVATION
935.96
933.37
930.39
927.39
924.39
921.39
918.39
915.39
912.39
909.49
906.95
904.80
903.02
902.7
913.1
930.5
927.4
924.1
921.7
918.6
915.6
912.7
909.7
906.9
904.5
903.7
38+00
37+00
36+00
35+00
34+00
33+00
32+00
950
940
930
920
910
900
895
(NAVD 88)
BASE ELEV.
895.00
HOR. SCALE IN FEET
0
20
40
VER. SCALE IN FEET
0
4
8


WALES
MONSON ROAD
PROFILE - MONSON ROAD
MONSON ROAD
HIGH POINT ELEV = 941.33
HIGH POINT STA = 40+29.65
PVI STA = 39+40.00
PVI ELEV = 944.79
A.D. = -8.35%
K = 49.11
410' VC
325.6' SSD
PVT: 41+45
ELEV: 939.97
-2.35%
PROPOSED GRADE
EXISTING GRADE
FULL SUPERELEVATION LEFT
e=5.8%
BENCHMARK:
SPIKE IN UTILITY POLE
ELE = 938.37
STA: 38+22.13
OFF: 18.11' RT
NAVD 88
BASE ELEV
920.00
CONTINUED BELOW
CONTINUED ON SHEET NO. 27
HIGH POINT ELEV = 935.32
HIGH POINT STA = 48+95.60
PVI STA = 48+80.00
PVI ELEV = 936.58
A.D. = -4.80%
K = 44.58
214' VC
331.8' SSD
PVT: 47+72
ELEV: 933.61
PVC: 47+73
ELEV: 933.64
PVC: 44+44
ELEV: 932.95
LOW POINT ELEV = 931.18
LOW POINT STA = 45+95.09
PVI STA = 46+08.00
PVI ELEV = 929.10
A.D. = 5.10%
K = 64.33
328' VC
308.1' HSD
PROPOSED GRADE
EXISTING GRADE
PROPOSED 12" RCP CLASS V
EXIST. 12" CMP
PROPOSED TWIN 12" RCP
FULL SUPERELEVATION RIGHT
e=4.8%
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=4.8%
HOR. SCALE IN FEET
VER. SCALE IN FEET
NORMAL CROWN
SUPERELEVATION
TRANSITION e=5.8% TO NORMAL CROWN
FOR CONSTRUCTION PLANS
SEE SHEET NOS. 15-16
CONTINUED ON SHEET NO. 29
CONTINUED ABOVE


608163_HDA\PROFILE).DWG Plotted on 9-Aug-2024 2:40 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
PROFILE - MONSON ROAD
FOR CONSTRUCTION PLANS
SEE SHEET NO. 17
CONTINUED ON SHEET NO. 30
CONTINUED ON SHEET NO. 28
MONSON ROAD
PROPOSED GRADE
EXISTING GRADE
EXISTING 36" PVC
Monson Rd (59)
Station=50+97.97
elev = 933.82
PVC: 50+12.50
ELEV: 933.86
PVT: 49+87
ELEV: 934.39
PVT: 51+87.50
ELEV: 938.19
PVC: 52+33
ELEV: 941.38
PVI STA = 53+60.00
PVI ELEV = 950.27
A.D. = -5.60%
K = 46.36
254' VC
319.7' SSD
LOW POINT ELEV = 933.46
LOW POINT STA = 50+52.14
PVI STA = 51+00.00
PVI ELEV = 932.07
A.D. = 9.05%
K = 19.34
175' VC
128.0' HSD
HIGH POINT ELEV = 936.32
HIGH POINT STA = 49+95.60
PVI STA = 49+80.00
PVI ELEV = 936.58
A.D. = -4.80%
K = 44.58
214' VC
331.8' SSD
-2.05%
1.00%
NORMAL CROWN
SUPERELEVATION TRANSITION
e=4.8% TO NORMAL CROWN
FULL SUPERELEVATION RIGHT
e=4.8%
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=4.2%
FULL SUPERELEVATION LEFT
e=4.2%
SUPERELEVATION TRANSITION
e=4.2% TO NORMAL CROWN
+88
+93
+36
+30
+48
+44
49+00
50+00
51+00
52+00
53+00
54+00
970
960
950
940
930
920
915
EXST. ELEVATION
PROP. ELEVATION
935.32
934.99
934.12
933.46
934.05
935.93
939.07
945.57
948.06
950.00
975.3
974.5
973.1
972.8
974.0
976.4
939.1
945.6
948.3
950.0
942.2
942.54
NAVD 88
BASE ELEV
915.00
HOR. SCALE IN FEET
0
20
40
VER. SCALE IN FEET
0
4
8
20
4


WALES
MONSON ROAD
PROFILE - MONSON ROAD
STATE
NA
FED. AID PROJ. NO.
STP-0032(04)3/X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
MONSON ROAD
REED HILL ROAD
LIMIT OF WORK
STA 2+20.00
N 2847299.213
E 454204.816
EL = 1003.70
LIMIT OF WORK
STA 88+00+.00
N 2847443.733
E 454226.983
EL = 1011.27
LOW POINT ELEV = 1001.62
LOW POINT STA = 85+83.89
PVI STA = 86+63.00
PVI ELEV = 1000.11
A.D. = 2.15%
K = 23.98
233' VC
148.4' HSD
HIGH POINT ELEV = 1003.63
HIGH POINT STA = 83+86.60
PVI STA = 84+20.00
PVI ELEV = 1003.88
A.D. = -2.05%
K = 68.48
130' VC
592.0' SSD
LOW POINT ELEV = 1003.23
LOW POINT STA = 82+74.76
PVI STA = 82+05.00
PVI ELEV = 1002.81
A.D. = 3.15%
K = 64.77
204' VC
371.2' HSD
LOW POINT ELEV = 1002.46
LOW POINT STA = 1+65.74
PVI STA = 1+98.00
PVI ELEV = 1001.64
A.D. = 9.18%
K = 11.93
110' VC
93.0' HSD
GRADE BREAK STA = 1+14.00
ELEV = 1003.22
GRADE BREAK STA = 88+00.00
ELEV = 1011.27
PVT: 87+79.29
ELEV: 1009.58
PVC: 85+46.71
ELEV: 1001.91
PVT: 83+07
ELEV: 1003.31
PVC: 83+55
ELEV: 1003.55
PVT: 84+85
ELEV: 1002.87
PVC: 1+43.23
ELEV: 1002.67
PVT: 2+52.76
ELEV: 1005.63
PROPOSED GRADE
EXISTING GRADE
EXISTING 12" CMP
PROPOSED 18" RCP
PROPOSED 18" RCP
EXISTING 24" STONE BOX CULVERT
PROPOSED 8' BOX CULVERT
EXISTING 24" STONE BOX CULVERT
2' OF STREAMBED MATERIAL
FULL SUPERELEVATION LEFT
e=6.0%
SUPERELEVATION TRANSITION
e=0.0% TO e=6.0%
-1.55%
0.50%
-1.89%
9.15%
7.39%
+78
BENCHMARK
BACK+1000.00
ELEV = 1001.17
STA 87+15.35
OFF-41.86 LT
BENCHMARK
BACK+1000.00
ELEV = 1007.89
STA 87+05.97
OFF-188' RT
STA 89+63.21 MONSON RD ℄
STA 1+00.00 REED HILL RD ℄
EXIST. ELEVATION
PROP. ELEVATION
NAVD 88
BASE ELEV
990.00
995.00
1000.00
CONTINUED ON SHEET NO. 34
FOR CONSTRUCTION PLANS
SEE SHEET NO. 23
HOR. SCALE IN FEET
VER. SCALE IN FEET

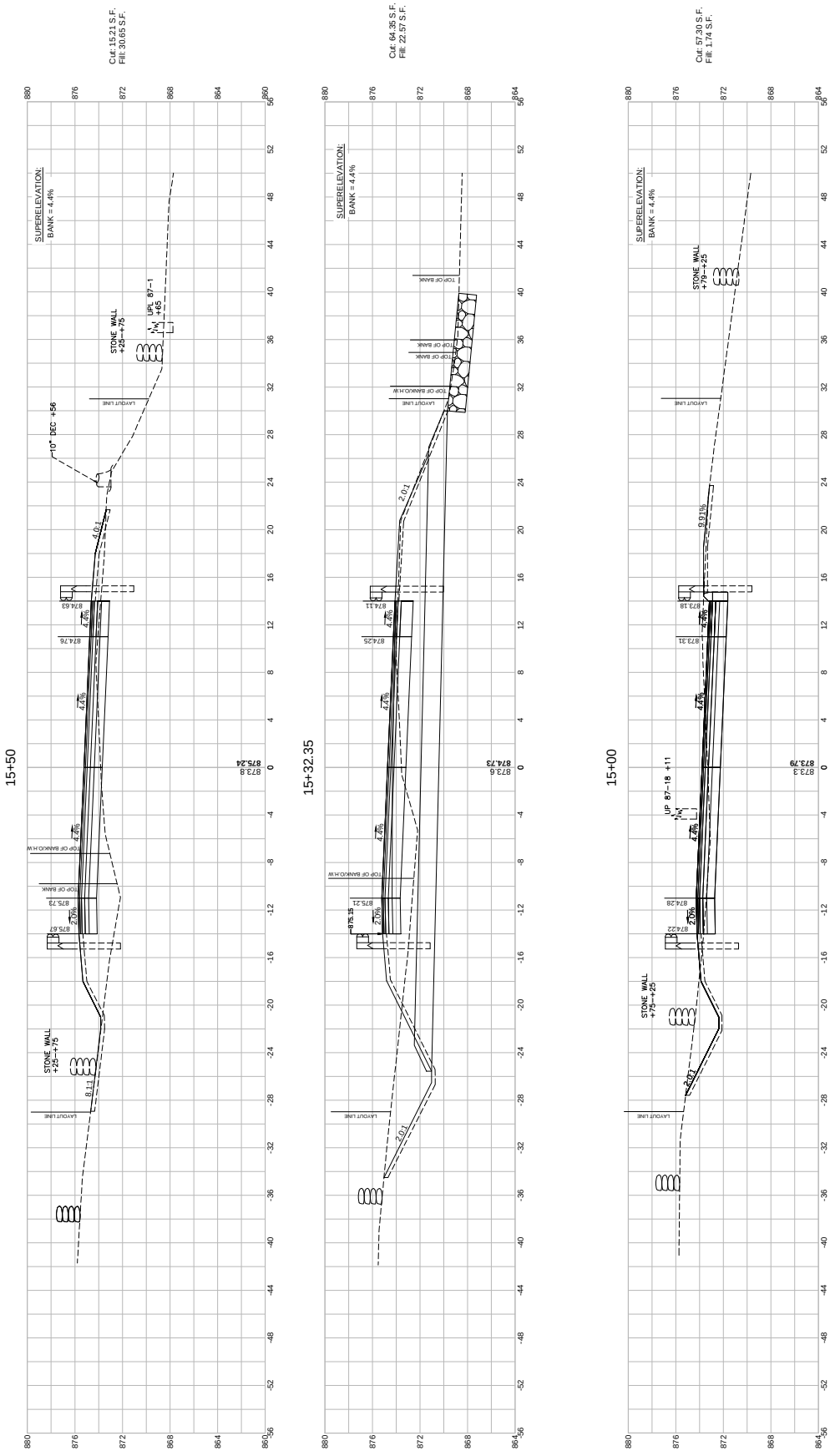
608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 4:29 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0132(043)X		
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
4 0 4 8
VER. SCALE IN FEET
4 0 4 8



608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 3:57 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET
VER. SCALE IN FEET

Cut: 33.06 S.F.
Fill: 27.18 S.F.

25+50

878.6
878.86

Cut: 121.15 S.F.
Fill: 0.00 S.F

25+00

877.5
877.51

EXIST. STONE HEADWALL
+77'--+07'

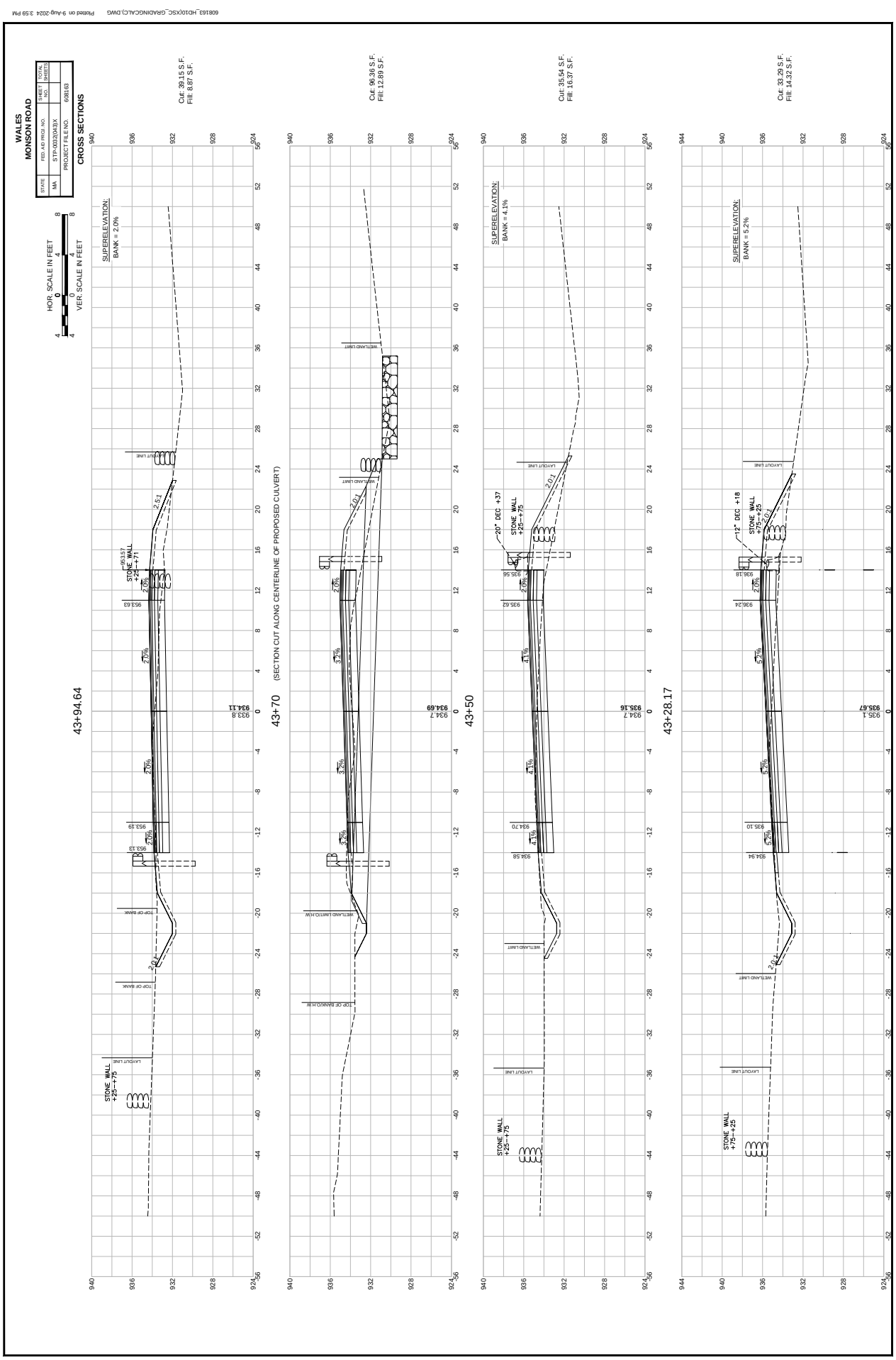
24° DEC +77

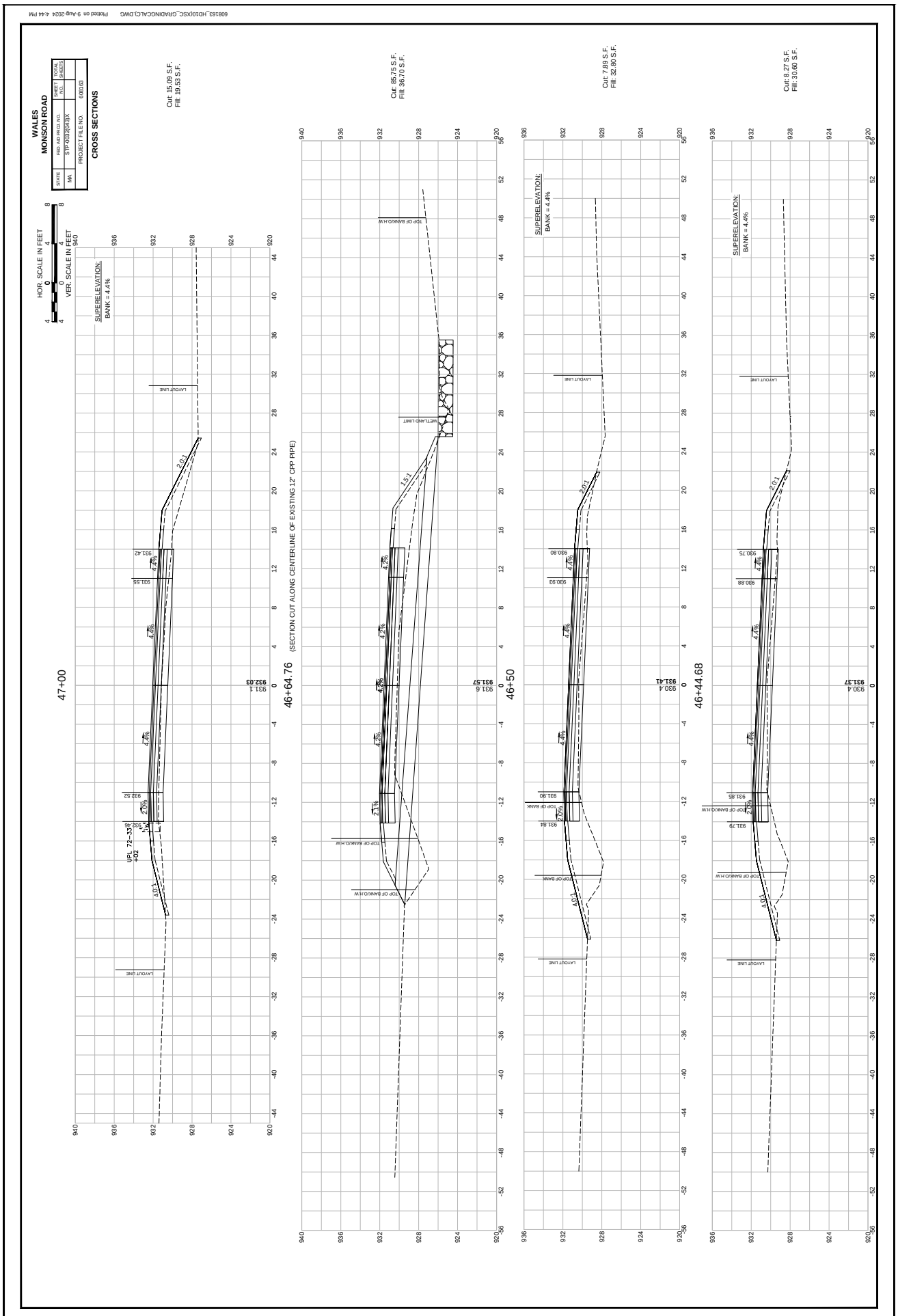
24+91.52

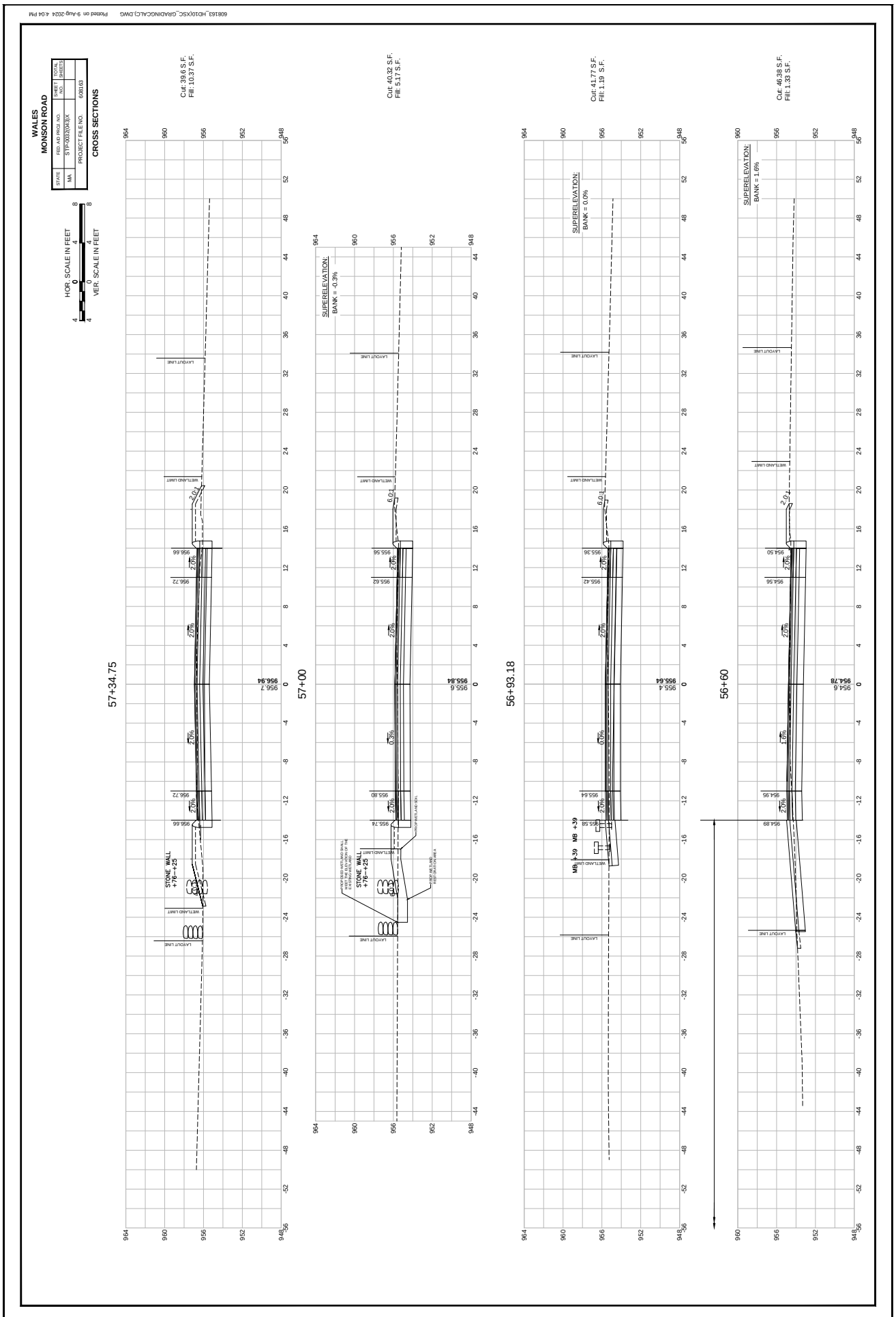
877.4
877.33

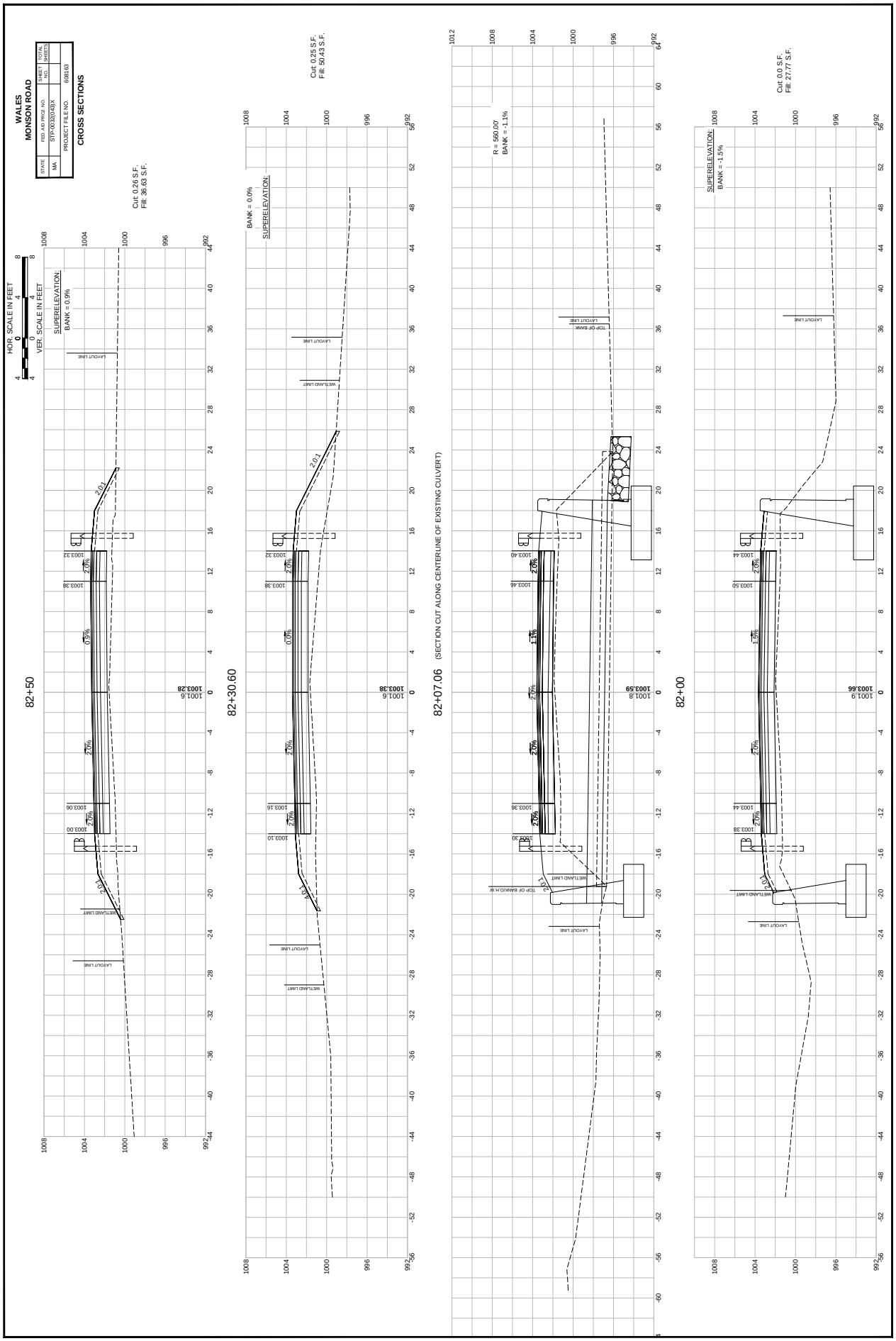
877.03
877.09
877.03
877.09
877.03

LAYOUT LINE
TOP OF BANK
WETLAND LIMIT
2.0%
3.0:1
1:1
UPL 82'-23
SLOPE
SLOPE
SLOPE


608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 3:59 PM
WALES
MONSON ROAD
CROSS SECTIONS
STATE
MA
FED. AID PROJ. NO.
STP-003(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
HOR. SCALE IN FEET
VER. SCALE IN FEET
43+94.64
Cut: 39.15 S.F.
Fill: 8.87 S.F.
SUPERELEVATION:
BANK = 2.0%
STONE WALL
+25--+75
STONE WALL
+75--+71
43+70
(SECTION CUT ALONG CENTERLINE OF PROPOSED CULVERT)
Cut: 96.36 S.F.
Fill: 12.89 S.F.
WETLAND LIMIT
TOP OF BANK
43+50
Cut: 35.54 S.F.
Fill: 16.37 S.F.
SUPERELEVATION:
BANK = 4.1%
20° DEG +37
STONE WALL
+25--+75
43+28.17
Cut: 33.29 S.F.
Fill: 14.32 S.F.
SUPERELEVATION:
BANK = 5.2%
12° DEG +18
STONE WALL
+75--+25
LAYOUT LINE


608163_HD10(XSC_GRADINGCALC).DWG Plotted on 9-Aug-2024 4:44 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
SHEET NO.
TOTAL SHEETS
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 15.09 S.F.
Fill: 19.53 S.F.
Cut: 85.75 S.F.
Fill: 36.70 S.F.
Cut: 7.89 S.F.
Fill: 32.80 S.F.
Cut: 8.27 S.F.
Fill: 30.60 S.F.
SUPERELEVATION:
BANK = 4.4%
47+00
46+64.76
46+50
46+44.68
(SECTION CUT ALONG CENTERLINE OF EXISTING 12" CPP PIPE)
UPL 72-33
+02
LAYOUT LINE
TOP OF BANK/O.H.W
WETLAND LIMIT


608163_HD10(XSC_GRADINGCALC).DWG Plotted on 9-Aug-2024 4:04 PM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
SHEET NO.
TOTAL SHEETS
PROJECT FILE NO.
608163
CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
Cut: 39.6 S.F.
Fill: 10.37 S.F.
Cut: 40.32 S.F.
Fill: 5.17 S.F.
Cut: 41.77 S.F.
Fill: 1.19 S.F.
Cut: 46.38 S.F.
Fill: 1.33 S.F.
57+34.75
57+00
56+93.18
56+60
SUPERELEVATION:
BANK = -0.3%
SUPERELEVATION:
BANK = 0.0%
SUPERELEVATION:
BANK = 1.6%
STONE WALL
+76 - +25
MB +39
LAYOUT LINE
WETLAND LIMIT


608163_HD10\XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 4:25 PM
WALES
MONSON ROAD
CROSS SECTIONS
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
HOR. SCALE IN FEET
VER. SCALE IN FEET
82+50
Cut: 0.26 S.F.
Fill: 36.63 S.F.
SUPERELEVATION:
BANK = 0.0%
82+30.60
Cut: 0.25 S.F.
Fill: 50.43 S.F.
82+07.06
(SECTION CUT ALONG CENTERLINE OF EXISTING CULVERT)
R = 560.00'
BANK = -1.1%
82+00
Cut: 0.0 S.F.
Fill: 27.77 S.F.
SUPERELEVATION:
BANK = -1.5%
LAYOUT LINE
WETLAND LIMIT
TOP OF BANK
TOP OF BANK/O.H.W

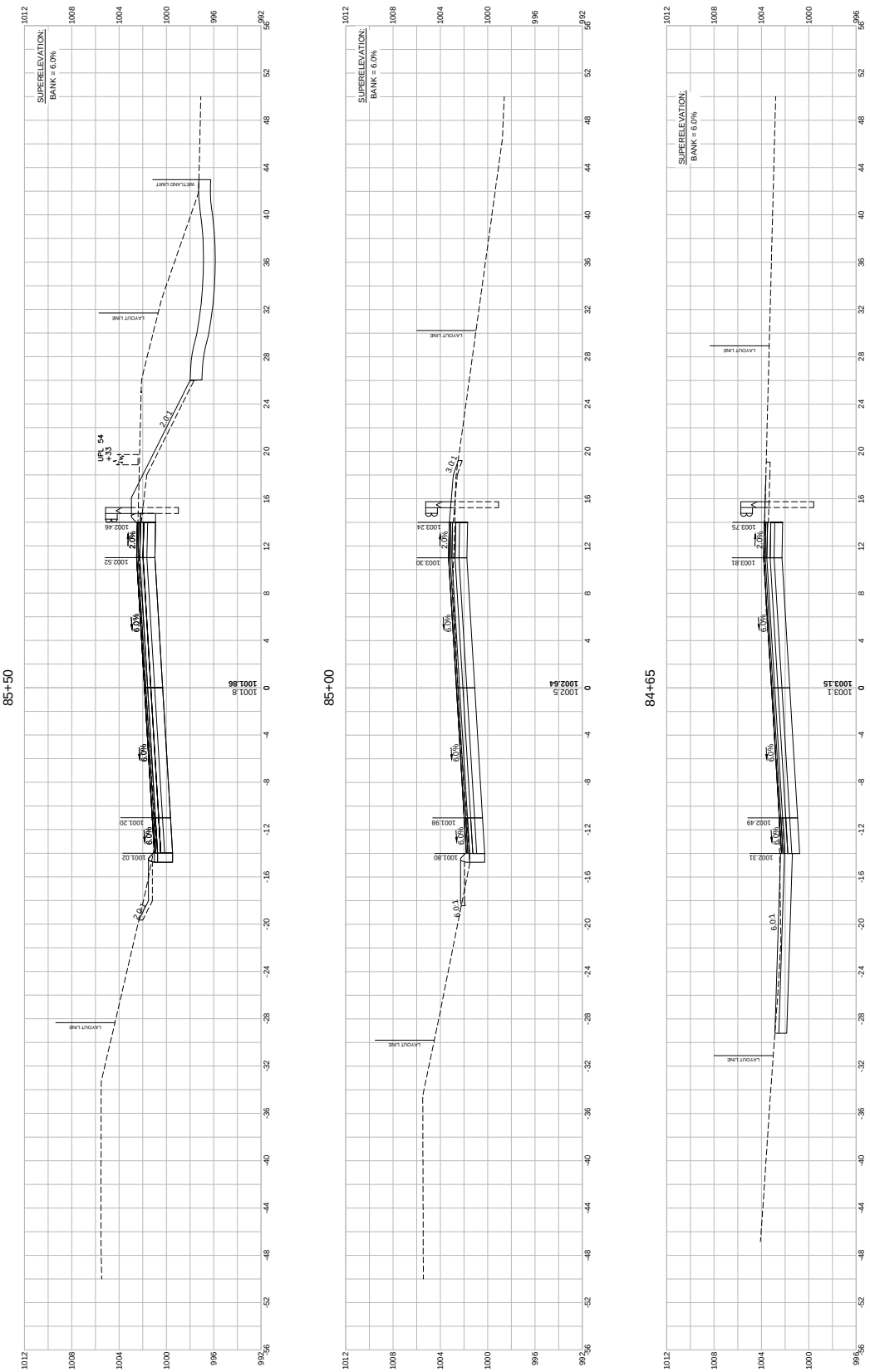
608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 4:15 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	S-TP-0032(043)X	4	
	PROJECT FILE NO.	608163	

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



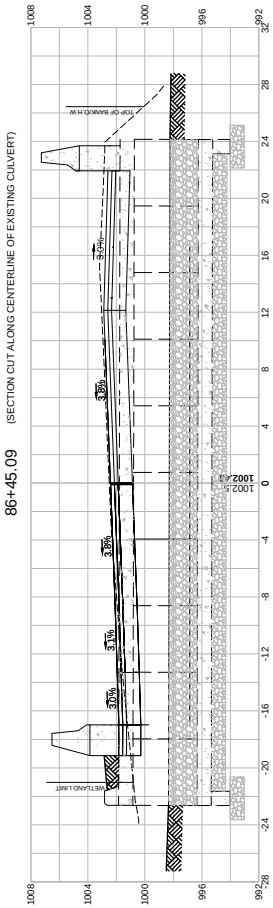
608163_HD10XSC_GRADINGCALC.DWG Plotted on 9-Aug-2024 4:27 PM

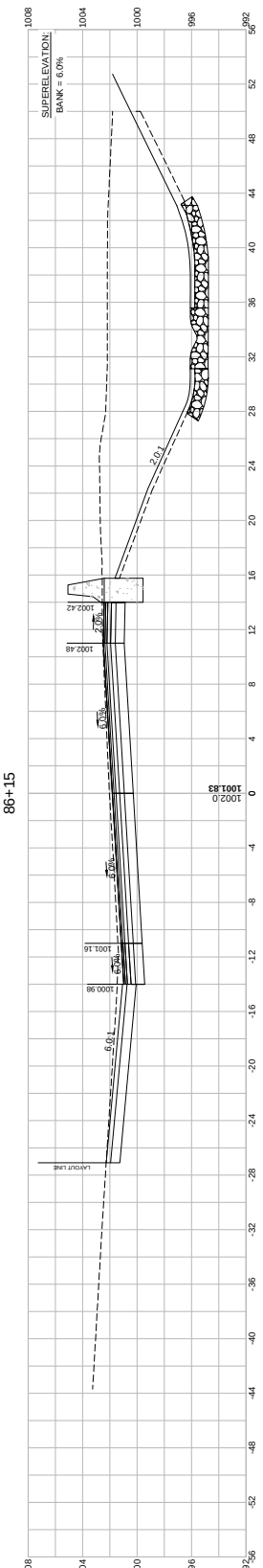
WALES
MONSON ROAD

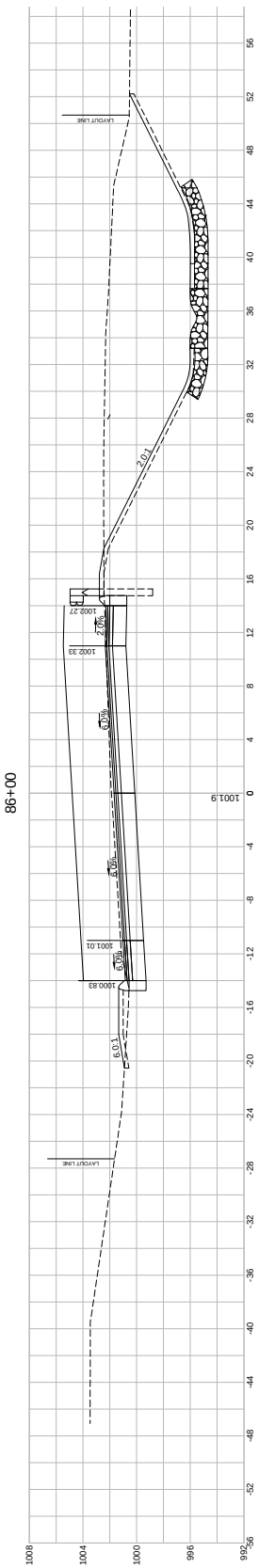
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

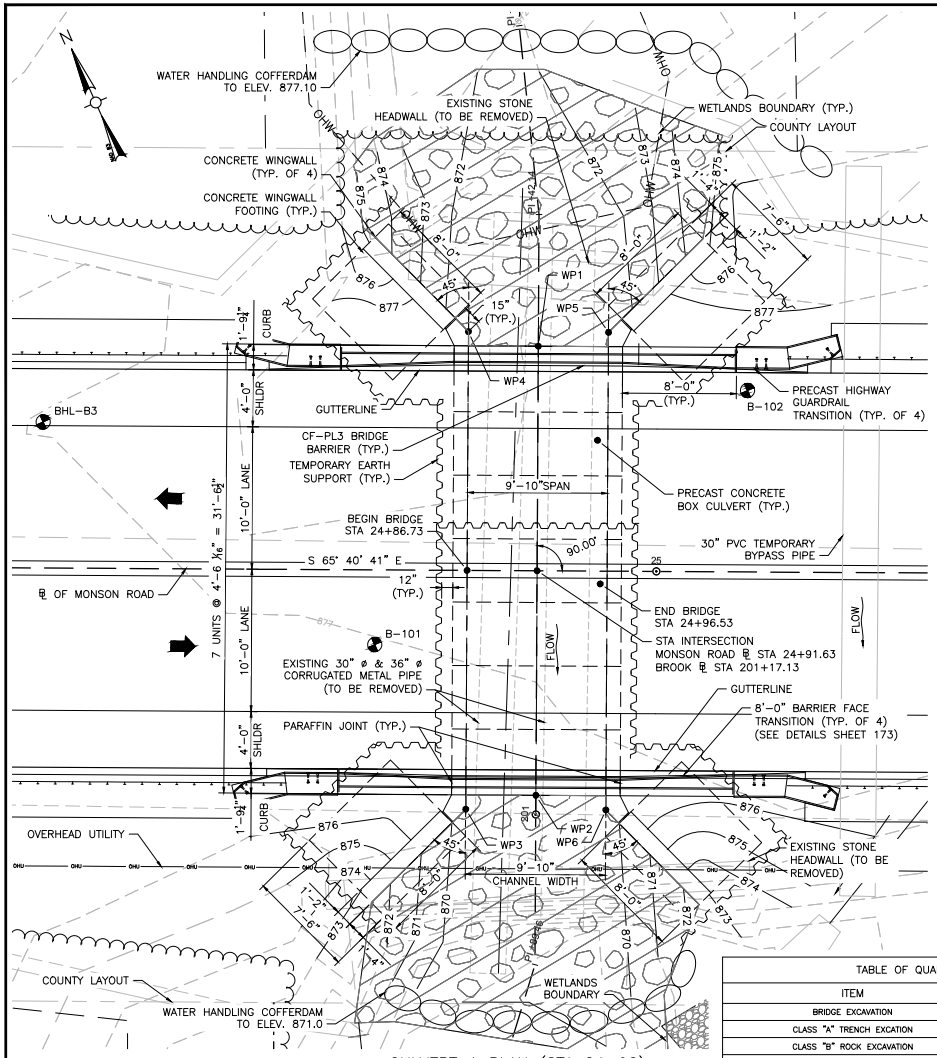
CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8









CULVERT 1 PLAN (STA 24+92)
SCALE: 1" = 4'

WORKING POINTS		
POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2848111.9174	448173.3849
2	2848083.1730	448160.3979
3	2848084.2791	448155.5221
4	2848114.8452	448169.3343
5	2848110.8082	448178.2683
6	2848080.2408	448164.4559

NOTES:

1. THE FACTORED BEARING PRESSURE = 2.06 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 5.04 KSF.
   FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS 9TH EDITION, 2020, FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 21+38± (RT) MAGNAIL IN UTILITY POLE: EL. 876.92 FT

BENCHMARK STA 29+60± (RT) MAGNAIL IN UTILITY POLE: EL. 900.23 FT

BENCHMARK STA 29+90± (LT) MAGNAIL BRASS RIVET: EL. 901.72 FT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

5000 PSI, ¾", 685 HP CEMENT CONCRETE.....CF-PL3 BARRIER CURB, TRANSITION BARRIER CURB

5000 PSI, 1½", 660 CEMENT CONCRETE.....WINGWALLS

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	443
CLASS "A" TRENCH EXCATION	C.Y.	69
CLASS "B" ROCK EXCAVATION	C.Y.	30
NATURAL STREAMBED MATERIAL	C.Y.	26
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	300
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	18
PRECAST GUARDRAIL HIGHWAY TRANSITION	EA.	4
5000 PSI, ¾", 685 HP CEMENT CONCRETE	C.Y.	27
5000 PSI, 1½", 660 CEMENT CONCRETE	C.Y.	27
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	17050
DAMPPROOFING	S.F.	1244
PRECAST CONCRETE BOX CULVERT – SITE 1	L.S.	1
TEMPORARY SUPPORT OF EARTH	L.S.	1
CONTROL OF WATER – STRUCTURE NO. 1	L.S.	1

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 1 KEY PLAN AND NOTES

TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	0.903
DESIGN FLOOD DISCHARGE (C.F.S.)	123
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	6.32
DESIGN FLOOD ELEVATION (FEET, NAVD)	873.95
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	174
BASE FLOOD ELEVATION (FEET, NAVD)	874.72
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	43
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	7.72
DESIGN FLOOD ELEVATION (FEET, NAVD)	876.1

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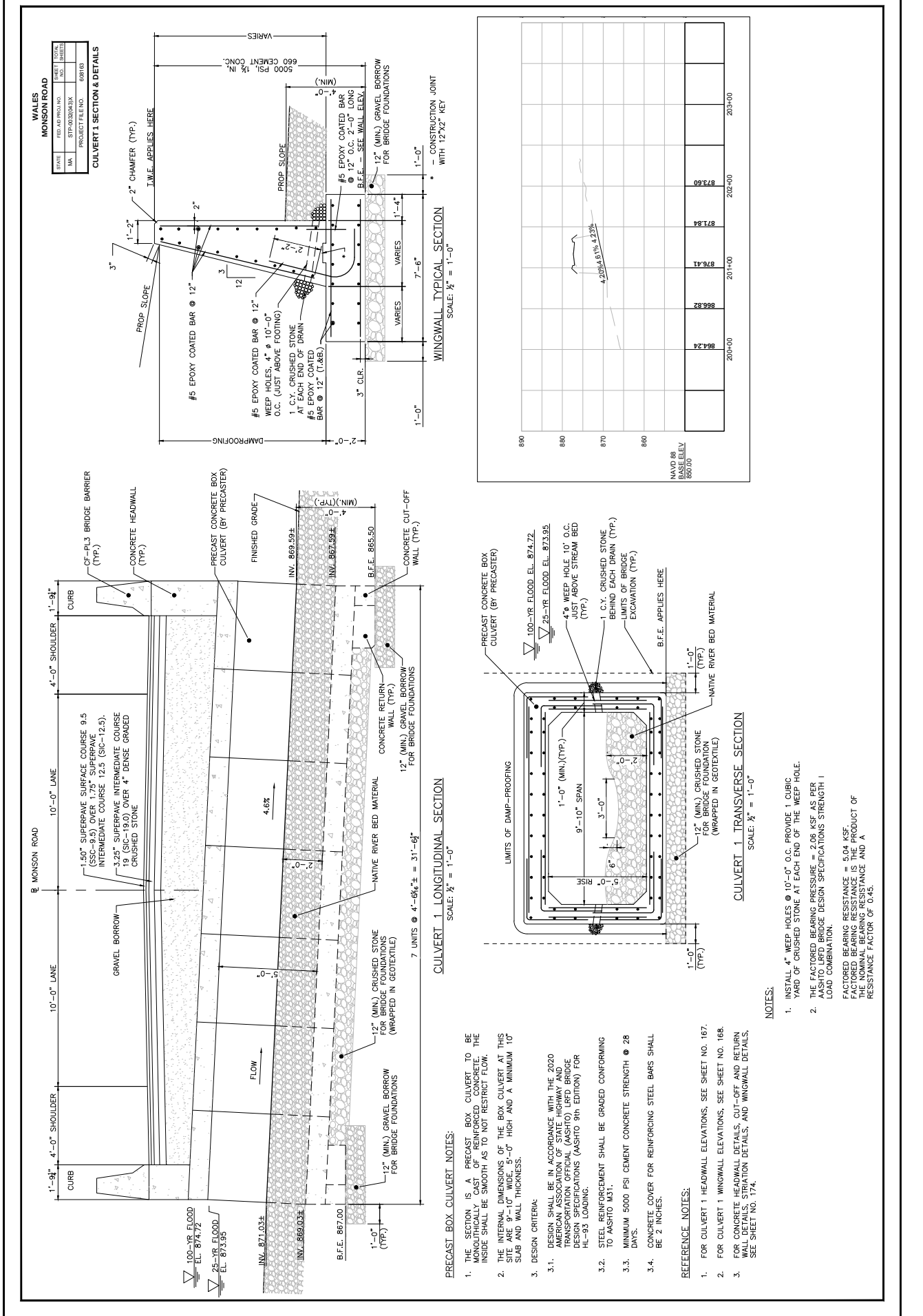
Proposal No. 608163-128112


WALES
MONSON ROAD
CULVERT 1 SECTION & DETAILS
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
NA
STP-0032(043)X
PROJECT FILE NO.
608163
WINGWALL TYPICAL SECTION
SCALE: ½" = 1'-0"
CULVERT 1 LONGITUDINAL SECTION
SCALE: ½" = 1'-0"
CULVERT 1 TRANSVERSE SECTION
SCALE: ½" = 1'-0"
PRECAST BOX CULVERT NOTES:
REFERENCE NOTES:
NOTES:

608163_HD11\STRUCTURAL PLAN\.DWG Plotted on 9-Aug-2024 3:15 PM

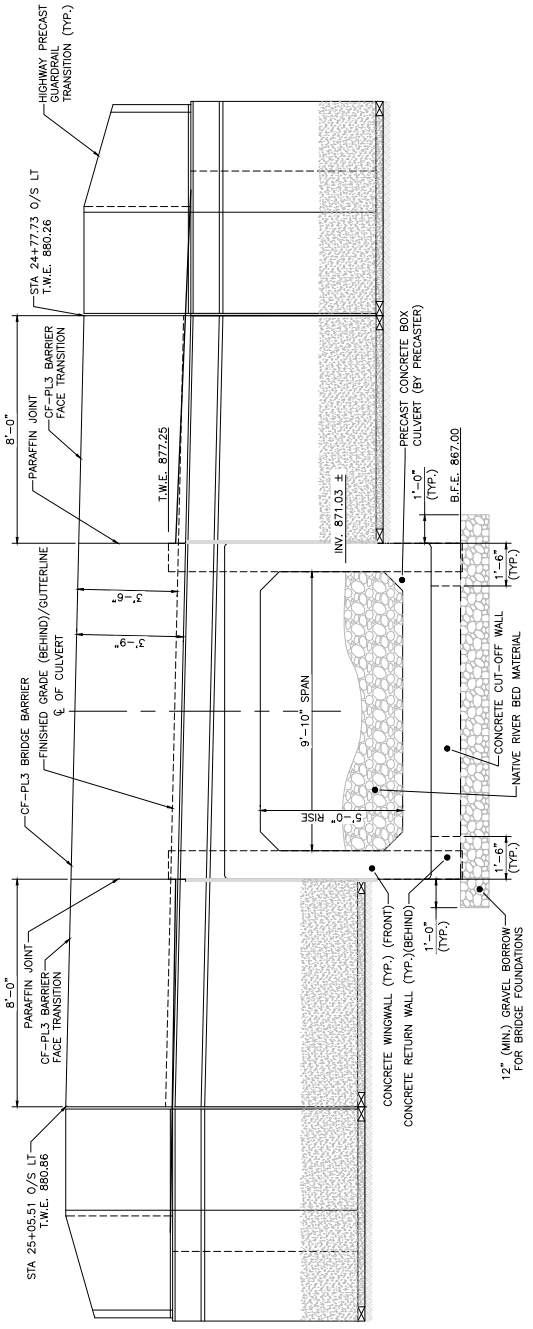
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

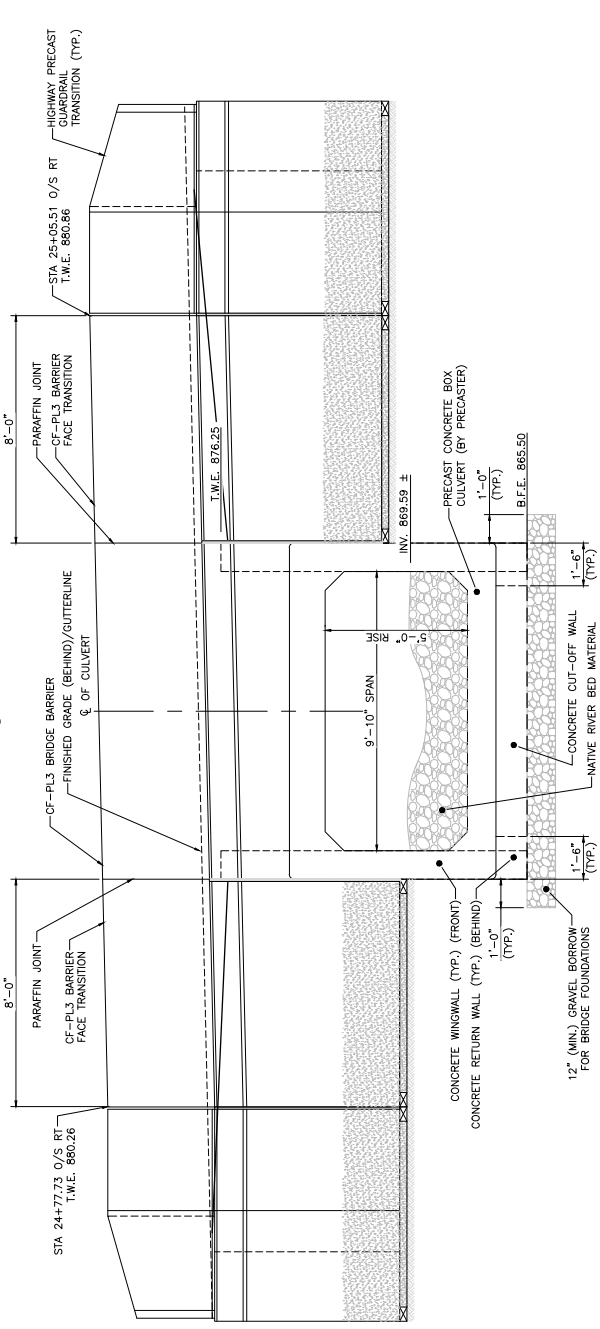
CULVERT 1 HEADWALL ELEVATIONS

REFERENCE NOTES:

1. FOR CULVERT 1 WINGWALL ELEVATIONS, SEE SHEET NO. 168
2. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, PARAFFIN JOINT DETAILS AND WINGWALL DETAILS, SEE SHEET NO. 174.



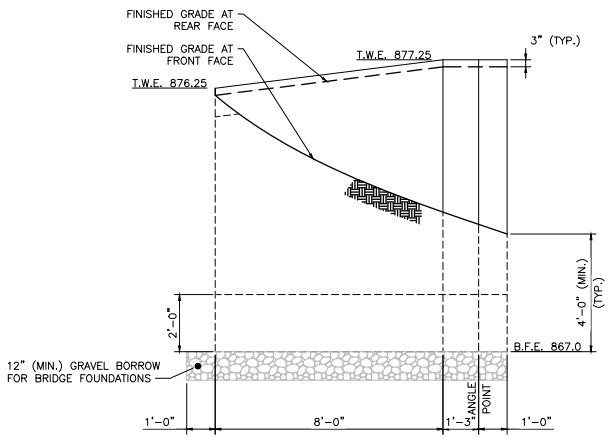
CULVERT 1 INLET ELEVATION
SCALE: ½" = 1'-0"



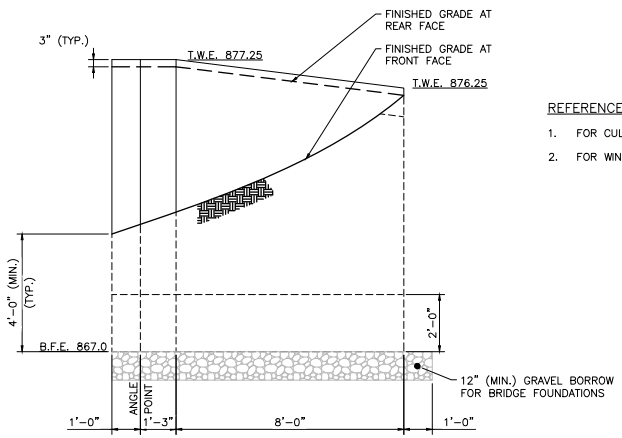
CULVERT 1 OUTLET ELEVATION
SCALE: ½" = 1'-0"

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

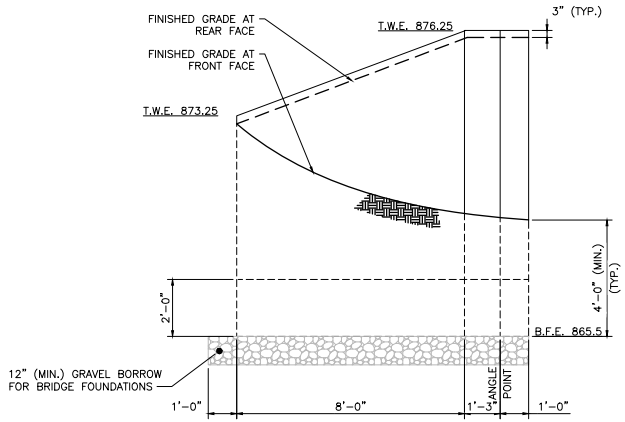
CULVERT 1 WINGWALL ELEVATIONS



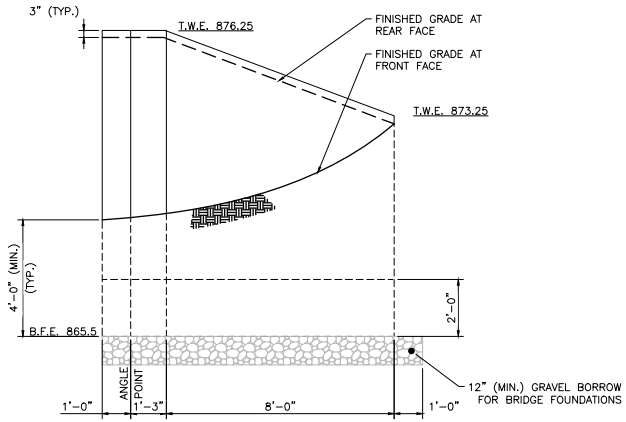
NORTHEAST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



NORTHWEST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



SOUTHWEST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



SOUTHEAST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"

REFERENCE NOTES:

1. FOR CULVERT 1 WINGWALL SECTION, SEE SHEET NO. 166.
2. FOR WINGWALL DETAILS, SEE SHEET NO. 174.

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Proposal No. 608163-128112

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 2 KEY PLAN AND NOTES

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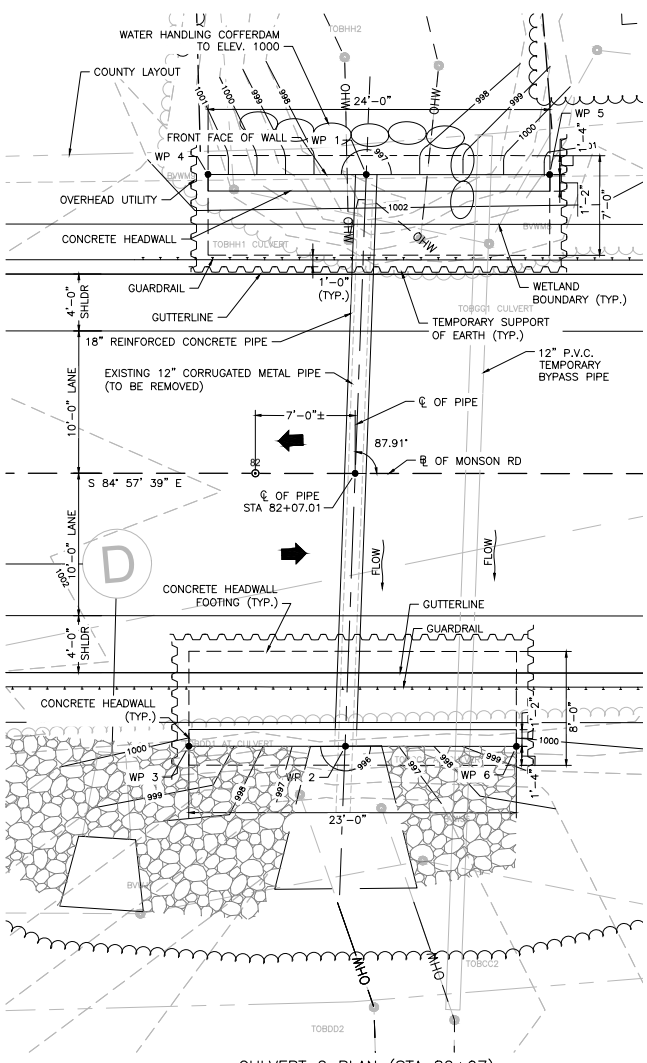

CULVERT 2 PLAN (STA 82+07)
SCALE: 1" = 4'

NOTES:

1. THE FACTORED BEARING PRESSURE = 2.18 KSF AT THE INLET HEADWALL AND 2.64 KSF AT THE OUTLET HEADWALL AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 5.35 KSF AT THE INLET HEADWALL AND 5.52 KSF AT THE OUTLET HEADWALL. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 81+25± (LT) SPIKE IN UTILITY POLE: EL. 1005.74

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

5000 PSI, 1½", 660 CEMENT CONCRETE.....HEADWALLS

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING PIPES.
4. INSTALL THE PROPOSED PIPE & HEADWALLS.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE PROPOSED CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	167
CLASS "A" TRENCH EXCAVATION	C.Y.	11
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	150
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	20
5000 PSI 1½" 660 CEMENT CONCRETE	C.Y.	52
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	10010
DAMPPROOFING	S.F.	426
TEMPORARY SUPPORT OF EARTH	L.S.	1
CONTROL OF WATER – STRUCTURE NO. 2	L.S.	1

WORKING POINTS		
POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2847313.7204	453680.2286
2	2847273.8336	453675.2733
3	2847274.8008	453664.3163
4	2847314.6939	453669.1581
5	2847312.5891	453693.0567
6	2847272.7828	453687.1995

TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	10.24
DESIGN FLOOD DISCHARGE (C.F.S.)	9
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	0.14
DESIGN FLOOD ELEVATION (FEET, NAVD)	996.14
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	9
BASE FLOOD ELEVATION (FEET, NAVD)	999.20
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	5
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	6.70
DESIGN FLOOD ELEVATION (FEET, NAVD)	998.46

A00830 -1171

Proposal No. 608163-128112

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 2 WALL DETAILS

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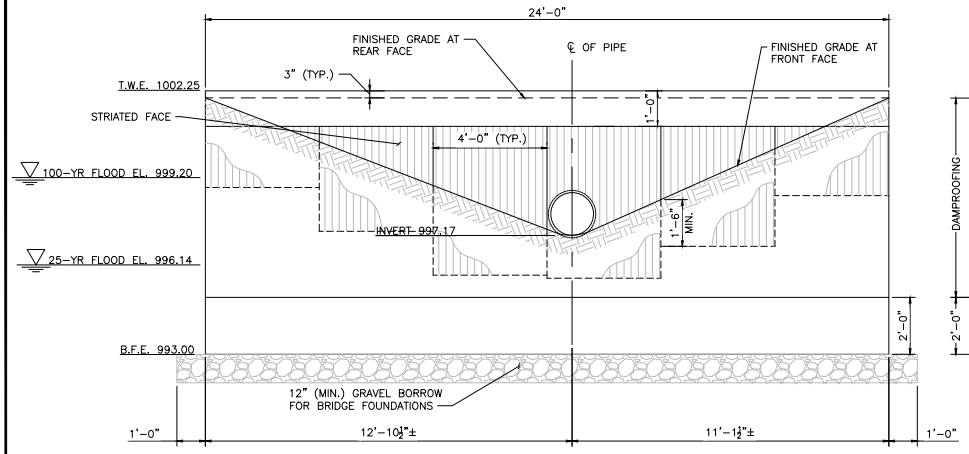
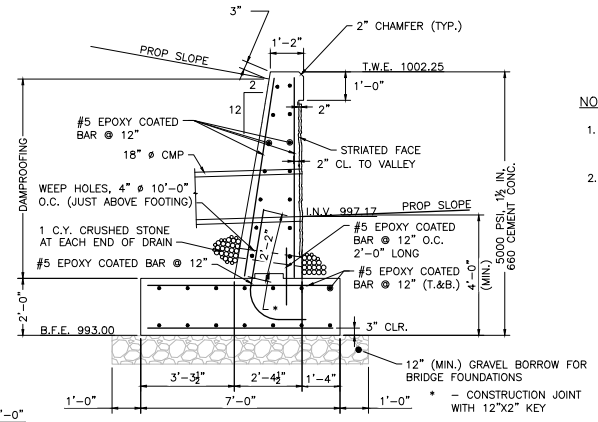


NORTH INLET HEADWALL ELEVATION
SCALE: ½" = 1'-0"

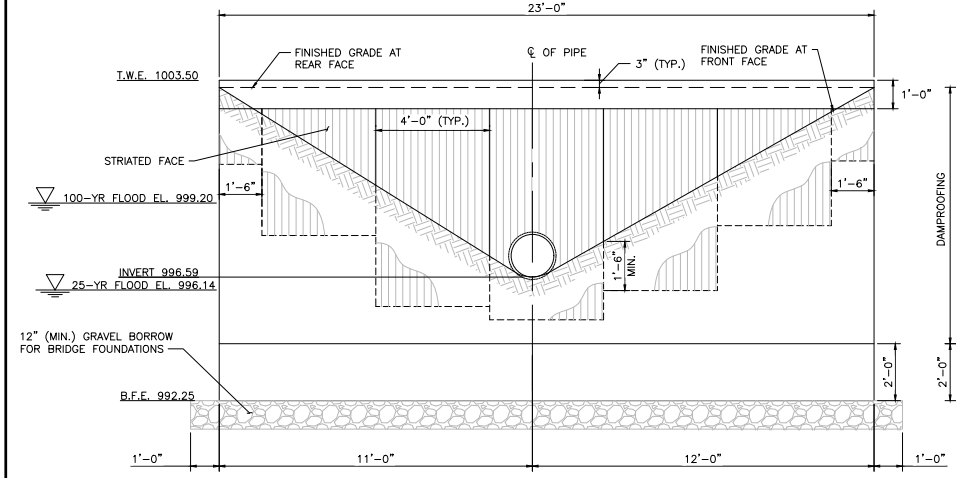


NORTH INLET HEADWALL SECTION
SCALE: ½" = 1'-0"

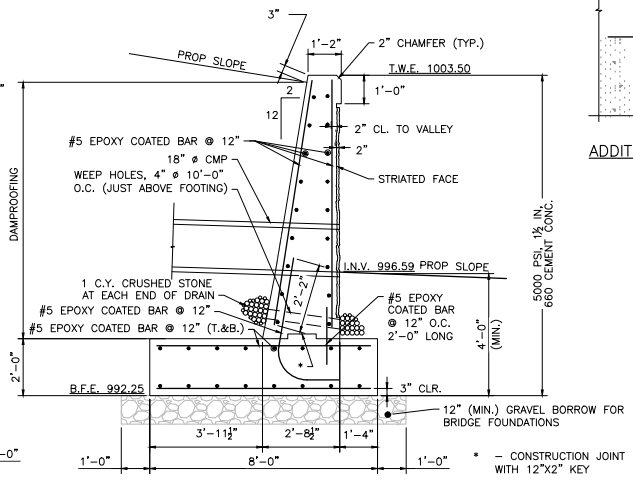
NOTES:

1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 2.18 KSF AT THE INLET HEADWALL AND 2.64 KSF AT THE OUTLET HEADWALL AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

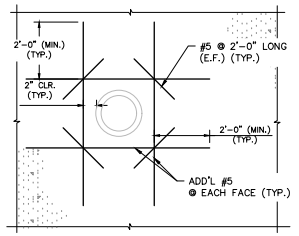
   FACTORED BEARING RESISTANCE = 5.35 KSF AT THE INLET HEADWALL AND 5.52 KSF AT THE OUTLET HEADWALL. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.



SOUTH OUTLET HEADWALL ELEVATION
SCALE: ½" = 1'-0"



SOUTH OUTLET HEADWALL SECTION
SCALE: ½" = 1'-0"



ADDITIONAL REINFORCEMENT AT PIPE
SCALE: ½" = 1'-0"

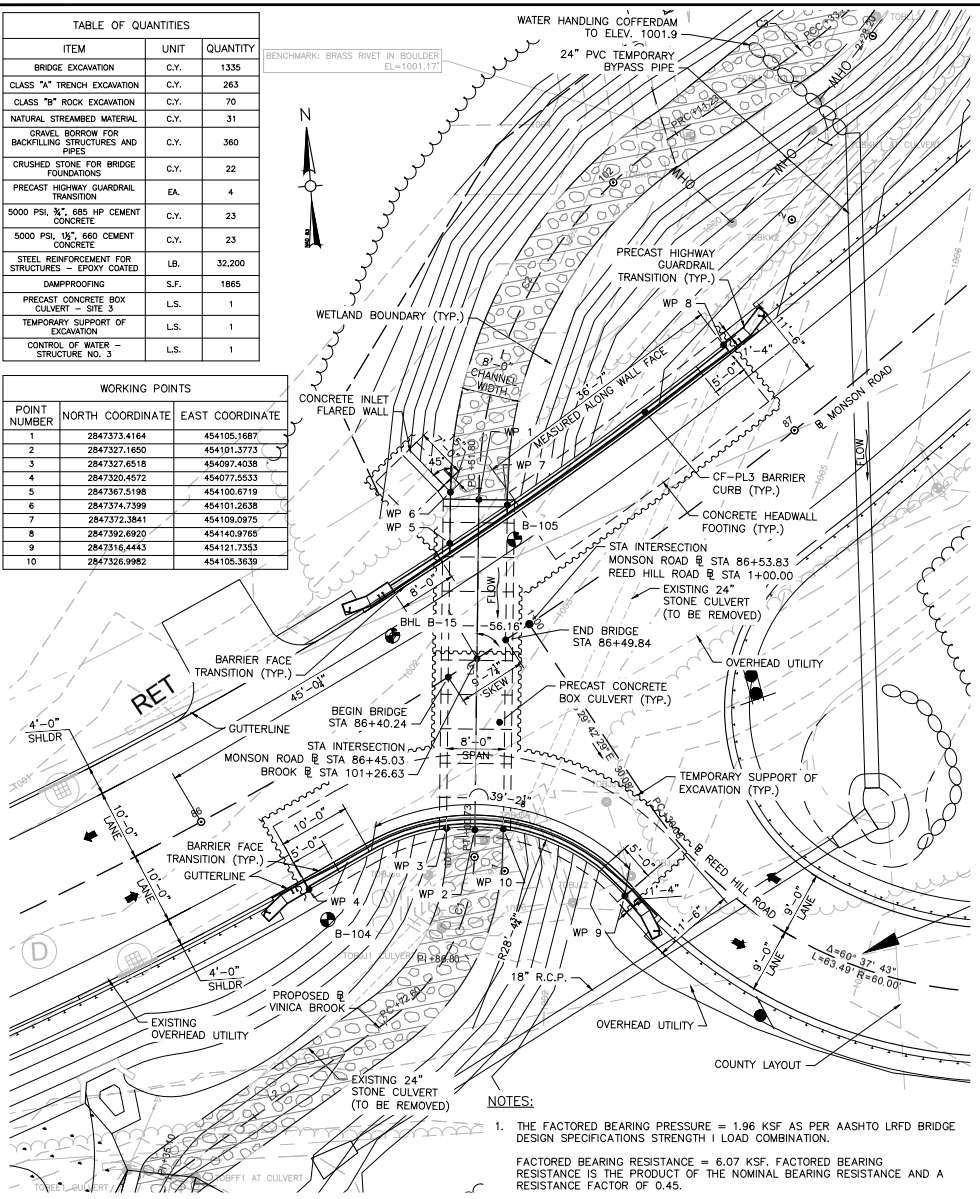
REFERENCE NOTES:

1. FOR STRIATION DETAILS, SEE SHEET NO. 174.

Proposal No. 608163-128112

TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	1335
CLASS "A" TRENCH EXCAVATION	C.Y.	263
CLASS "B" ROCK EXCAVATION	C.Y.	70
NATURAL STREAMBED MATERIAL	C.Y.	31
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	360
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	22
PRECAST HIGHWAY GUARDRAIL TRANSITION	EA.	4
5000 PSI, ¾", 685 HP CEMENT CONCRETE	C.Y.	23
5000 PSI, 1½", 660 CEMENT CONCRETE	C.Y.	23
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	32,200
DAMPPROOFING	S.F.	1865
PRECAST CONCRETE BOX CULVERT – SITE 3	L.S.	1
TEMPORARY SUPPORT OF EXCAVATION	L.S.	1
CONTROL OF WATER – STRUCTURE NO. 3	L.S.	1

WORKING POINTS		
POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2847373.4164	454105.1687
2	2847327.1650	454101.3773
3	2847327.6518	454097.4038
4	2847320.4572	454077.5533
5	2847367.5198	454100.6719
6	2847374.7399	454101.2638
7	2847372.3841	454109.0975
8	2847392.6920	454140.9765
9	2847316.4443	454121.7353
10	2847326.9982	454105.3639



CULVERT 3 PLAN (STA 86+45)

SCALE: 1" = 8'

NOTES:

1. THE FACTORED BEARING PRESSURE = 1.96 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 6.07 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 87+10± (RT) SPIKE IN UTILITY POLE: EL. 1007.89 FT

BENCHMARK STA 87+20± (LT) BRASS RIVET: EL. 1001.17 FT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

5000 PSI, ¾", 685 HP CEMENT CONCRETE.....CF-PL3 BARRIER CURB AND TRANSITION BARRIER CURB

5000 PSI, 1½", 660 CEMENT CONCRETE.....HEADWALLS

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 3 KEY PLAN AND NOTES

TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

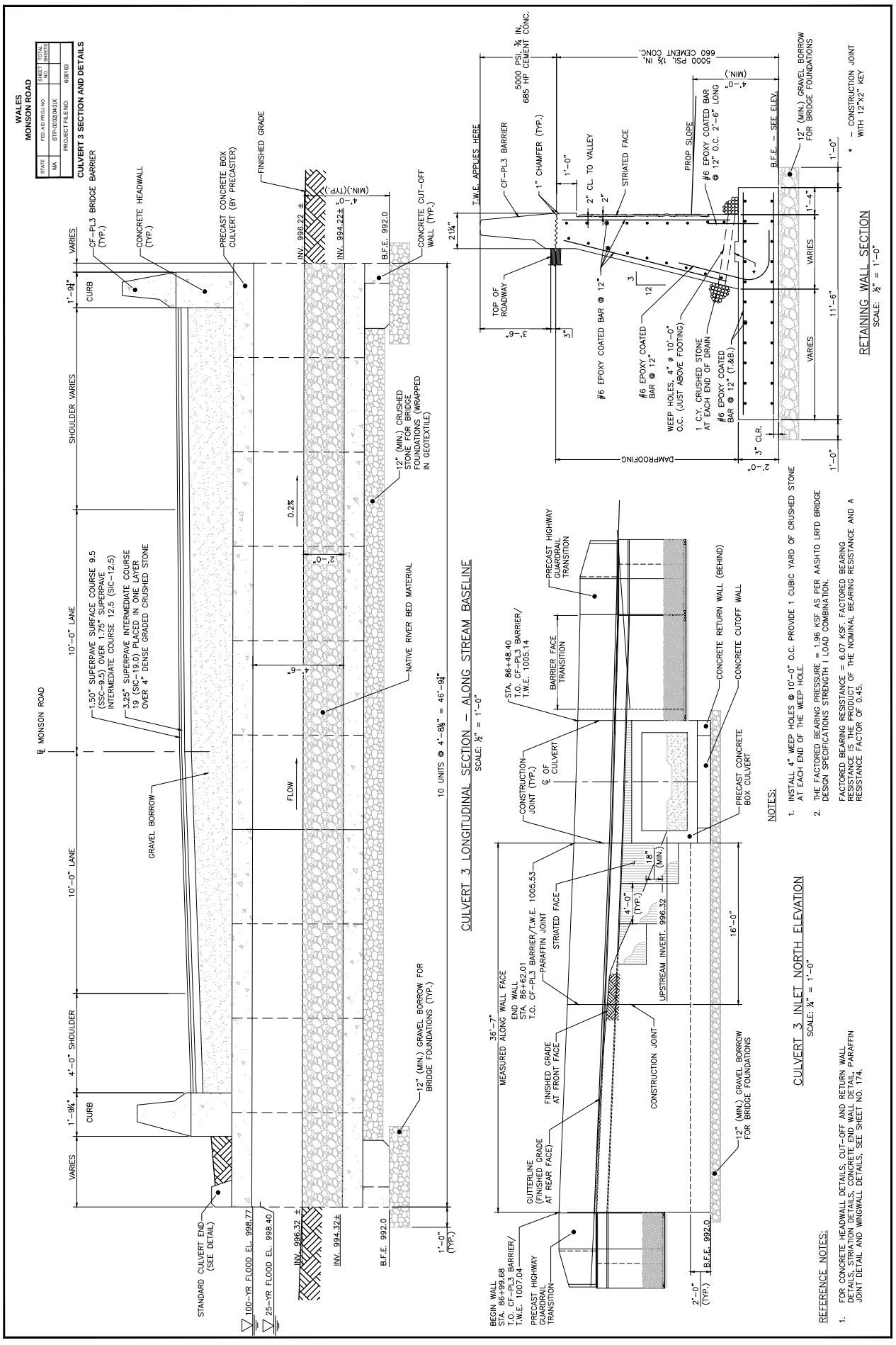
HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	0.33
DESIGN FLOOD DISCHARGE (C.F.S.)	52
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	3.22
DESIGN FLOOD ELEVATION (FEET, NAVD)	998.40
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	73
BASE FLOOD ELEVATION (FEET, NAVD)	998.77
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	18
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	8.91
DESIGN FLOOD ELEVATION (FEET, NAVD)	1001.42

608163_HD11(STRUCTURAL PLAN).DWG Plotted on 9-Aug-2024 3:19 PM

A00830 -1173

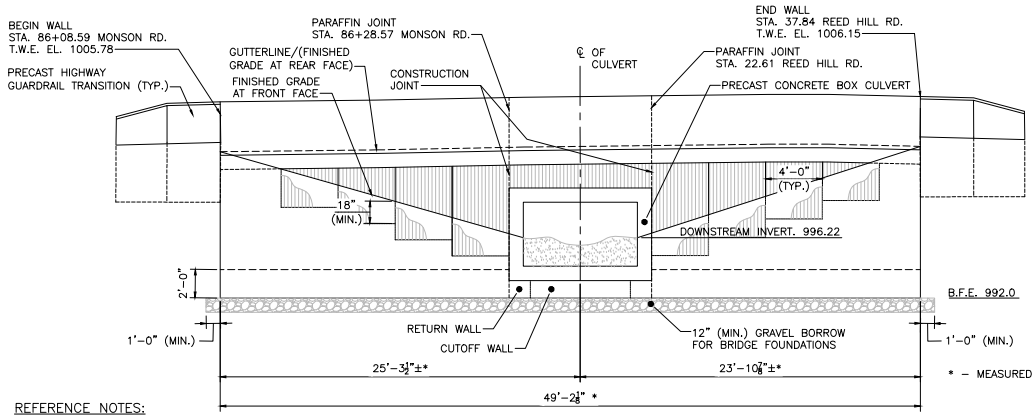
Proposal No. 608163-128112


WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
CULVERT 3 SECTION AND DETAILS
℄ MONSON ROAD
10'-0" LANE
SHOULDER VARIES
VARIES
1'-9½"
CURB
CF-PL3 BRIDGE BARRIER (TYP.)
CONCRETE HEADWALL (TYP.)
PRECAST CONCRETE BOX CULVERT (BY PRECASTER)
FINISHED GRADE
4'-0" (MIN.)(TYP.)
INV. 996.22 ±
INV. 994.22 ±
B.F.E. 992.0
CONCRETE CUT-OFF WALL (TYP.)
1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5)
3.25" SUPERPAVE INTERMEDIATE COURSE 19 (SIC-19.0) PLACED IN ONE LAYER OVER 4" DENSE GRADED CRUSHED STONE
GRAVEL BORROW
FLOW
0.2%
NATIVE RIVER BED MATERIAL
12" (MIN.) CRUSHED STONE FOR BRIDGE FOUNDATIONS (WRAPPED IN GEOTEXTILE)
10 UNITS @ 4'-8⅝" = 46'-9"
STANDARD CULVERT END (SEE DETAIL)
100-YR FLOOD EL. 998.77
25-YR FLOOD EL. 998.40
INV. 996.32 ±
INV. 994.32 ±
B.F.E. 992.0
12" (MIN.) GRAVEL BORROW FOR BRIDGE FOUNDATIONS (TYP.)
1'-0" (TYP.)
CULVERT 3 LONGITUDINAL SECTION – ALONG STREAM BASELINE
SCALE: ½" = 1'-0"
T.W.E. APPLIES HERE
CF-PL3 BARRIER
1" CHAMFER (TYP.)
5000 PSI, ¾ IN, 685 HP CEMENT CONC.
1'-0"
2" CL. TO VALLEY
2"
STRIATED FACE
PROP SLOPE
#6 EPOXY COATED BAR @ 12" O.C. 2'-6" LONG
4'-0" (MIN.)
6500 PSI, 1½ IN, 660 CEMENT CONC.
B.F.E. – SEE ELEV.
12" (MIN.) GRAVEL BORROW FOR BRIDGE FOUNDATIONS
1'-4"
1'-0"
21¼"
TOP OF ROADWAY
1'-6"
3"
#6 EPOXY COATED BAR @ 12"
3
12
#6 EPOXY COATED BAR @ 12"
#6 EPOXY COATED BAR @ 12" (T.&B.)
WEEP HOLES, 4" ø 10'-0" O.C. (JUST ABOVE FOOTING)
1 C.Y. CRUSHED STONE AT EACH END OF DRAIN
VARIES
11'-6"
DAMPROOFING
3" CLR.
2'-0"
1'-0"
* – CONSTRUCTION JOINT WITH 12"X2" KEY
RETAINING WALL SECTION
SCALE: ½" = 1'-0"
STA. 86+48.40
T.O. CF-PL3 BARRIER/
T.W.E. 1005.14
PRECAST HIGHWAY GUARDRAIL TRANSITION
BARRIER FACE TRANSITION
CONSTRUCTION JOINT (TYP.)
℄ OF CULVERT
CONCRETE RETURN WALL (BEHIND)
CONCRETE CUTOFF WALL
PRECAST CONCRETE BOX CULVERT
18" (MIN.)
4'-0" (TYP.)
UPSTREAM INVERT. 996.32
16'-0"
36'-7"
MEASURED ALONG WALL FACE
END WALL
STA. 86+62.01
T.O. CF-PL3 BARRIER/T.W.E. 1005.53
PARAFFIN JOINT
STRIATED FACE
FINISHED GRADE AT FRONT FACE
CONSTRUCTION JOINT
GUTTERLINE (FINISHED GRADE AT REAR FACE)
12" (MIN.) GRAVEL BORROW FOR BRIDGE FOUNDATIONS
BEGIN WALL
STA. 86+99.68
T.O. CF-PL3 BARRIER/
T.W.E. 1007.04
PRECAST HIGHWAY GUARDRAIL TRANSITION
2'-0" (TYP.)
B.F.E. 992.0
CULVERT 3 INLET NORTH ELEVATION
SCALE: ½" = 1'-0"
NOTES:
1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 1.96 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.
FACTORED BEARING RESISTANCE = 6.07 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.
REFERENCE NOTES:
1. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRATIFICATION DETAILS, CONCRETE END WALL DETAIL, PARAFFIN JOINT DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 174.

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 3 WALL ELEVATION AND DETAILS



* – MEASURED ALONG WALL FACE

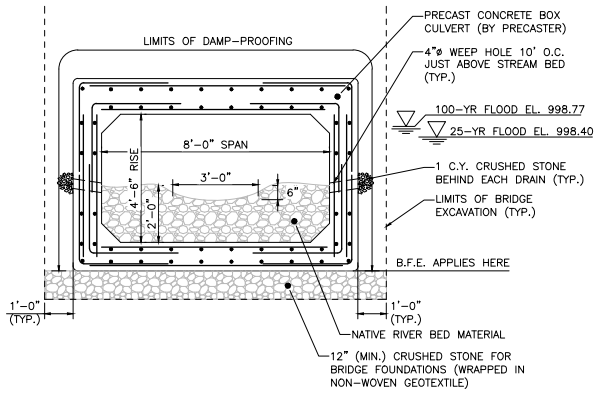
CULVERT 3 OUTLET/SOUTH ELEVATION
SCALE: ¼" = 1'-0"

PRECAST BOX CULVERT NOTES:

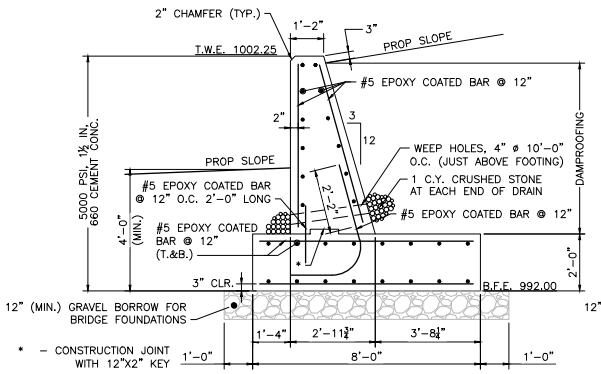
1. THE SECTION IS A PRECAST BOX CULVERT TO BE MONOLITHICALLY CAST OF REINFORCED CONCRETE. THE INSIDE SHALL BE SMOOTH AS TO NOT RESTRICT FLOW.
2. THE INTERNAL DIMENSIONS OF THE BOX CULVERT AT THIS SITE ARE 8'-0" WIDE, 4'-6" HIGH AND A MINIMUM 10" SLAB AND WALL THICKNESS.
3. DESIGN CRITERIA:
   - 3.1. DESIGN SHALL BE IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIAL (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS (9th EDITION) FOR HL-93 LOADING.
   - 3.2. STEEL REINFORCEMENT SHALL BE GRADED CONFORMING TO AASHTO M31.
   - 3.3. MINIMUM 5000 PSI CEMENT CONCRETE STRENGTH @ 28 DAYS.
   - 3.4. CONCRETE COVER FOR REINFORCING STEEL BARS SHALL BE 2 INCHES.

REFERENCE NOTES:

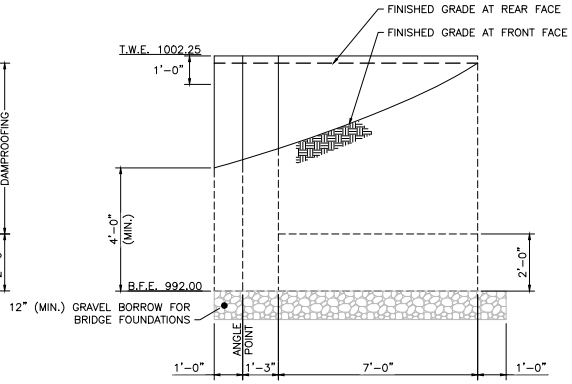
1. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, CONCRETE END WALL DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 172.



CULVERT 3 TRANSVERSE SECTION
SCALE: ½" = 1'-0"



CULVERT 3 INLET FLARED WALL – SECTION
SCALE: ½" = 1'-0"



CULVERT 3 INLET FLARED WALL – ELEVATION
SCALE: ½" = 1'-0"

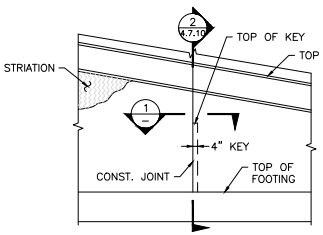
NOTES:

1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 1.90 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

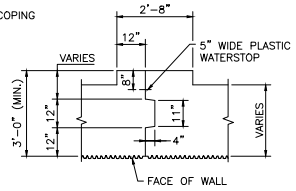
   FACTORED BEARING RESISTANCE = 5.27 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

REFERENCE NOTES:

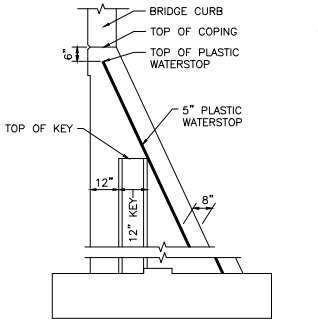
1. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, CONCRETE END WALL DETAIL, PARAFFIN JOINT DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 174.



WALL ELEVATION AT CONSTRUCTION JOINT
SCALE: ½" = 1'-0"

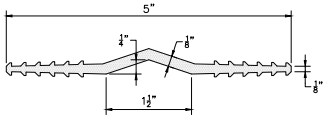


SECTION 1
SCALE: ½" = 1'-0"



NOTE:
REINFORCEMENT SHALL BE CONTINUOUS THROUGH CONSTRUCTION JOINTS.

SECTION 2
SCALE: ½" = 1'-0"



5" WATERSTOP
FULL SIZE

608163_HD11\STRUCTURAL PLAN.DWG Plotted on 9-Aug-2024 3:24 PM

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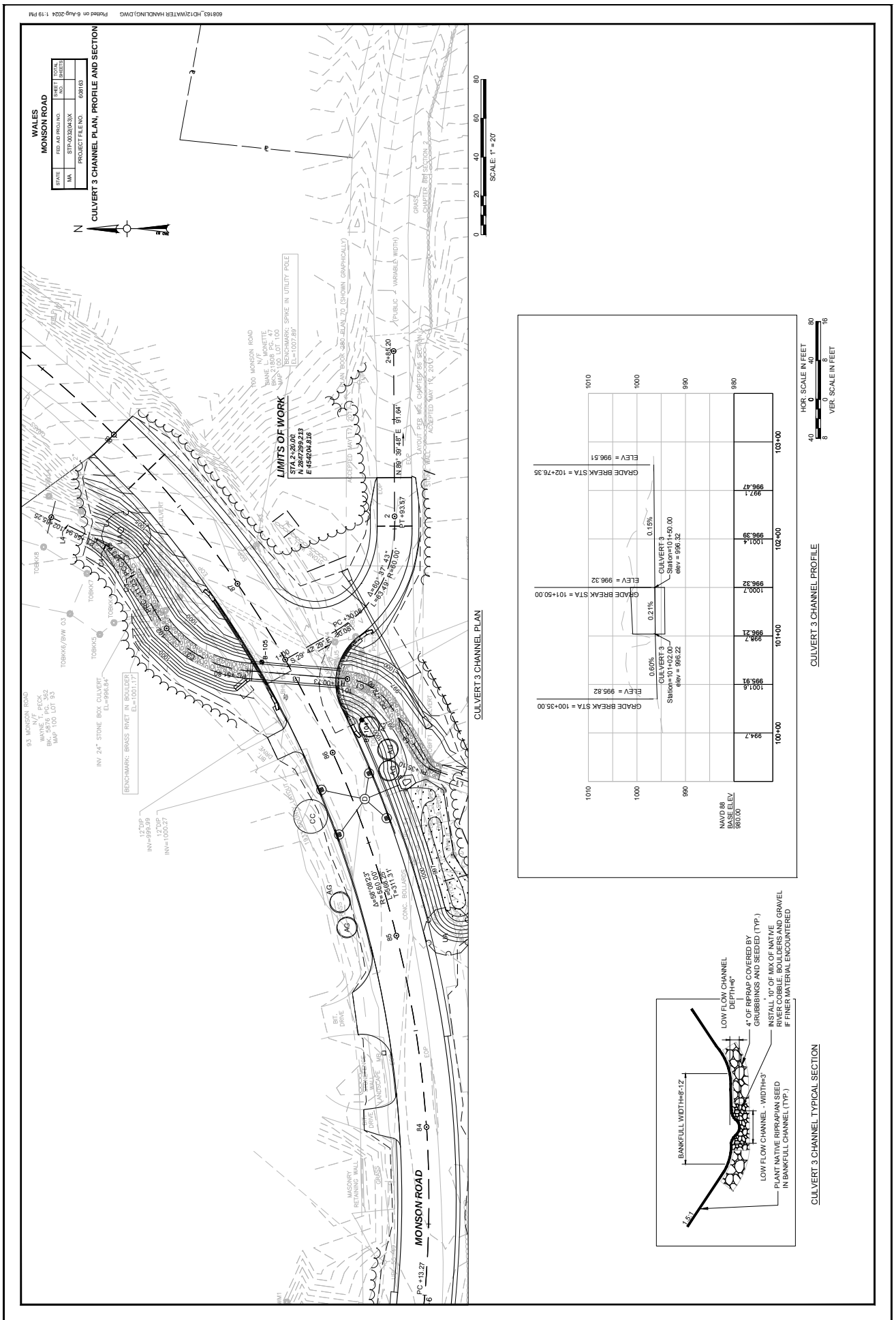
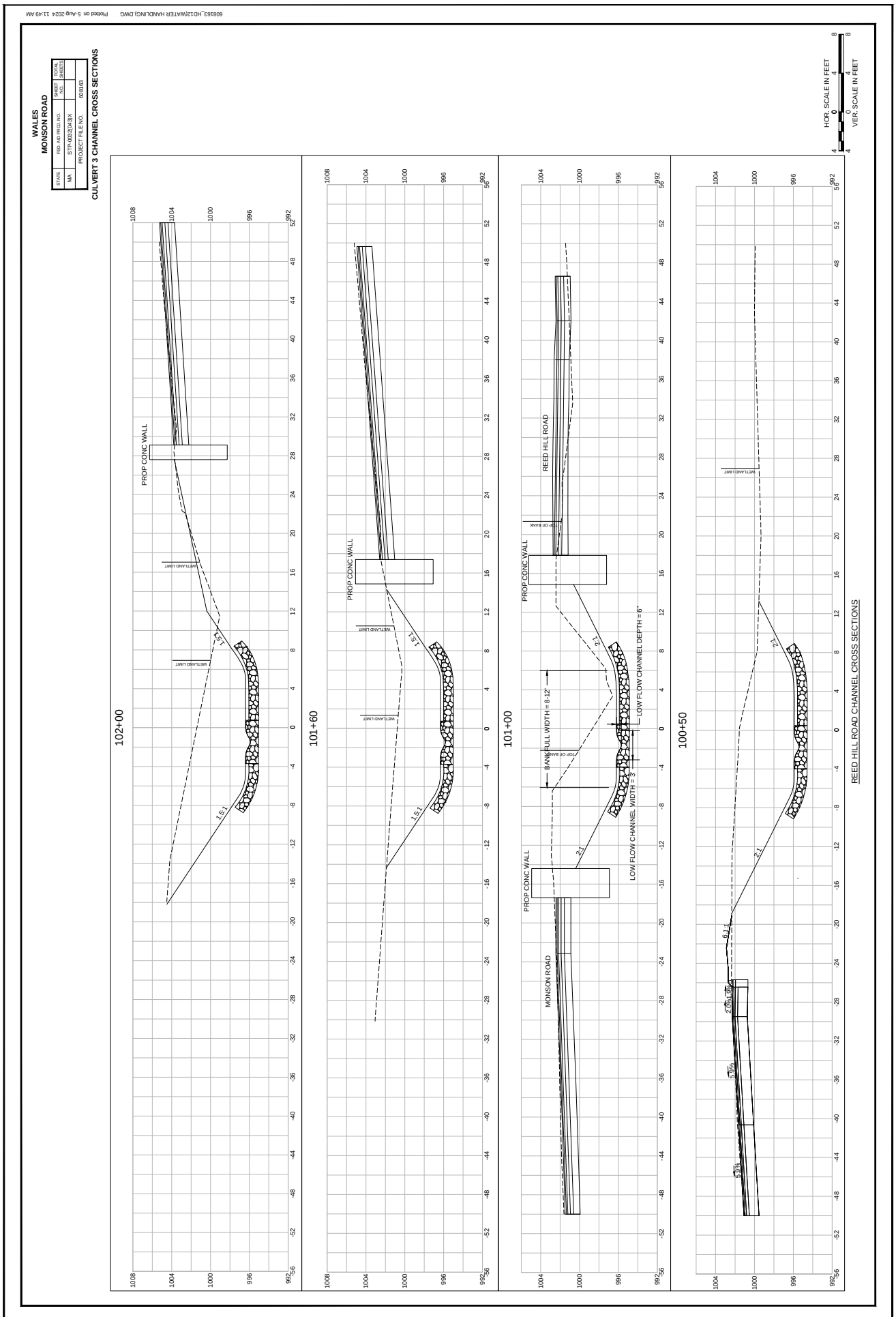
Proposal No. 608163-128112


WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
CULVERT 3 CHANNEL PLAN, PROFILE AND SECTION
SCALE: 1" = 20'
LIMITS OF WORK
STA 1+26.00
N 2847299.213
E 454204.816
MONSON ROAD
CULVERT 3 CHANNEL PLAN
CULVERT 3 CHANNEL PROFILE
GRADE BREAK STA = 100+35.00
ELEV = 995.82
GRADE BREAK STA = 101+50.00
ELEV = 996.32
GRADE BREAK STA = 102+76.35
ELEV = 996.51
CULVERT 3
Station=101+02.00
elev = 996.22
CULVERT 3
Station=101+50.00
elev = 996.32
0.60%
0.21%
0.15%
NAVD 88
BASE EL. ELEV.
980.00
HOR. SCALE IN FEET
VER. SCALE IN FEET
CULVERT 3 CHANNEL TYPICAL SECTION
BANKFULL WIDTH=8'-12'
LOW FLOW CHANNEL DEPTH=6"
4" OF RIPRAP COVERED BY GRUBBINGS AND SEEDED (TYP.)
INSTALL 10" OF MIX OF NATIVE RIVER COBBLE, BOULDERS AND GRAVEL IF FINER MATERIAL ENCOUNTERED
LOW FLOW CHANNEL WIDTH=3'
PLANT NATIVE RIPRAPIAN SEED IN BANKFULL CHANNEL (TYP.)
1.5:1


608163_HD12\WATER HANDLING.DWG Plotted on 5-Aug-2024 11:49 AM
WALES
MONSON ROAD
STATE
MA
FED. AID PROJ. NO.
STP-0032(043)X
PROJECT FILE NO.
608163
SHEET NO.
TOTAL SHEETS
CULVERT 3 CHANNEL CROSS SECTIONS
HOR. SCALE IN FEET
VER. SCALE IN FEET
102+00
101+60
101+00
100+50
PROP CONC WALL
WETLAND LIMIT
1.5:1
REED HILL ROAD
TOP OF BANK
BANK FULL WIDTH = 8-12'
LOW FLOW CHANNEL DEPTH = 6"
LOW FLOW CHANNEL WIDTH = 3'
2:1
MONSON ROAD
REED HILL ROAD CHANNEL CROSS SECTIONS

608163_HD12\WATER HANDLING.DWG Plotted on 5-Aug-2024 11:50 AM

WALES
MONSON ROAD

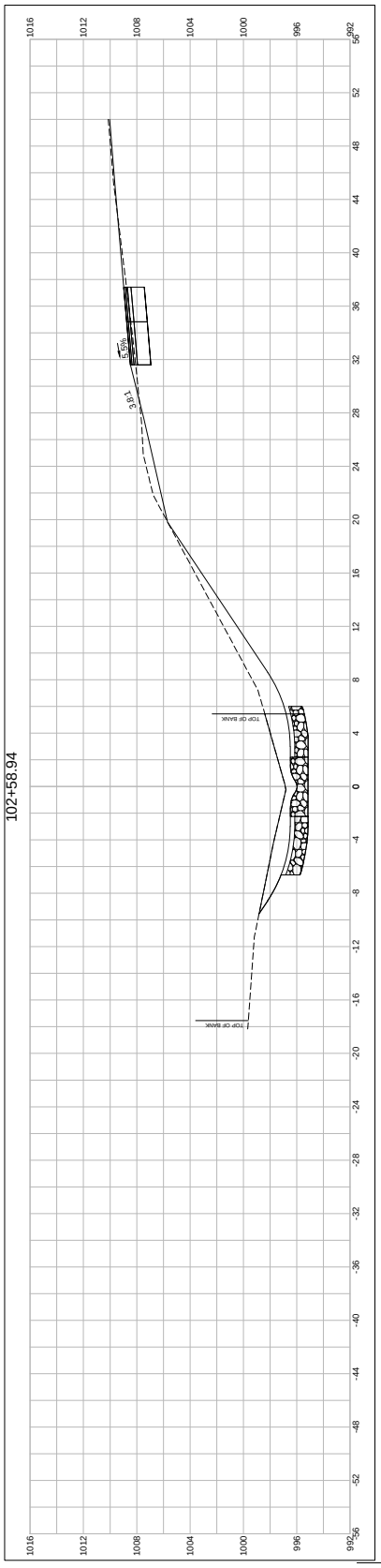
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

CULVERT 3 CHANNEL CROSS SECTIONS

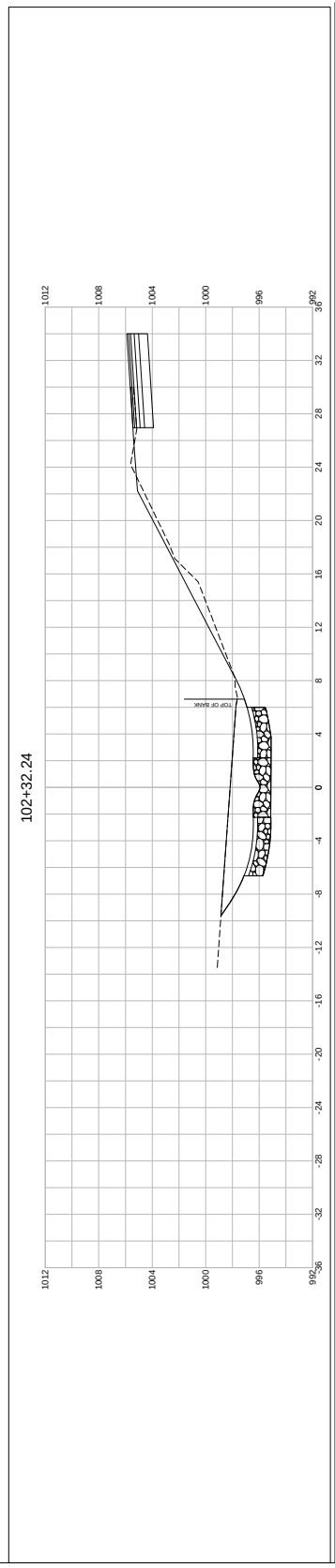
HOR. SCALE IN FEET
4 0 4 8
VER. SCALE IN FEET
4 0 4 8

REED HILL ROAD CHANNEL CROSS SECTIONS

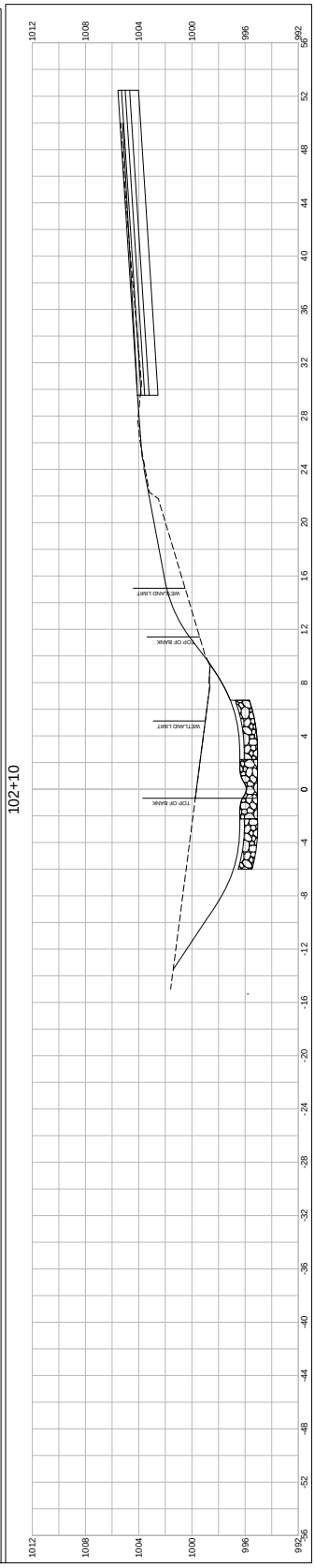
102+58.94



102+32.24



102+10

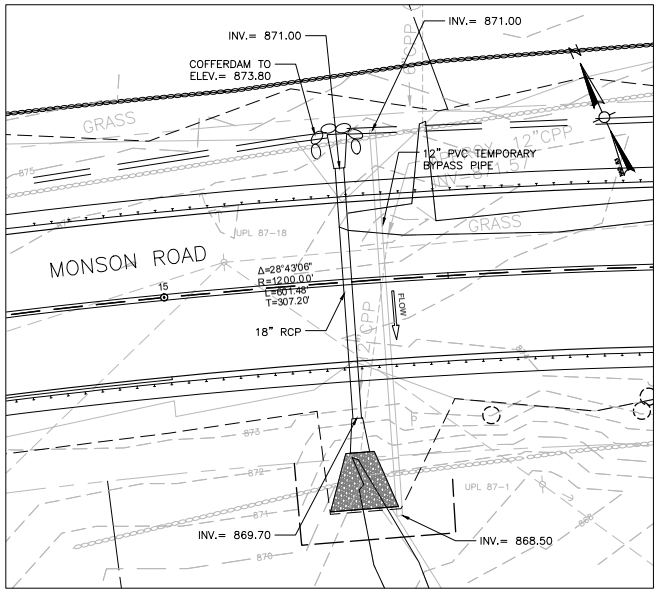


WALES
MONSON ROAD

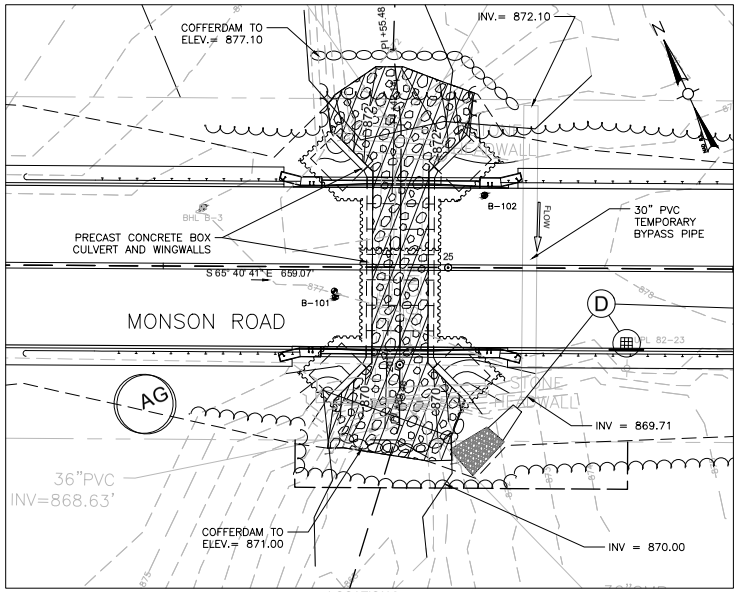
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CONTROL OF WATER PLANS

608163_HD12\WATER HANDLING\.DWG Plotted on 5-Aug-2024 11:52 AM



LOCATION 1
STA 15+33



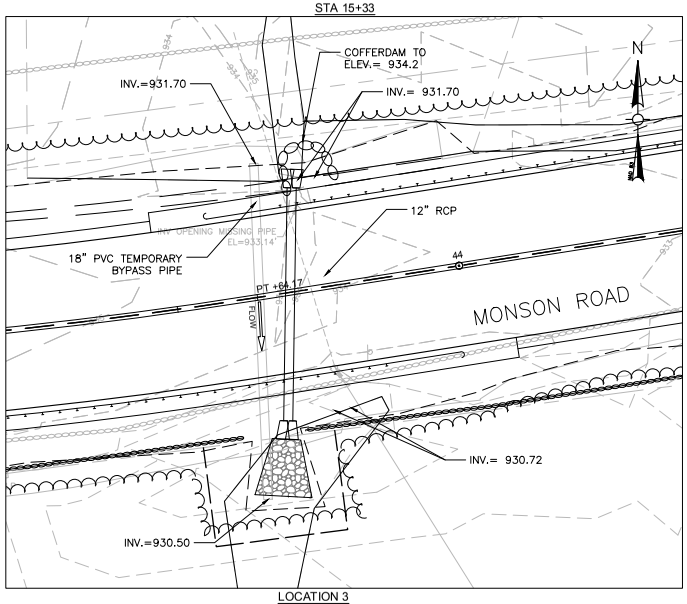
LOCATION 2
STA 24+92

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

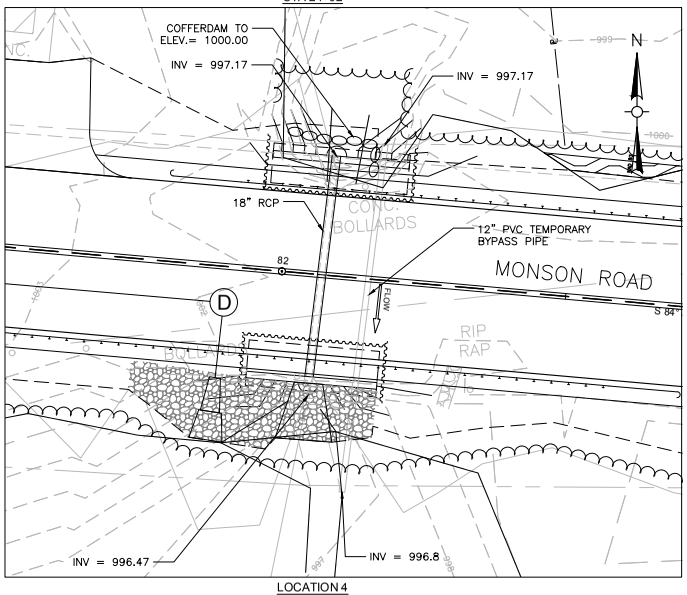
CONTROL OF WATER SEQUENCE FOR CULVERTS:

PLANS AND CALCULATIONS FOR ALL SANDBAGGING, DIKES,OPTIONAL SHEETING AND OTHER WATER CONTROL MEASURES SHALL BE DEVELOPED BY THE CONTRACTOR. THESE PLANS AND CALCULATIONS SHALL BE PREPARED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS AND SHALL BE SUBMITTED FOR APPROVAL OF THE ENGINEER PRIOR TO THE START OF CONSTRCUTION.

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE AND INVERT ELEVATIONS) AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE. SEE PLAN FOR HEIGHT OF COFFERDAM.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.



LOCATION 3
STA 43+76



LOCATION 4
STA 82+07

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE FOR CULVERTS AND END WALLS

PLANS AND CALCULATIONS FOR ALL SANDBAGGING, DIKES,OPTIONAL SHEETING AND OTHER WATER CONTROL MEASURES SHALL BE DEVELOPED BY THE CONTRACTOR. THESE PLANS AND CALCULATIONS SHALL BE PREPARED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS AND SHALL BE SUBMITTED FOR APPROVAL OF THE ENGINEER PRIOR TO THE START OF CONSTRCUTION.

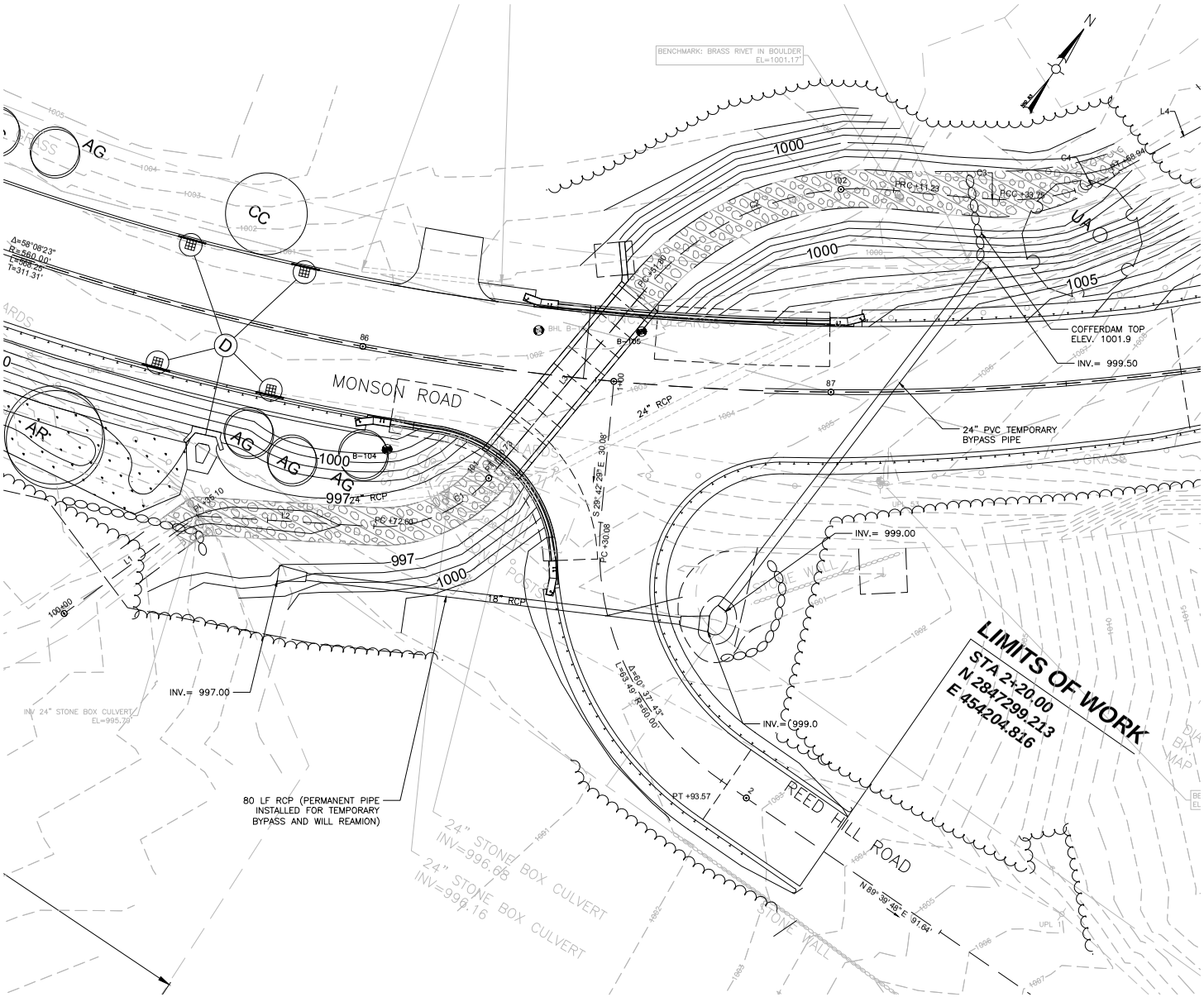
1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE) AND INSTALL THE COFFERDAMS IN THE STREAM ON BOTH ENDS OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND ENDWALLS.
4. INSTALL THE NEW CULVERT.
5. INSTALL THE END WALLS.
6. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT. RECONFIGURE THE COFFERDAMS AROUND THE SIDE THAT WILL BE CONSTRUCTED NEXT.
7. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
8. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

0 10 20 30 40
SCALE: 1" = 10'

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO.	608163	

CONTROL OF WATER PLAN - CULVERT 3



LOCATION 5
STA 87+00 and STA 1+33

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE AND INVERT ELEVATIONS) AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE. SEE PLAN FOR HEIGHT OF COFFERDAM.
3. REMOVE THE EXISTING CULVERT
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

0 10 20 30 40
SCALE: 1" = 10'

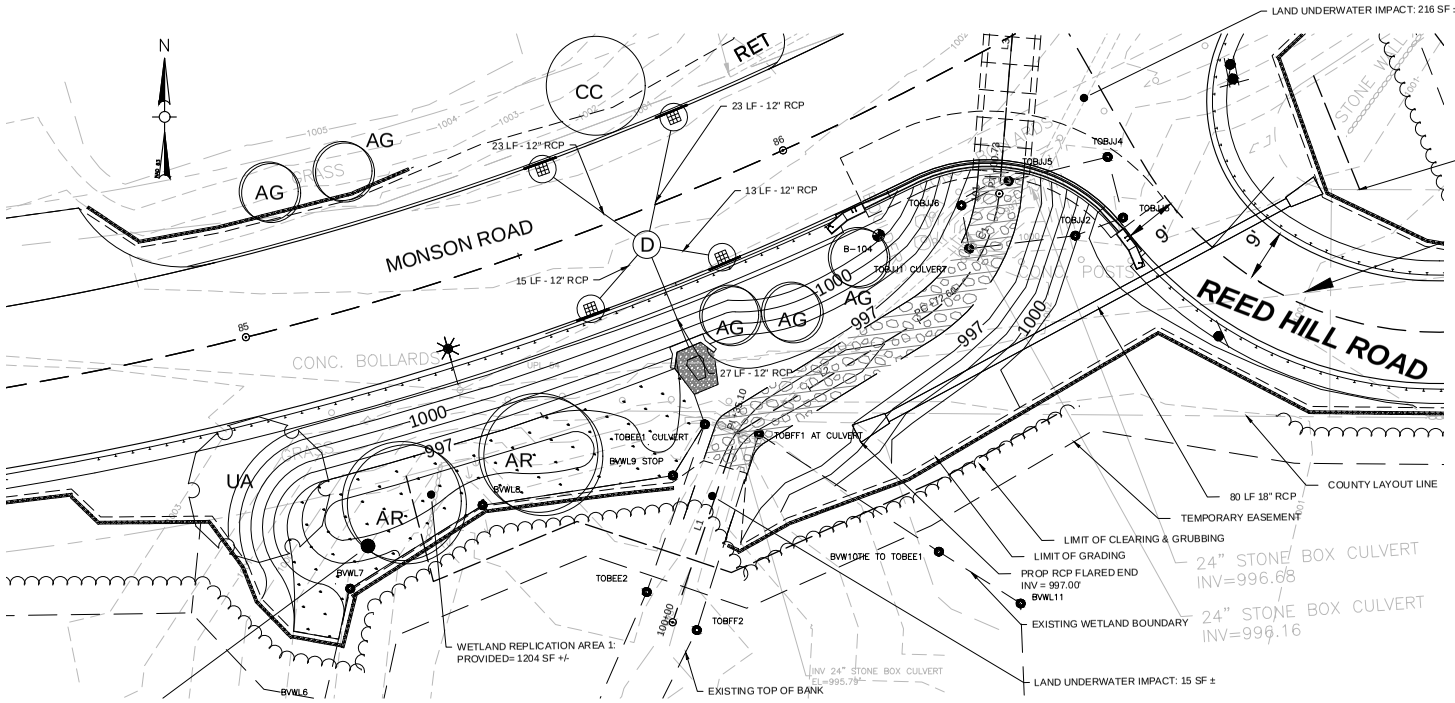
608163_HD12(WATER HANDLING).DWG Plotted on 8-Aug-2024 9:29 AM

608163_HD13(WETLAND REPLICATION).DWG Plotted on 9-Aug-2024 3:42 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

WETLAND REPLICATION AREA DETAIL



WETLAND REPLICATION AREA 1 GRADING PLAN

0 10 20 30 40
SCALE: 1" = 10'

WETLAND SEED MIX - OBLIGATE MIX

BOTANICAL GRASS	COMMON NAME	%PLS BY WEIGHT
CAREX VULPINOIDEA	FOX SEDGE	26.50%
CAREX LURIDA	SHALLOW SEDGE	15.00%
SAPERGANIUM EURYCARPUM	GIANT BUR REED ECO PA	10.00%
CAREX LUPULINA	HOP SEDGE	7.00%
CAREX CRINITA	FRINGED SEDGE	6.00%
SCIRPUS CYPERINUS	WOOLGRASS	4.00%
JUNCUS EFFUSUS	SOFT RUSH	3.00%
CAREX COMOSA	BEAREDED SEDGE	3.00%
SCIRPUS ATROVIRENS	GREEN BULRUSH	3.00%
SPARGANIUM AMERICANUM	BURRWEED	2.50%
SCIRPUS VALIDUS	BULRUSH, SOFT-STEM	2.00%
CAREX STRICTA	TUSSOCK SEDGE	1.00%
GLYCERIA CANADENISIS	MANNA GRASS	1.00%
		86.00%
VERBENA HASTATA	BLUE VERVAIN	4.00%
ASTER PUNICEUS	ASTER - SWAMP	2.00%
EUPATORIUM MACULATUM	JOE-PYE WEED	1.50%
EUPATORIUM PERFOLIATUM	BONESET	2.00%
IRIS VERSICOLOR	BLUE FLAG IRIS	2.00%
ALISMA SUBCORDATUM	MUD PLAINTAIN	1.00%
VERONIA NOVEBORACENSIS	NEW YORK IRONWEED	1.00%
BUDENS CERNUA	NODDING BURR MARIGOLD	1.00%
SOLIDAGO PATULA	ROUGHLEAF GOLDENROD	0.50%
MIMULUS RINGENS	MONKEY FLOWER	0.50%
CHELONE GLABRA	WHITE TURTLEHEAD	0.50%
		14.00%
		100.00%

SEED RATING:
SPECIES ECOTYPE SHALL BE AS NATIVE TO NEW ENGLAND REGION AS POSSIBLE. APPLY THIS MIX AT 20 LBS PLS/ACRE.

WETLAND REPLACEMENT AREA 1 NOTES:

1. A WETLAND SCIENTIST SHALL BE PROVIDED ON-SITE TO MONITOR CONSTRUCTION OF THE WETLAND MITIGATION AREA TO ENSURE COMPLIANCE WITH THE MITIGATION PLAN.
2. AT LEAST 12 INCHES OF NATURAL OR MANMADE WETIAND SOIL SHALL BE INSTALLED IN THE WETLAND REPLICATION AREA.
3. ONLY PLANT MATERIALS NATIVE AND INDIGENOUS TO THE REGION SHALL BE USED. SPECIES NOT SPECIFIED IN THE REPLICATION PLAN SHALL NOT BE USED WITHOUT WRITTEN APPROVAL FROM THE REGULATORY AUTHORITIES. PLANT SPECIES ON THE INVASIVE SPECIES PLANT LIST IN THE CORPS MITIGATION INTRODUCTION: PERFORMANCE STANDARDS AND SUPPLEMENTARY INFORMATION DATED 2/21/01 SHALL NOT BE USED IN AND WITHIN 100 FEET OF MITIGATION SITES.
4. A SUPPLY OF DEAD AND DYING WOODY DEBRIS SHALL COVER between 5%-20% OF THE GROUND THROUGHOUT THE MITIGATION SITE AFTER THE COMPLETION OF CONSTRUCTION OF THE MITIGATION SITE. THESE MATERIALS SHOULD NOT INCLUDE INVASIVE SPECIES.
5. TEMPORARY DEVICES AND STRUCTURES TO CONTROL EROSION AND SEDIMENTATION IN AND AROUND MITIGATION SITES SHALL BE DISASSEMBLED AND PROPERLY DISPOSED OF NO LATER THAN NOVEMBER 1 THREE FULL GROWING SEASON AFTER PLANTING. SEDIMENT COLLECTED BY THESE DEVICES SHALL BE REMOVED AND PROPERLY DISPOSED OF IN A MANNER THAT PREVENT ITS EROSION AND TRANSPORT TO A WATERWAY OR WETLAND.

WETLAND REPLICATION AREA 1 PLANTING PLAN

SHRUBS
HIGHBUSH BLUEBERRY (VACCINIUM CORYMBOSUM): 4 PLANTS, SPACED 10 FEET ON CENTER MINIMUM
WINTERBERRY (ILEX VERTICILLATE): 4 PLANTS, SPACED 10 FEET ON CENTER MINIMUM

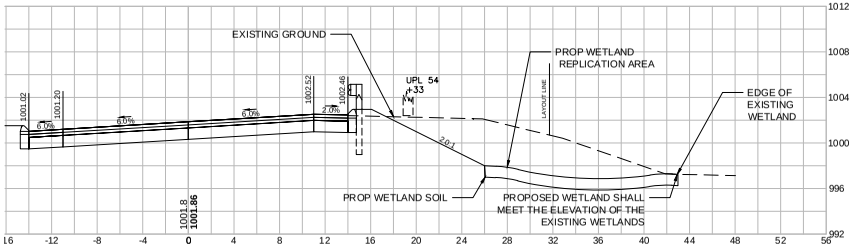
FERNS
CINNAMON FERN (OSMUNDA CINNAMOMEA): 50 PLANTS, SPACED 2 FEET ON CENTER, PUT IN CLUSTERS OF AT LEAST 5 TOGETHER IN SAME AREA TO PROVIDE A NATURAL PATTERN.
SENSITIVE FERN (ONOCLEA SENSIBILIS): 50 PLANTS, SPACED 2 FEET ON CENTER, PUT IN CLUSTERS OF AT LEAST 5 TOGETHER IN SAME AREA TO PROVIDE A NATURAL PATTERN.

SEED MIX
IN WETLAND REPLICATION AREA: SEE WETLAND SEED - OBLIGATE MIX - THIS SHEET (SAME MIX TO BE USED ON PLAN SHEET 16 FOR WETLAND RESTORATION AREA 1)

FOR ALL AREA OUTSIDE AND ADJACENT TO WETLAND RESTORATION AND/OR REPLICATION AREAS PROVIDE PART SHADE ROADSIDE SEED MIX AS INDICATED ON CONSTRUCTION DETAIL SHEET 84.

TREES
OCTOBER GLORY (ACER RUBRUM): 2 TREES SPACED 25 FEET ON CENTER, WITH A 3 INCH TO 3.5 INCH CALIPER, TO PROVIDE A NATURAL PATTERN.
PRINCTON (ULMUS AMERICANA): 1 TREE WITH A 2 INCH TO 2.5 INCH CALIPER.

85+50



WETLAND REPLICATION AREA CROSS SECTION

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DOCUMENT A00831

ARMY CORPS OF ENGINEERS

GENERAL PERMIT

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Regulatory Division
Transportation & Utility Section
File Number: NAE-2024-01688

Courtney Walker
MassDOT - Highway Division
10 Park Plaza
Room 7360
Boston, Massachusetts 02116
Via Email: courtney.l.walker@dot.state.ma.us

John Grasso
Town of Wales
3 Hollow Road
Wales, Massachusetts 01081
Via Email: select@townofwales.net

Dear Ms. Walker and Mr. Grasso:

This letter is in response to the application you submitted to the U.S. Army Corps of Engineers, New England District, on June 27, 2024, for a Department of the Army general permit verification for the Monson Road improvements project. This project has been assigned the file number NAE-2024-01688. This file number should be referenced in all correspondence with this office.

The work includes the permanent discharge of fill material within 2,186 square feet below the Ordinary High Water (OHW) mark of two unnamed perennial tributaries and two unnamed intermittent tributaries to Vinica Brook and within 674 square feet of wetlands associated with the reconstruction of 1.5 miles of Monson Road, at Latitude 42.058743º and Longitude -72.244425º; in the Town of Wales, Hampden County, Massachusetts. Improvements to Monson Road include full-depth reconstruction and widening from 22 feet to 28 feet, as well as changes to the alignment of the intersection of Reed Hill Road and Monson Road. Associated impacts at the four stream crossings are summarized as follows:

- Station 24+92: An existing 30” polyvinyl chloride pipe (PVC) and 36” corrugated metal pipe (CMP) will be replaced by a 9’ x 5’ concrete box culvert, embedded two feet below grade with native stream material. The upstream and downstream headwalls will be removed and replaced with wingwalls. A three-foot-wide by six-inches-high low flow channel will be shaped in the center.

- Station 43+75 and 46+60: A 12” collapsed CMP and 12” corrugated plastic pipe (CPP) are proposed to be replaced with two 12” class five reinforced concrete pipes (RCP) within the existing footprints. Modified rock fill aprons will be installed at the outlets to provide scour protection.
- Station 82+07: A 12” CMP will be replaced by an 18” RCP with new headwalls at the inlet and outlet. A rockfill apron will be installed for scour protection at the outlet.
- Station 86+45: A 24” concrete box culvert under Reed Hill Road and a 24” concrete box culvert conveying an intermittent stream under Monson Road will be replaced with an 8’ wide x 5 high concrete box culvert. The culvert will be embedded two feet with natural stream material and a three-foot-wide by six-inches-high low flow channel will be shaped in the center. A wingwall will be added on the upstream inlet and a headwall will be added to the downstream outlet of the culvert. There will be 1,018 square feet of waters of the U.S. (WOTUS) daylighted at this location.

The project also includes temporary impacts within 1,943 square feet below OHW associated with temporary access, cofferdams, and dewatering. Additionally, 550 SF of temporary impacts to wetlands will result from drainage improvements and reconfiguration of Monson Road and Reed Hill Road. The work is shown on the enclosed plans titled “MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION, PLAN AND PROFIE OF MONSON ROAD IMPROVEMENTS IN THE TOWN OF WALES HAMPDEN COUNTY,” on 41 sheets and dated August 2024.

Based on the information you have provided, we verify that the activity is authorized under General Permit 23 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. A copy of these permits can be found 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. A conditioned Water Quality Certification (WQC) has been issued by the Massachusetts Department of Environmental Protection for your project and is attached. You must comply with the conditions specified in the WQC.

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.

If you have any questions related to this verification or have issues accessing documents referenced in this letter, please contact Kevin Newton, Project Manager, at (978)-318-8044, or by email at kevin.m.newton@usace.army.mil and cenae-r-ma@usace.army.mil.

This agency continually strives to improve our customer service. In order to better serve you, please complete the Customer Service Survey located at: https://regulatory.ops.usace.army.mil/customer-service-survey/.

Sincerely,

Stephen Rochette
Chief, Technical Support Branch
Regulatory Division

Enclosures

cc (w/enclosures):

Ed Reiner, U.S. EPA, Region 1 (via reiner.ed@epa.gov)
Rachel Croy, U.S. EPA, Region 1 (via croy.rachel@epa.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)

Work-Start Notification Form

File Number: NAE-2024-01688 State: Massachusetts County: Hampden

Permittee: MassDOT - Highway Division, Courtney Walker
Date Verification Issued: 9/18/2024
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

Compliance Certification Form

File Number: NAE-2024-01688 State: Massachusetts County: Hampden

Permittee: MassDOT - Highway Division, Courtney Walker
Date Verification Issued: 9/18/2024
Project Manager: Kevin Newton

Within one month of completion of the activity authorized by this permit and any mitigation required by the permit (you must submit this form after mitigation is complete, but not the mitigation monitoring, which requires separate submittals), 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

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.

I hereby certify that the work, and mitigation (if applicable), authorized by the above referenced permit has been completed in accordance with the terms and conditions of the said permit including any general or specific conditions.

Date Authorized Work Started: _____ Completed: _____

Describe any deviations from permit (attach drawing(s) depicting the deviations):

_____

_____

***Note: The description of any deviations on this form does not constitute approval by the USACE.**

_____ _____

Signature of Permittee **Date**

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

PLAN AND PROFILE OF

MONSON ROAD IMPROVEMENTS

IN THE TOWN OF

WALES

HAMPDEN COUNTY

100% SUBMITTAL

404 ENVIRONMENTAL PERMIT PLAN SET

WALES
MONSON ROAD

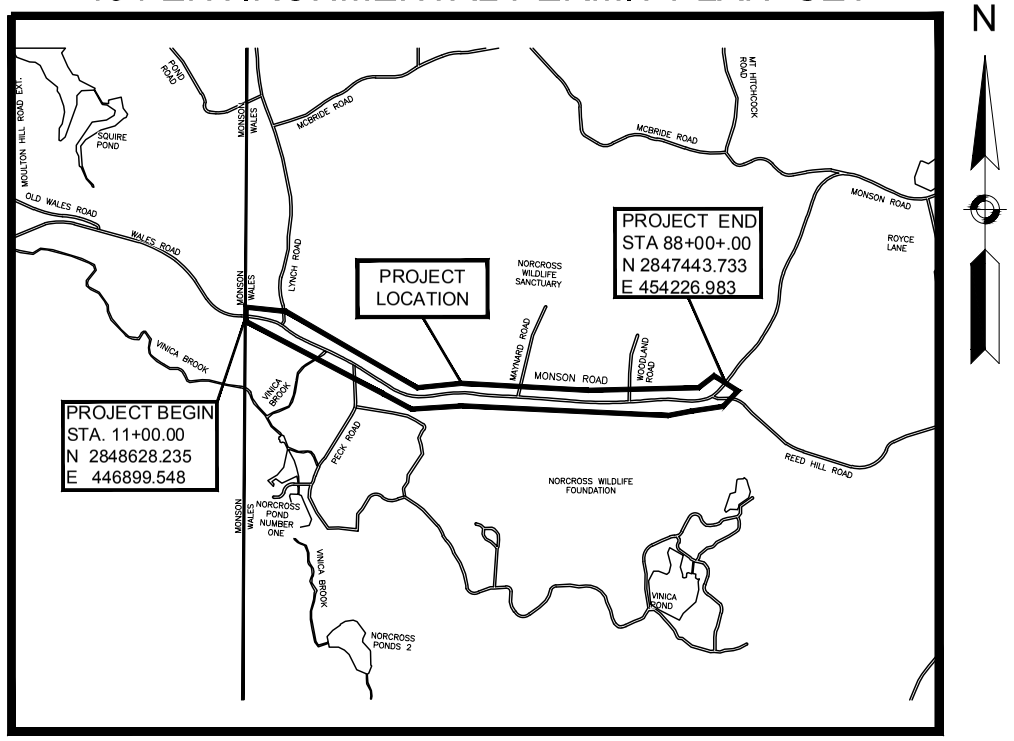
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-		
PROJECT FILE NO.	608163		

TITLE SHEET & INDEX

THESE PLANS ARE SUPPLEMENTED BY THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DATED 2024, 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	KEY PLAN
3	LEGEND, ABBREVIATIONS & GENERAL NOTES
4	TYPICAL SECTIONS
5-12	CONSTRUCTION PLANS
13-18	PROFILES
19-26	CROSS SECTIONS
27-35	STRUCTURAL PLANS
36	CULVERT 3 CHANNEL PLAN, PROFILE AND SECTION
37-38	CULVERT 3 CHANNEL CROSS SECTIONS
39-40	TEMPORARY WATER HANDLING PLAN
41	WETLAND REPLICATION AREA DETAIL



DESIGN DESIGNATION - MONSON ROAD

DESIGN SPEED	40 MPH
ADT (2017)	660
ADT (2025)	760
K	11%
D	52%
T (PEAK HOUR)	3.0%
T (AVERAGE DAY)	3.0%
DHV	85
DDHV	45
FUNCTIONAL CLASSIFICATION	RURAL MAJOR COLLECTOR

LENGTH OF PROJECT = 7700.00 FEET = 1.458 MILES

August 2024

COMMONWEALTH OF MASSACHUSETTS
SCOTT R. BRUSO
STRUCTURAL
No. 48061
REGISTERED PROFESSIONAL ENGINEER

2024.08.05 12:45:27-04'00'

Weston & Sampson
712 Brook Street, Suite 103
Rocky Hill, CT 06067
860.513.1473
www.westonandsampson.com

DATE	DESCRIPTION	REV #

MassDOT Massachusetts Department of Transportation Highway Division

APPROVED

CHIEF ENGINEER **DATE**

608163_HD1(TITLE, LEGEND, KEY & TYPICAL SECTIONS)404.DWG Plotted on 9-Aug-2024 5:04 PM

Proposal No. 608163-128112

A00831 - 8

608163_HD1(TITLE, LEGEND, KEY & TYPICAL SECTIONS).DWG Plotted on 5-Aug-2024 8:17 AM

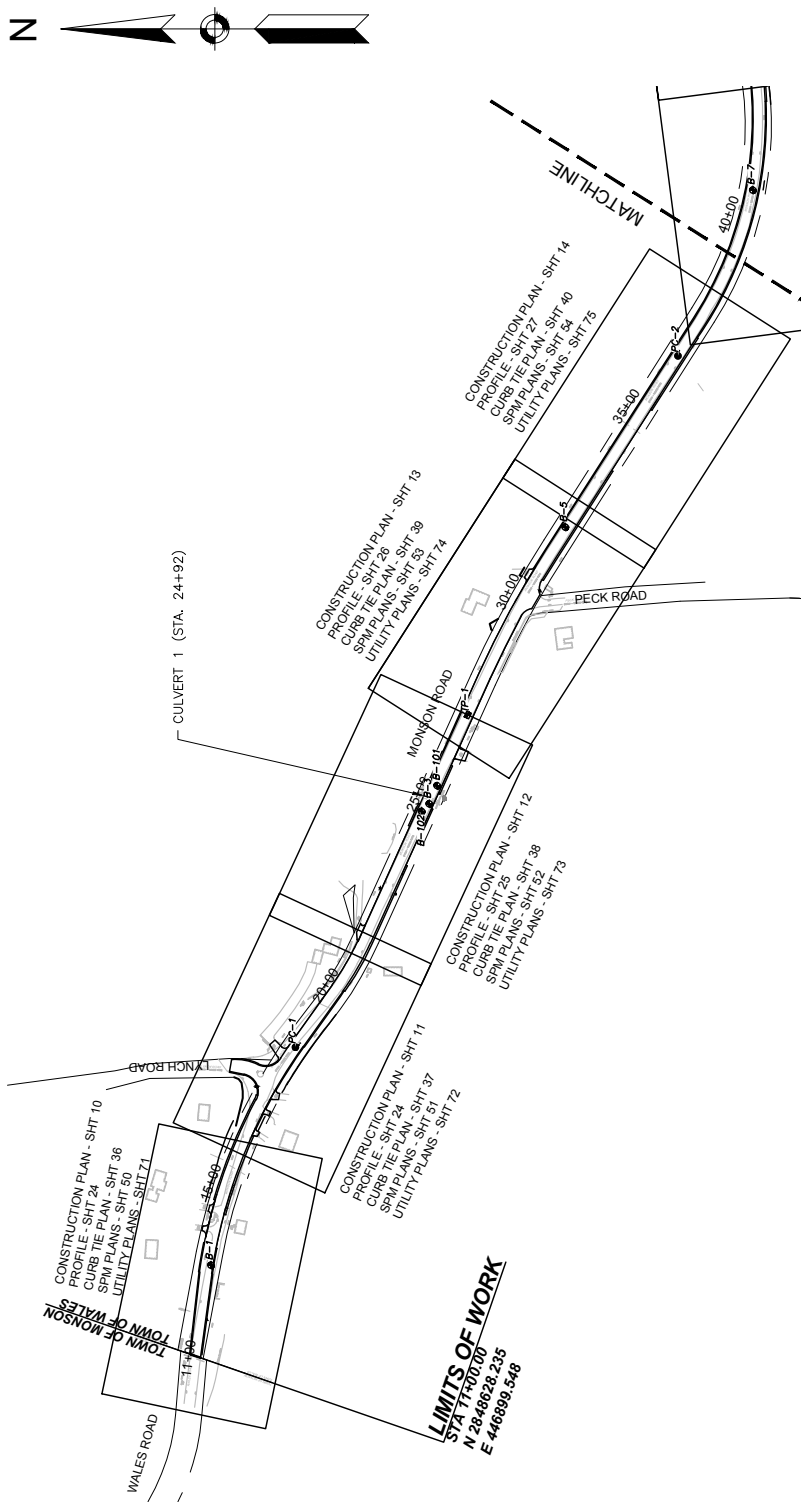
WALES
MONSON ROAD

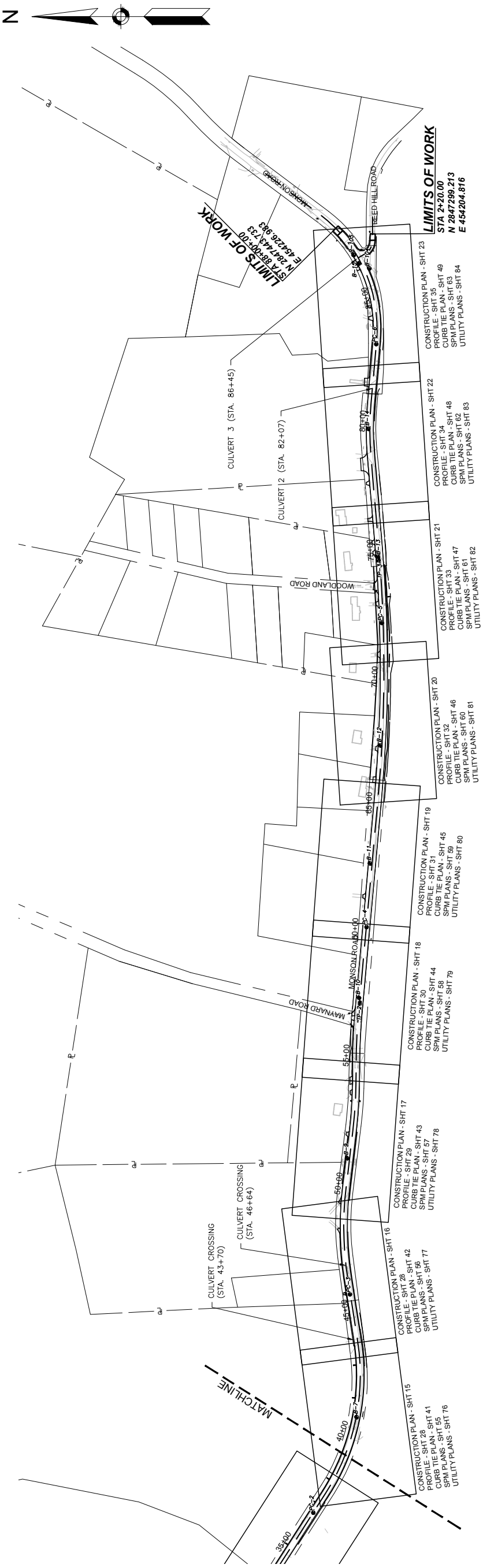
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

KEY PLAN

BORING LOCATIONS (FEET)

BORING	NORTHING	EASTING	STATION	OFFSET	SURFACE EL.	H.B.E.
B-1	2,848,584	447,074	12+80	22.4 RT	868.0	861.5
B-3	2,848,121	448,154	24+56	10.0 LT	877.0	865.2
B-5	2,847,789	448,792	31+89	10.8 LT	902.0	897.5
B-7	2,847,423	449,318	38+27	18.1 RT	941.0	937.0
B-9	2,847,397	450,584	51+05	9.6 LT	933.0	916.5
B-10	2,847,355	451,197	57+19	6.7 LT	956.0	951.5
B-11	2,847,315	451,727	62+51	14.1 LT	989.0	984.5
B-12	2,847,272	452,354	68+80	16.0 LT	1011.0	1007.0
B-13	2,847,294	452,969	74+98	19.4 LT	1019.0	1014.5
B-14	2,847,322	453,443	79+72	12.1 LT	1009.0	1004.5
B-15	2,847,355	454,092	86+37	9.1 LT	1002.0	999.1
B-101	2,848,098	448,155	24+80	4.2 RT	877.1	861.9
B-102	2,848,103	448,186	25+06	12.85 LT	877.5	849.0
B-104	2,847,316	454,080	86+09	20.6 RT	1002.4	974.4
B-105	2,847,367	454,110	85+59	11.0 RT	1001.8	987.7





NOTES:
1. BENCH MARK:
   - MAGNAIL U.P.L. LOCATED EAST OF NORTH STREET AT STATION 12+79.94 AND EL. 869'
   - MAGNAIL U.P.L. LOCATED WEST OF NORTH STREET AT STATION 21+37.43 AND EL. 877'
   - MAGNAIL U.P.L. LOCATED WEST OF NORTH STREET AT STATION 29+56.65 AND EL 900'
   - BRASS RIVET LOCATED WEST OF NORTH STREET AT STATION 29+94.76 AND EL 902'
   - SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 38+22.13 AND EL 938'
   - SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 47+02.17 AND EL 934'
   - SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 56+22.73 AND EL 957'
   - SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 65+94.25 AND EL 1007'
   - SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 74.95.16 AND EL 1022'
   - SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 81+31.62 AND EL 1006'
   - SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 47+02.17 AND EL 934'
   - SPIKE U.P.L. LOCATED WEST OF NORTH STREET AT STATION 87+05.97 AND EL 1008'
   - BRASS RIVET LOCATED WEST OF NORTH STREET AT STATION 87+15.35 AND EL 1001'

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
	CBCI	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
		CABLE MANHOLE
		DRAINAGE MANHOLE
		ELECTRIC MANHOLE
		GAS MANHOLE
		MISC MANHOLE
		SEWER MANHOLE
		TELEPHONE MANHOLE
		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
		SWAMP / MARSH
WG	WG	WATER GATE
PM	PM	PARKING METER
	OHU	OVERHEAD CABLE/WIRE
		CURBING
100 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
x	x	CHAIN LINK OR METAL FENCE
o	o	WOOD FENCE
		EROSION AND SEDIMENT CONTROL BARRIER
		TREE LINE
		LIMITS OF CLEARING AND GRUBBING
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		EDGE OF PAVEMENT
		LIMIT OF MICROMILLING AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT WETLAND BUFFER
		200 FT RIVERFRONT AREA BUFFER
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
t		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT
		SIGN AND POST
		SIGN AND DOUBLE POST

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
CBCI-DB	DOUBLE GRATE CATCH BASIN W/ 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
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
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
LB	LEACH BASIN

ABBREVIATIONS (cont.)

GENERAL

LP	LIGHT POLE
LT	LEFT
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NIC	NOT IN CONTRACT
NO.	NUMBER
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
PSB	PLANTABLE 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 WATER WAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCCE	REINFORCED CONCRETE CULVERT END
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	STA
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SW	SIDEWALK
SWTU	STORMWATER TREATMENT UNIT
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
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

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
	SL	12"-WIDE STOP LINE
	SWL	6"-WIDE SOLID WHITE LINE
	DBYL	DOUBLE YELLOW LINE (2 - 6"-WIDE YELLOW LINES)

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

LEGEND, ABBREVIATIONS & GENERAL NOTES

GENERAL NOTES:

1. TOPOGRAPHICAL INFORMATION BASED ON AN ON THE GROUND SURVEY PERFORMED BY CHAPPELL ENGINEERING ON DECEMBER 2017 AND SUPPLEMENTED BY CHAPPELL ENGINEERING IN OCTOBER 2023. WETLAND FLAGGING WAS PERFORMED BY WESTON & SAMPSON IN NOVEMBER 2020 AND REFLAGGED IN SEPTEMBER OF 2023.
2. THE HORIZONTAL COORDINATES ARE BASED ON NAD 83, THE VERTICAL DATUM IS NAVD 88.
3. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. THE CONTRACTOR SHALL DIG TEST PITS WITH THE LOCATIONS BEING APPROVED BY THE ENGINEER PRIOR TO COMMENCEMENT OF WORK TO EXACTLY LOCATE EXISTING UTILITIES.
4. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
5. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY OWNER. ANY ALTERATIONS SHALL BE INCIDENTAL TO THE PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY SUPPORT OF ALL UTILITIES TO REMAIN IN PLACE AND SHALL DESCRIBE IN WRITING, TO THE SATISFACTION OF THE ENGINEER, HIS METHOD OF TEMPORARY SUPPORT.
6. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
7. THE TERM "PROPOSED (PROP)" INDICATES WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET (R&R)".
8. ALL EXISTING STATE, COUNTY AND TOWN LOCATION LINES AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATION ARE NOT GUARANTEED.
9. ALL EXCESS MATERIAL FROM ROADWAY RECONSTRUCTION OR THE EXCAVATION PROCESS SHALL BE REUSED ON SITE OR REMOVED FROM THE SITE AND DISPOSED OF IN A LEGAL AND PROPER MANNER.
10. THE CONTRACTOR SHALL CALL DIGSAFE AT 1-888-344-7233 AT LEAST 72 HOURS, SATURDAYS, AND HOLIDAYS EXCLUDED, PRIOR TO EXCAVATING AT ANY LOCATION. A COPY OF THE DIGSAFE PROJECT REFERENCE NUMBER(S) SHALL BE GIVEN TO THE TOWN PRIOR TO EXCAVATION.
11. JOINTS BETWEEN HOT MIX ASPHALT TRENCH PAVEMENT AND SAWCUT EXISTING PAVEMENT SHALL BE SEALED WITH BITUMEN AND BACKSANDED.
12. IF DEEMED NECESSARY DUE TO THE WORK, THE CONTRACTOR SHALL COORDINATE WITH THE TOWN OF WALES HIGHWAY DEPARTMENT, THE WALES FIRE DEPARTMENT, AND THE ENGINEER FOR APPROVAL OF SHUTTING DOWN ANY EXISTING WATER MAINS AND SHALL ALSO OBTAIN APPROVAL FOR DISRUPTING ANY EXISTING SEWER FLOWS.
13. THE CONTRACTOR SHALL BE AWARE THAT ONLY TOWN PERSONNEL ARE ALLOWED TO OPERATE WATER GATES AND HYDRANTS. ANY REQUESTS TO OPERATE THE GATES SHALL BE COORDINATED THROUGH THE ENGINEER.
14. THE CONTRACTOR SHALL COORDINATE ANY WORK FOR THE PROJECT WITH ALL ADJACENT/CONCURRENT PROJECTS AND CONTRACTORS.
15. THE CONTRACTOR SHALL INSTALL PRIOR TO COMMENCEMENT OF WORK, MAINTAIN, AND REMOVE AT THE END OF THE PROJECT INLET SEDIMENT CONTROL BAGS IN ALL CATCH BASINS, WITHIN OR ADJACENT TO THE PROJECT LIMITS. THE CONTRACTOR SHALL ALSO MAINTAIN SILT FENCE AND COMPOST FILTER TUBES AS SHOWN ON THE PLANS THROUGHOUT THE DURATION OF THE PROJECT AND REMOVE AT THE END.
16. ANY GRASS AREAS DISTURBED BY THE WORK SHALL BE RESTORED WITH LOAM AND SEED.
17. ANY LANDSCAPED AREAS DISTURBED BY THE WORK SHALL BE RESTORED TO EXISTING CONDITIONS WITH EXISTING OR NEW GROUND COVER MATERIALS AS DIRECTED BY THE ENGINEER. ANY PLANTS, SHRUBS, OR FLOWERS DISTURBED BY THE WORK SHALL BE RESET TO EXISTING CONDITIONS OR REPLACED WITH NEW PLANTS, SHRUBS, OR FLOWERS AS DIRECTED BY THE ENGINEER. ALL WORK TO RESTORE LANDSCAPE AREAS, NEW GROUND COVER MATERIALS, NEW PLANTS, NEW SHRUBS, OR NEW FLOWERS REQUIRED BY THE ENGINEER SHALL BE INCIDENTAL TO THE PROJECT.
18. CONTRACTOR TO COORDINATE WITH UTILITY POLE OWNERS IN AREAS WHERE UNDERGROUND UTILITY WORK IS WITHIN CLOSE PROXIMITY AND POSSIBLE UTILITY POLE SHORING IS REQUIRED WHILE INSTALLING PROPOSED UTILITIES.
19. RAISE AND ADJUST FRAMES AND GRATES, FRAMES AND COVERS AND GATE BOXES PRIOR TO PAVEMENT OVERLAY, IF REQUIRED.
20. CONTRACTOR IS RESPONSIBLE FOR REPLACING ANY PROPERTY PINS THAT ARE DAMAGED OR DESTROYED DURING CONSTRUCTION, TO THEIR LOCATION JUST PRIOR TO CONSTRUCTION.
21. ALL TRAFFIC SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS OTHERWISE NOTED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
22. CONTRACTOR TO ESTABLISH TEMPORARY BENCHMARKS EVERY 1000 FEET BASED ON THE PERMANENT BENCHMARKS LOCATED AT STA 29+85.04, 24.73 LEFT AND STA 87+27.18, 41.17 LEFT OR AS REQUIRED BY THE ENGINEER.
23. CONTRACTOR TO PROVIDE ADDITIONAL TRAVERSE POINTS AND TRAVERSE LINES IN THE VICINITY OF EXISTING TRAVERSE POINTS WHERE THE EXISTING TRAVERSE POINT IS LOCATED IN "SOFT GROUND" OR AS REQUIRED BY THE ENGINEER.
24. ALL EXISTING STONE WALLS PROPOSED FOR RELOCATION SHALL NOT BE REMOVED FROM THE IMMEDIATE AREA SHOWN ON THE PLANS.

608163_HD1(TITLE, LEGEND, KEY & TYPICAL SECTIONS).DWG Plotted on 5-Aug-2024 8:17 AM
Proposal No. 608163-128112
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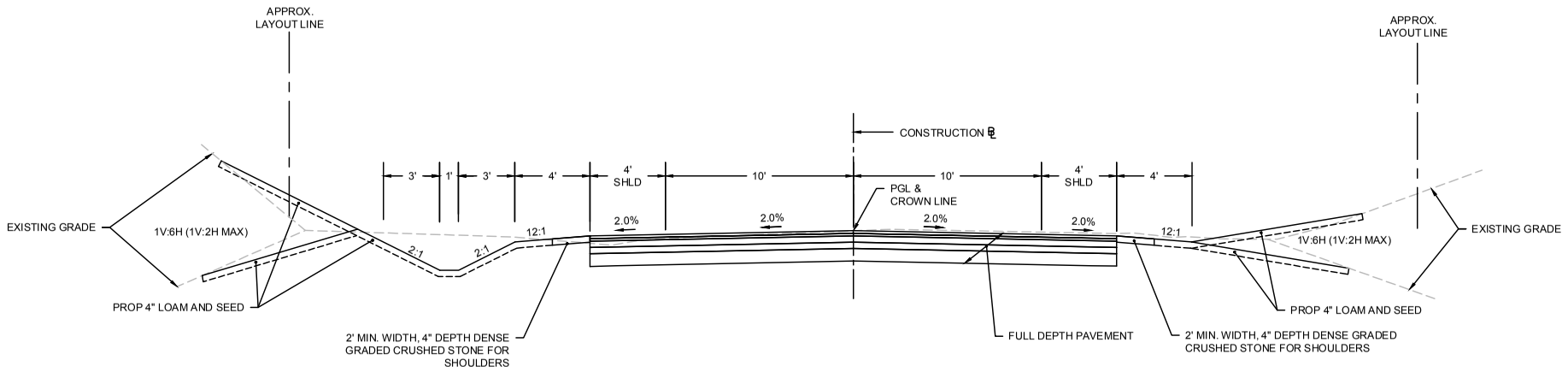
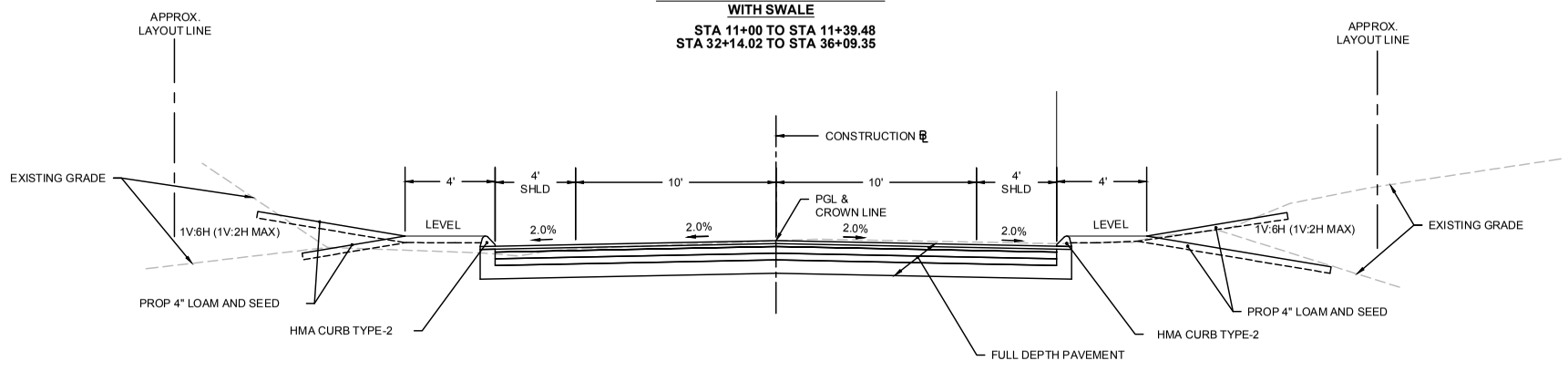
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

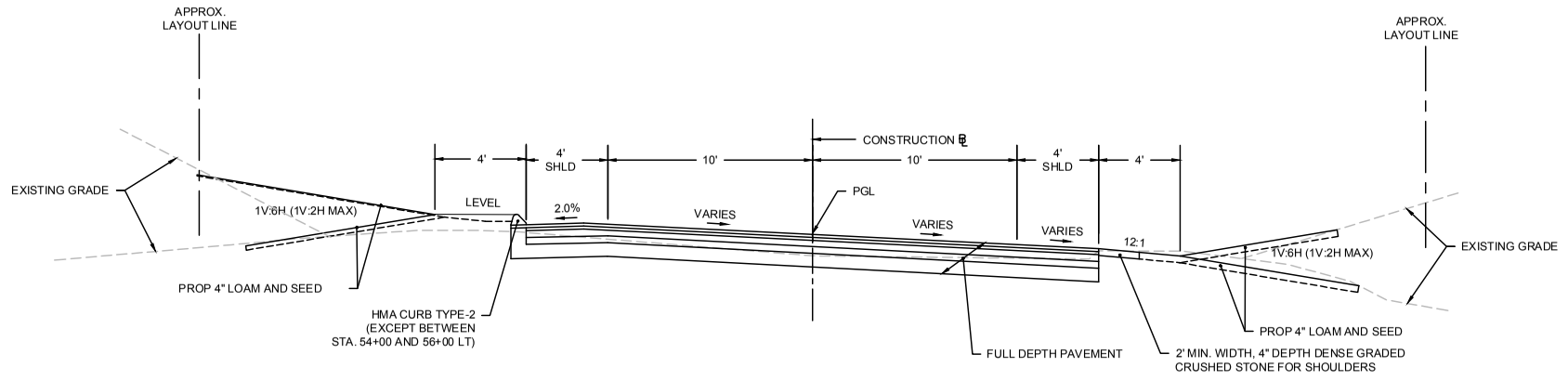
TYPICAL SECTIONS



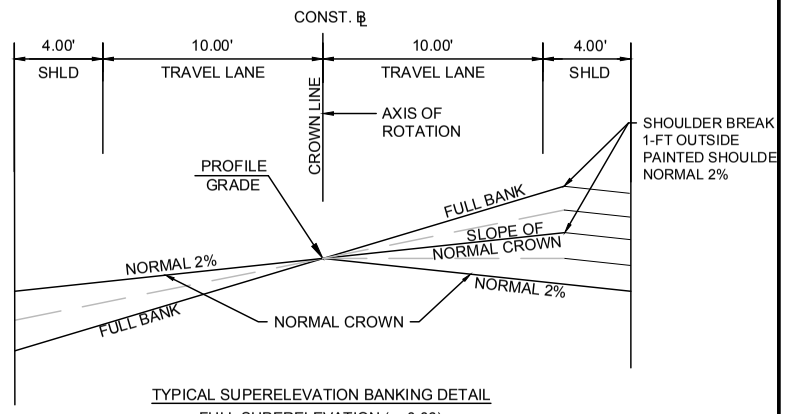
MONSON ROAD TYPICAL SECTION
WITH SWALE
STA 11+00 TO STA 11+39.48
STA 32+14.02 TO STA 36+09.35



MONSON ROAD TYPICAL SECTION
WITH CURBING
STA 22+70.43 TO STA 26+98.72
STA 57+46.79 TO STA 64+41.04
STA 75+70.50 TO STA 77+39.51



MONSON ROAD TYPICAL SECTION
FULL SUPERELEVATION AND TRANSITIONS
STA 11+39.48 TO STA 22+70.43
STA 26+98.72 TO STA 32+14.02
STA 36+09.35 TO STA 57+46.79
STA 64+41.04 TO STA 75+70.50
STA 77+39.51 TO STA 88+00



TYPICAL SUPERELEVATION BANKING DETAIL
FULL SUPERELEVATION (e=0.06)
N.T.S.

PAVEMENT NOTES

PROPOSED PAVEMENT MILLING AND OVERLAY:

1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 1.50" PAVEMENT MILLING

PROPOSED FULL DEPTH PAVEMENT:

SURFACE COURSE: 1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5).

BASE COURSE: 3.25" SUPERPAVE INTERMEDIATE COURSE 19 (SIC-19.0) PLACED IN ONE LAYER.

SUBBASE: 4" DENSE GRADED CRUSHED STONE OVER 8" GRAVEL BORROW, TYPE B.

BITUMEN FOR TACK COAT (RS-1) TO BE APPLIED AT A RATE OF 0.07 TO 0.09 GAL/SY OVER MILLED SURFACES AND 0.06 TO 0.08 GAL/SY ON BASE AND INTERMEDIATE PAVEMENT COURSES.

PROPOSED HOT MIX ASPHALT DRIVEWAY :

SURFACE COURSE: 1.50" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 2.50" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5)

FOUNDATION: 8" GRAVEL BORROW, TYPE B

PROPOSED GRAVEL DRIVEWAY:

8" GRAVEL BORROW, TYPE B

PROPOSED CEMENT CONCRETE WALK

4" CEMENT CONCRETE OVER
8" GRAVEL BORROW, TYPE B

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Proposal No. 608163-128112

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP/HSI-0032(043)X		
	PROJECT FILE NO. 608163		

CONSTRUCTION PLANS

HIGHWAY GUARD DETAILS

STA 14+65 TO STA 14+78 LT TANGENT END TREATMENT TL-3
STA 14+78 TO STA 16+88 LT (TL-3)
STA 14+50 TO STA 14+63 RT TANGENT END TREATMENT TL-3
STA 14+63 TO STA 16+02 RT (TL-3)

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

SEE UTILITY PLANS

404 PERMIT IMPACT NUMBERS

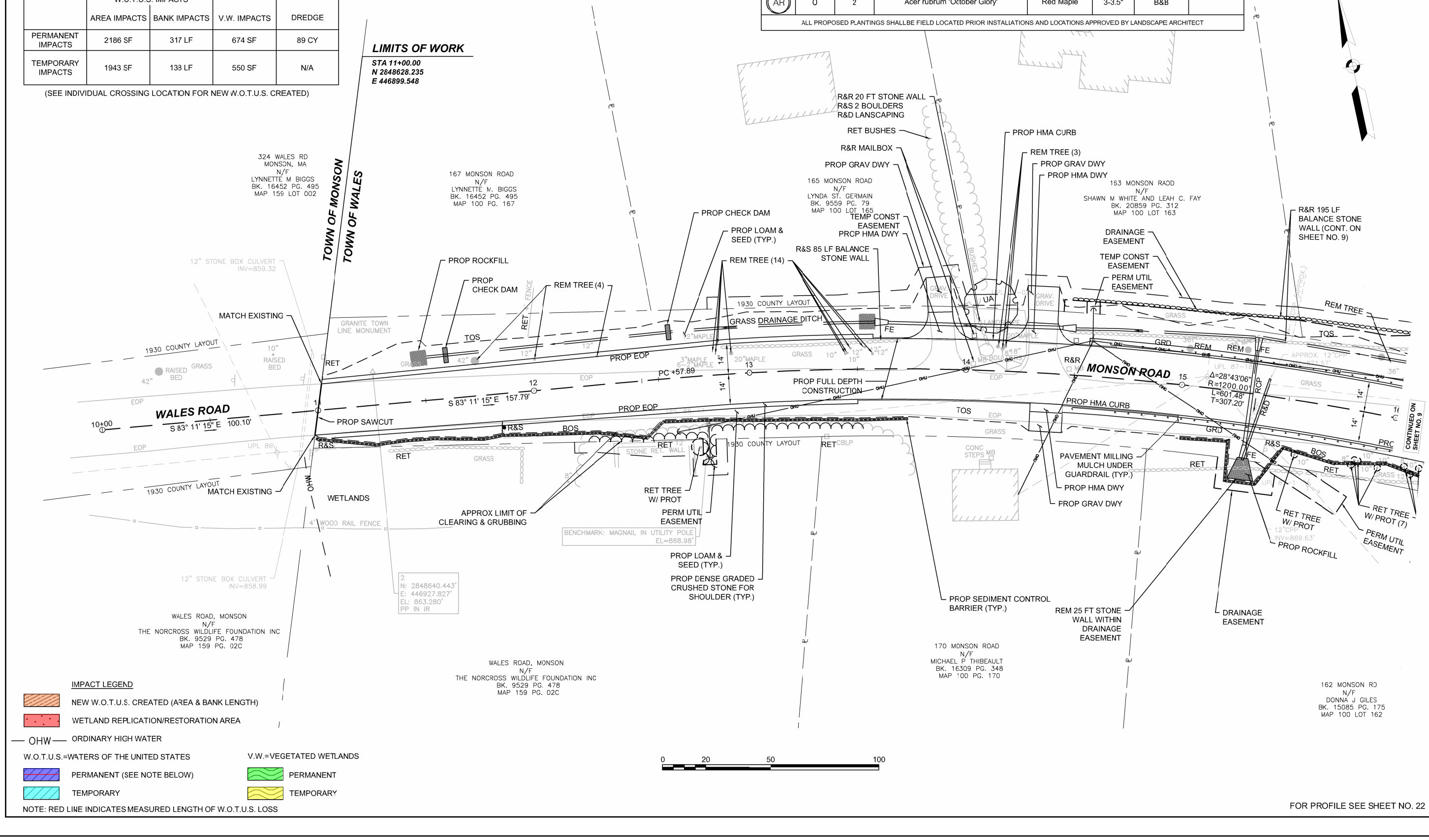
	W.O.T.U.S. IMPACTS			
	AREA IMPACTS	BANK IMPACTS	V.W. IMPACTS	DREDGE
PERMANENT IMPACTS	2186 SF	317 LF	674 SF	89 CY
TEMPORARY IMPACTS	1943 SF	133 LF	550 SF	N/A

(SEE INDIVIDUAL CROSSING LOCATION FOR NEW W.O.T.U.S. CREATED)

PLANT SCHEDULE

TREES	QTY (PER SHEET)	QTY (MASTER TOTAL)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	13	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	0	27	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	1	13	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	2	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALLBE FIELD LOCATED PRIOR INSTALIATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT



IMPACT LEGEND

- NEW W.O.T.U.S. CREATED (AREA & BANK LENGTH)
- WETLAND REPLICATION/RESTORATION AREA
- OHW — ORDINARY HIGH WATER

W.O.T.U.S.=WATERS OF THE UNITED STATES

- PERMANENT (SEE NOTE BELOW)
- TEMPORARY

V.W.=VEGETATED WETLANDS

- PERMANENT
- TEMPORARY

NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS

FOR PROFILE SEE SHEET NO. 22

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WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

CONSTRUCTION PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	3	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	0	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	4	Ulmus americana 'Prnceton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

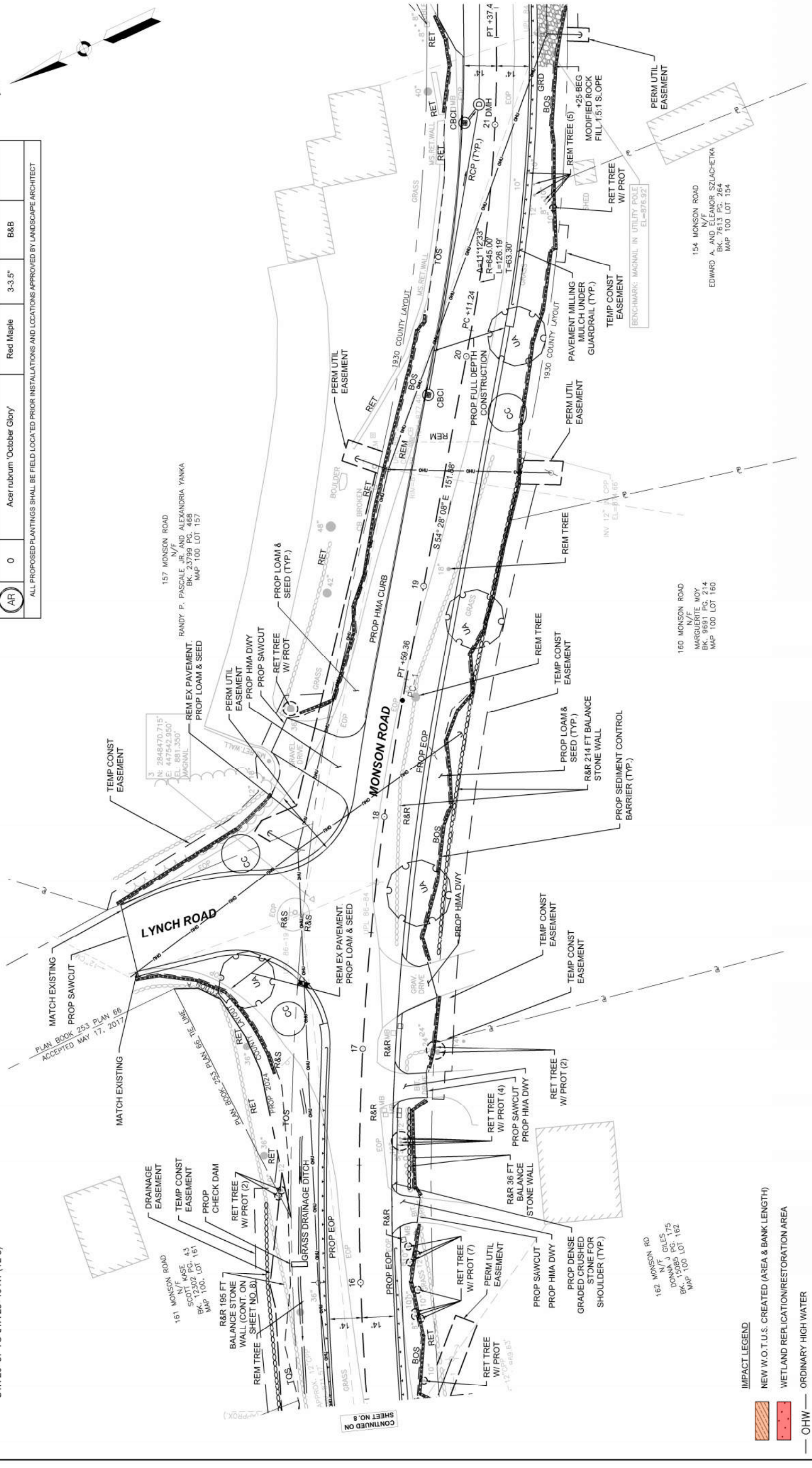
SEE UTILITY PLANS

TRAFFIC SIGNAL CONDUIT

NONE

HIGHWAY GUARD DETAILS

STA 14+78 TO STA 16+88 LT (TL-3)
STA 16+88 TO STA 17+00 LT TANGENT END TREATMENT TL-3
STA 14+63 TO STA 16+02 RT (TL-3)
STA 16+02 TO STA 16+14 RT TANGENT END TREATMENT TL-3
STA 20+25 TO STA 20+37 RT TANGENT END TREATMENT TL-3
STA 20+37 TO STA 23+10 RT (TL-3)



IMPACT LEGEND

NEW W.O.T.U.S. CREATED (AREA & BANK LENGTH)

WETLAND REPLICATION/RESTORATION AREA

— OHW — ORDINARY HIGH WATER

W.O.T.U.S.=WATERS OF THE UNITED STATES

V.W.=VEGETATED WETLANDS

PERMANENT (SEE NOTE BELOW)

PERMANENT

TEMPORARY

TEMPORARY

NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS

HIGHWAY GUARD DETAILS

STA 20+37 TO STA 23+10 RT (TL-3)
STA 23+10 TO STA 23+22 RT TANGENT END TREATMENT TL-3
STA 23+86 TO STA 23+98 RT TANGENT END TREATMENT TL-3
STA 23+98 TO STA 25+61 RT (TL-3)
STA 24+25 TO STA 24+37 RT TANGENT END TREATMENT TL-3
STA 24+25 TO STA 24+37 LT TANGENT END TREATMENT TL-3
STA 24+37 TO STA 24+77 RT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 24+37 TO STA 24+77 LT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+06 TO STA 25+46 RT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+06 TO STA 25+46 LT TRANSITION TO BRIDGE RAIL (SINGLE FACED)
STA 25+46 TO STA 25+60 RT (TL-3)
STA 25+46 TO STA 25+79 LT (TL-3)
STA 25+60 TO STA 25+72 RT TANGENT END TREATMENT TL-3
STA 25+79 TO STA 25+91 LT TANGENT END TREATMENT TL-3

TRAFFIC SIGNAL CONDUIT

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

SEE UTILITY PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	3	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	3	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	1	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CONSTRUCTION PLANS

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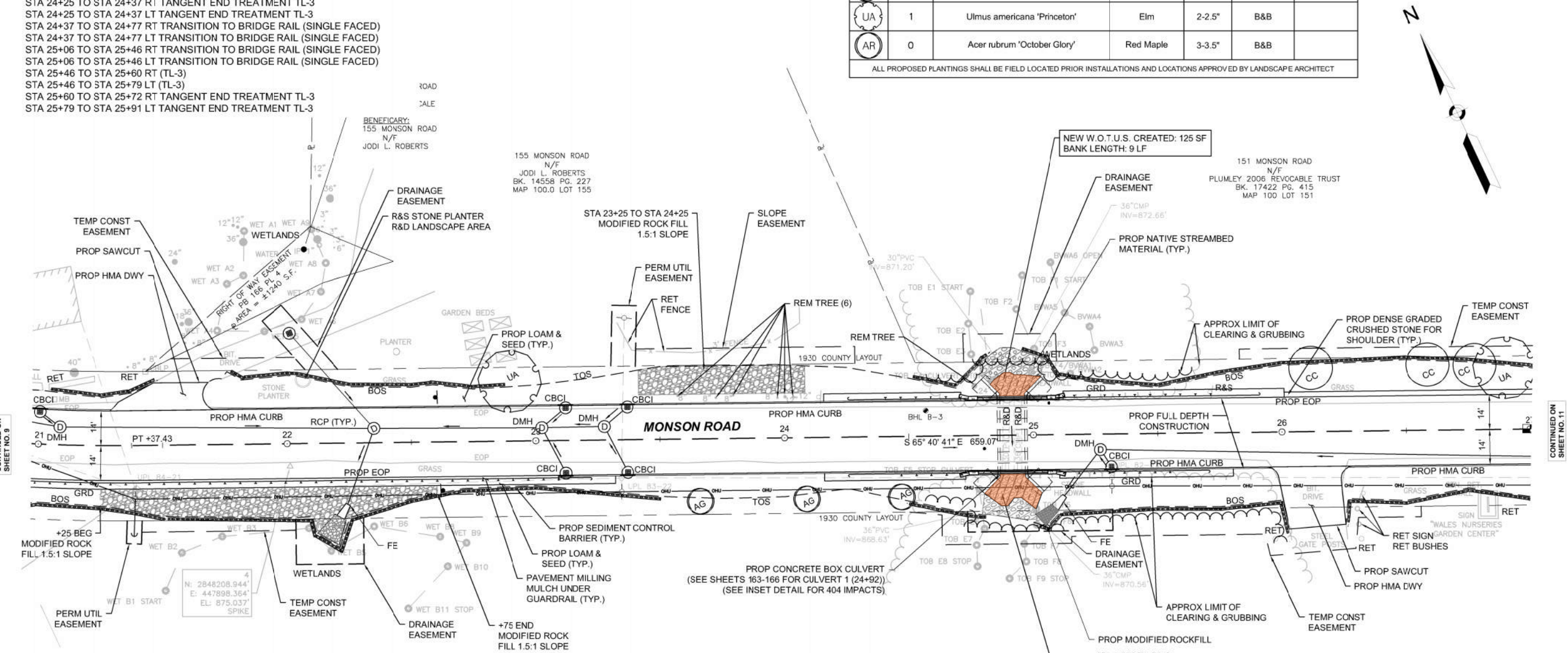
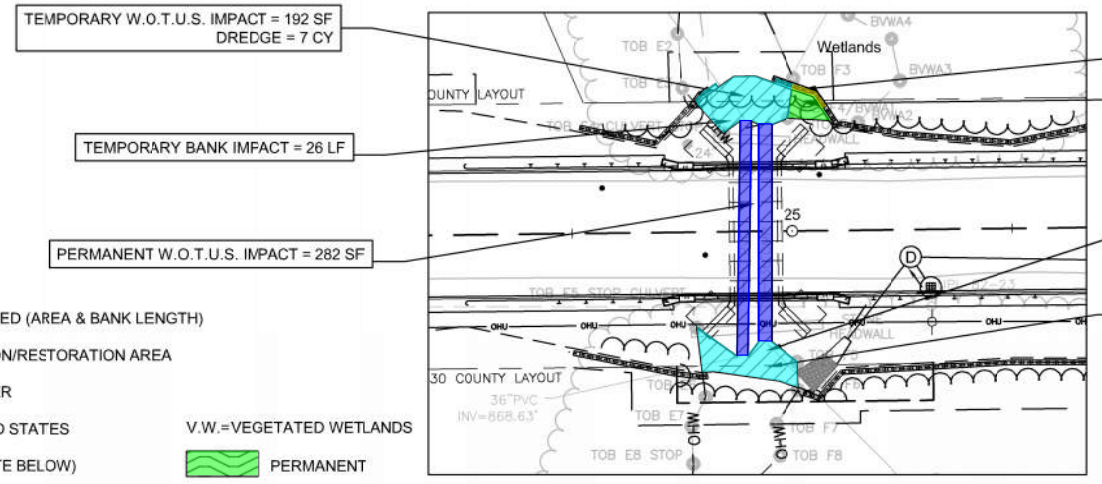




404 IMPACT DETAIL

IMPACT LEGEND

- NEW W.O.T.U.S.CREATED (AREA & BANK LENGTH)
- WETLAND REPLICATION/RESTORATION AREA
- OHW — ORDINARY HIGH WATER

W.O.T.U.S.=WATERS OF THE UNITED STATES

- PERMANENT (SEE NOTE BELOW)
- TEMPORARY

V.W.=VEGETATED WETLANDS

- PERMANENT
- TEMPORARY

NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 23

A00031 - 14

Proposal No. 608163-128112

608163_HD3(CONSTRUCTION PLANS)404.DWG Plotted on 27-Aug-2024 3:01 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

CONSTRUCTION PLANS

N

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	2	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	0	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

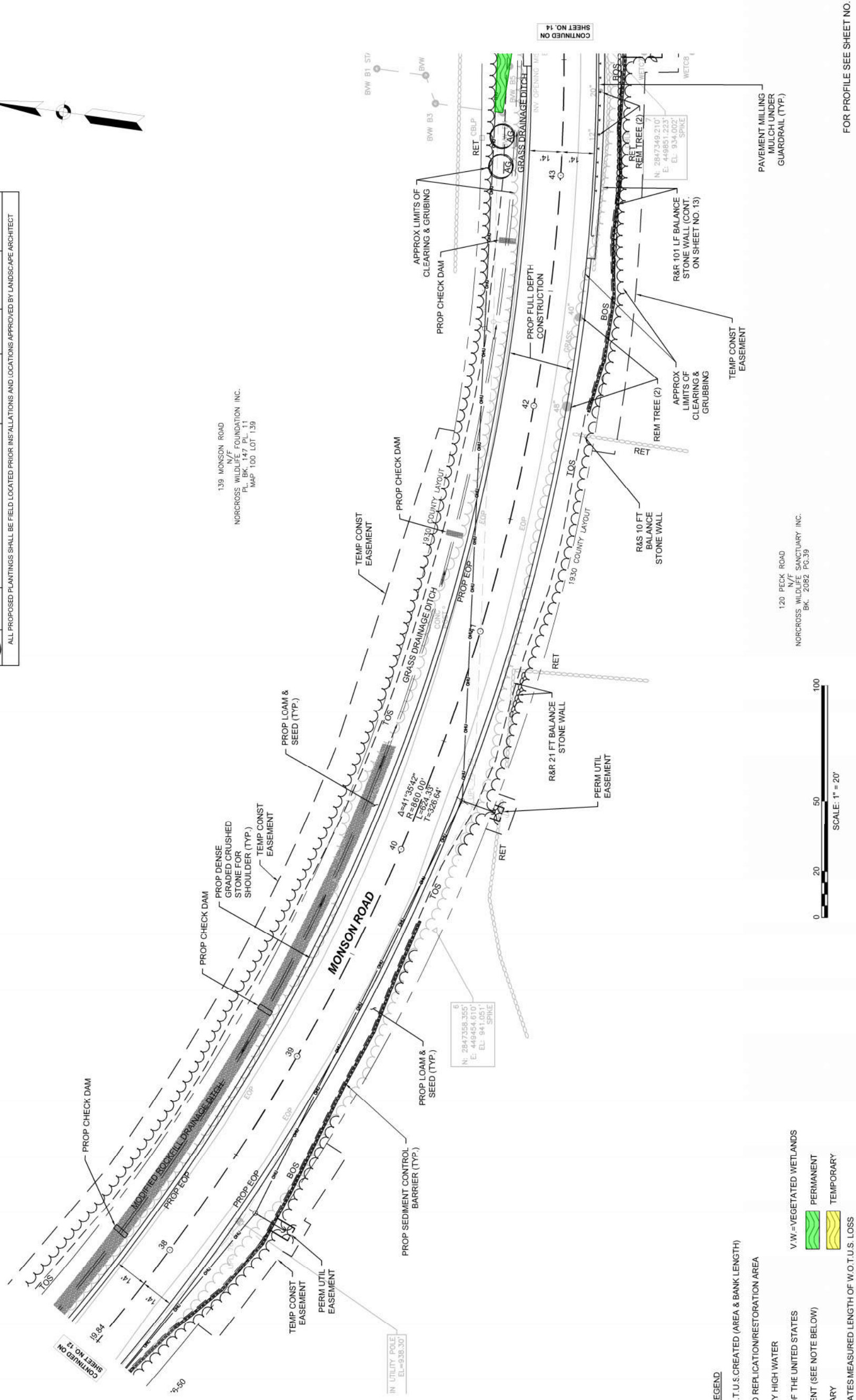
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

WATER SUPPLY ALTERATIONS
NONE

DRAINAGE DETAILS
SEE UTILITY PLANS

TRAFFIC SIGNAL CONDUIT
NONE

HIGHWAY GUARD DETAILS
STA 42+75 TO STA 42+87 RT TANGENT END TREATMENT TL-3
STA 42+87 TO STA 43+86 RT (TL-3)



IMPACT LEGEND

NEW W.O.T.U.S.CREATED (AREA & BANK LENGTH)

WETLAND REPLICATION/RESTORATION AREA

— OHW — ORDINARY HIGH WATER

W.O.T.U.S.=WATERS OF THE UNITED STATES

V.W.=VEGETATED WETLANDS

PERMANENT (SEE NOTE BELOW)

PERMANENT

TEMPORARY

TEMPORARY

NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS

HIGHWAY GUARD DETAILS
STA 42+87 TO STA 43+86 RT (TL-3)
STA 43+86 TO STA 43+98 RT TANGENT END TREATMENT TL-3
STA 43+57 TO STA 43+70 LT TANGENT END TREATMENT TL-3
STA 43+70 TO STA 44+57 LT (TL-3)
STA 44+57 TO STA 44+70 LT TANGENT END TREATMENT TL-3

TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
NONE

DRAINAGE DETAILS
SEE UTILITY PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	6	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	0	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

CONSTRUCTION PLANS

135 MONSON ROAD
N/F
NORCROSS WILDLIFE FOUNDATION INC.
BK. 9562 PG. 213
MAP 100 MAP 135

131 MONSON ROAD
N/F
STANLEY AND BARBARA KUSTRA
BK. 5611 PG. 359
MAP 100 LOT 131

120 PECK ROAD
N/F
NORCROSS WILDLIFE SANCTUARY INC.
BK. 2082 PG.39
BK. 2099 PG. 244
BK.2158 PG. 397
BK. 2168 PG. 192
BK. 2433 PG. 283
BK. 2815 PG. 554
BK. 3184 PG. 407
BK. 3217 PG. 19
MAP 100 LOT 120

PERMANENT V.W. IMPACT = 243 SF
TEMPORARY BANK IMPACT = 8 LF
TEMPORARY W.O.T.U.S. IMPACT = 44 SF
PERMANENT W.O.T.U.S. IMPACT = 35 SF
PERMANENT BANK IMPACT = 285 LF
PERMANENT W.O.T.U.S. IMPACT = 1231 SF
PERMANENT W.O.T.U.S. IMPACT= 35 SF
PERMANENT BANK IMPACT = 14 LF
PROP 12" RCP FLARED ENDS
TEMPORARY W.O.T.U.S. IMPACT= 215 SF
PROP MODIFIED ROCKFILL
TEMPORARY BANK IMPACT= 13 LF
PERMANENT W.O.T.U.S. IMPACT= 41 SF
TEMPORARY BANK IMPACT = 12 LF
PROP MODIFIED ROCKFILL
PERMANENT V.W. IMPACT = 31 SF
TEMPORARY W.O.T.U.S. IMPACT = 69 SF
PERMANENT V.W. IMPACT = 15 SF

GRASS DRAINAGE DITCH
PROP LOAM & SEED (TYP.)
12" RCP - CLASS V REM EXIST PIPE
PROP HMA DWY
APPROX LIMITS OF CLEARING & GRUBBING
TEMP CONST EASEMENT
PERM UTIL EASEMENT
PROP GRAV DWY
PROP EOP
PROP FULL DEPTH CONSTRUCTION
N 81° 03' 14" E 250.18'
MONSON ROAD
Δ=15°45'55"
R=1300.00'
L=357.70'
T=179.99'
PROP HMA CURB
RCP (TYP.)
DMH
CBCI
TOS
LANDSCAPE
WETLANDS
FE (2)
REM TREE (2)
PAVEMENT MILLING MULCH UNDER GUARDRAIL (TYP.)
R&R 101 FT BALANCE STONE WALL (CONT. ON SHEET NO. 12)
R&R 103 LF BALANCE STONE WALL
DRAINAGE EASEMENT
R&R 12 FT BALANCE STONE WALL
PROP DENSE GRADED CRUSHED STONE FOR SHOULDER (TYP.)
PROP SEDIMENT CONTROL BARRIER (TYP.)
wetlance
BENCHMARK: SPIKE IN UTIL. POLE
EL=933.86'
N: 2847349.210'
E: 449851.223'
EL: 934.002'
SPIKE

IMPACT LEGEND
NEW W.O.T.U.S.CREATED (AREA & BANK LENGTH)
WETLAND REPLICATION/RESTORATION AREA
OHW ORDINARY HIGH WATER
W.O.T.U.S.=WATERS OF THE UNITED STATES
PERMANENT (SEE NOTE BELOW)
TEMPORARY
V.W.=VEGETATED WETLANDS
PERMANENT
TEMPORARY
NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS

0 20 50 100
SCALE: 1" = 20'

CONTINUED ON SHEET NO. 13
CONTINUED ON SHEET NO. 15
FOR PROFILE SEE SHEET NO. 26

608163_HD3\CONSTRUCTION PLANS\404.DWG Plotted on: 27-Aug-2024 3:01 PM
Proposal No. 608163-128112
A0083 1 - 16

608163_HD3(CONSTRUCTION PLANS)404.DWG Plotted on 27-Aug-2024 3:01 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

CONSTRUCTION PLANS

N

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	0	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	0	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	0	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

ALTERATIONS

DRAINAGE DETAILS
SEE UTILITY PLANS

WATER SUPPLY
NONE

TRAFFIC SIGNAL CONDUIT
NONE

HIGHWAY GUARD DETAILS
NONE

FOR PROFILE SEE SHEET NO. 28

CONTINUED ON SHEET NO. 17

CONTINUED ON SHEET NO. 15

MONSON ROAD

MAYNARD ROAD

ACCEPTED MAY 17, 2017

121 MONSON ROAD
N/F
MICHAEL P & VIRGINIA S. LATO
BK. 5961 PG. 267
MAP 100 LOT 121

120 PECK ROAD
N/F
NORCROSS WILDLIFE SANCTUARY INC.
BK. 2082 PG.39
BK. 2099 PG. 244
BK.2158 PG. 397
BK. 2168 PG. 192
BK. 2433 PG. 283
BK. 2815 PG. 554
BK. 3184 PG. 407
BK. 3217 PG. 19
MAP 100 LOT 120

TEMPORARY V.W. IMPACT = 291 SF ± WETLAND RESTORATION AREA 1 =217 SF ± **NOTE: SEE WETLAND SOIL AND SEED MIX ON SHEET 180 AND SPECIAL PROVISION FOR ITEM 755.35**

TEMPORARY V.W. IMPACT = 6 SF ±

THE PROPOSED TREELINE REPRESENTS LIMITED OVERHEAD TREE CANOPY TRIMMING ONLY ALONG THE EXISTING OVERHEAD UTILITY LINES. NO DIRECT GROUND WETLAND IMPACTS ARE PROPOSED OR REQUIRED

BENCHMARK: SPIKE IN UTILITY POLE EL=956.75'

IMPACT LEGEND

NEW W.O.T.U.S. CREATED (AREA & BANK LENGTH)

WETLAND REPLICATION/RESTORATION AREA

— OHW — ORDINARY HIGH WATER

W.O.T.U.S.=WATERS OF THE UNITED STATES

V.W.=VEGETATED WETLANDS

PERMANENT (SEE NOTE BELOW)

PERMANENT

TEMPORARY

TEMPORARY

NOTE: RED LINE INDICATES MEASURED LENGTH OF W.O.T.U.S. LOSS

0 20 50 100

SCALE: 1" = 20'

608163_HDS\CONSTRUCTION PLANS\404.DWG Plotted on: 27-Aug-2024 3:01 PM

HIGHWAY GUARD DETAILS

STA 80+08 TO STA 80+21 RT TANGENT END TREATMENT TL-3
STA 80+21 TO STA 82+59 RT (TL-3)
STA 81+79 TO STA 81+92 LT TANGENT END TREATMENT TL-3
STA 81+92 TO STA 82+92 LT (TL-3)

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

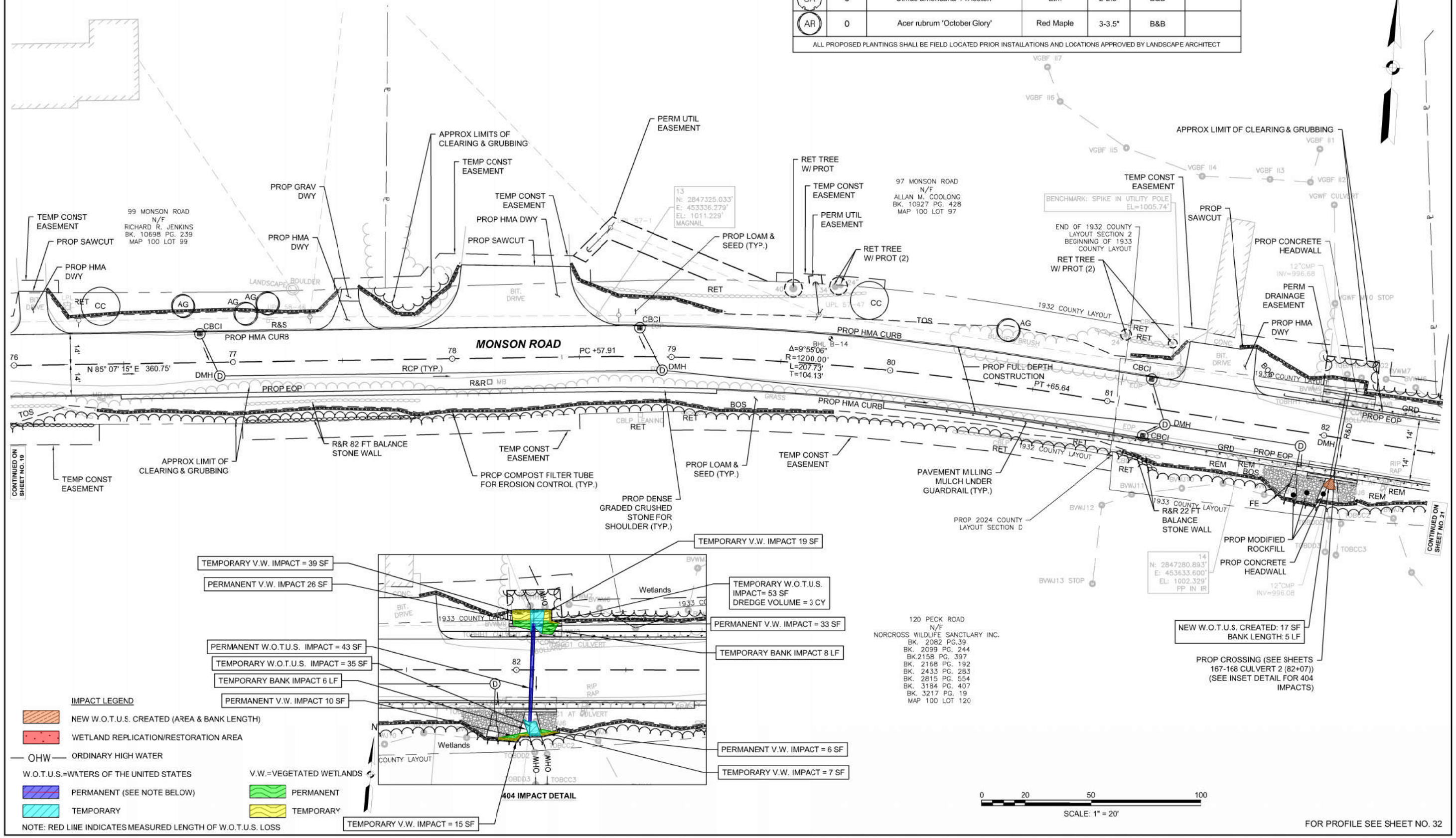
DRAINAGE DETAILS

SEE UTILITY PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	2	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	4	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	0	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	0	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT



FOR PROFILE SEE SHEET NO. 32

Proposal No. 608163-128112
AA00831 - 18080

HIGHWAY GUARD DETAILS

STA 80+21 TO STA 82+59 RT (TL-3)
STA 82+59 TO STA 82+72 RT TANGENT END TREATMENT TL-3
STA 81+92 TO STA 82+92 LT (TL-3)
STA 82+92 TO STA 83+04 LT TANGENT END TREATMENT TL-3
STA 84+54 TO STA 84+66 RT TANGENT END TREATMENT TL-3
STA 84+66 TO STA 85+54 RT (TL-3)
STA 85+64 TO STA 86+04 RT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 1+43 TO STA 1+83 RT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 1+83 TO STA 2+07 RT (TL-3)
STA 02+07 TO STA 02+20 RT TANGENT END TREATMENT TL-3
STA 02+20 TO STA 02+07 LT TANGENT END TREATMENT TL-3
STA 02+07 TO STA 87+79 RT (TL-3)
STA 87+79 TO STA 87+92 RT TANGENT END TREATMENT TL-3
STA 87+02 TO STA 87+42 LT TRANSITION TO RIGID BARRIER (SINGLE FACED)
STA 87+42 TO STA 87+87 LT (TL-3)
STA 87+87 TO STA 88+00 LT TANGENT END TREATMENT TL-3

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

SEE UTILITY PLANS

PLANT SCHEDULE

TREES	QTY (PER SHEET)	BOTANICAL NAME	COMMON NAME	CALIPER	CONTAINER	REMARKS
CC	1	Cercis canadensis	Eastern Redbud	2-2.5"	B&B	Single-stem
AG	5	Amelanchier grandiflora 'Autumn Brilliance'	Serviceberry	2-2.5"	B&B	Single-stem
UA	2	Ulmus americana 'Princeton'	Elm	2-2.5"	B&B	
AR	2	Acer rubrum 'October Glory'	Red Maple	3-3.5"	B&B	

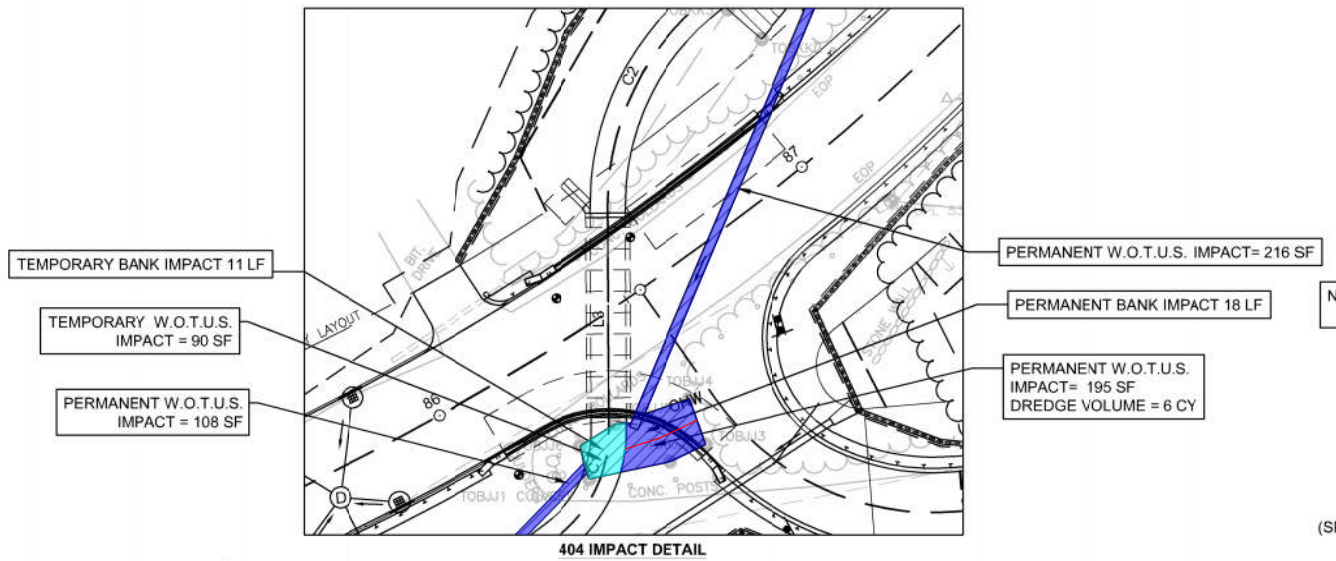
ALL PROPOSED PLANTINGS SHALL BE FIELD LOCATED PRIOR INSTALLATIONS AND LOCATIONS APPROVED BY LANDSCAPE ARCHITECT

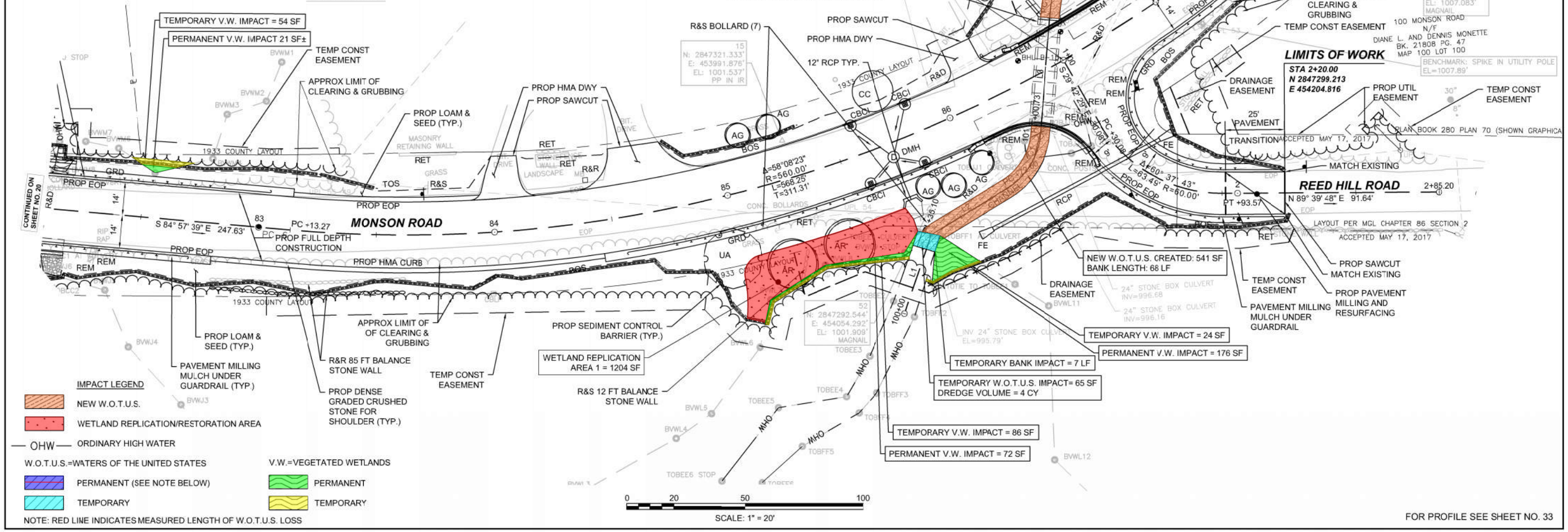
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CONSTRUCTION PLANS

N

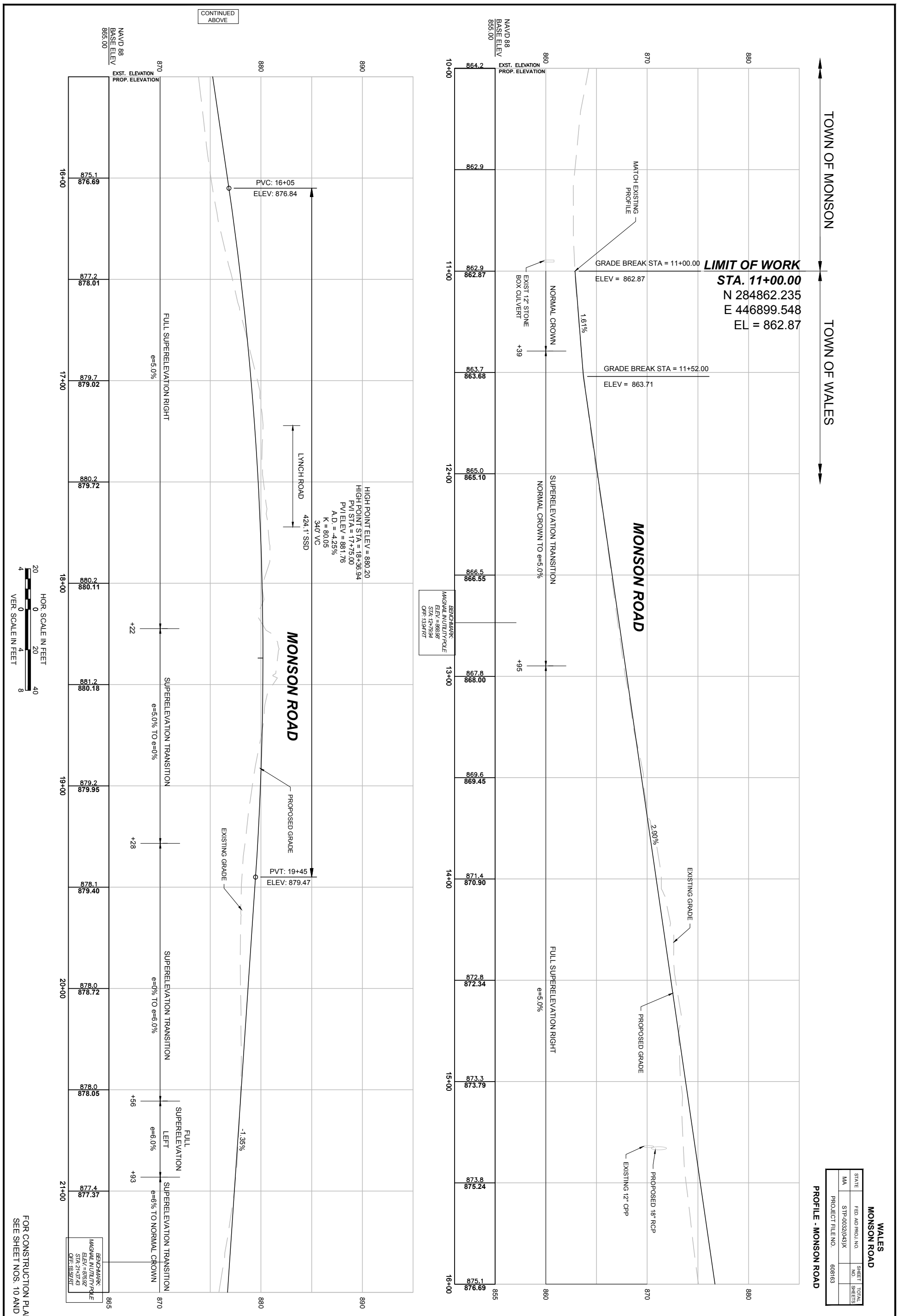




608163_HDS\CONSTRUCTION PLANS\404.DWG Plotted on: 27-Aug-2024 3:01 PM

Proposal No. 608163-128112

A0083 1 - 19



WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

PROFILE - MONSON ROAD

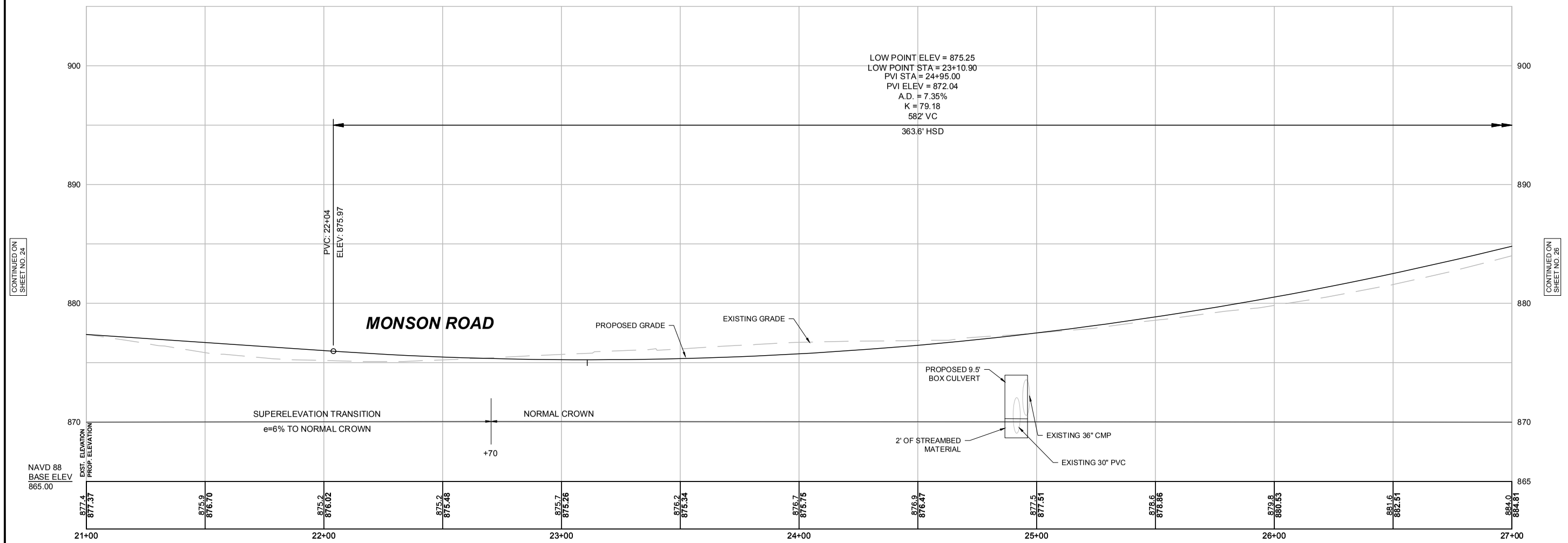
608163_HD4(PROFILE).DWG Plotted on 9-Aug-2024 2:38 PM

FOR CONSTRUCTION PLANS
SEE SHEET NOS. 10 AND 11

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

PROFILE - MONSON ROAD



HOR. SCALE IN FEET
20 0 20 40
4 0 4 8
VER. SCALE IN FEET

FOR CONSTRUCTION PLANS
SEE SHEET NO. 12

608163_HD4\PROFILE\.DWG Plotted on 9-Aug-2024 2:38 PM

Proposal No. 608163-128112

A00831 - 21

608163_HD4(PROFILE).DWG Plotted on 9-Aug-2024 2:39 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

PROFILE - MONSON ROAD

FOR CONSTRUCTION PLANS
SEE SHEET NO. 14

CONTINUED ON SHEET NO. 28

HIGH POINT ELEV = 941.33
HIGH POINT STA = 40+29.65
PVI STA = 39+40.00
PVI ELEV = 944.79
A.D. = -8.35%
K = 49.11
410' VC
325.6' SSD

PVC: 37+35
ELEV: 932.49

SUPERELEVATION TRANSITION
NORMAL CROWN TO e=5.8%

+82

6.00%

MONSON ROAD

EXISTING 15" UG DRAIN
REM

NORMAL CROWN

+9

PVT: 33+86
ELEV: 911.55

EXISTING GRADE

PVI STA = 32+38.00
PVI ELEV = 902.67
A.D. = 4.50%
K = 65.77
296' VC
314.4' HSD

PROPOSED GRADE

+14

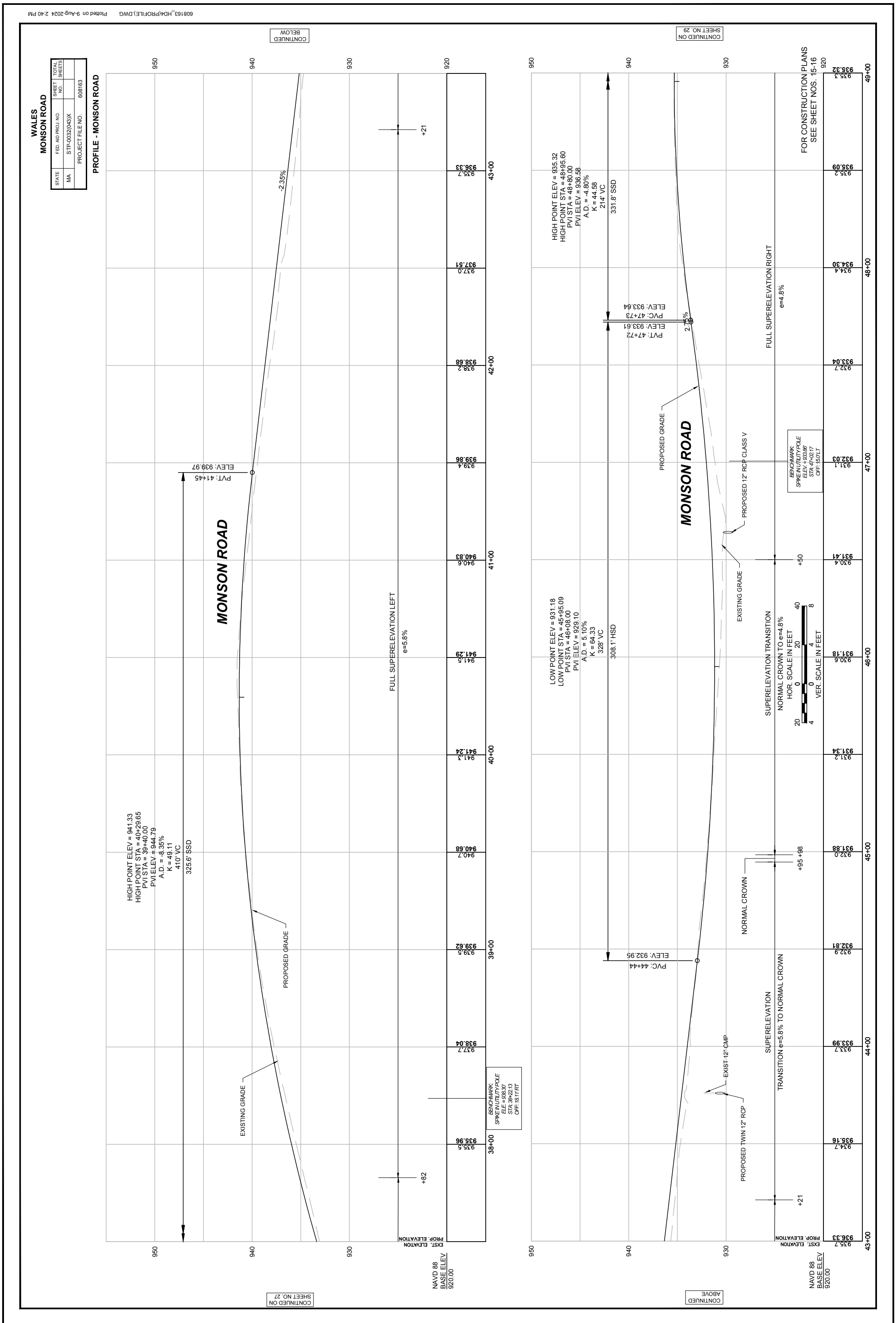
STA	EXST. ELEVATION	PROP. ELEVATION
38+00	935.5	935.96
	933.1	933.37
37+00	930.5	930.39
	927.4	927.39
36+00	924.3	924.39
	921.7	921.39
35+00	918.6	918.39
	915.6	915.39
34+00	912.7	912.39
	909.7	909.49
33+00	906.9	906.95
	904.5	904.80
32+00	902.7	903.02

950 940 930 920 910 900 895

NAVD 88
BASE ELEV
895.00

HOR. SCALE IN FEET 20 0 20 40
VER. SCALE IN FEET 4 0 4 8

CONTINUED ON SHEET NO. 26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WALES
MONSON ROAD
STATE
FED. AID PROJ. NO.
SHEET NO.
TOTAL SHEETS
MA
STP-0032(043)X
PROJECT FILE NO.
608163
PROFILE - MONSON ROAD
CONTINUED BELOW
CONTINUED ON SHEET NO. 29
CONTINUED ON SHEET NO. 27
CONTINUED ABOVE
MONSON ROAD
HIGH POINT ELEV = 941.33
HIGH POINT STA = 40+29.65
PVI STA = 39+40.00
PVI ELEV = 944.79
A.D. = -8.35%
K = 49.11
410' VC
325.6' SSD
PVT: 41+45
ELEV: 939.97
-2.35%
+21
+82
PROPOSED GRADE
EXISTING GRADE
FULL SUPERELEVATION LEFT
e=5.8%
BENCHMARK:
SPIKE IN UTILITY POLE
ELE. = 938.30'
STA: 38+22.13
OFF: 18.11' RT
HIGH POINT ELEV = 935.32
HIGH POINT STA = 48+95.60
PVI STA = 48+80.00
PVI ELEV = 936.58
A.D. = -4.80%
K = 44.58
214' VC
331.8' SSD
PVC: 47+73
ELEV: 933.64
PVT: 47+72
ELEV: 933.61
2.75%
FULL SUPERELEVATION RIGHT
e=4.8%
PROPOSED GRADE
PROPOSED 12" RCP CLASS V
EXISTING GRADE
BENCHMARK:
SPIKE IN UTILITY POLE
ELEV. = 933.86'
STA: 47+02.17
OFF: 15.0' LT
LOW POINT ELEV = 931.18
LOW POINT STA = 45+95.09
PVI STA = 46+08.00
PVI ELEV = 929.10
A.D. = 5.10%
K = 64.33
328' VC
308.1' HSD
SUPERELEVATION TRANSITION
NORMAL CROWN TO e=4.8%
HOR. SCALE IN FEET
VER. SCALE IN FEET
NORMAL CROWN
PVC: 44+44
ELEV: 932.95
SUPERELEVATION
TRANSITION e=5.8% TO NORMAL CROWN
EXIST 12" CMP
PROPOSED TWIN 12" RCP
FOR CONSTRUCTION PLANS
SEE SHEET NOS. 15-16
NAVD 88
BASE ELEV
920.00
EXST. ELEVATION
PROP. ELEVATION

608163_HD4(PROFILE).DWG Plotted on 9-Aug-2024 2:40 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

PROFILE - MONSON ROAD

CONTINUED ON SHEET NO. 30

FOR CONSTRUCTION PLANS
SEE SHEET NO. 17

970 960 950 940 930 920 915

LOW POINT ELEV = 933.46
LOW POINT STA = 50+52.14
PVI STA = 51+00.00
PVI ELEV = 932.07
A.D. = 9.05%
K = 19.34
175' VC
128.0' HSD

PVC: 50+12.50
ELEV: 933.86

PVT: 51+87.50
ELEV: 938.19

PVC: 52+33
ELEV: 941.38

HIGH POINT ELEV = 935.32
HIGH POINT STA = 48+95.60
PVI STA = 48+80.00
PVI ELEV = 936.58
A.D. = -4.80%
K = 44.58
214' VC
331.8' SSD

PVT: 49+87
ELEV: 934.39

-2.05%

7.00%

PROPOSED GRADE

EXISTING GRADE

Monson Rd (53)
Station=50+87.97
elev = 933.82

MONSON ROAD

EXISTING 36" PVC

NORMAL CROWN

SUPERELEVATION TRANSITION
e=4.8% TO NORMAL CROWN

FULL SUPERELEVATION RIGHT
e=4.8%

SUPERELEVATION TRANSITION
NORMAL CROWN TO e=4.2%

FULL SUPERELEVATION LEFT
e=4.2%

SUPERELEVATION TRANSITION
e=4.2% TO NORMAL CROWN

+88 +93
+36
+30
+48
+44

EXIST. ELEVATION	PROP. ELEVATION	
933.46	932.8	
934.12	933.3	50+00
934.99	934.5	
935.32	935.3	49+00
934.05	934.0	
935.93	936.4	
939.07	939.1	52+00
942.54	942.2	
945.57	945.6	53+00
948.06	948.3	
950.00	950.0	54+00

NAVD 88
BASE ELEV
915.00

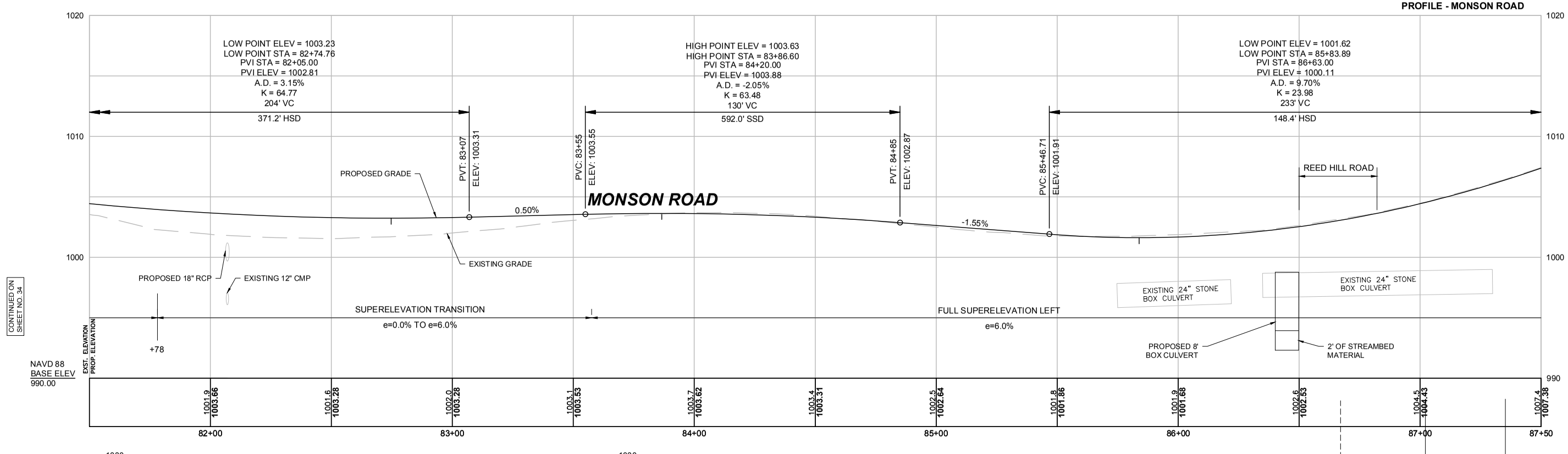
HOR. SCALE IN FEET 20 0 20 40
VER. SCALE IN FEET 4 0 4 8

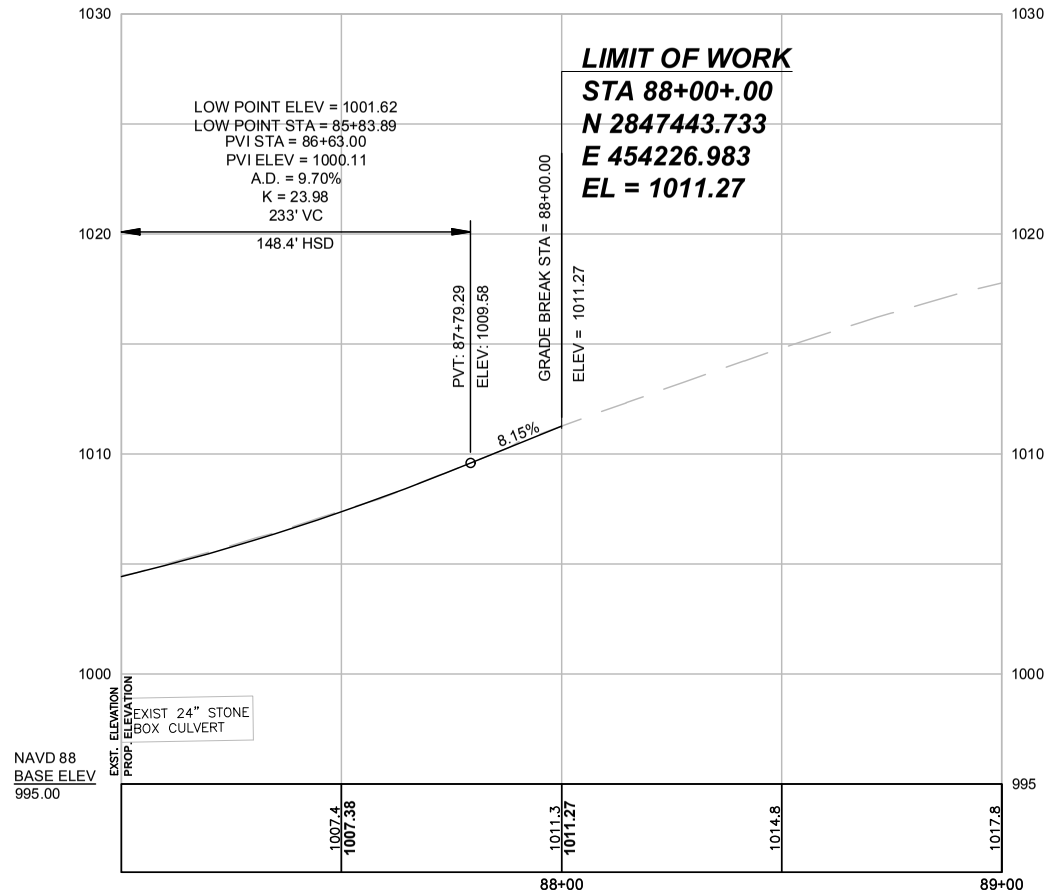
CONTINUED ON SHEET NO. 28

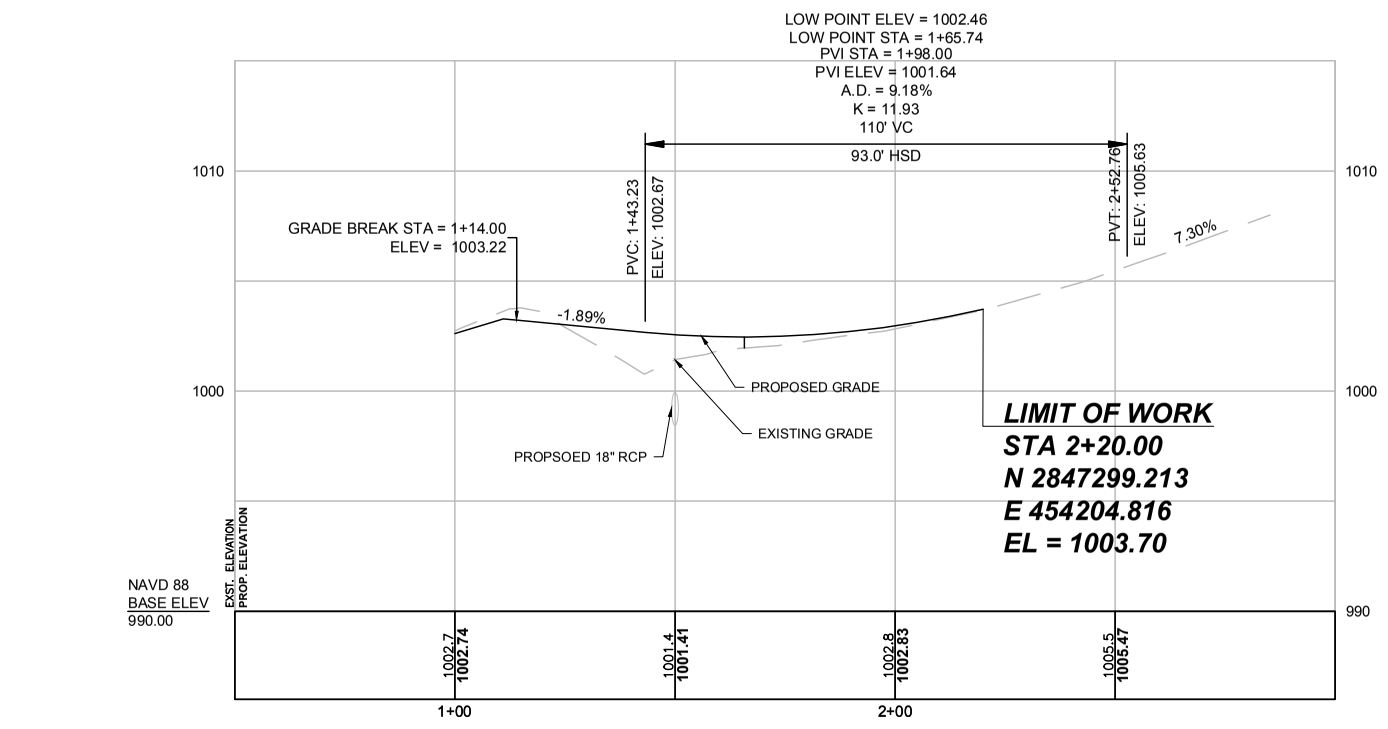
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

PROFILE - MONSON ROAD







HOR. SCALE IN FEET
20 0 20 40
VER. SCALE IN FEET
4 0 4 8

FOR CONSTRUCTION PLANS
SEE SHEET NO. 23

608163_HD4(PROFILE).DWG Plotted on 9-Aug-2024 2:43 PM
Proposal No. 608163-128112
A0008J1 - 25

608163_HD10(XSC_GRADINGCALC).DWG Plotted on 9-Aug-2024 4:29 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8

15+50

Cut: 15.21 S.F.
Fill: 30.65 S.F.

SUPERELEVATION:
BANK = 4.4%

STONE WALL
+25--+75

UPL 87--1
+65

LAYOUT LINE

10" DEC +56

4.0:1

874.63
4.4%
874.76
4.4%
4.4%
TOP OF BANK/O.H.W
TOP OF BANK
875.73
2.0%
875.67
STONE WALL
+25--+75
8.1:1
LAYOUT LINE
873.8
875.24

15+32.35

Cut: 64.35 S.F.
Fill: 22.57 S.F.

SUPERELEVATION:
BANK = 4.4%

TOP OF BANK
TOP OF BANK
TOP OF BANK/O.H.W
LAYOUT LINE
2.0:1
874.11
4.4%
874.25
4.4%
4.4%
TOP OF BANK/O.H.W
875.21
2.0%
875.15
LAYOUT LINE
2.0:1
873.6
874.73

15+00

Cut: 57.30 S.F.
Fill: 1.74 S.F.

SUPERELEVATION:
BANK = 4.4%

STONE WALL
+79--+25
LAYOUT LINE
9.91%
873.18
4.4%
873.31
4.4%
4.4%
UP 87--18 +11
874.28
2.0%
874.22
STONE WALL
+75--+25
2.0:1
LAYOUT LINE
873.3
873.79

608163_HD10(XSC_GRADINGCALC).DWG Plotted on 9-Aug-2024 3:57 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

CROSS SECTIONS

HOR. SCALE IN FEET 0 4 8
VER. SCALE IN FEET 0 4 8

25+50

Cut: 33.06 S.F.
Fill: 27.18 S.F.

878.6
878.86

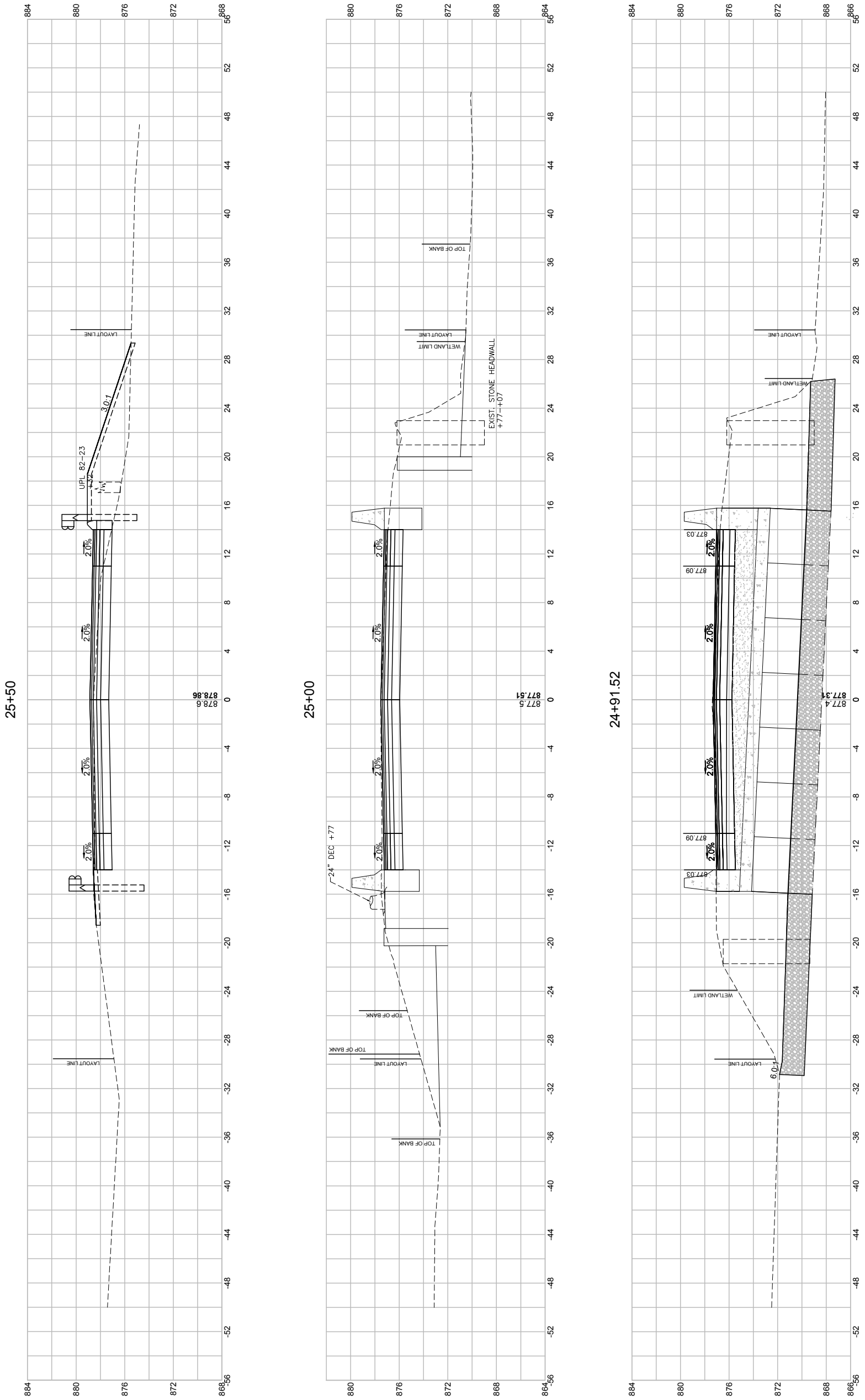
25+00

Cut: 121.15 S.F.
Fill: 0.00 S.F

877.5
877.51

24+91.52

877.4
877.31



608163_HD10(XSC_GRADINGCALC).DWG Plotted on 9-Aug-2024 3:59 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8

(SECTION CUT ALONG CENTERLINE OF PROPOSED CULVERT)

43+94.64

Cut: 39.15 S.F.
Fill: 8.87 S.F.

SUPERELEVATION:
BANK = 2.0%

LAYOUT LINE
STONE WALL +25 - +71
953.57
953.63
953.19
953.13
933.8
934.11
TOP OF BANK
2.0%
2.5:1

43+70

Cut: 96.36 S.F.
Fill: 12.89 S.F.

WETLAND LIMIT
WETLAND LIMIT/O.H.W
TOP OF BANK/O.H.W
934.7
934.69
2.0%
3.2%
2.0:1

43+50

Cut: 35.54 S.F.
Fill: 16.37 S.F.

SUPERELEVATION:
BANK = 4.1%

20" DEC +37
STONE WALL +25 - +75
LAYOUT LINE
WETLAND LIMIT
935.56
935.62
934.70
934.58
934.7
935.16
2.0%
4.1%
2.0:1

43+28.17

Cut: 33.29 S.F.
Fill: 14.32 S.F.

SUPERELEVATION:
BANK = 5.2%

12" DEC +18
STONE WALL +75 - +25
LAYOUT LINE
WETLAND LIMIT
936.18
936.24
935.10
934.94
934.7
935.67
2.0%
5.2%
2.0:1

608163_HD10(XSC_GRADINGCALC).DWG Plotted on 9-Aug-2024 4:44 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8

47+00

Cut: 15.09 S.F.
Fill: 19.53 S.F.

SUPERELEVATION:
BANK = 4.4%

LAYOUT LINE

2.0:1
4.4%
931.42
931.55
4.4%
4.4%
4.4%
932.52
2.0%
932.46
UPL 72–33 +02
4.0:1

46+64.76 (SECTION CUT ALONG CENTERLINE OF EXISTING 12" CPP PIPE)

Cut: 85.75 S.F.
Fill: 36.70 S.F.

TOP OF BANK/O.H.W

WETLAND LIMIT

1.5:1
4.2%
4.2%
4.2%
4.2%
2.1%
TOP OF BANK/O.H.W
931.6
931.57
TOP OF BANK/O.H.W

46+50

Cut: 7.89 S.F.
Fill: 32.80 S.F.

SUPERELEVATION:
BANK = 4.4%

LAYOUT LINE

2.0:1
4.4%
930.80
930.93
4.4%
4.4%
4.4%
931.90
TOP OF BANK
2.0%
931.84
TOP OF BANK
4.0:1
930.4
931.41

46+44.68

Cut: 8.27 S.F.
Fill: 30.60 S.F.

SUPERELEVATION:
BANK = 4.4%

LAYOUT LINE

2.0:1
4.4%
930.75
930.88
4.4%
4.4%
4.4%
931.85
TOP OF BANK/O.H.W
2.0%
931.79
TOP OF BANK/O.H.W
4.0:1
930.4
931.37

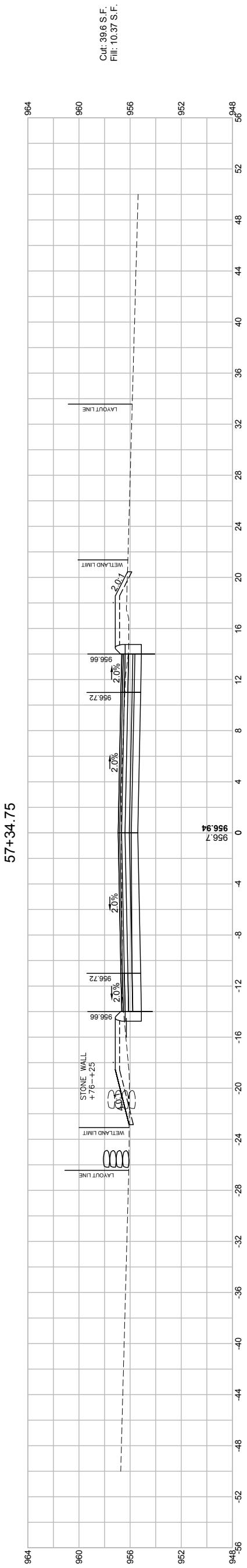
608163_HD10(XSC_GRADINGCALC).DWG Plotted on 9-Aug-2024 4:04 PM

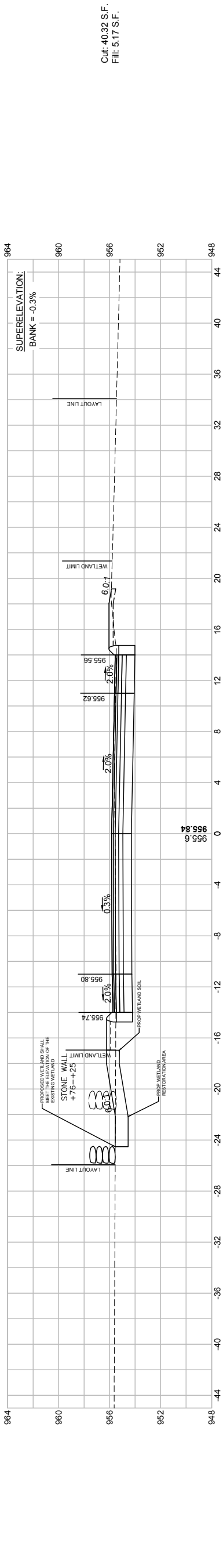
WALES
MONSON ROAD

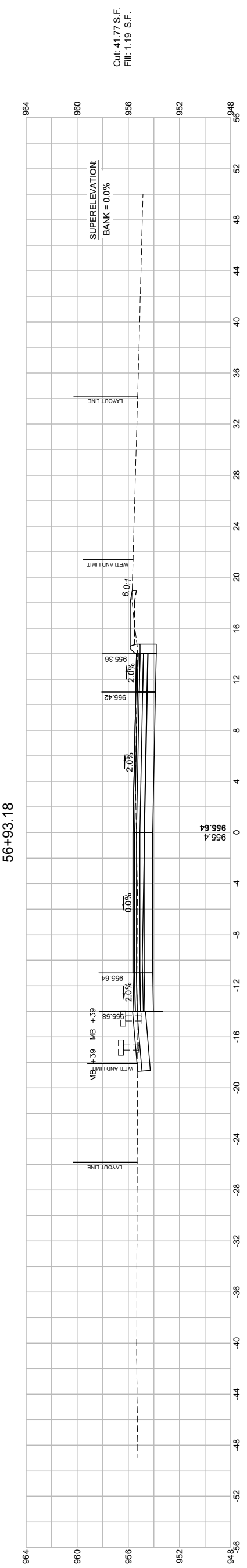
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

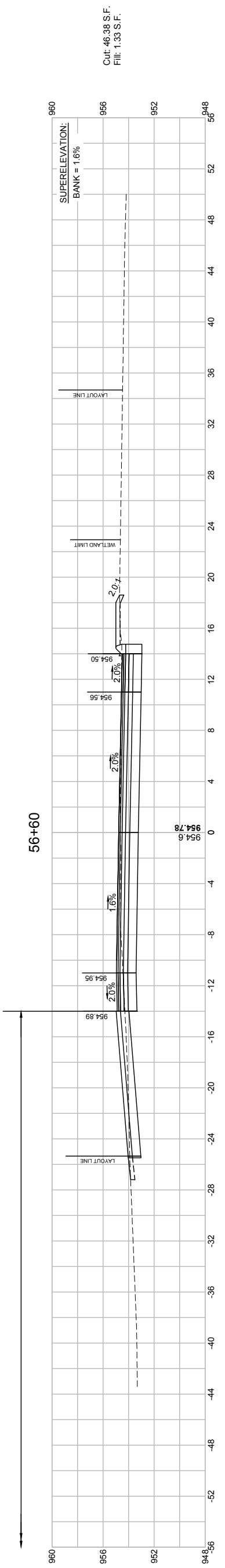
CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8









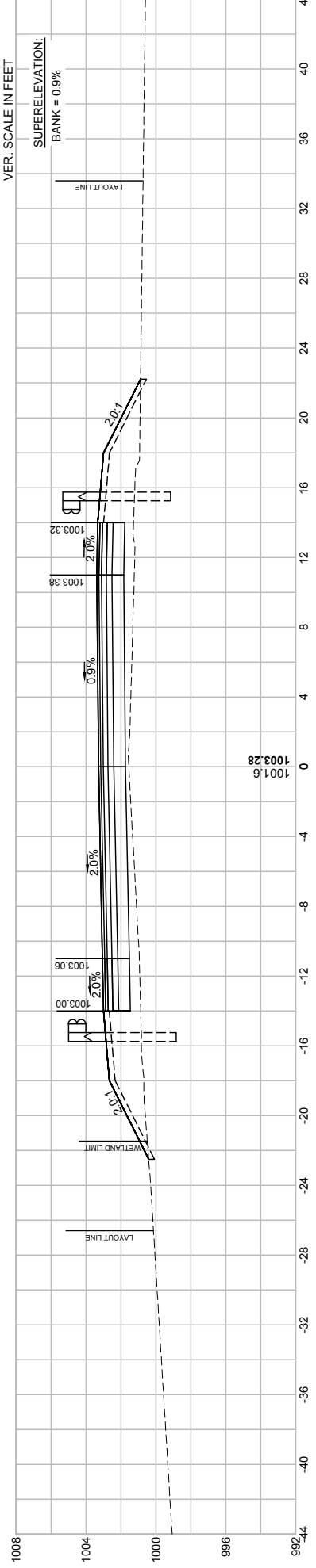
608163_HD10(XSC_GRADINGCALC).DWG Plotted on 9-Aug-2024 4:25 PM

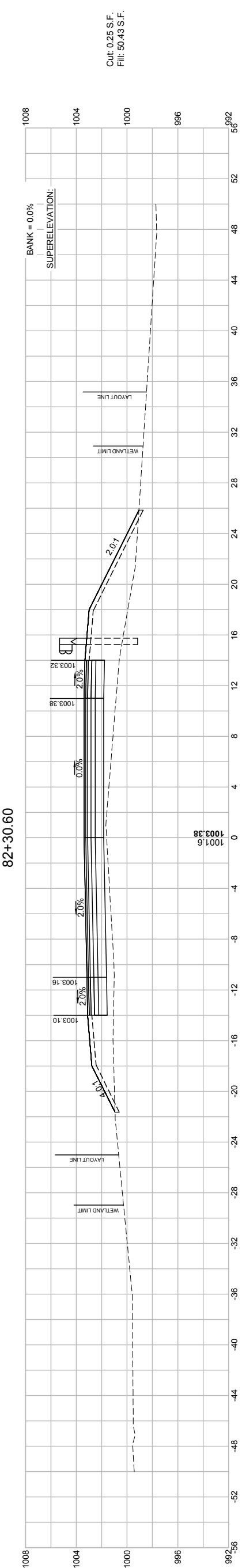
WALES
MONSON ROAD

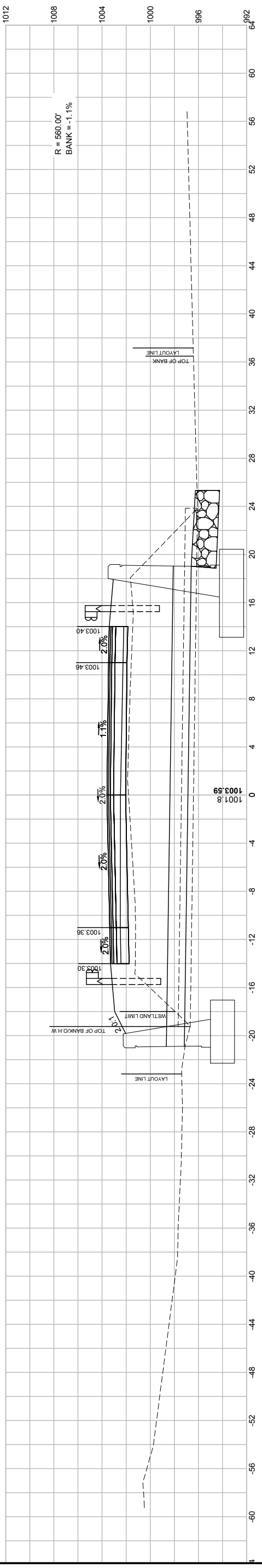
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

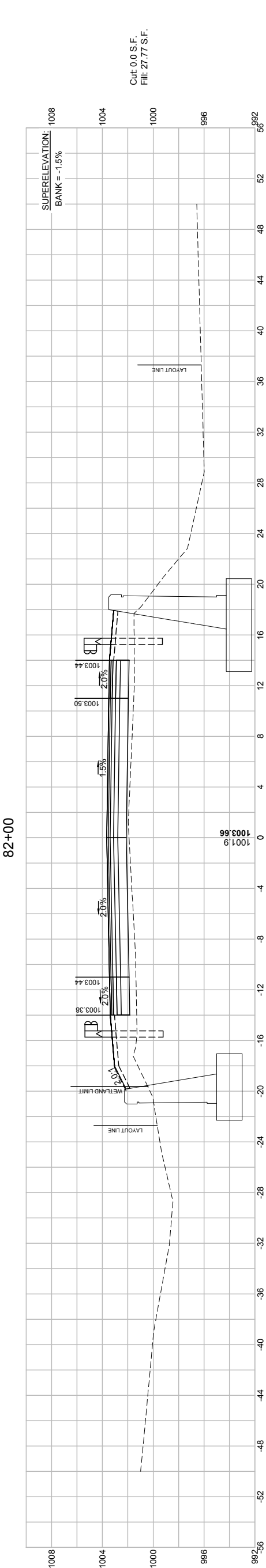
CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8









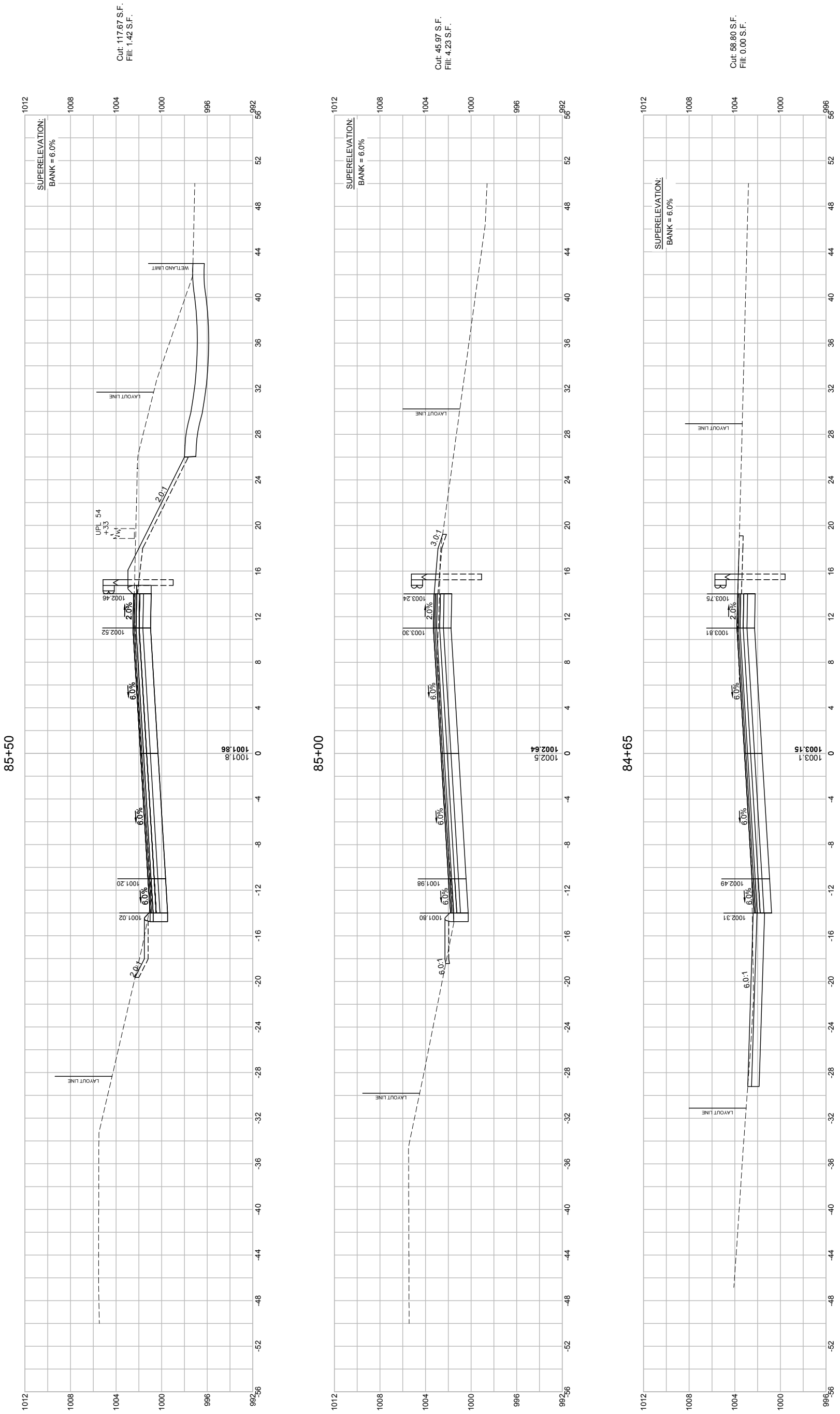
608163_HD10(XSC_GRADINGCALC).DWG Plotted on 9-Aug-2024 4:15 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



608163_HD10(XSC_GRADINGCALC).DWG Plotted on 9-Aug-2024 4:27 PM

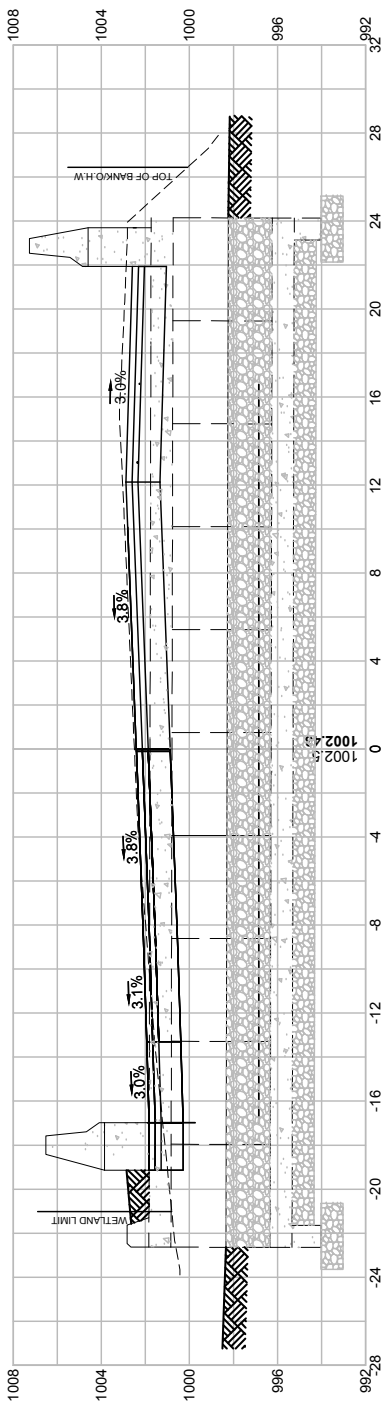
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8

86+45.09 (SECTION CUT ALONG CENTERLINE OF EXISTING CULVERT)



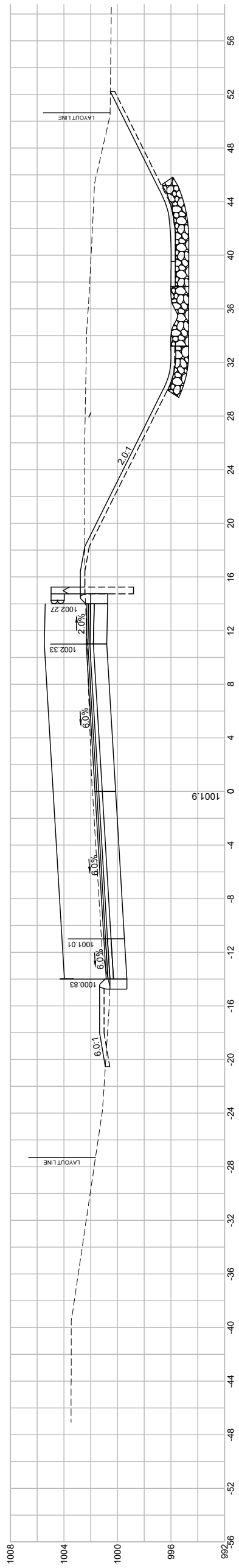
86+15

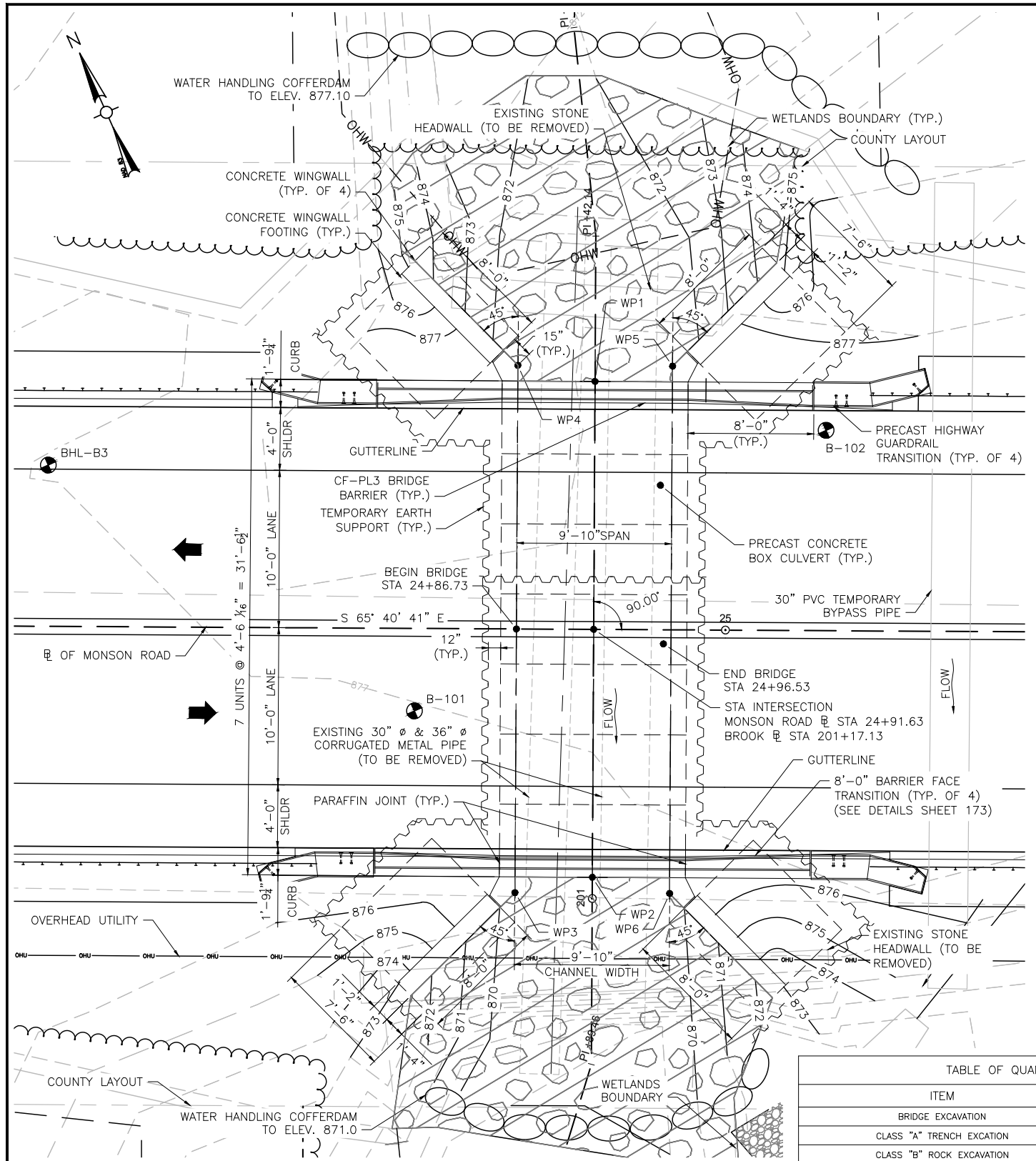
Cut: 238.87 S.F.
Fill: 0.0 S.F.

SUPERELEVATION:
BANK = 6.0%

86+00

Cut: 202.10 S.F.
Fill: 4.42 S.F.





CULVERT 1 PLAN (STA 24+92)

SCALE: 1" = 4'

WORKING POINTS		
POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2848111.9174	448173.3849
2	2848083.1730	448160.3979
3	2848084.2791	448155.5221
4	2848114.8452	448169.3343
5	2848110.8082	448178.2683
6	2848080.2408	448164.4559

NOTES:

1. THE FACTORED BEARING PRESSURE = 2.06 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 5.04 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS 9TH EDITION, 2020, FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 21+38± (RT) MAGNAIL IN UTILITY POLE: EL. 876.92 FT

BENCHMARK STA 29+60± (RT) MAGNAIL IN UTILITY POLE: EL. 900.23 FT

BENCHMARK STA 29+90± (LT) MAGNAIL BRASS RIVET: EL. 901.72 FT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

5000 PSI, ¾", 685 HP CEMENT CONCRETE.....CF-PL3 BARRIER CURB, TRANSITION BARRIER CURB

5000 PSI, 1½", 660 CEMENT CONCRETE.....WINGWALLS

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	443
CLASS "A" TRENCH EXCATION	C.Y.	69
CLASS "B" ROCK EXCAVATION	C.Y.	30
NATURAL STREAMBED MATERIAL	C.Y.	26
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	300
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	18
PRECAST GUARDRAIL HIGHWAY TRANSITION	EA.	4
5000 PSI, ¾", 685 HP CEMENT CONCRETE	C.Y.	27
5000 PSI, 1½", 660 CEMENT CONCRETE	C.Y.	27
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	17050
DAMPPROOFING	S.F.	1244
PRECAST CONCRETE BOX CULVERT – SITE 1	L.S.	1
TEMPORARY SUPPORT OF EARTH	L.S.	1
CONTROL OF WATER – STRUCTURE NO. 1	L.S.	1

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 1 KEY PLAN AND NOTES

TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

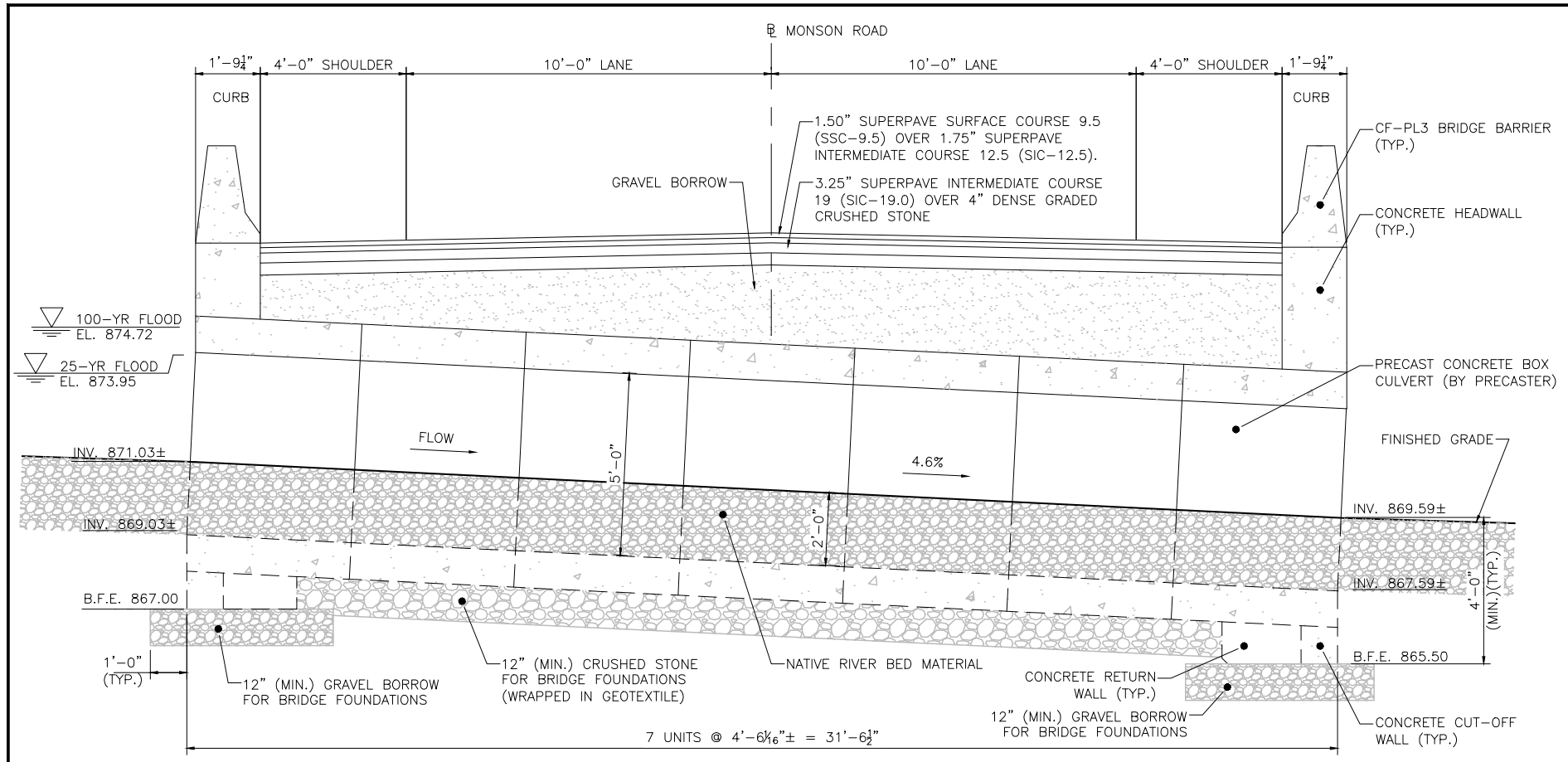
HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	0.903
DESIGN FLOOD DISCHARGE (C.F.S.)	123
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	6.32
DESIGN FLOOD ELEVATION (FEET, NAVD)	873.95
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	174
BASE FLOOD ELEVATION (FEET, NAVD)	874.72
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	43
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	7.72
DESIGN FLOOD ELEVATION (FEET, NAVD)	876.1

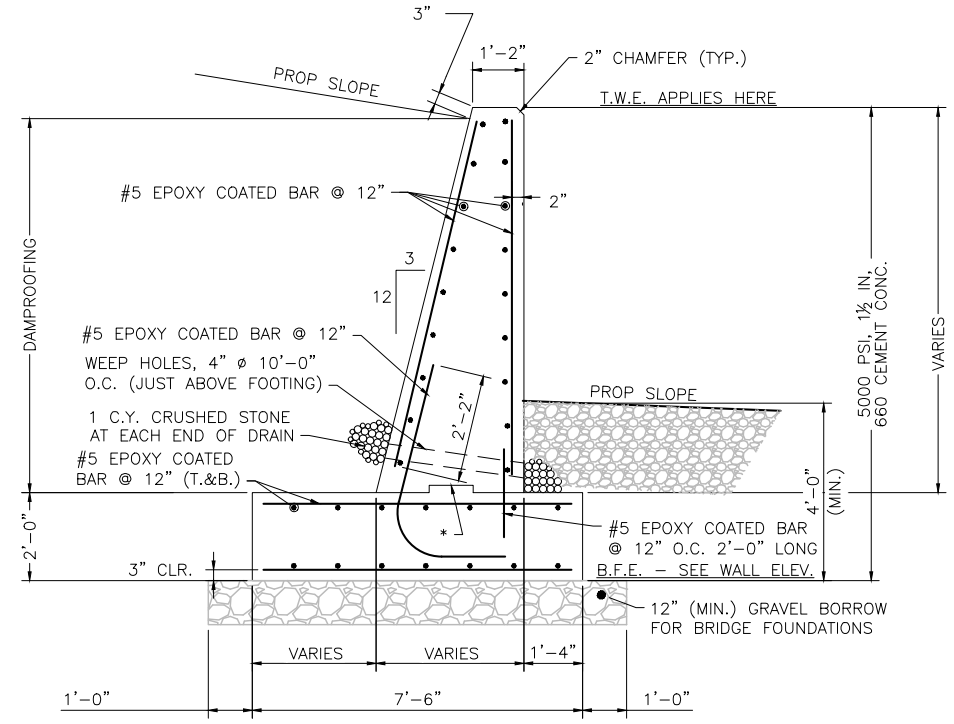
608163_HD11(STRUCTURAL PLAN).DWG Plotted on 9-Aug-2024 3:13 PM

Proposal No. 608163-128112

A00831-34



CULVERT 1 LONGITUDINAL SECTION
SCALE: ½" = 1'–0"



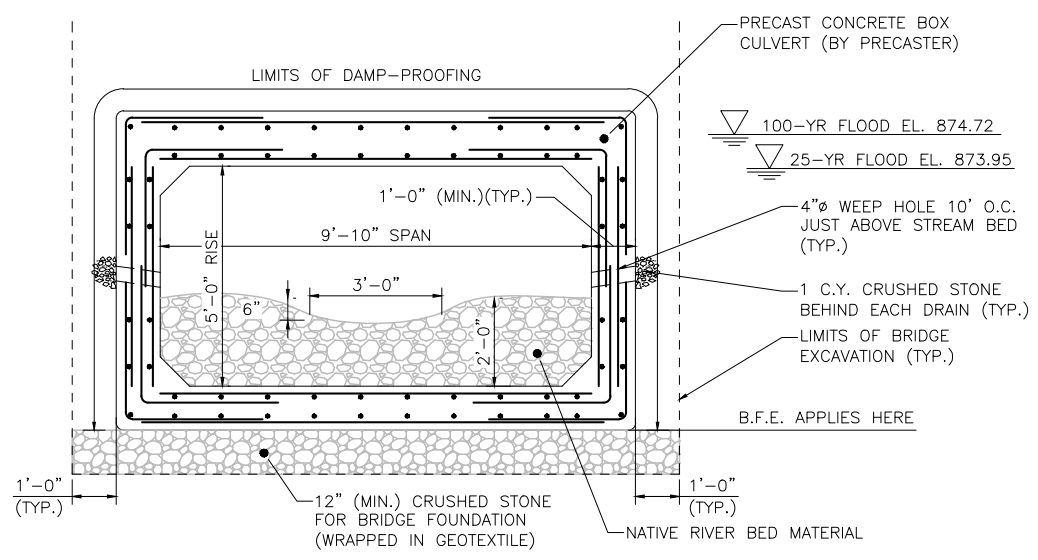
WINGWALL TYPICAL SECTION
SCALE: ½" = 1'–0"

PRECAST BOX CULVERT NOTES:

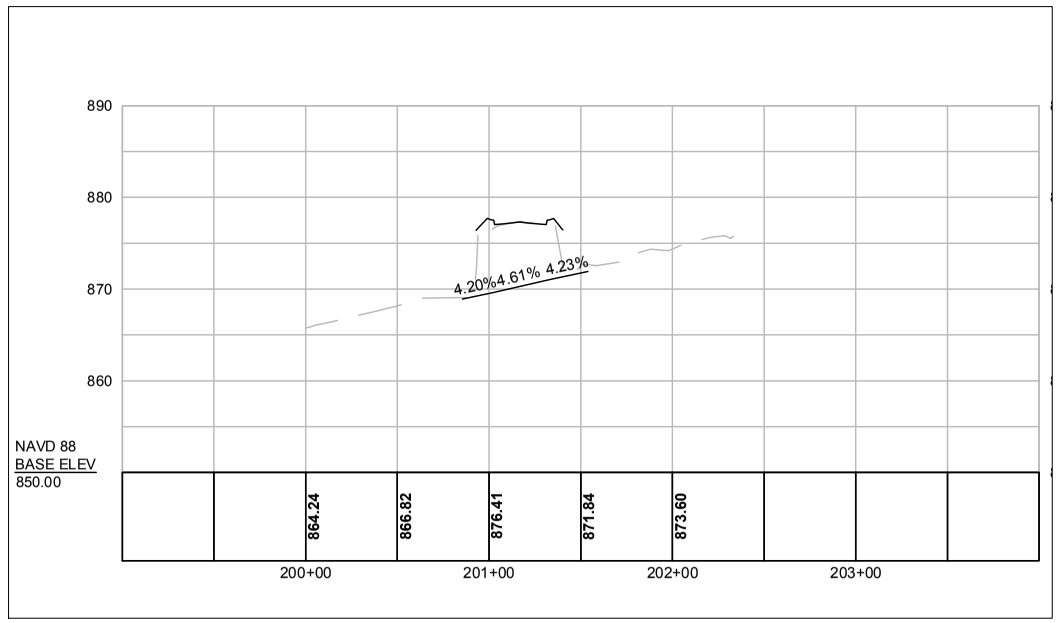
1. THE SECTION IS A PRECAST BOX CULVERT TO BE MONOLITHICALLY CAST OF REINFORCED CONCRETE. THE INSIDE SHALL BE SMOOTH AS TO NOT RESTRICT FLOW.
2. THE INTERNAL DIMENSIONS OF THE BOX CULVERT AT THIS SITE ARE 9'–10" WIDE, 5'–0" HIGH AND A MINIMUM 10" SLAB AND WALL THICKNESS.
3. DESIGN CRITERIA:
   - 3.1. DESIGN SHALL BE IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIAL (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS (AASHTO 9th EDITION) FOR HL–93 LOADING.
   - 3.2. STEEL REINFORCEMENT SHALL BE GRADED CONFORMING TO AASHTO M31.
   - 3.3. MINIMUM 5000 PSI CEMENT CONCRETE STRENGTH @ 28 DAYS.
   - 3.4. CONCRETE COVER FOR REINFORCING STEEL BARS SHALL BE 2 INCHES.

REFERENCE NOTES:

1. FOR CULVERT 1 HEADWALL ELEVATIONS, SEE SHEET NO. 167.
2. FOR CULVERT 1 WINGWALL ELEVATIONS, SEE SHEET NO. 168.
3. FOR CONCRETE HEADWALL DETAILS, CUT–OFF AND RETURN WALL DETAILS, STRIATION DETAILS, AND WINGWALL DETAILS, SEE SHEET NO. 174.



CULVERT 1 TRANSVERSE SECTION
SCALE: ½" = 1'–0"



NOTES:

1. INSTALL 4" WEEP HOLES @ 10'–0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 2.06 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 5.04 KSF.
   FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

608163_HD11(STRUCTURAL PLAN).DWG Plotted on 9-Aug-2024 3:14 PM
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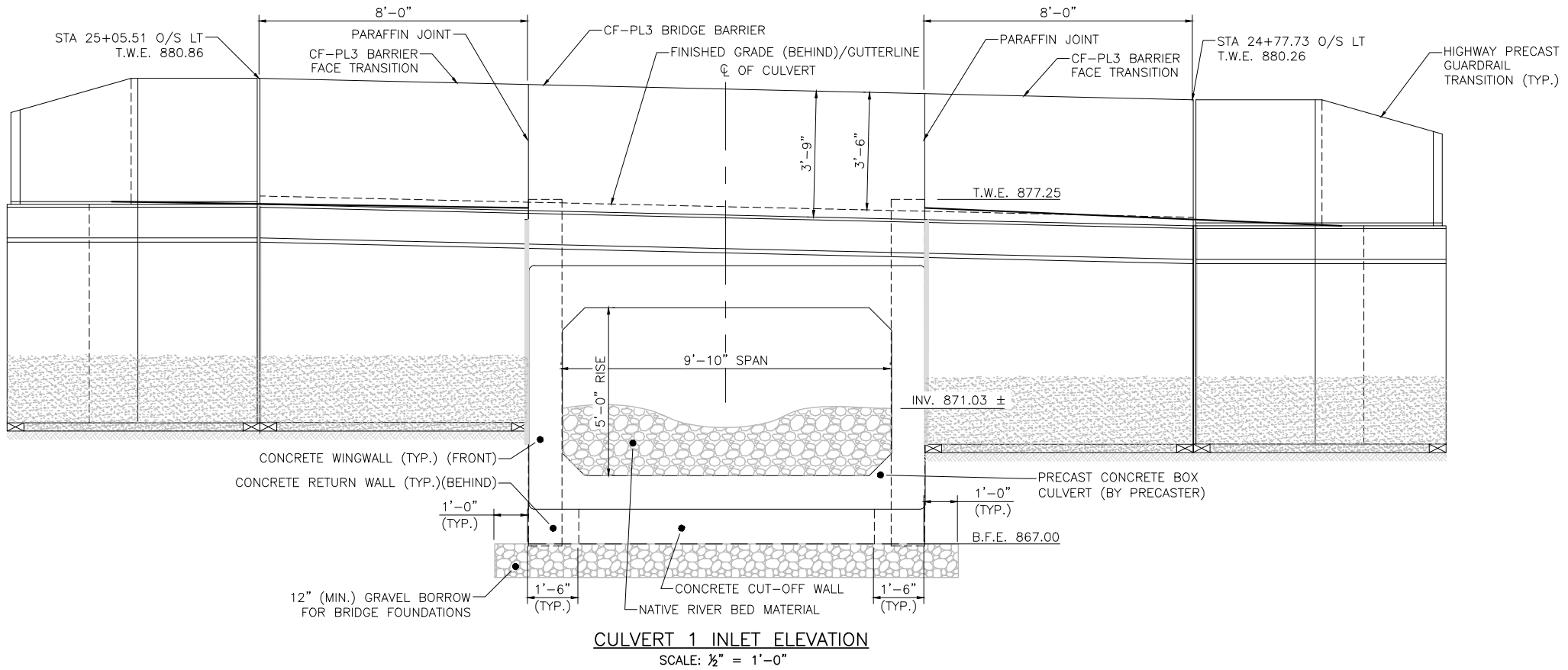
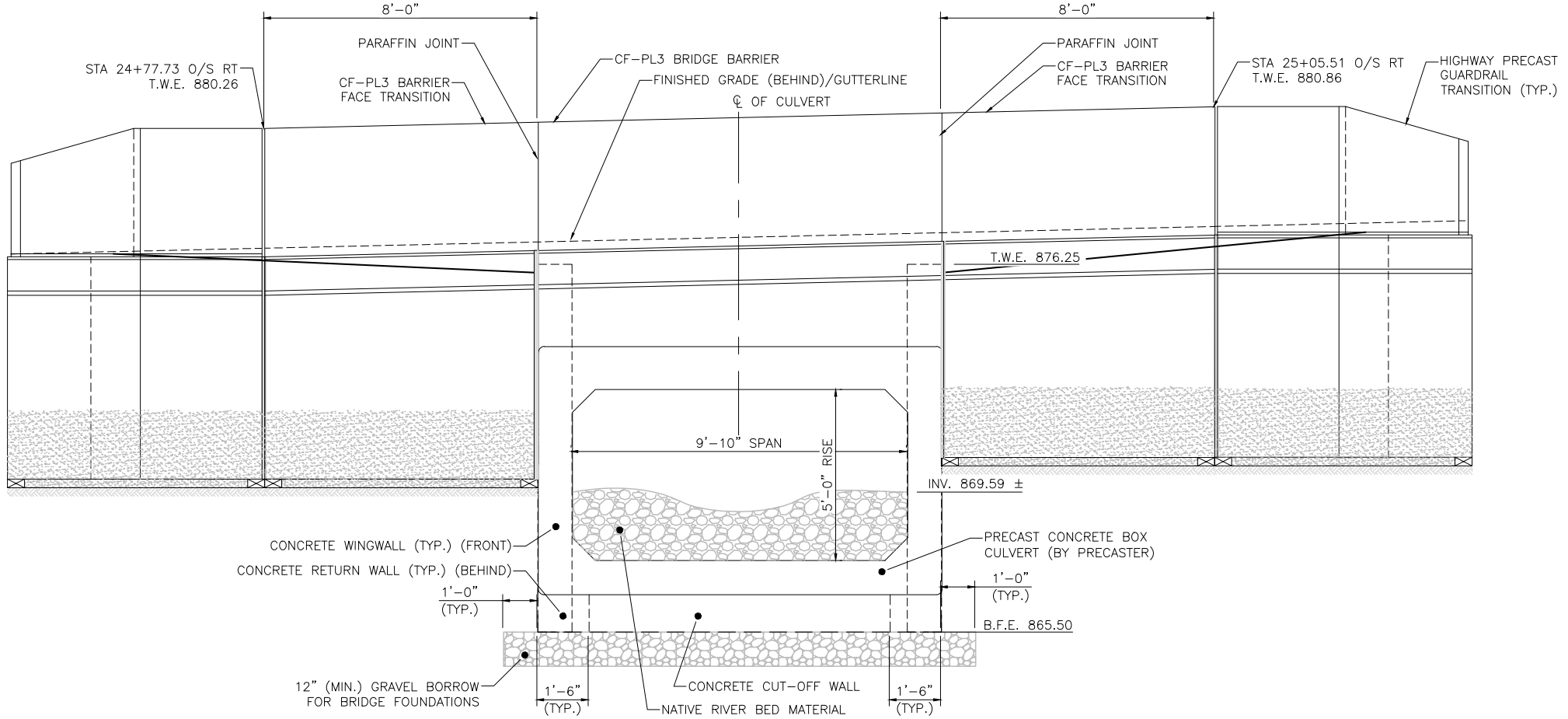
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 1 HEADWALL ELEVATIONS



CULVERT 1 INLET ELEVATION
SCALE: ½" = 1'-0"



CULVERT 1 OUTLET ELEVATION
SCALE: ½" = 1'-0"

REFERENCE NOTES:

1. FOR CULVERT 1 WINGWALL ELEVATIONS, SEE SHEET NO. 168
2. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, PARAFFIN JOINT DETAILS AND WINGWALL DETAILS, SEE SHEET NO. 174.

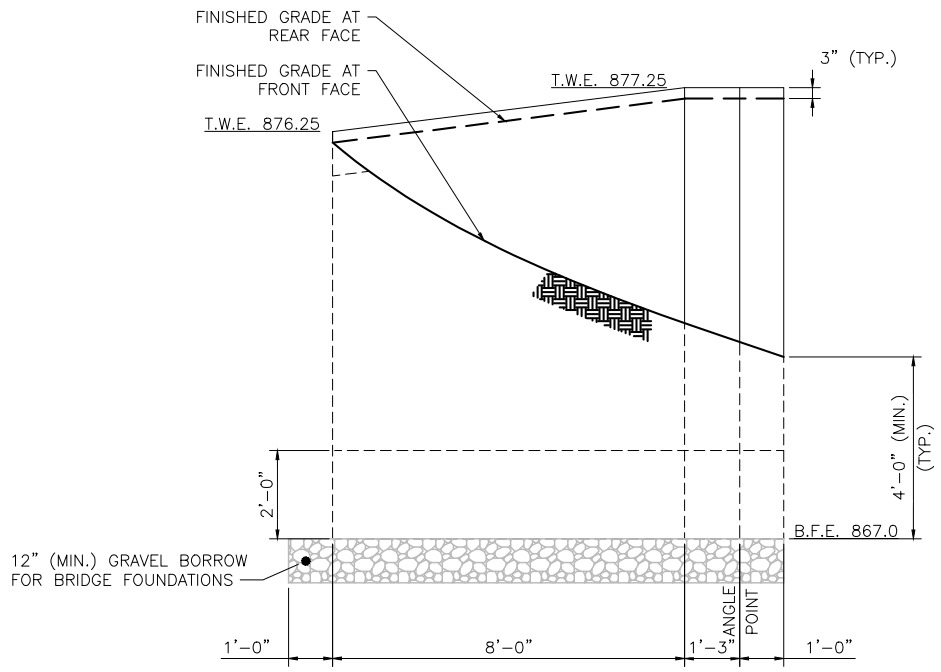
608163_HD11(STRUCTURAL PLAN).DWG Plotted on 9-Aug-2024 3:15 PM

Proposal No. 608163-128112

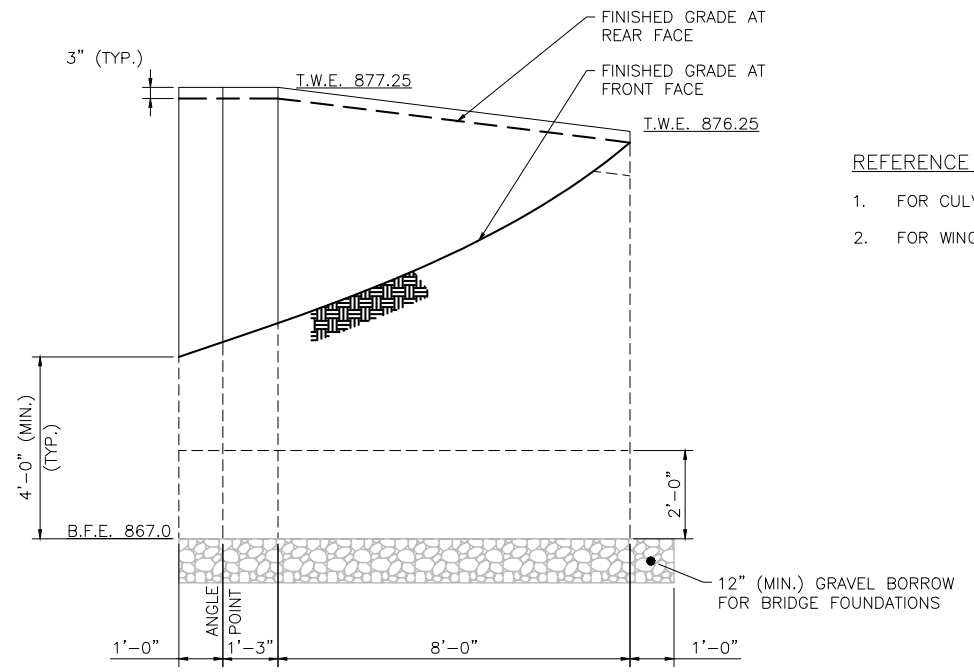
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 1 WINGWALL ELEVATIONS



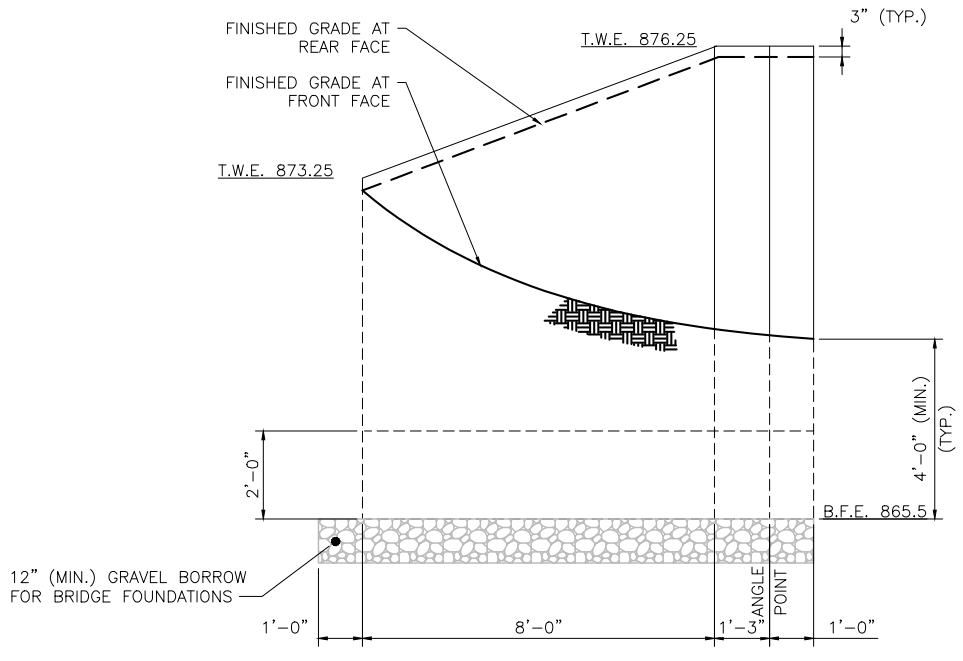
NORTHEAST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



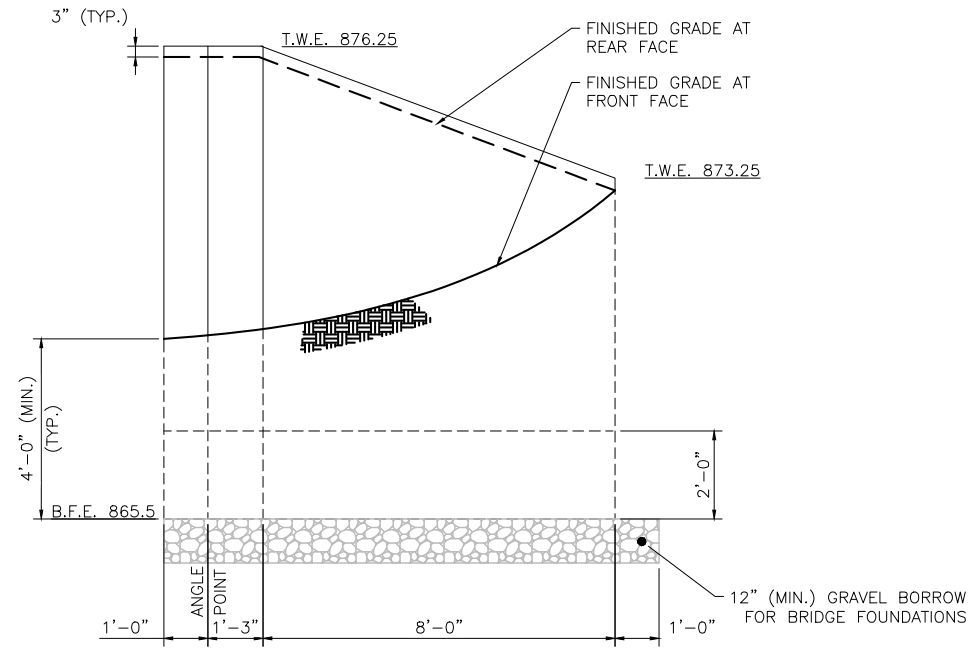
NORTHWEST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"

REFERENCE NOTES:

1. FOR CULVERT 1 WINGWALL SECTION, SEE SHEET NO. 166.
2. FOR WINGWALL DETAILS, SEE SHEET NO. 174.



SOUTHWEST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"



SOUTHEAST WINGWALL DEVELOPED ELEVATION
SCALE: ½" = 1'-0"

608163_HD11(STRUCTURAL PLAN).DWG Plotted on 9-Aug-2024 3:16 PM
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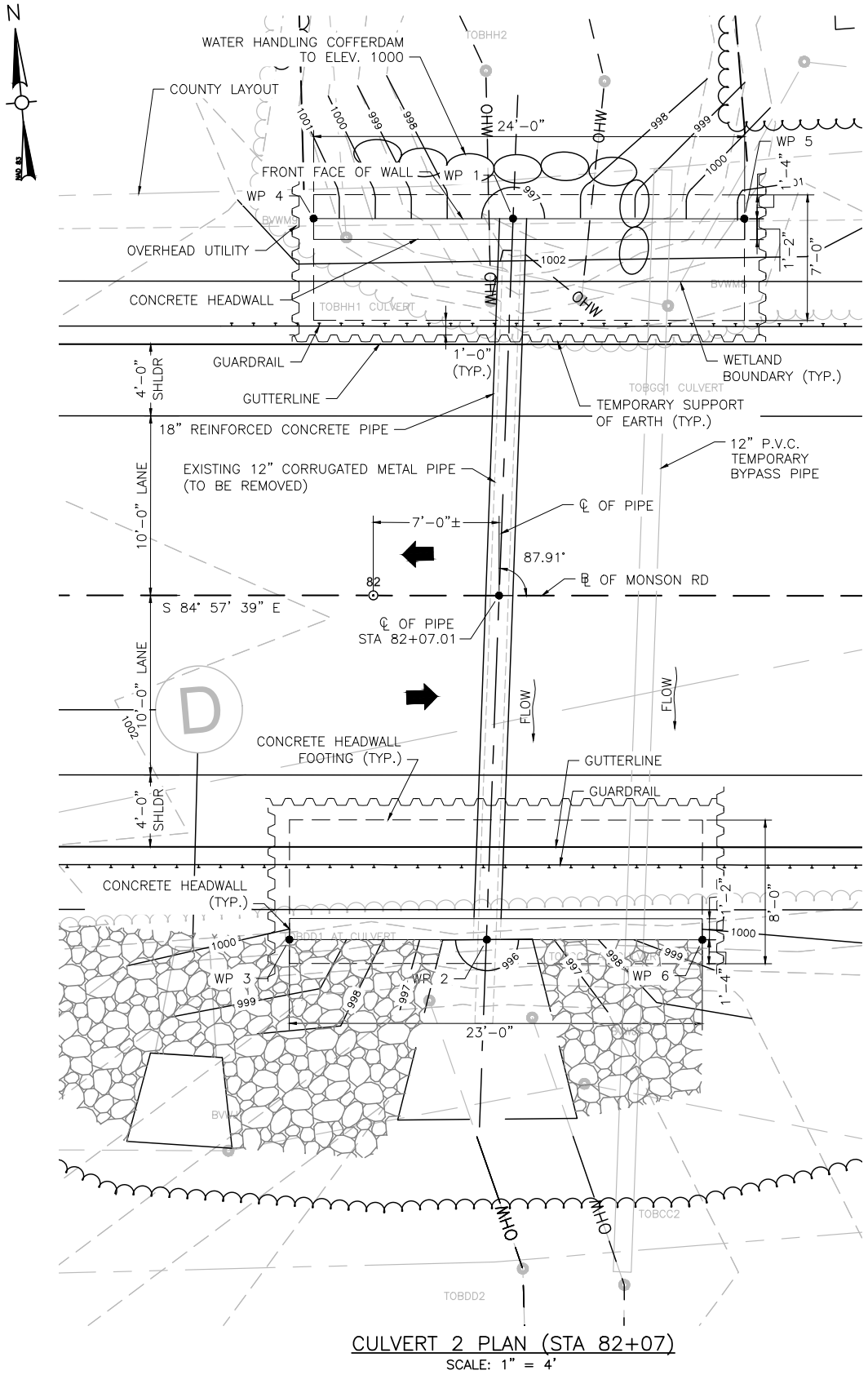

CULVERT 2 PLAN (STA 82+07)

SCALE: 1" = 4'

NOTES:

1. THE FACTORED BEARING PRESSURE = 2.18 KSF AT THE INLET HEADWALL AND 2.64 KSF AT THE OUTLET HEADWALL AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 5.35 KSF AT THE INLET HEADWALL AND 5.52 KSF AT THE OUTLET HEADWALL. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS FOR HL–93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 81+25± (LT) SPIKE IN UTILITY POLE: EL. 1005.74

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

5000 PSI, 1½", 660 CEMENT CONCRETE.....HEADWALLS

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING PIPES.
4. INSTALL THE PROPOSED PIPE & HEADWALLS.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE PROPOSED CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	167
CLASS "A" TRENCH EXCAVATION	C.Y.	11
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	150
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	20
5000 PSI 1½" 660 CEMENT CONCRETE	C.Y.	52
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	10010
DAMPPROOFING	S.F.	426
TEMPORARY SUPPORT OF EARTH	L.S.	1
CONTROL OF WATER – STRUCTURE NO. 2	L.S.	1

WORKING POINTS		
POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2847313.7204	453680.2286
2	2847273.8336	453675.2733
3	2847274.8008	453664.3163
4	2847314.6939	453669.1581
5	2847312.5891	453693.0567
6	2847272.7828	453687.1995

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO. 608163			

CULVERT 2 KEY PLAN AND NOTES

TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	10.24
DESIGN FLOOD DISCHARGE (C.F.S.)	9
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	0.14
DESIGN FLOOD ELEVATION (FEET, NAVD)	996.14
BASE (100–YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	9
BASE FLOOD ELEVATION (FEET, NAVD)	999.20
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	5
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	6.70
DESIGN FLOOD ELEVATION (FEET, NAVD)	998.46

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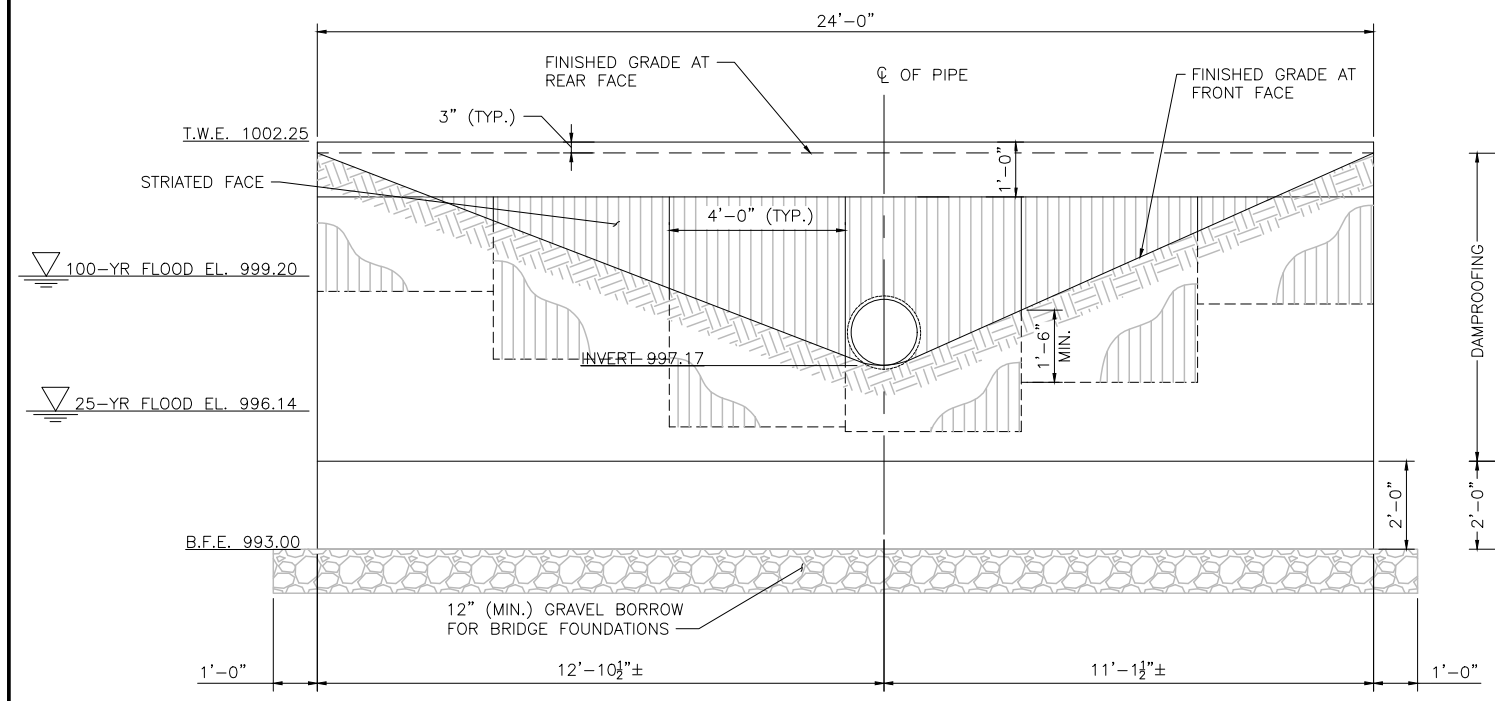
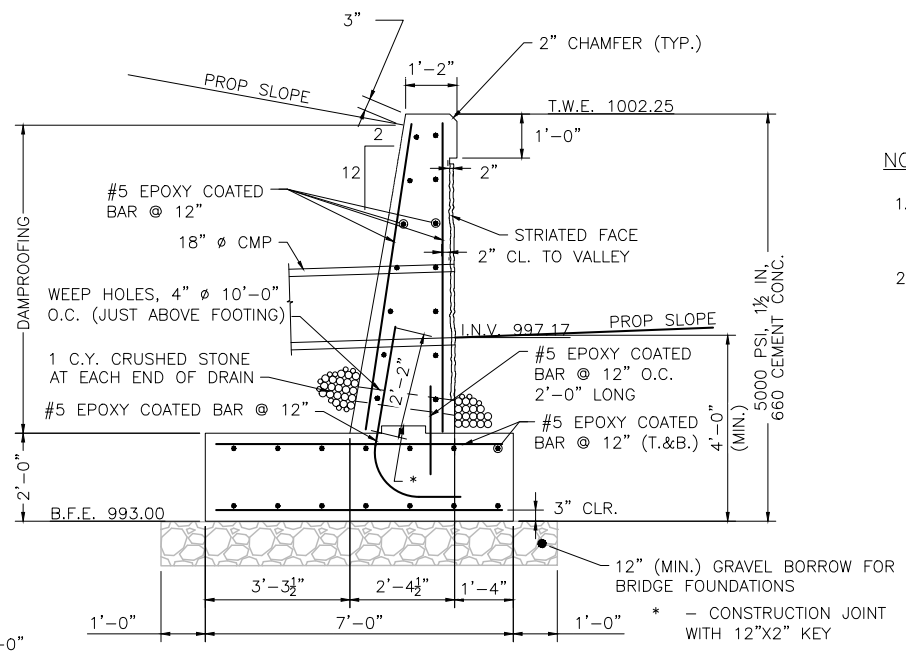
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 2 WALL DETAILS



NORTH INLET HEADWALL ELEVATION
SCALE: ½" = 1'-0"

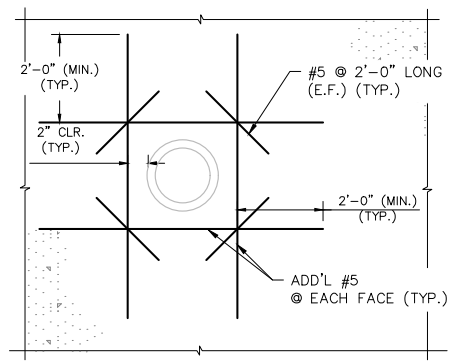


NORTH INLET HEADWALL SECTION
SCALE: ½" = 1'-0"

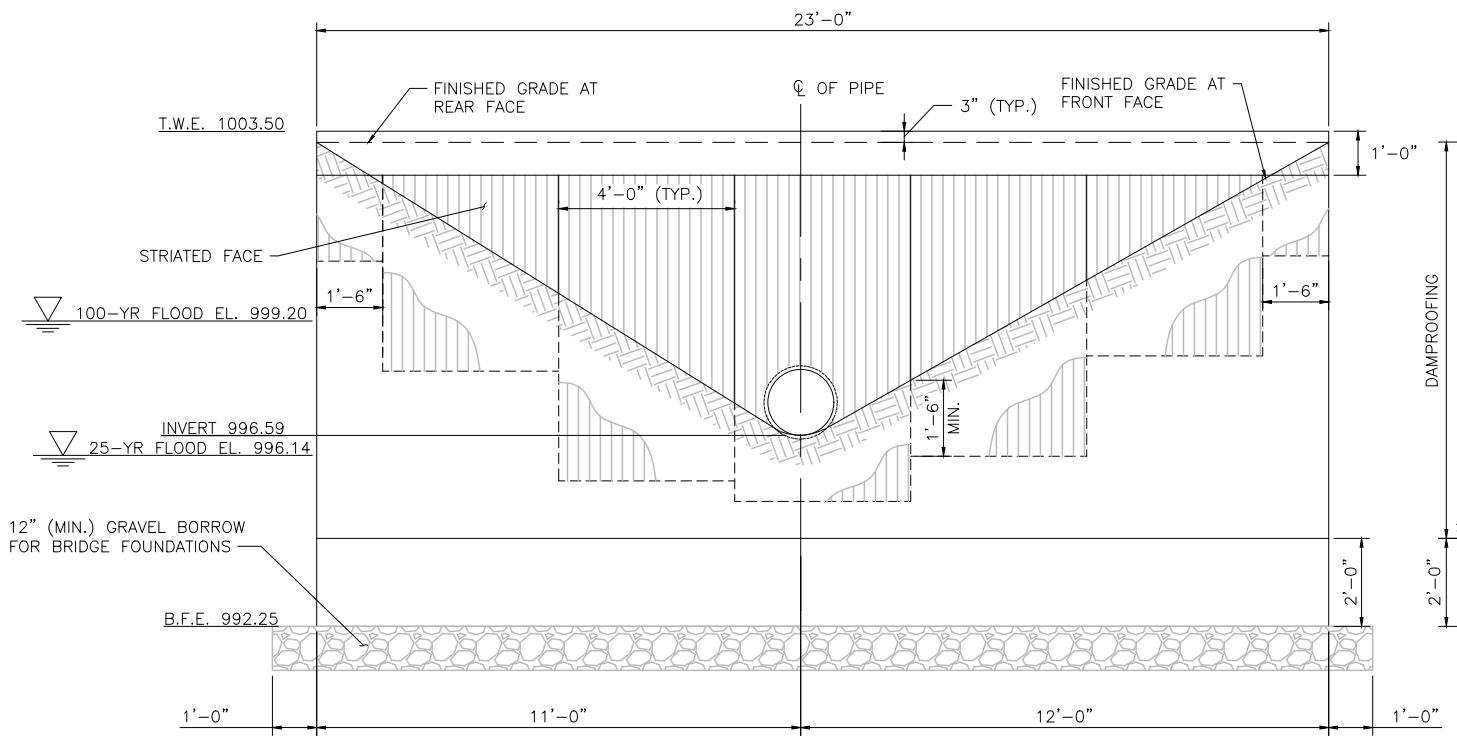
NOTES:

1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 2.18 KSF AT THE INLET HEADWALL AND 2.64 KSF AT THE OUTLET HEADWALL AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

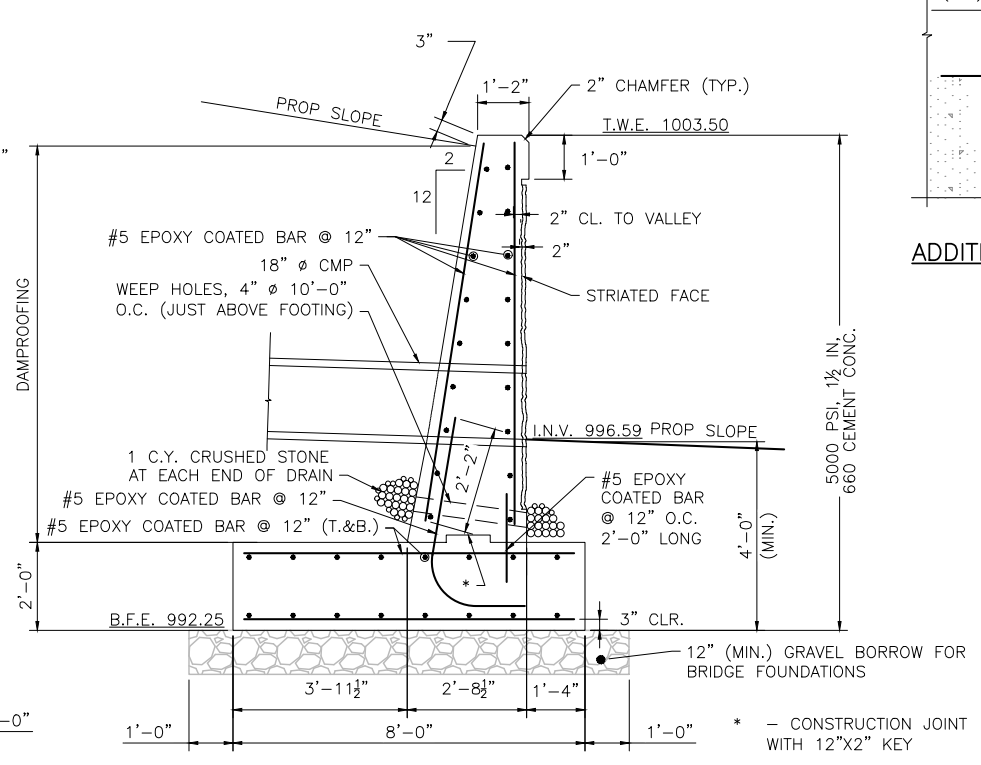
   FACTORED BEARING RESISTANCE = 5.35 KSF AT THE INLET HEADWALL AND 5.52 KSF AT THE OUTLET HEADWALL. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.



ADDITIONAL REINFORCEMENT AT PIPE
SCALE: ½" = 1'-0"



SOUTH OUTLET HEADWALL ELEVATION
SCALE: ½" = 1'-0"



SOUTH OUTLET HEADWALL SECTION
SCALE: ½" = 1'-0"

REFERENCE NOTES:

1. FOR STRIATION DETAILS, SEE SHEET NO. 174.

608163_HD11(STRUCTURAL PLAN).DWG Plotted on 9-Aug-2024 3:19 PM

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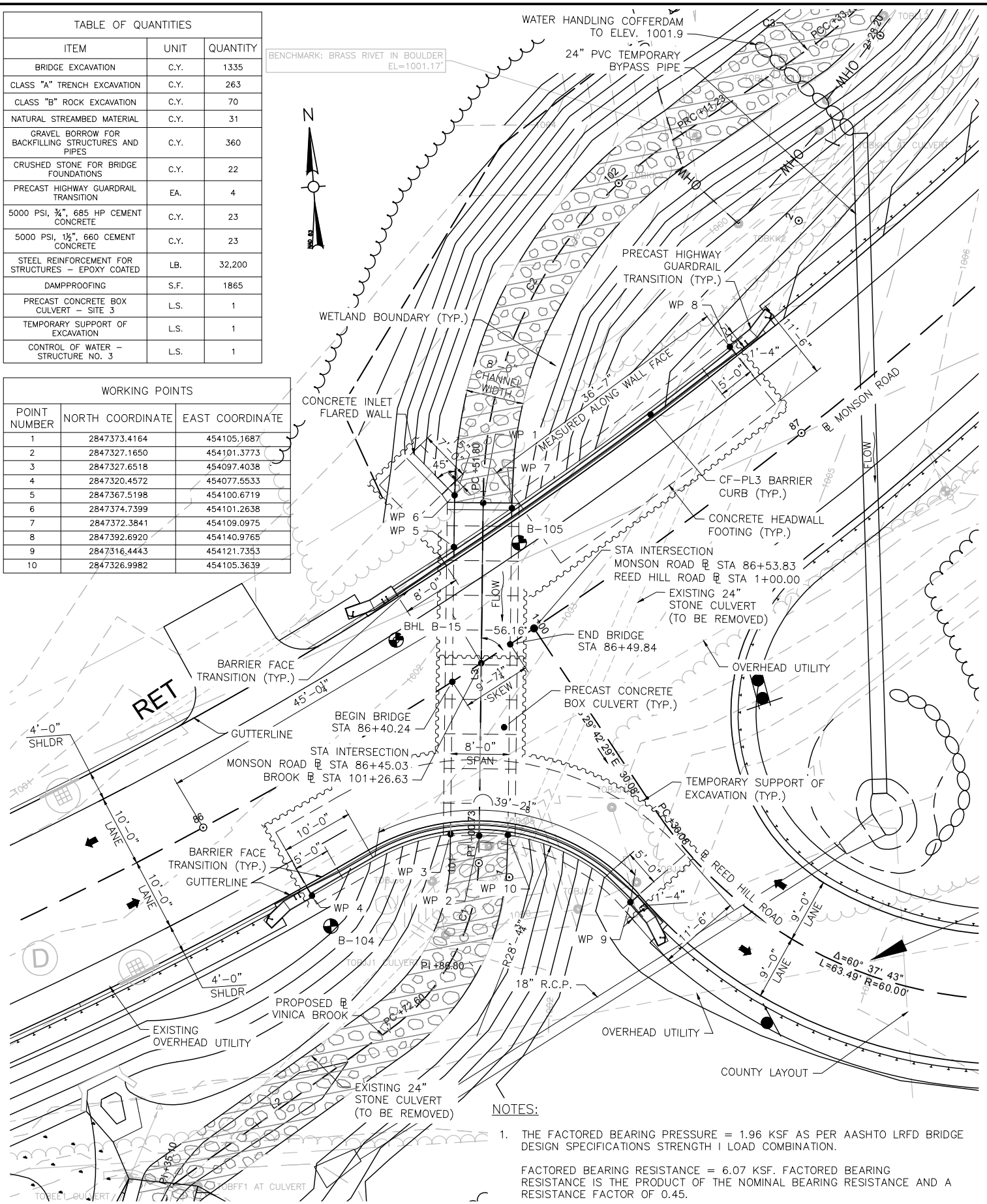
TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
BRIDGE EXCAVATION	C.Y.	1335
CLASS "A" TRENCH EXCAVATION	C.Y.	263
CLASS "B" ROCK EXCAVATION	C.Y.	70
NATURAL STREAMBED MATERIAL	C.Y.	31
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	C.Y.	360
CRUSHED STONE FOR BRIDGE FOUNDATIONS	C.Y.	22
PRECAST HIGHWAY GUARDRAIL TRANSITION	EA.	4
5000 PSI, ¾", 685 HP CEMENT CONCRETE	C.Y.	23
5000 PSI, 1½", 660 CEMENT CONCRETE	C.Y.	23
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	LB.	32,200
DAMPPROOFING	S.F.	1865
PRECAST CONCRETE BOX CULVERT – SITE 3	L.S.	1
TEMPORARY SUPPORT OF EXCAVATION	L.S.	1
CONTROL OF WATER – STRUCTURE NO. 3	L.S.	1

WORKING POINTS		
POINT NUMBER	NORTH COORDINATE	EAST COORDINATE
1	2847373.4164	454105.1687
2	2847327.1650	454101.3773
3	2847327.6518	454097.4038
4	2847320.4572	454077.5533
5	2847367.5198	454100.6719
6	2847374.7399	454101.2638
7	2847372.3841	454109.0975
8	2847392.6920	454140.9765
9	2847316.4443	454121.7353
10	2847326.9982	454105.3639



CULVERT 3 PLAN (STA 86+45)

SCALE: 1" = 8'

NOTES:

1. THE FACTORED BEARING PRESSURE = 1.96 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 6.07 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIM SPECIFICATIONS FOR HL-93 LOADING.

EXISTING CONDITIONS:

DIMENSIONS SHOWN AND DETAILS DEPICTED ARE BASED UPON THE ORIGINAL BRIDGE PLANS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

BENCH MARK:

BENCHMARK STA 87+10± (RT) SPIKE IN UTILITY POLE: EL. 1007.89 FT

BENCHMARK STA 87+20± (LT) BRASS RIVET: EL. 1001.17 FT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIALS:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS

CONCRETE MIX:

THE CEMENT CONCRETE SPECIFIED BELOW SHALL BE USED ON THE FOLLOWING BRIDGE COMPONENTS:

5000 PSI, ¾", 685 HP CEMENT CONCRETE.....CF-PL3 BARRIER CURB AND TRANSITION BARRIER CURB

5000 PSI, 1½", 660 CEMENT CONCRETE.....HEADWALLS

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

WATER HANDLING SEQUENCE FOR CULVERTS:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO. 608163			

CULVERT 3 KEY PLAN AND NOTES

TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2025	–
AVERAGE DAILY TRAFFIC – PRESENT	660	–
AVERAGE DAILY TRAFFIC – DESIGN YEAR	760	–
DESIGN HOURLY VOLUME	85	–
DIRECTIONAL DISTRIBUTION	52%	–
TRUCK PERCENTAGE – AVERAGE DAY	3%	–
TRUCK PERCENTAGE – PEAK HOUR	3%	–
DESIGN SPEED	40 MPH	–
DIRECTIONAL DESIGN HOURLY VOLUME	45	–

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000 YR
DESIGN SPECTRA	
As	0.071g
SDs	0.156g
SD1	0.063g
SITE CLASS	C
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	0.33
DESIGN FLOOD DISCHARGE (C.F.S.)	52
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	3.22
DESIGN FLOOD ELEVATION (FEET, NAVD)	998.40
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	73
BASE FLOOD ELEVATION (FEET, NAVD)	998.77
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	UNKNOWN
MAXIMUM ELEVATION (FEET, NAVD)	UNKNOWN
DATE (MM/YYYY)	UNKNOWN
HISTORY OF ICE FLOES	NONE
EVIDENCE OF SCOUR AND EROSION	NONE

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	18
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	8.91
DESIGN FLOOD ELEVATION (FEET, NAVD)	1001.42

608163_HD11(STRUCTURAL PLAN).DWG Plotted on 9-Aug-2024 3:19 PM
Proposal No. 608163-128112
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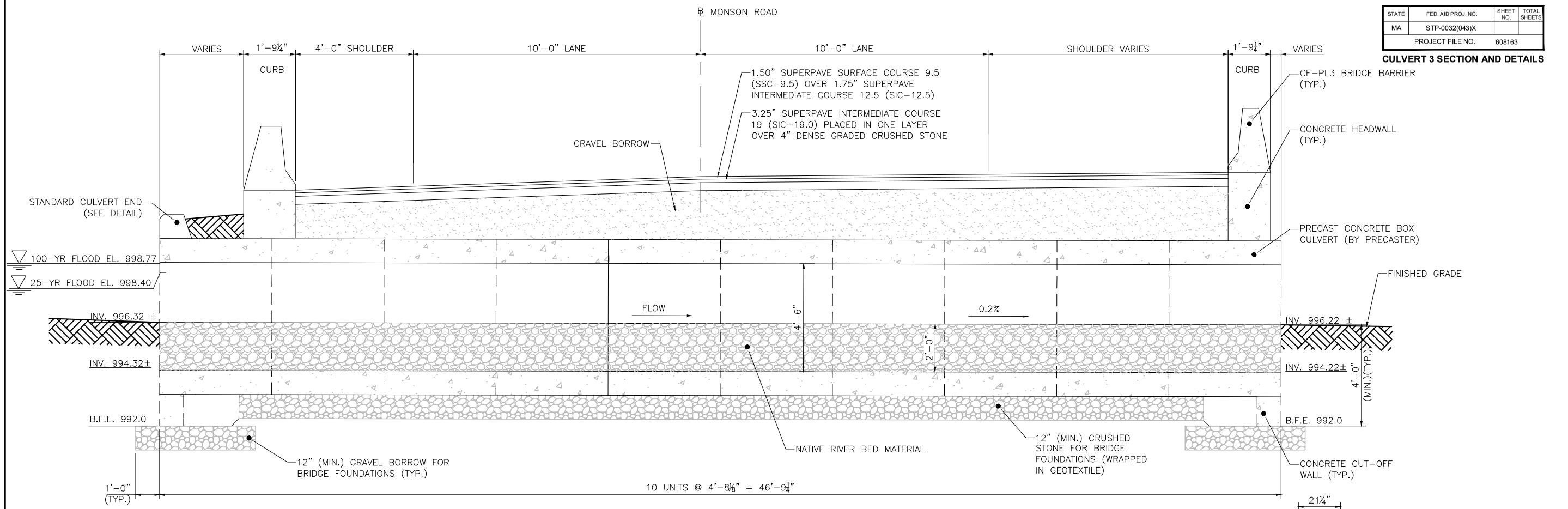
WALES
MONSON ROAD

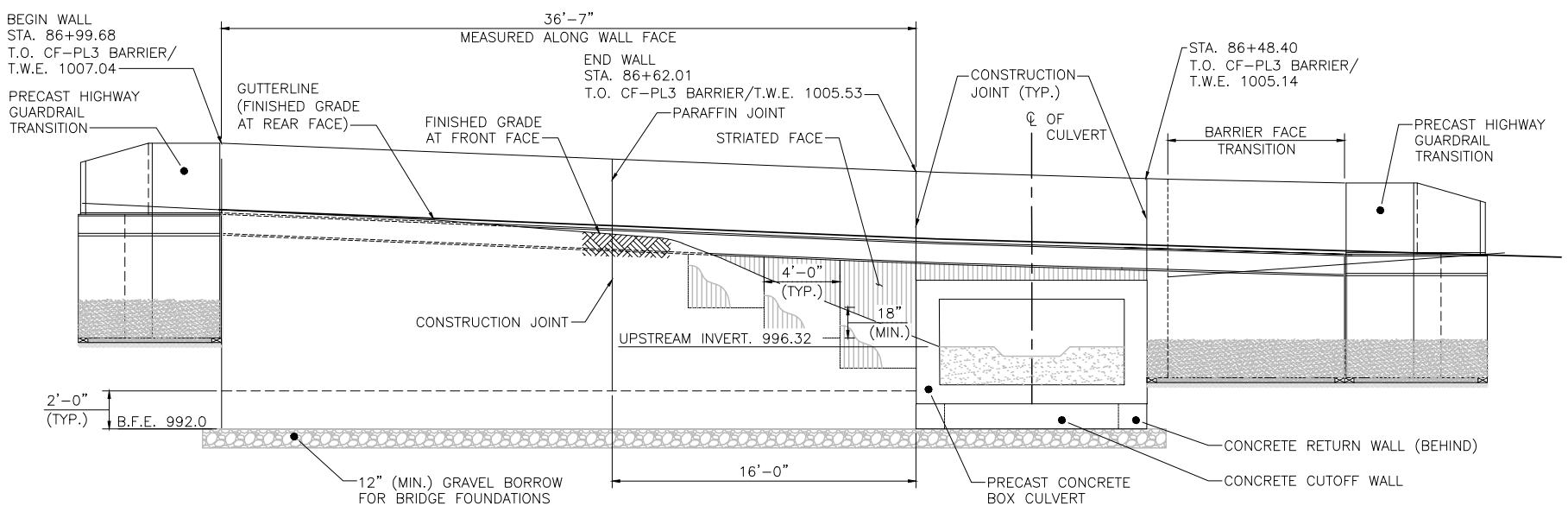
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 3 SECTION AND DETAILS



CULVERT 3 LONGITUDINAL SECTION – ALONG STREAM BASELINE

SCALE: ½" = 1'-0"



CULVERT 3 INLET NORTH ELEVATION

SCALE: ¼" = 1'-0"

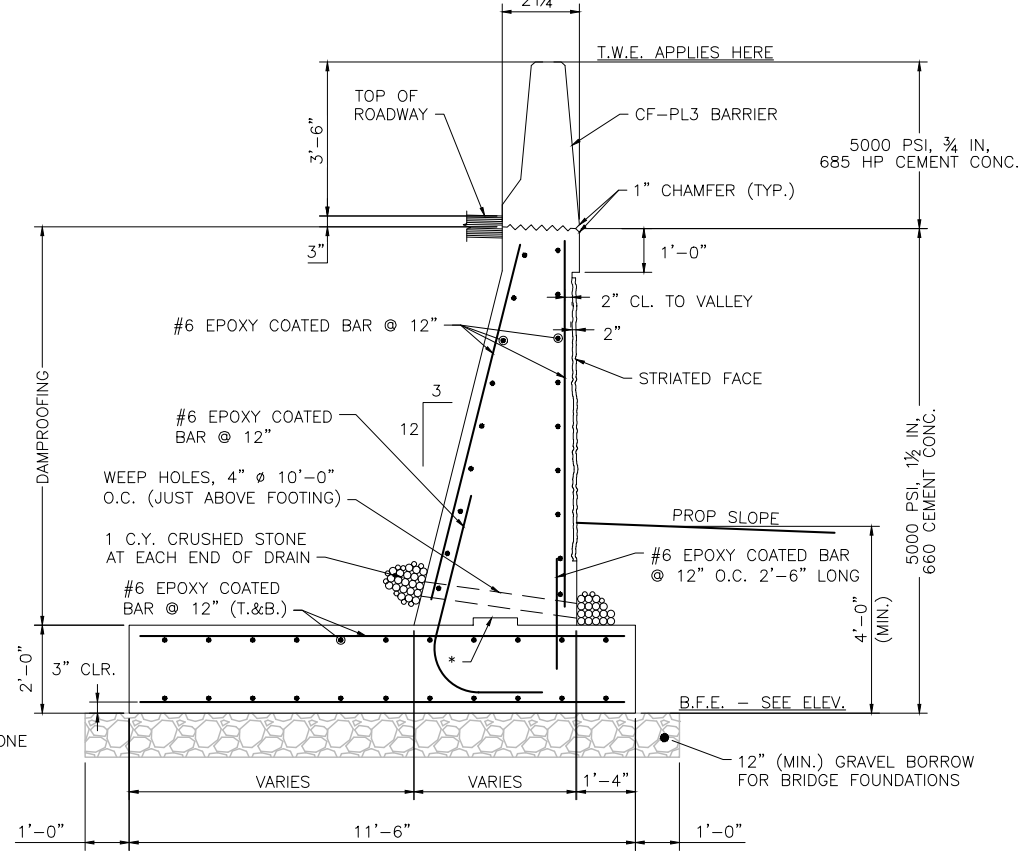
REFERENCE NOTES:

1. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, CONCRETE END WALL DETAIL, PARAFFIN JOINT DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 174.

NOTES:

1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 1.96 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 6.07 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.



RETAINING WALL SECTION

SCALE: ½" = 1'-0"

* – CONSTRUCTION JOINT WITH 12"X2" KEY

608163_HD11(STRUCTURAL PLAN).DWG Plotted on 9-Aug-2024 3:21 PM

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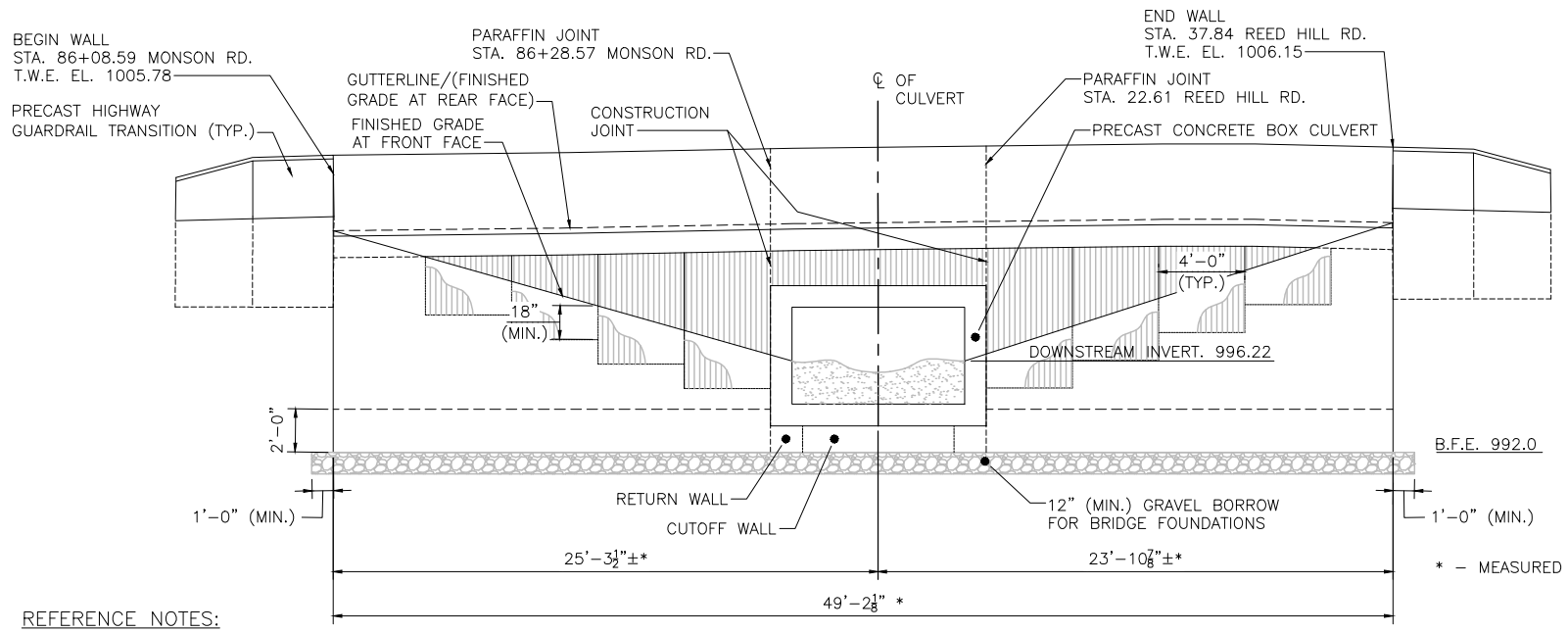
608163_HD11(STRUCTURAL PLAN).DWG Plotted on 9-Aug-2024 3:24 PM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CULVERT 3 WALL ELEVATION AND DETAILS



* – MEASURED ALONG WALL FACE

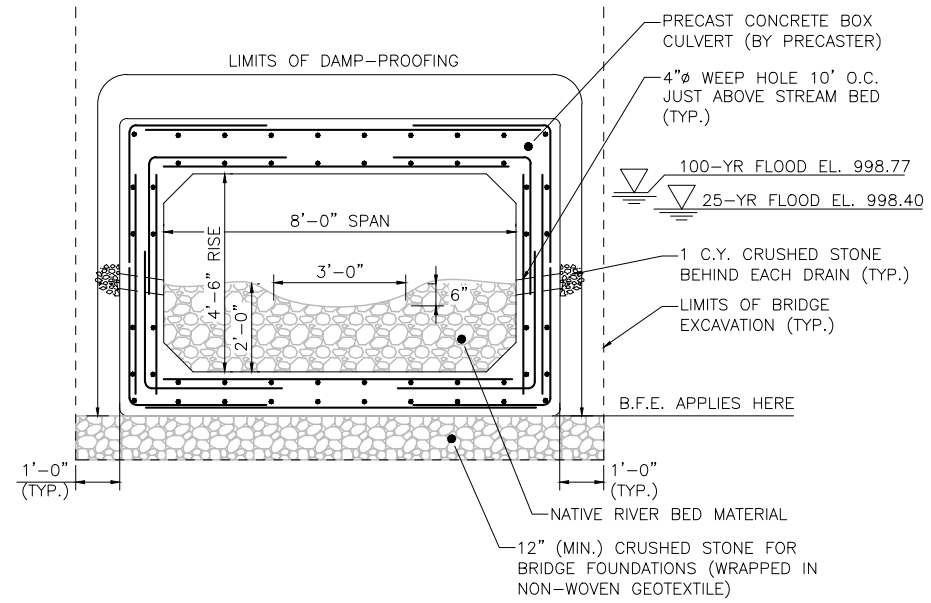
CULVERT 3 OUTLET/SOUTH ELEVATION
SCALE: ¼" = 1'-0"

REFERENCE NOTES:

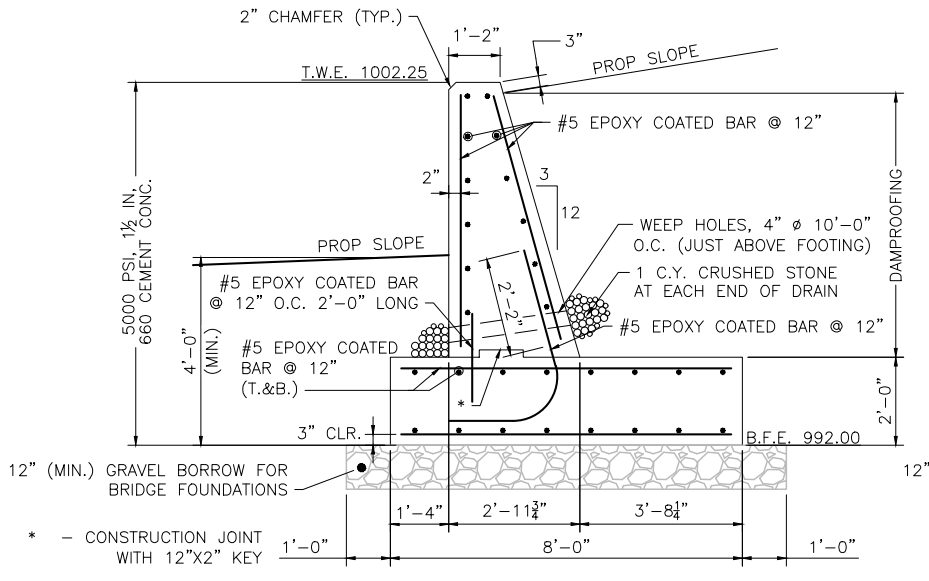
1. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, CONCRETE END WALL DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 172.

PRECAST BOX CULVERT NOTES:

1. THE SECTION IS A PRECAST BOX CULVERT TO BE MONOLITHICALLY CAST OF REINFORCED CONCRETE. THE INSIDE SHALL BE SMOOTH AS TO NOT RESTRICT FLOW.
2. THE INTERNAL DIMENSIONS OF THE BOX CULVERT AT THIS SITE ARE 8'-0" WIDE, 4'-6" HIGH AND A MINIMUM 10" SLAB AND WALL THICKNESS.
3. DESIGN CRITERIA:
   - 3.1. DESIGN SHALL BE IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIAL (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS (9th EDITION) FOR HL-93 LOADING.
   - 3.2. STEEL REINFORCEMENT SHALL BE GRADED CONFORMING TO AASHTO M31.
   - 3.3. MINIMUM 5000 PSI CEMENT CONCRETE STRENGTH @ 28 DAYS.
   - 3.4. CONCRETE COVER FOR REINFORCING STEEL BARS SHALL BE 2 INCHES.

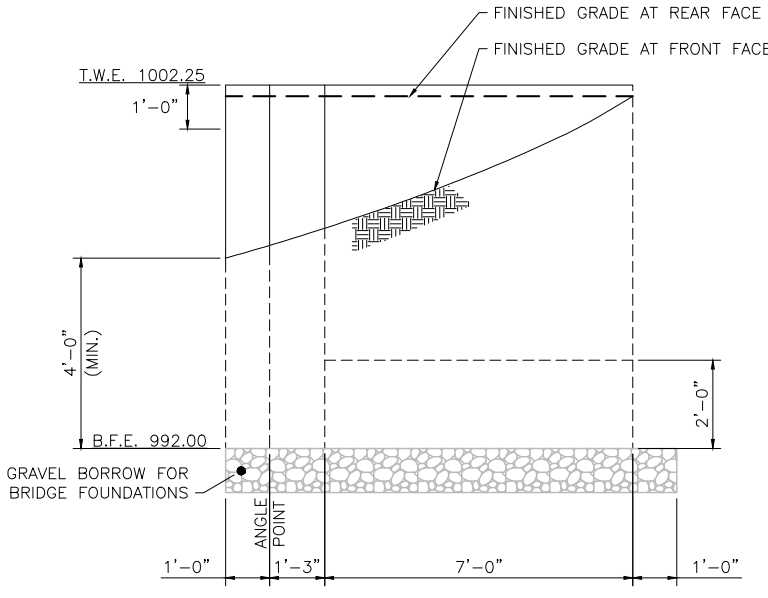


CULVERT 3 TRANSVERSE SECTION
SCALE: ½" = 1'-0"



* – CONSTRUCTION JOINT WITH 12"X2" KEY

CULVERT 3 INLET FLARED WALL – SECTION
SCALE: ½" = 1'-0"



CULVERT 3 INLET FLARED WALL – ELEVATION
SCALE: ½" = 1'-0"

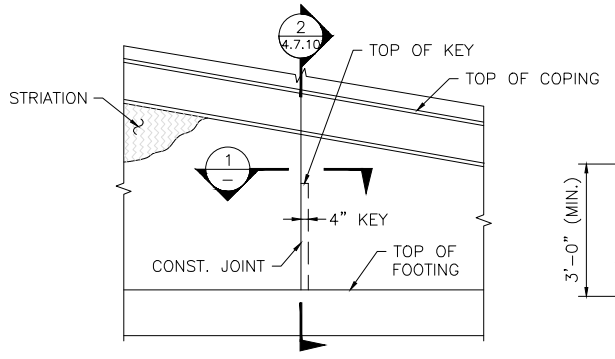
NOTES:

1. INSTALL 4" WEEP HOLES @ 10'-0" O.C. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF THE WEEP HOLE.
2. THE FACTORED BEARING PRESSURE = 1.90 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

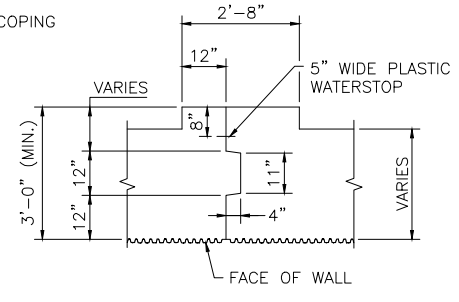
   FACTORED BEARING RESISTANCE = 5.27 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

REFERENCE NOTES:

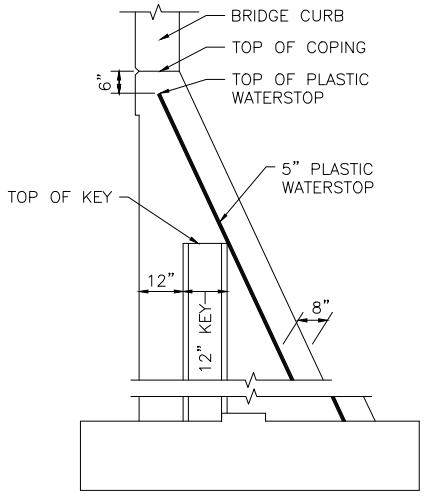
1. FOR CONCRETE HEADWALL DETAILS, CUT-OFF AND RETURN WALL DETAILS, STRIATION DETAILS, CONCRETE END WALL DETAIL, PARAFFIN JOINT DETAIL AND WINGWALL DETAILS, SEE SHEET NO. 174.



WALL ELEVATION AT CONSTRUCTION JOINT
SCALE: ½" = 1'-0"

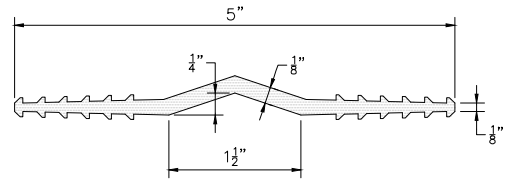


SECTION 1
SCALE: ½" = 1'-0"



NOTE:
REINFORCEMENT SHALL BE CONTINUOUS THROUGH CONSTRUCTION JOINTS.

SECTION 2
SCALE: ½" = 1'-0"



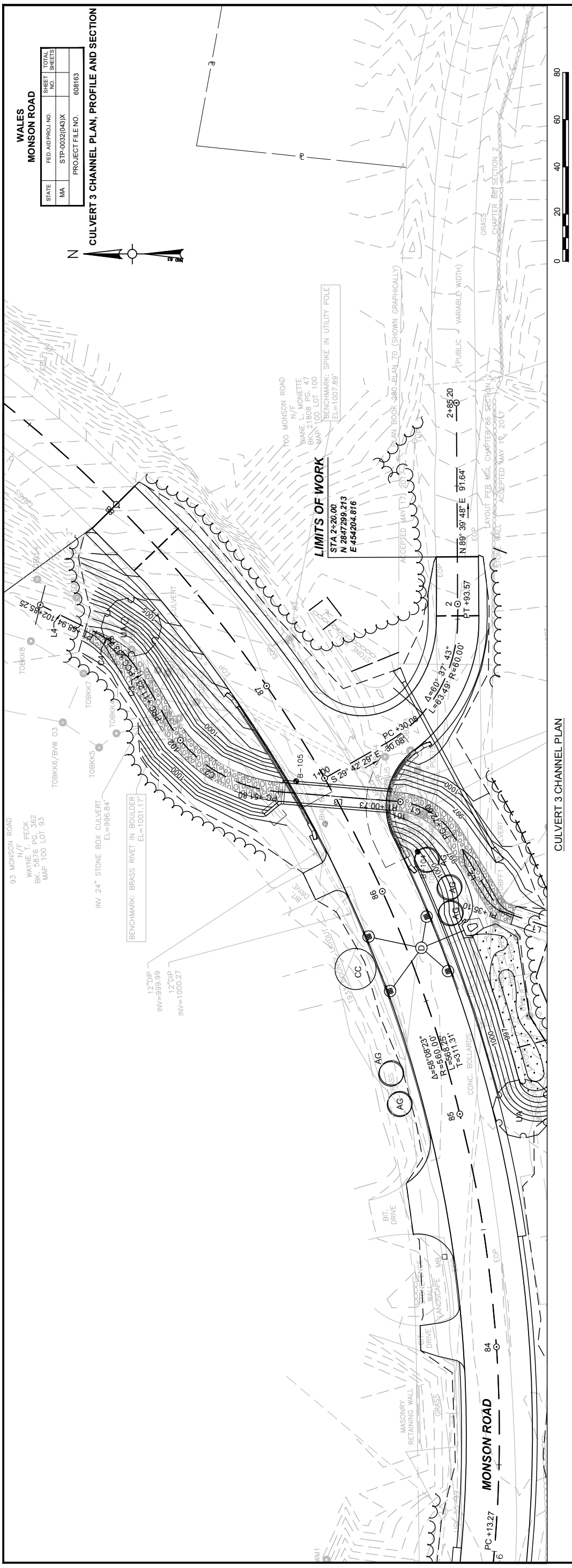
5" WATERSTOP
FULL SIZE

608163_HD12(WATER HANDLING).DWG Plotted on 6-Aug-2024 1:19 PM

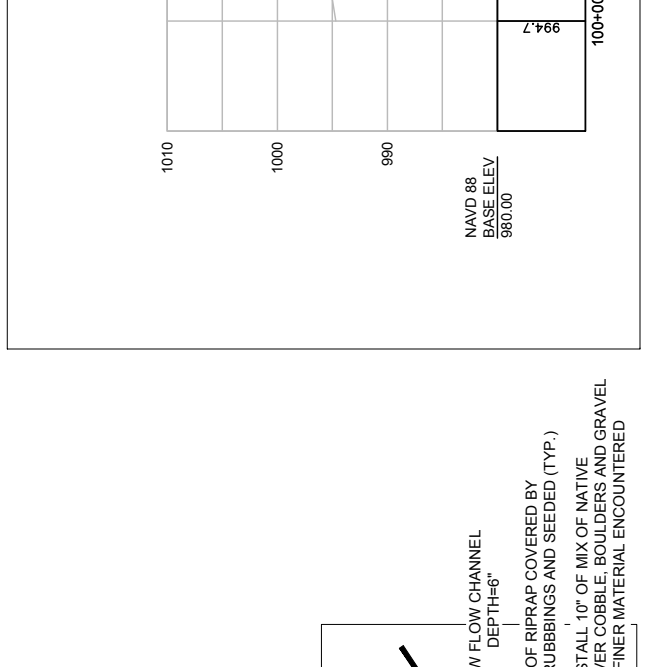
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

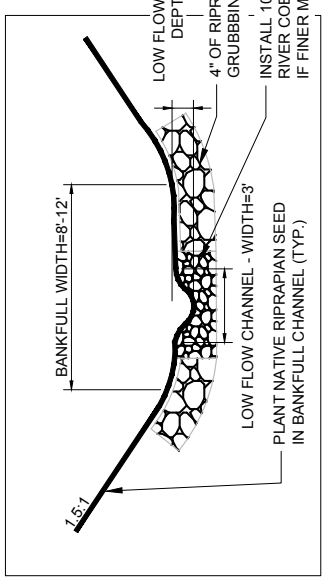
CULVERT 3 CHANNEL PLAN, PROFILE AND SECTION



CULVERT 3 CHANNEL PLAN



CULVERT 3 CHANNEL PROFILE



CULVERT 3 CHANNEL TYPICAL SECTION

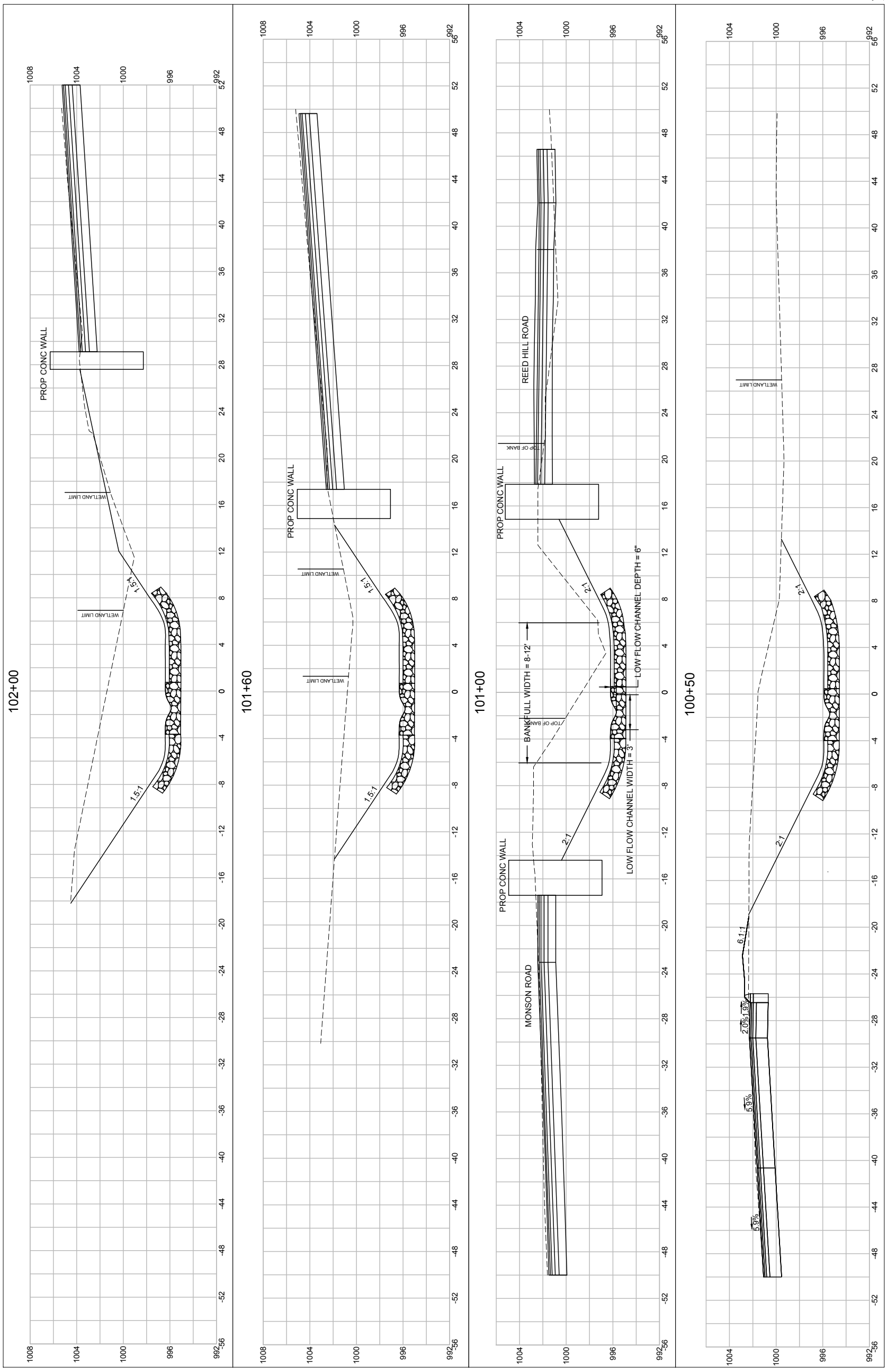
608163_HD12(WATER HANDLING).DWG Plotted on 5-Aug-2024 11:49 AM

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

CULVERT 3 CHANNEL CROSS SECTIONS

HOR. SCALE IN FEET 4 0 4 8
VER. SCALE IN FEET 4 0 4 8



REED HILL ROAD CHANNEL CROSS SECTIONS

608163_HD12(WATER HANDLING).DWG Plotted on 5-Aug-2024 11:50 AM

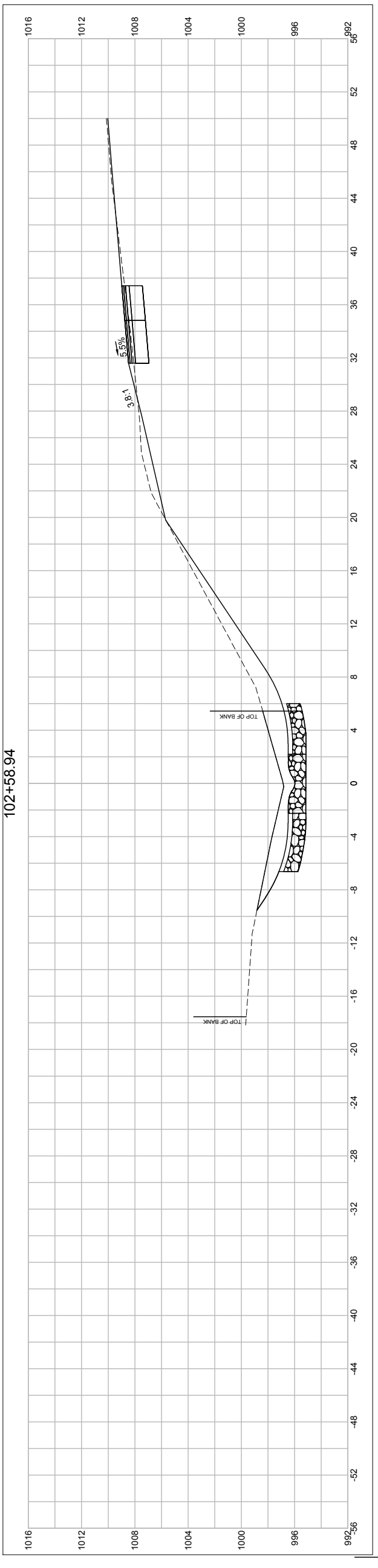
WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
	PROJECT FILE NO. 608163		

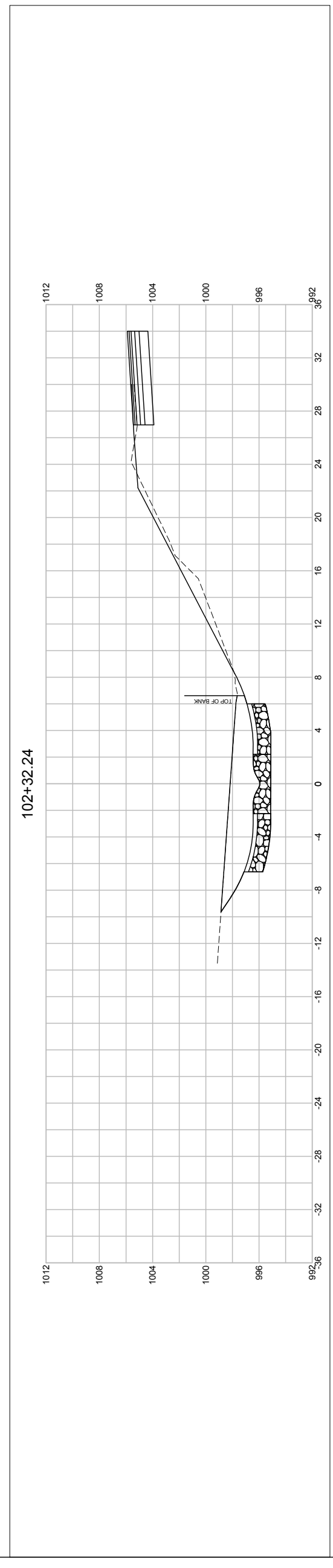
CULVERT 3 CHANNEL CROSS SECTIONS

HOR. SCALE IN FEET 0 4 8
VER. SCALE IN FEET 0 4 8

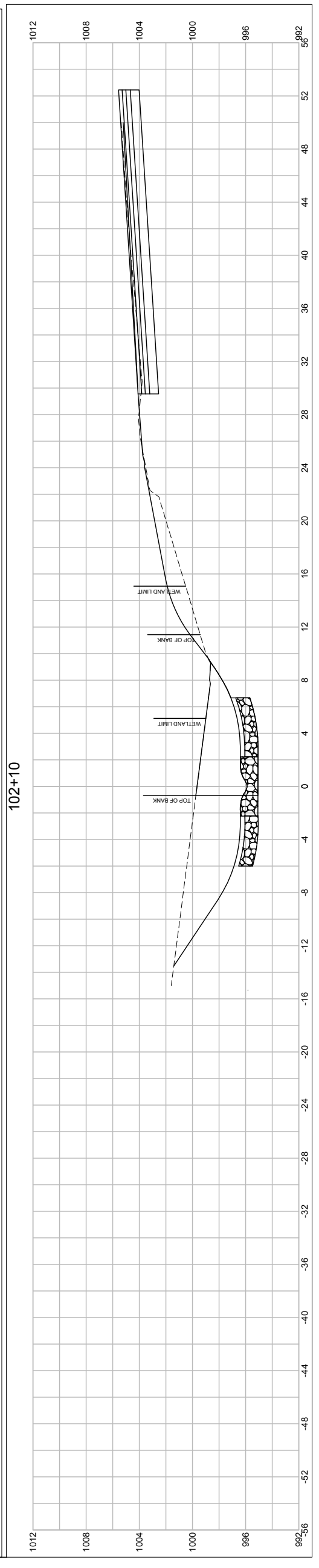
102+58.94



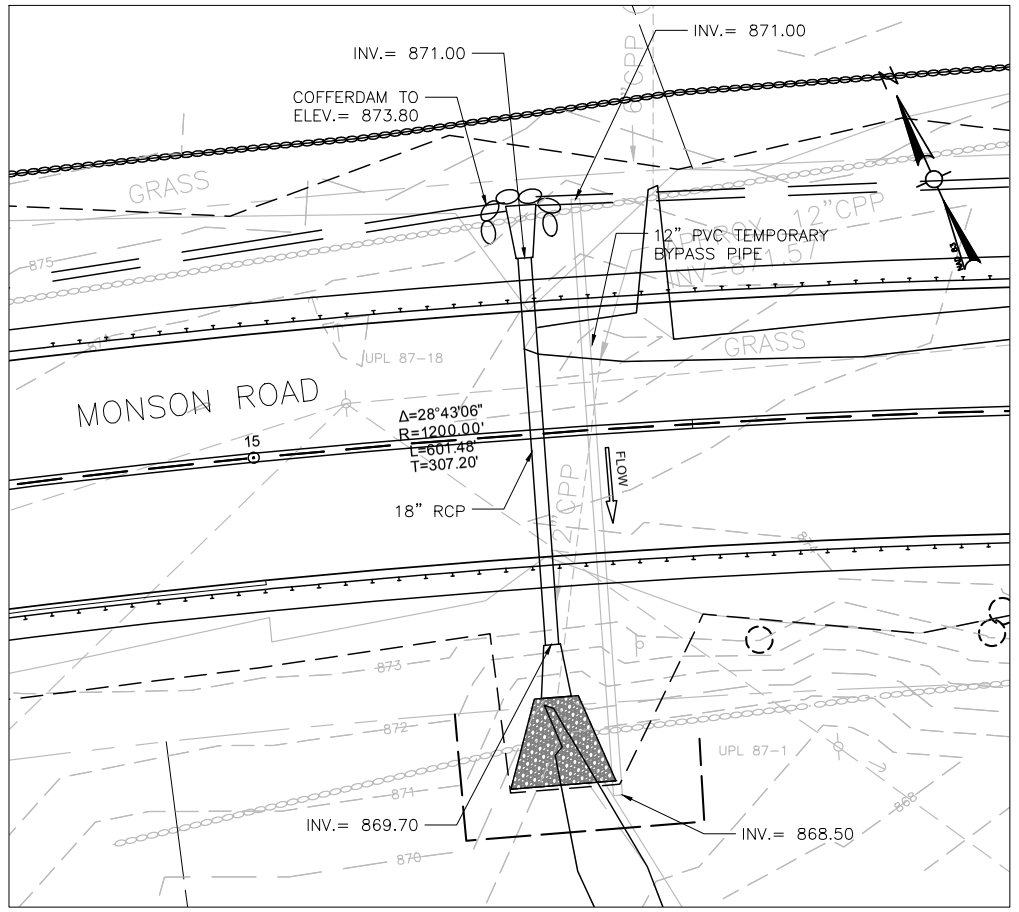
102+32.24



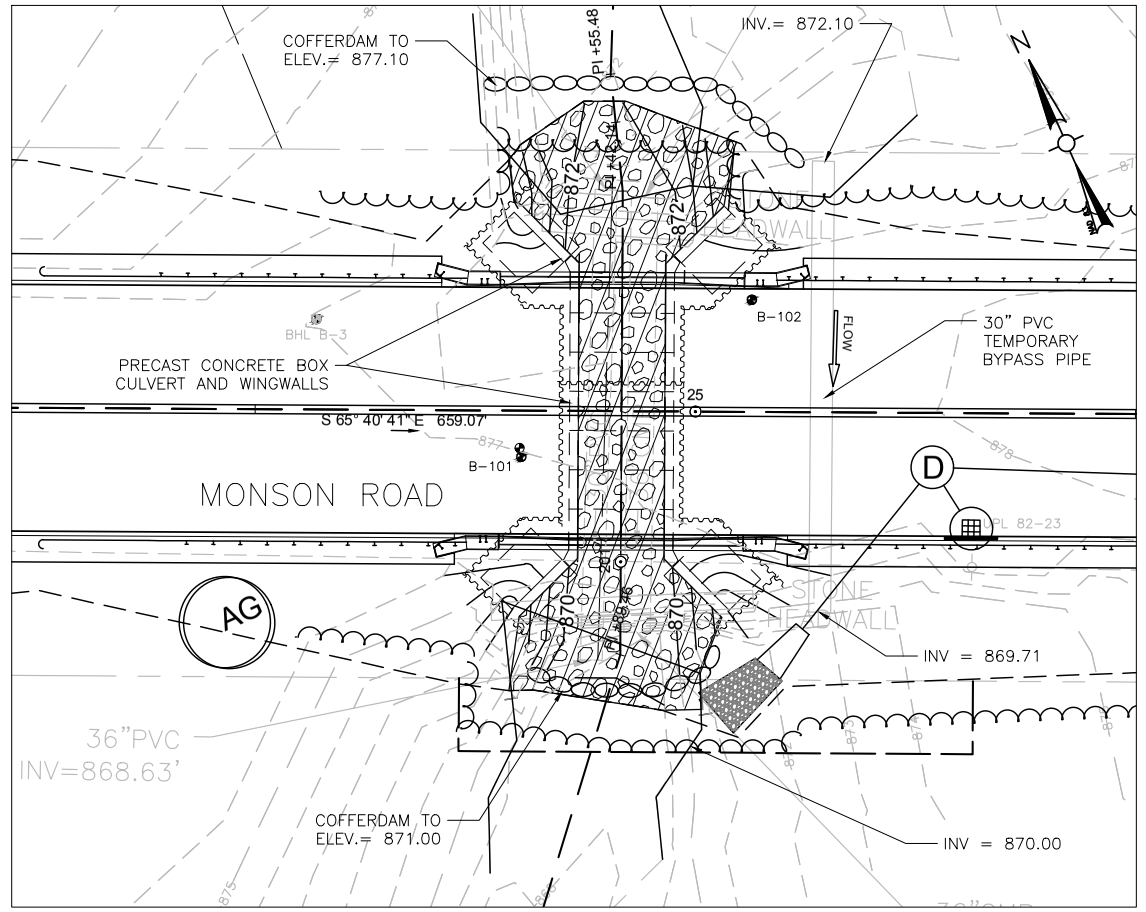
102+10



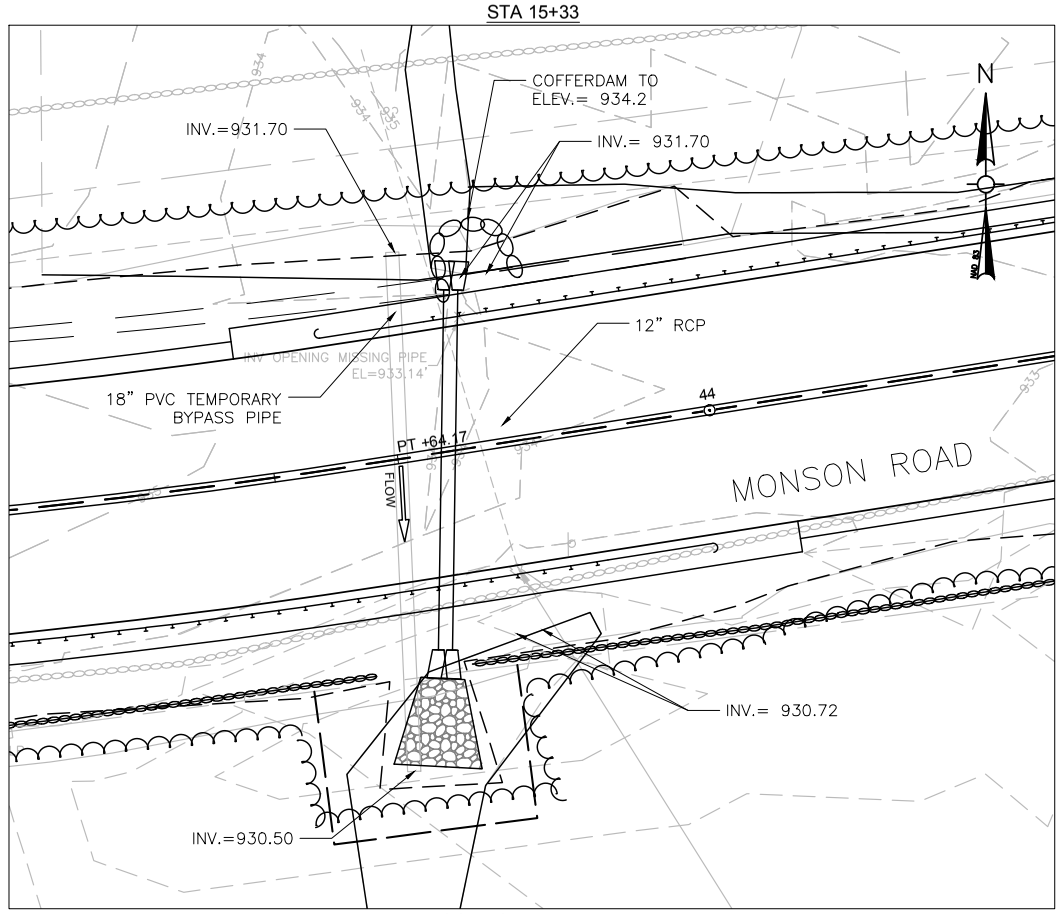
REED HILL ROAD CHANNEL CROSS SECTIONS



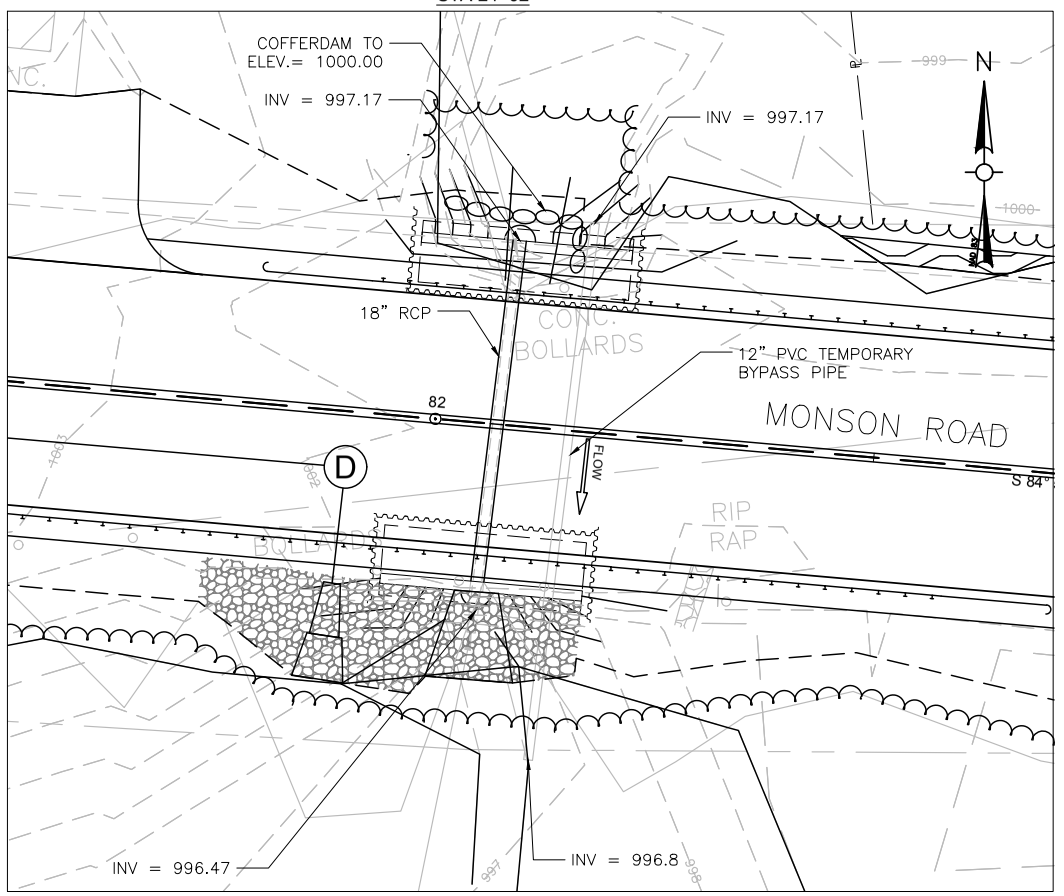
LOCATION 1
STA 15+33



LOCATION 2
STA 24+92



LOCATION 3
STA 43+76



LOCATION 4
STA 82+07

WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO. 608163			

CONTROL OF WATER PLANS

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE FOR CULVERTS:

PLANS AND CALCULATIONS FOR ALL SANDBAGGING, DIKES,OPTIONAL SHEETING AND OTHER WATER CONTROL MEASURES SHALL BE DEVELOPED BY THE CONTRACTOR. THESE PLANS AND CALCULATIONS SHALL BE PREPARED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS AND SHALL BE SUBMITTED FOR APPROVAL OF THE ENGINEER PRIOR TO THE START OF CONSTRCUTION.

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE AND INVERT ELEVATIONS) AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE. SEE PLAN FOR HEIGHT OF COFFERDAM.
3. REMOVE THE EXISTING CULVERT AND PIPES.
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE FOR CULVERTS AND END WALLS

PLANS AND CALCULATIONS FOR ALL SANDBAGGING, DIKES,OPTIONAL SHEETING AND OTHER WATER CONTROL MEASURES SHALL BE DEVELOPED BY THE CONTRACTOR. THESE PLANS AND CALCULATIONS SHALL BE PREPARED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS AND SHALL BE SUBMITTED FOR APPROVAL OF THE ENGINEER PRIOR TO THE START OF CONSTRCUTION.

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE) AND INSTALL THE COFFERDAMS IN THE STREAM ON BOTH ENDS OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE.
3. REMOVE THE EXISTING CULVERT AND ENDWALLS.
4. INSTALL THE NEW CULVERT.
5. INSTALL THE END WALLS.
6. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT. RECONFIGURE THE COFFERDAMS AROUND THE SIDE THAT WILL BE CONSTRUCTED NEXT.
7. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
8. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

0 10 20 30 40
SCALE: 1" = 10'

608163_HD12(WATER HANDLING).DWG Plotted on 5-Aug-2024 11:52 AM

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WALES
MONSON ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

CONTROL OF WATER PLAN - CULVERT 3

REFER TO TEMPORARY TRAFFIC CONTROL PLANS AND STRUCTURAL PLANS FOR SPECIFIC STAGE CONSTRUCTION REQUIREMENTS.

CONTROL OF WATER SEQUENCE:

1. INSTALL SEDIMENT & EROSION CONTROL MEASURES.
2. INSTALL THE TEMPORARY BY PASS PIPE (SEE PLAN FOR SIZE AND INVERT ELEVATIONS) AND INSTALL THE COFFERDAMS ON THE UPSTREAM END OF THE PROPOSED CULVERT WHILE MAINTAINING FLOW THROUGH THE BY PASS PIPE. SEE PLAN FOR HEIGHT OF COFFERDAM.
3. REMOVE THE EXISTING CULVERT
4. INSTALL THE NEW CULVERT.
5. REMOVE THE BY PASS PIPE, ALLOW THE WATER TO FLOW THROUGH THE CULVERT.
6. RECONFIGURE THE COFFERDAMS, INSTALL OUTLET PROTECTION, FINALIZE GRADING, AND INSTALL GUARD RAIL.
7. REMOVE THE COFFERDAMS, REMOVE THE SEDIMENT & EROSION CONTROL MEASURES.

BENCHMARK: BRASS RIVET IN BOULDER
EL=1001.17'

MONSON ROAD

Δ=58°08'23"
R=560.00'
L=568.25'
T=311.31'

PC +51.80

PRC +11.23

PCC +33.75

PT +68.94

COFFERDAM TOP
ELEV. 1001.9

INV.= 999.50

24" PVC TEMPORARY
BYPASS PIPE

INV.= 999.00

24" RCP

997 24" RCP

PI +39.10

PC +72.60

997

1000

18" RCP

100+00

INV.= 997.00

INV 24" STONE BOX CULVERT
EL=995.79'

80 LF RCP (PERMANENT PIPE
INSTALLED FOR TEMPORARY
BYPASS AND WILL REAMION)

24" STONE BOX CULVERT
INV=996.66

24" STONE BOX CULVERT
INV=996.16

S 29° 42' 29" E 30.08'

PC +30.08

Δ=60° 37' 43"
L=63.49' R=60.00'

INV.= 999.0

PT +93.57

REED HILL ROAD

N 89° 39' 48" E 91.64'

STONE WALL

LIMITS OF WORK
STA 2+20.00
N 2847299.213
E 454204.816

0 10 20 30 40
SCALE: 1" = 10'

LOCATION 5
STA 87+00 and STA 1+33

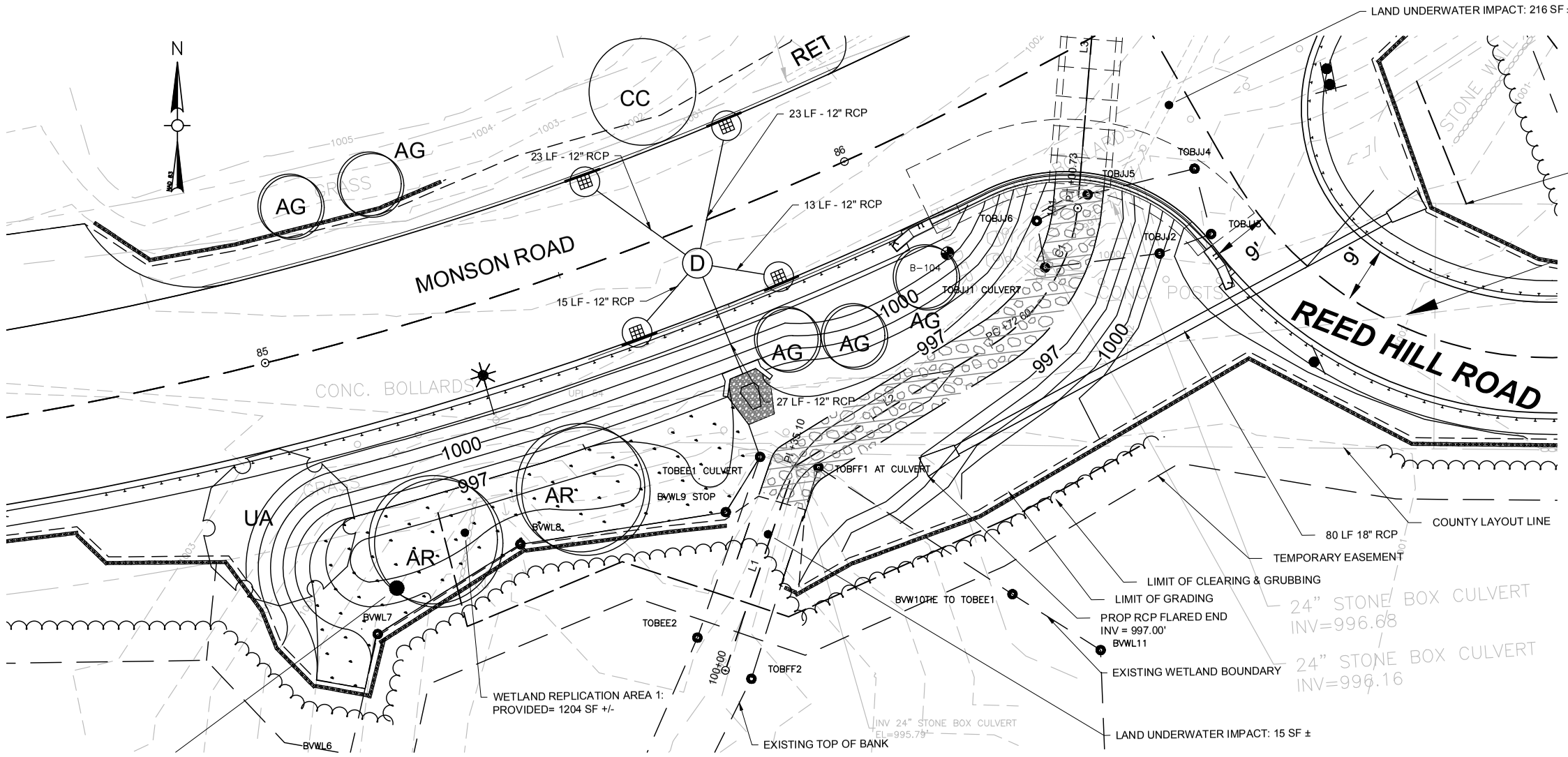
608163_HD12(WATER HANDLING).DWG Plotted on 8-Aug-2024 9:29 AM

Proposal No. 608163-128112

A00831 - 47

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	STP-0032(043)X		
PROJECT FILE NO.	608163		

WETLAND REPLICATION AREA DETAIL



WETLAND REPLICATION AREA 1 GRADING PLAN

0 10 20 30 40

SCALE: 1" = 10'

WETLAND SEED MIX - OBLIGATE MIX

BOTANICAL

GRASS	COMMON NAME	%PLS BY WEIGHT
CAREX VULPINOIDEA	FOX SEDGE	26.50%
CAREX LURIDA	SHALLOW SEDGE	15.00%
SAPERGANIUM EURYCARPUM	GIANT BUR REED ECO PA	10.00%
CAREX LUPULINA	HOP SEDGE	7.00%
CAREX CRINITA	FRINGED SEDGE	6.00%
SCRIPUS CYPERINUS	WOOLGRASS	4.00%
JUNCUS EFFUSUS	SOFT RUSH	3.00%
CAREX COMOSA	BEAREDED SEDGE	3.00%
SCIRPUS ATROVIRENS	GREEN BULRUSH	3.00%
SPARGANIUM AMERICANUM	BURRWEED	2.50%
SCIRPUS VALIDUS	BULRUSH, SOFT-STEM	2.00%
CAREX STRICTA	TUSSOCK SEDGE	1.00%
GLYCERIA CANADENISIS	MANNA GRASS	1.00%
		86.00%
VERBENA HASTATA	BLUE VERVAIN	4.00%
ASTER PUNICEUS	ASTER - SWAMP	2.00%
EUPATORIUM MACULATUM	JOE-PYE WEED	1.50%
EUPATORIUM PERFOLIATUM	BONESET	2.00%
IRIS VERSICOLOR	BLUE FLAG IRIS	2.00%
ALISMA SUBCORDATUM	MUD PLAINTAIN	1.00%
VERONIA NOVEBORACENSIS	NEW YORK IRONWEED	1.00%
BUDENS CERNUA	NODDING BURR MARIGOLD	1.00%
SOLIDAGO PATULA	ROUGHLEAF GOLDENROD	0.50%
MIMULUS RINGENS	MONKEY FLOWER	0.50%
CHELONE GLABRA	WHITE TURTLEHEAD	0.50%
		14.00%
		100.00%

SEED RATING:
SPECIES ECOTYPE SHALL BE AS NATIVE TO NEW ENGLAND REGION AS POSSIBLE. APPLY THIS MIX AT 20 LBS PLS/ACRE.

WETLAND REPLACEMENT AREA 1 NOTES:

1. A WETLAND SCIENTIST SHALL BE PROVIDED ON-SITE TO MONITOR CONSTRUCTION OF THE WETLAND MITIGATION AREA TO ENSURE COMPLIANCE WITH THE MITIGATION PLAN.
2. AT LEAST 12 INCHES OF NATURAL OR MANMADE WETIAND SOIL SHALL BE INSTALLED IN THE WETLAND REPLICATION AREA.
3. ONLY PLANT MATERIALS NATIVE AND INDIGENOUS TO THE REGION SHALL BE USED. SPECIES NOT SPECIFIED IN THE REPLICATION PLAN SHALL NOT BE USED WITHOUT WRITTEN APPROVAL FROM THE REGULATORY AUTHORITIES. PLANT SPECIES ON THE INVASIVE SPECIES PLANT LIST IN THE CORPS MITIGATION INTRODUCTION: PERFORMANCE STANDARDS AND SUPPLEMENTARY INFORMATION DATED 2/21/01 SHALL NOT BE USED IN AND WITHIN 100 FEET OF MITIGATION SITES.
4. A SUPPLY OF DEAD AND DYING WOODY DEBRIS SHALL COVER between 5%-20% OF THE GROUND THROUGHOUT THE MITIGATION SITE AFTER THE COMPLETION OF CONSTRUCTION OF THE MITIGATION SITE. THESE MATERIALS SHOULD NOT INCLUDE INVASIVE SPECIES.
5. TEMPORARY DEVICES AND STRUCTURES TO CONTROL EROSION AND SEDIMENTATION IN AND AROUND MITIGATION SITES SHALL BE DISASSEMBLED AND PROPERLY DISPOSED OF NO LATER THAN NOVEMBER 1 THREE FULL GROWING SEASON AFTER PLANTING. SEDIMENT COLLECTED BY THESE DEVICES SHALL BE REMOVED AND PROPERLY DISPOSED OF IN A MANNER THAT PREVENT ITS EROSION AND TRANSPORT TO A WATERWAY OR WETLAND.

WETLAND REPLICATION AREA 1 PLANTING PLAN

SHRUBS
HIGHBUSH BLUEBERRY (VACCINIUM CORYMBOSUM): 4 PLANTS, SPACED 10 FEET ON CENTER MINIMUM
WINTERBERRY (ILEX VERTICILLATE): 4 PLANTS, SPACED 10 FEET ON CENTER MINIMUM

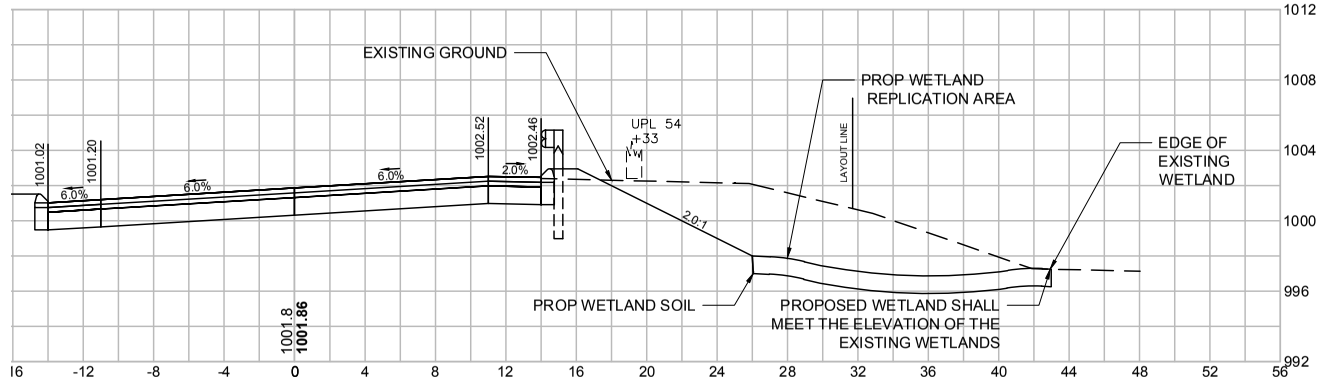
FERNS
CINNAMON FERN (OSMUNDA CINNAMOMEA): 50 PLANTS, SPACED 2 FEET ON CENTER, PUT IN CLUSTERS OF AT LEAST 5 TOGETHER IN SAME AREA TO PROVIDE A NATURAL PATTERN.
SENSITIVE FERN (ONOCLEA SENSIBILIS): 50 PLANTS, SPACED 2 FEET ON CENTER, PUT IN CLUSTERS OF AT LEAST 5 TOGETHER IN SAME AREA TO PROVIDE A NATURAL PATTERN.

SEED MIX
IN WETLAND REPLICATION AREA: SEE WETLAND SEED - OBLIGATE MIX - THIS SHEET
(SAME MIX TO BE USED ON PLAN SHEET 16 FOR WETLAND RESTORATION AREA 1)

FOR ALL AREA OUTSIDE AND ADJACENT TO WETLAND RESTORATION AND/OR REPLICATION AREAS PROVIDE PART SHADE ROADSIDE SEED MIX AS INDICATED ON CONSTRUCTION DETAIL SHEET 84.

TREES
OCTOBER GLORY (ACER RUBRUM): 2 TREES SPACED 25 FEET ON CENTER, WITH A 3 INCH TO 3.5 INCH CALIPER, TO PROVIDE A NATURAL PATTERN.
PRINCTON (ULMUS AMERICANA): 1 TREE WITH A 2 INCH TO 2.5 INCH CALIPER.

85+50



WETLAND REPLICATION AREA CROSS SECTION

608163_HD13\WETLAND REPLICATION).DWG Plotted on 9-Aug-2024 3:42 PM

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
100 Cambridge Street Suite 900 Boston, MA 02114 • 617-292-5500

Maura T. Healey
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

September 6, 2024

Town of Wales
3 Hollow Road
Wales, MA 01081
ATTN: Mr. John Grasso, Board of Selectmen Chair

RE: 401 WATER QUALITY CERTIFICATION
BRP WW 10, Major Fill Project
Monson Road Transportation Improvement Project
Wales, MA

401 WQC Filing Number: 24-WW10-0037-APP
USACE Application No. NAE-2024-01688
MassDOT File Number: 608163

Dear Mr. Grasso:

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed your application for a Water Quality Certification (WQC), as referenced above; this application was deemed complete on August 23, 2024. In accordance with the provisions of MGL Ch. 21, §§26-53 and Section 401 of the Federal Clean Water Act as amended (33 U.S.C. §1251 et seq.), it has been determined there is reasonable assurance the proposed project will be conducted in a manner which will not violate applicable water quality standards (314 CMR 4.00) and other applicable requirements of state law.

The proposed project primarily consists of upgrades and replacement of six stream crossings under Monson Road and Reed Hill Road involving four streams (the Project), as described below. The Project also involves relocation of the intersection of Monson Road and Reed Hill Road; roadway widening and full depth reconstruction; changes to the roadway horizontal and vertical alignments; wetland and stream replication and restoration; and stormwater infrastructure improvements. The Project purpose is to improve the roadway, shoulder, stormwater drainage, and stream crossings which are stated as being in poor condition and deteriorating. The Project proponent states that the existing culverts are undersized and overtopping of the roadway during large storms. Changes to the horizontal and vertical alignments will also meet current design standards and improve sight lines.

This work is a portion of the larger roadway improvements proposed along an approximately 1.5-mile section of Monson Road from the Monson town line to the Monson Road intersection with Reed Hill Road. However, as the stream crossing replacements and approach work are exempt from the

Massachusetts Wetlands Protection Act (MGL Ch.131, §40), those portions of the Project require a WQC per 314 CMR 9.04(4). The activities permitted by this WQC include all work associated with the six stream crossing replacements and associated approach work described in the Project Description below, and the entirety of the stormwater improvements which were reviewed as a single and complete project per 314 CMR 9.06(6)(d).

It should be noted the stream that crosses under Monson Road at Station 15+32 has been deemed non-jurisdictional as a non-relatively permanent water by the U.S. Army Corps of Engineers (USACE). Two other stream crossings at Stations 50+72 and 55+00 will not be replaced or improved. As such, these three additional stream crossings are discussed in the Existing Conditions section below for site context but are not discussed further.

Existing Conditions

Monson Road is classified as a Rural Major Collector and is oriented in an east/west alignment. It consists of one 11-foot-wide lane in each direction with no shoulders, sidewalks, or bicyclist accommodations, for a total roadway width of 22 feet. Reed Hill Road intersects Monson Road at the eastern end of the Project. Stormwater runoff flows untreated to roadside swales, Bordering Vegetated Wetlands (BVWs), and streams via country drainage.

Seven streams in the Project area flow south through culverts under Monson Road and Reed Hill Road and are tributaries to Vinica Pond or Vinica Brook. In addition to the culverts being undersized causing overtopping of the roadway, roadside sediment deposits block water from sheeting off the roadway which exacerbates flooding. Existing culvert outfalls are stable; however, significant bank erosion is present along the outfalls in several areas. BVWs are present in several areas along the Project corridor. In addition to the stream crossings identified below, a 12-inch diameter CMP at Station 55+20 connects BVWs on either side of the roadway.

Portions of the Project are located within Zone II Wellhead Protection Area and Coldwater Fishery Critical Areas. Portions of the Project are also located within Massachusetts Natural Heritage and Endangered Species Program (NHESP) Priority and Estimated Habitats of Rare Species.

Intermittent Streams

Intermittent streams cross under Monson Road and Reed Hill Road via culverts at Stations 15+32, 55+00, 82+07, and 86+00 to 87+00 (two culverts).

The non-jurisdictional intermittent stream at Station 15+32 flows west parallel to the north side of Monson Road before flowing under the roadway via a 40-foot-long 12-inch diameter corrugated plastic pipe (CPP). The intermittent stream at Station 82+07 flows under Monson Road through a 43-foot-long 12-inch diameter corrugated metal pipe (CMP). The intermittent stream at Station 55+00 flows through a 48-foot-long 12-inch diameter CMP. Bankfull width indicators are not present at any of these streams.

At Stations 86+00 to 87+00, an intermittent stream flows through two culverts; first through a 108-foot-long 24-inch stone box culvert under Monson Road to a daylighted depression at its intersection with Reed Hill Road; then through a 54-foot-long 24-inch stone box culvert under Reed Hill Road. Bankfull width is approximately 10.5 feet. This stream is a Coldwater Fishery Critical Area.

Perennial Streams

Perennial streams cross under Monson Road via culverts at Stations 24+92, 43+75 and 46+60 (two culverts), and 50+72.

The perennial stream at Station 24+92 flows under Monson Road via a 54-foot-long 30-inch diameter polyvinyl chloride (PVC) pipe and a 49-foot-long 36-inch diameter relief CMP with an invert one foot higher than the 30-inch culvert. The relief culvert only receives flow during storm events. Bankfull width is approximately 11.5 feet. This stream is a Coldwater Fishery Critical Area.

The perennial stream at Station 43+75 flowed under Monson Road via a 49-foot-long 12-inch diameter CMP but collapsed due to roadway flooding. The stream was diverted and currently flows east along the north side of Monson Road then under the roadway via a 41-foot-long 12-inch diameter CPP at Station 46+60. Bankfull width indicators are not present. The western portion of this stream crossing is located within Massachusetts Natural Heritage and Endangered Species Program (NHESP) Priority and Estimated Habitats of Rare Species.

The perennial stream at Station 50+72 flows through a 61-foot-long 36-inch diameter PVC-lined CMP. Bankfull width is 15 feet, and this stream is a Coldwater Fishery Critical Area.

Project Description

Improvements to Monson Road include full depth reconstruction and widening from 22 feet to 28 feet to allow for a 10-foot-wide lane in each direction and four-foot-wide shoulders, as well as changes to the horizontal and vertical alignments. A portion of Reed Hill Road will be realigned and its intersection with Monson Road will be shifted northeast approximately 75 feet to improve sight lines.

The stream crossing at Station 24+92 will be replaced with a 31.5-foot long by 9.8-feet-wide by five-foot-high concrete box culvert. Both headwalls will be replaced with wingwalls. Two feet of native streambed material will be placed within the box culvert, and a three-foot-wide by six-inches-high low flow channel will be shaped in the center.

The two culverts under Monson Road and Reed Hill Road from Stations 86+00 to 87+00 will be replaced with a single 46.8-foot-long by eight-foot-wide by five-foot-high concrete box culvert under Monson Road at Station 86+45. A wingwall will be constructed on the upstream end and a headwall will be constructed on the downstream end. Two feet of native streambed material will be placed within the box culvert, and a three-foot-wide by six-inches-high low flow channel will be shaped in the center. The stream will be realigned to have sinuosity and match the new box culvert alignment. Ten inches of native streambed material will be placed in the realigned channel beyond the box culvert, and it will also have a three-foot-wide by six-inches-high low flow channel in the center. Realignment of Reed Hill Road and relocation of the stream crossing will daylight 1,018 sf of new LUW at this location.

The stream crossing at Station 43+75 will be replaced with double 12-inch diameter reinforced concrete pipes (RCPs), and the associated culvert at Station 46+60 will be replaced with a single 12-inch RCP. The intent is to re-establish flow at its original location at Station 43+75, while retaining the culvert at Station 46+60 as an overflow during storm events. The stream crossing at Station 82+07 will be replaced with an 18-inch RCP. Modified rock fill aprons will be installed at the outlet of all of these culverts.

Stormwater infrastructure improvements consist of new sections of curbing and installation of deep sump catch basins as described below.

BVW and LUW Impacts

In total, 5,338 square feet (sf) of fill impacts to BVWs and Land Under Water (LUW) are required to construct the Project. The Project will result in 674 sf of permanent and 535 sf of temporary BVW impacts, and 2,186 sf of permanent and 1,943 sf of temporary LUW impacts. The Project will result in 89 cubic yards (cy) of dredging. Permanent BVW and LUW impacts, and dredging are required primarily for the culvert replacements and associated headwall/wingwall and outlet protection installations. Temporary impacts are required primarily for temporary work areas and associated access.

Alternatives Analysis

Constraints adjacent to Monson Road including but not limited to residential properties, wetlands and waters, Norcross Wildlife Sanctuary, and utilities make realigning Monson Road to further avoid BVW and LUW impacts not practicable. Lanes and shoulders have been designed to be the minimum practicable width and sidewalks and bike lanes are not proposed. The Stream Crossing Standards section below describes the alternatives analysis relative to the Project stream crossing replacements.

BVW and LUW Replication and Restoration

A 1,204 sf BVW replication area will be constructed south of Monson Road between approximate Stations 85+00 to 85+75, adjacent to BVW L and the realigned stream southwest of the Monson Road and Reed Hill Road intersection. The area will be excavated to 12 inches below the adjacent BVW elevation to allow for installation of 12 inches of wetland soil. Native trees and shrubs will be planted, and a native wetland seed mix will be applied. Temporary BVW impacts will be restored in place with a native wetland seed mix. All BVW replication and restoration areas will be constructed under the supervision of a qualified Wetland Scientist. LUW replication and restoration as described in the Project Description will take place under the supervision of a qualified Fluvial Geomorphologist (FGM).

Stormwater Management Standards

The Project will increase impervious surface by 0.88 acres and qualifies as a redevelopment project as defined at 314 CMR 9.02. Seven new closed drainage systems consisting of curbing and 57 deep sump catch basins will be installed. All new outfalls will have modified rockfill outlet protection. Stormwater in remaining areas will flow via country drainage through one-foot-wide grass-lined or modified rockfill-lined roadside drainage channels. A complete evaluation concluded that additional locations for Stormwater Control Measures (SCMs) are not practicable within the Project area.

Stream Crossing Standards

A qualified FGM performed a rapid stream geomorphic assessment and Stream Crossing Standards maximum extent practicable alternatives analysis for the Project stream crossing replacements. Priority was given to the three streams identified as Coldwater Fishery Critical Areas. Given the size of the structure required for the crossing at Station 50+72, proper replacement of the crossing was deemed impracticable and was not considered further.

Spans at Stations 24+92 and 86+45 were deemed impracticable; however, these crossings will be improved. The proposed box culverts will have spans of 0.9 and 0.8 times the bankfull width, respectively, and will be embedded with two feet of native streambed material. The box culvert at Station 24+92 will exceed the openness ratio Stream Crossing Standard; however, due to the required length of the crossing, the box culvert at Station 86+45 will meet the openness ratio Stream Crossing Standard to the maximum extent practicable (MEP). The geomorphic assessment and alternatives analysis concluded the box culverts will achieve many of the benefits of a larger crossing structure including improved flood conveyance, sediment transport, large wood movement, and fish and wildlife movement. The streams at Stations 43+75, 46+60, and 82+07 have been designed to improve hydraulic capacity and meet the Stream Crossing Standards to the MEP. As such, the Project is in compliance with the Stream Crossing Standards to the MEP in accordance with 314 CMR 9.06(2)(b)4.

Rare Species

As previously discussed, the western portion of the stream crossing at Stations 43+75 and 46+60 is located within NHESP Priority and Estimated Habitats of Rare Species. In a letter dated July 1, 2024, NHESP concluded that the Project will not adversely affect the actual Resource Area Habitat of state-protected rare wildlife species and will not result in a prohibited Take of state-listed rare species. Therefore, the Project is in compliance with 314 CMR 9.06(2).

Based on a review of information provided by the applicant, MassDEP finds that this project complies with the standards described under 314 CMR 9.06. Public notice was provided in the Journal Register on July 4, 2024, and in the MEPA Environmental Monitor on July 10, 2024. No comment letters were received during the public comment period.

Therefore, based on information currently in the record, MassDEP grants a WQC for this project subject to the following conditions to maintain water quality, to minimize impact on waters and wetlands, and to ensure compliance with appropriate state law. The Department further certifies in accordance with 314 CMR 9.00 that there is reasonable assurance the project or activity will be conducted in a manner which will not violate applicable water quality standards (314 CMR 4.00) and other applicable requirements of state law. Finally, the Department has determined that upon satisfying the conditions and mitigation requirements of this approval, the project provides a level of water quality necessary to protect existing uses and accordingly finds that the project to be implemented satisfies the Surface Water Quality Standards at 314 CMR 4.00.

Pursuant to 314 CMR 9.09(1)(d); 314 CMR 9.06(6)(a); 310 CMR 9.06(2); 314 CMR 9.07; 314 CMR 9.07(1); 314 CMR 9.09(7)(5)(c); 314 CMR 9.11; and 314 CMR 9.09(1)(e), the following Special Conditions are necessary to ensure that construction practices and stormwater controls are implemented in such a manner as to prevent degradation to wetlands and waters; ensure that practicable steps have been

taken which will avoid and minimize impacts to wetlands and waters; minimize turbidity and sediment caused by construction activities; ensure that water quality is not degraded, and that biology of the waters are not negatively impacted by potential discharges; and/or maintain a record of the dredged material for reference and to ensure accountability in its transportation.

Those Special Conditions that require direct submittals to MassDEP for either review, or review and approval, are denoted by the following notation (Submittal) at the end of the condition and are summarized in Attachment A. In addition, those conditions with the (Submittal) designation shall be included in the Special Provisions and, as applicable, reviewed at the Pre-Construction Meeting.

1. All work shall be performed in accordance with the following documents and plans:

    - Application for Water Quality Certification. Prepared by Weston & Sampson Engineers, Inc. on behalf of the Town of Wales, with cover letter and attachments. 401 WQC Filing Number: 24-WW10-0037-APP. Dated June 26, 2024.
    - Plans entitled: "Massachusetts Department of Transportation Highway Division Plan and Profile of Monson Road Improvements in the Town of Wales, Hampden County. 100% Submittal, 404 Environmental Permit Plan Set." Prepared by Weston & Sampson Engineers, Inc. Sheets 1 through 41. Last revised August 2024.
    - MassDEP Administrative Completeness and Technical Deficiency Review. Monson Road Transportation Improvement Project. 401 WQC Transmittal No: 24-WW10-0037-APP. Dated July 17, 2024.
    - Response to Technical Review – Monson Road Transportation Improvements Project, Wales Massachusetts (401 WQC Transmittal No. 24-WW10-0037-APP). Prepared by Weston & Sampson Engineers, Inc. on behalf of the Town of Wales. Dated August 9, 2024.
    - Updated Project Description. Prepared by Weston & Sampson Engineers, Inc. on behalf of the Town of Wales. Submitted via email August 28, 2024.
    - Updated Wetland Delineation Report. Prepared by Weston & Sampson Engineers, Inc. on behalf of the Town of Wales. Submitted via email August 28, 2024.
    - NHESP MESA Review. Monson Road Transportation Improvement Project. NHESP File No. 24-18601. Dated July 1, 2024.

Pre-Construction

2. The permittee shall employ an **Environmental Monitor** (EM) to oversee all project activities with the potential to have an adverse impact on BVWs and LUW and to ensure compliance with this WQC and the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan (CP/PP) as required herein. The EM shall have a minimum of five years of professional experience with construction site CP/PP compliance. The EM shall complete the U.S. Environmental Protection Agency (EPA) Construction General Permit (CGP) Inspector Training, or other training that meets the CGP requirements, and provide proof of completion prior to the start of work. The name, contact information, and qualifications of the proposed EM shall be provided to MassDEP for approval prior to the Pre-Construction Meeting required in Condition

6. The name and contact information of the approved EM shall be provided to the Wales Conservation Commission prior to the start of work. **(Submittal)**

3. A qualified **Wetland Scientist** (WS) with a minimum of five years of relevant professional experience with wetland and stream replication and restoration projects shall be employed to oversee all BVW and LUW replication and restoration activities, including but not limited to grading, placement of substrate, seeding, vegetation plantings, and placement of wildlife habitat features. The name, contact information, and qualifications of the WS shall be provided to MassDEP for approval prior to the Pre-Construction Meeting required in Condition 6. The name and contact information of the approved WS shall be provided to the Wales Conservation Commission prior to the start of work. The EM may also be the WS if the qualifications are met. **(Submittal)**

4. A qualified **Fluvial Geomorphologist** (FGM) with a minimum of five years of relevant professional experience in stream replication and restoration projects shall be employed to oversee all LUW replacement and restoration activities as proposed by MassDOT. The name, contact information, and qualifications of the FGM shall be provided to MassDEP for approval with a copy to the Wales Conservation Commission prior to the Pre-Construction Meeting required in Condition 6. **(Submittal)**

5. Prior to the Pre-Construction Meeting required in Condition 6, the proponent shall provide MassDEP with the name and contact information of the Resident Engineer (RE) responsible for ensuring that all work complies with the conditions of this WQC. **(Submittal)**

6. A minimum of 21 days prior to the start of work, the proponent shall contact MassDEP to schedule an onsite Pre-Construction Meeting to review the approved plans and terms and conditions of this WQC. The RE, the construction contractor, the EM, the WS a representative from the MassDOT Environmental Section and/or the District Environmental Engineer shall attend the Pre-Construction Meeting.

7. A minimum of 14 days prior to installation of the new culverts, the FGM shall meet with the contractor to determine the suitability of stockpiled streambed material for reuse.

8. MassDEP shall be copied on applicable submittals to the U.S. Army Corps of Engineers (USACE). These include but are not limited to: Self-Verification Notification Form (SVNF); Pre-Construction Notification (PCN); Work-Start Notification Form; Mitigation Work-Start Notification Form; and Compliance Certification Form. The Work-Start Notification Form shall be submitted at least 14 days before the anticipated start of work and the Compliance Certification Form shall be submitted within 30 days following the completion of the authorized work. **(Submittal)**

9. A CP/PP shall be developed and implemented as required by 314 CMR 9.06(6)(a)8. A minimum of 14 days prior to the start of work, the applicant shall submit the CP/PP for review and approval. If the EPA CGP applies, the Stormwater Pollution Prevention Plan (SWPPP) may serve as the CP/PP, providing it includes the measures required to be in the CP/PP per these Special Conditions, in addition to the measures specifically required by the CGP. Any subsequent

changes to the Final CP/PP (defined herein as including the construction period SWPPP if applicable) must be approved by MassDEP. **(Submittal)**

10. Training regarding erosion and sedimentation controls is required. The RE, CP/PP Inspector, and any other relevant personnel responsible for erosion and sedimentation controls shall complete the EPA CGP Inspector Training, or other training that meets the CGP requirements, as well as complete a comprehensive review of the Final CP/PP. Verification of proof of completion of the training shall be submitted to MassDEP prior to the start of work. **(Submittal)**

11. The CP/PP shall identify, but shall not be limited to, staging and laydown areas in relation to BVWs and LUW, proposed dewatering locations, proposed stockpile locations and their proximity to catch basins or other drainage conveyances that discharge to wetland resource areas, and the location of construction-period erosion and sedimentation controls.

12. A minimum of 14 days prior to the start of work, a Control of Water Plan shall be submitted for review and approval. The Plan shall include proposed methods to manage construction-period water including but not limited to dewatering methods and locations, specifications for any water bypass systems, and dredge and debris material dewatering prior to shipment off site, as applicable. The plan shall meet requirements of the CP/PP and be specific to the Project. Dewatering and water bypasses shall be conducted under the supervision of the EM and comply with the applicable conditions identified herein. **(Submittal)**

13. Prior to the start of work, approved erosion and sedimentation control measures shall be installed per the approved CP/PP and as applicable, the manufacturer specifications. Erosion and sedimentation control measures may consist of, but are not limited to, silt fence, staked straw bales, silt/turbidity curtains, compost filter tubes, etc.

14. Prior to the Pre-Construction Meeting, the boundaries of BVWs and LUW shall be re-flagged where they are within 50 feet of the limits of work. In the event BVW and LUW boundaries overlap, the outermost boundary (i.e., closest to the proposed work) shall be flagged. All boundary markers, once in place, shall remain in place throughout construction until all disturbed surfaces have been permanently stabilized. Boundary markers shall be fully evaluated annually and refreshed where needed. Implementation of and compliance with this requirement shall be documented by the EM. All construction personnel shall be made aware of these markers.

Construction Period

15. No more than **674 sf** of permanent and **535 sf** of temporary impacts to BVWs shall occur. No more than **2,186 sf** of permanent and **1,943 sf** of temporary impacts to LUW shall occur. No more than **89 cy** of dredging in LUW shall occur. All work shall avoid unapproved impacts to BVW and LUW.

16. The EM duties shall include, but are not limited to, oversight of installation and maintenance of erosion and sedimentation controls and SCMs, dewatering activities, cofferdam installation and removal, concrete washout containment, dust control, and hazardous or toxic material containment, as applicable. The EM shall only be responsible for the oversight of hazardous and

toxic materials to the extent that the CP/PP requires. All erosion and sedimentation controls shall be inspected by the EM prior to the start of work in each area, and all dewatering methods and locations shall be inspected by the EM prior to use. The EM shall have the authority to require modifications to or additional erosion and sedimentation controls or dewatering controls as they deem necessary to comply with this WQC and the CP/PP.

17. CP/PP inspections shall occur at least once every seven calendar days and within 24 hours of a storm event that produces 0.5 inches or more of rain within a 24-hour period, or at a more stringent frequency if the CP/PP requires.

18. Copies of CP/PP Inspection and Maintenance Log Forms shall be submitted to MassDEP within 14 days upon request.

19. The EM shall submit to MassDEP and the Wales Conservation Commission at least one report every two calendar weeks during active construction and once every month while work is shut down until the site achieves final stabilization. The permittee shall not participate in the preparation of any EM report. The report shall include:

    a. Relevant weather information including storm event amounts and durations since the last inspection;

    b. A general description of current and foreseeable construction activities;

    c. The status and effectiveness of erosion and sedimentation controls, stormwater control measures, and dewatering methods;

    d. Evidence of erosion, sedimentation, or improper material containment or spills;

    e. A description of any unauthorized discharges to BVWs or LUW, and actions taken to immediately stop the discharge;

    f. Recommendations to correct any deficiencies identified during the inspection;

    g. Due dates to resolve corrective actions as specified in the CP/PP and WQC, and dates and descriptions of the resolutions as they are completed;

    h. Representative photos of current site conditions, erosion and sedimentation controls, stormwater control measures, and dewatering methods;

    i. Specific photos of any unauthorized discharges to BVWs or LUW, deficiencies or non-compliance requiring corrective actions, and corrective actions that have been undertaken; and

    j. Any other recommendations for site management to promote compliance with this WQC and the CP/PP.

20. The EM shall immediately report any unauthorized discharges to BVWs or LUW, or any other significant non-compliance with this WQC or the CP/PP to MassDEP, MassDOT, the RE, and the

Wales Conservation Commission. The EM shall have stop-work authority in the event of significant non-compliance with this WQC and/or the CP/PP. The EM shall be authorized to respond to and communicate directly with MassDEP on all matters related to compliance with this WQC. MassDEP may make any requests directly to the EM and copy MassDOT, and MassDOT shall authorize the EM to fulfill such request in direct coordination with MassDEP.

21. Inspection and maintenance of erosion and sediment controls in work areas shall be the responsibility of both the Contractor and RE or MassDOT project staff. Maintenance is the responsibility of the Contractor; however, the applicant is ultimately responsible for erosion and sedimentation control failure. All recommendations of the lead inspector shall be followed. The project team individual with lead responsibility for inspections shall have at least three years of experience with construction period erosion and sedimentation controls. The RE and/or contractor shall immediately notify MassDEP and the Leominster Conservation Commission if any unauthorized discharges to wetland resource areas occur.

22. Disturbed areas shall be stabilized immediately after activities have permanently ceased or will be temporarily inactive for 14 or more calendar days. The installation of stabilization measures shall be implemented as soon as practicable, but no later than 14 calendar days after stabilization has been initiated.

23. Work within LUW shall be conducted in low or no-flow conditions to the extent practicable. Notice shall be provided to MassDEP and the Wales Conservation Commission within 24 hours prior to the commencement of dewatering. Dewatering methods and location(s) shall be approved by the EM prior to use, and shall be documented in the CP/PP. There shall be no discharge of untreated dewatered stormwater or groundwater to BVWs or LUW. Any discharges shall be visibly free of sediment.

24. Additional erosion and sedimentation control materials shall be stored on-site at all times for emergency and routine replacement. Materials shall be kept covered, dry, and accessible at all times. The RE and EM shall be responsible for anticipating the need for and installation of additional erosion and sedimentation controls and shall have the authority to require additional erosion control measures to protect wetland resource areas beyond what is shown on the plans if field conditions, or professional judgment dictate that additional protection is necessary.

25. Any storm drains with potential to receive discharge from stockpiled materials or construction operations shall be managed to inhibit the inflow of sediment while not increasing the likelihood of roadway flooding during periods of precipitation. Stockpiles shall be located no less than 50 feet from BVWs, LUW, catch basins, or other drainage conveyances that discharge to BVWs or LUW. The CP/PP shall specify measures to implement this. Filter fabric stretched under storm drain inlet grates are not acceptable for this purpose.

26. The contractor shall have designated washout areas for concrete equipment that will be comprised of impermeable material and sized to contain project concrete wastes and wash water. Concrete wash out areas shall be located no less than 50 feet from BVWs, LUW, and catch basins or other drainage conveyances that discharge directly or indirectly to BVWs or LUW.

27. Refueling, washing, and cleaning of vehicles and other construction equipment shall not take place within 50 feet of BVWs or LUW and any wash water shall be contained such that it does not drain toward BVWs or LUW. MassDEP shall explicitly approve in writing any deviation to this condition for oversized stationary vehicles.

28. The contractor shall have spill containment kits on site. In the event of a release of fuels and/or oils, the local fire department and MassDEP shall be notified.

29. If applicable, sheet piles shall be fully removed from BVW and LUW upon stabilization of the area as required. No portion of sheet piles shall remain unless approved by MassDEP in writing prior to installation. A request to leave sheet piles shall include, but not be limited to, demonstration that full removal of the sheet piles is not feasible or practicable, and an alternatives analysis demonstrating alternative methods to isolate the work area(s) are not feasible or practicable. At no time shall sheet piles be allowed to remain in LUW of a waterway that provides aquatic organism passage.

Wetland Mitigation

30. A minimum of 1,204 sf of wetland replication shall be completed in coordination with an approved WS. The WS shall oversee all BVW replication and restoration, including final grading, seeding, and planting. The WS shall confirm that constructed BVW replication and restoration areas have adequate soils and hydrology to promote wetland plant species prior to seeding and installation of plantings and shall recommend measures to amend soils and promote wetland hydrology as needed.

31. Planting and seeding shall not take place between November 15th and April 15th, except as allowed by MassDEP in writing. The WS shall inspect trees and shrubs to ensure they are healthy prior to planting. Trees and shrubs deemed unhealthy in the professional judgment of the WS shall be replaced. Plantings and seed mixes shall consist of native and non-invasive species. Species may be substituted at the recommendation of the WS, and review and approval by MassDEP.

32. At least 75% of the surface area of the BVW replication and restoration areas shall be vegetated with indigenous wetland plant species within two growing seasons, or the period required by the Section 404 permit, whichever is longer. Additionally, evidence of hydrology, including hydric soil formation shall be submitted at the same time. Annual monitoring reports shall be submitted by the WS no later than January 15th each year. Monitoring reports shall include an assessment based on the approved success criteria, representative photos, and recommended corrective actions as needed. **(Submittal)**

33. MassDEP reserves the right to determine the success or failure of the BVW replication and restoration areas, and reserves the right to require additional plantings, regrading, or other measures deemed necessary to promote success.

Stream Mitigation

34. The FGM shall oversee all LUW replication and restoration. Placement of streambed materials shall take place in no- or low-flow conditions. The Control of Water Plan required in Condition 12 shall include measures to create no-flow conditions for this work such as a pump bypass system or other dewatering method, if needed. Placement of streambed materials during greater than low-flow conditions shall require a placement plan, with a narrative describing turbidity control measures, submitted to MassDEP for review and approval.

35. Upon completion, the FGM shall provide photographs of the finished culvert installation and stream restoration along with a brief narrative describing the finished work to MassDEP and the Wales Conservation Commission.
(Submittal)

36. Water shall be slowly introduced back into the restored and dewatered LUW work areas as to not cause erosion and sedimentation. This work shall be overseen by the EM and/ or FGM.

37. MassDEP reserves the right to determine the success or failure of the LUW replication and restoration areas and reserves the right to require additional measures deemed necessary to promote success.

Post-Construction

38. All temporary erosion controls shall be removed at the conclusion of work once the surrounding area has achieved final stabilization.

General Conditions

39. Any proposed alterations, minor plan changes, or amendment requests, as well as any required submittals shall be sent by email for review and approval to heidi.davis@mass.gov and ryan.hale@mass.gov. **(Submittal)**

40. This WQC remains in effect for the same duration as the Section 404 permit that requires it.

41. No Special Condition set forth herein shall be construed or operate to prohibit MassDEP from taking enforcement against the Town of Wales or its contractors for any failure to comply with the terms and requirements of this WQC.

42. No activity authorized by this WQC may begin prior to expiration of the 21-day appeal period, or until a final decision is issued by MassDEP in the event of an appeal.

Failure to comply with this Certification is grounds for enforcement, including civil and criminal penalties, under MGL Ch. 21 §42, MGL Ch. 21A §16, or other possible actions/penalties as authorized by the General Laws of the Commonwealth.

This Certification does not relieve the applicant of the obligation to comply with other appropriate state or federal statutes or regulations.

NOTICE OF APPEAL RIGHTS

a.) Appeal Rights and Time Limits

Certain persons shall have a right to request an adjudicatory hearing concerning certifications by MassDEP when an application is required: (a) the applicant or property owner; (b) any person aggrieved by the decision who has submitted written comments during the public comment period; (c) any ten (10) persons of the Commonwealth pursuant to M.G.L. c.30A where a group member has submitted written comments during the public comment period; or (d) any governmental body or private organization with a mandate to protect the environment which has submitted written comments during the public comment period. Any person aggrieved, any ten (10) persons of the Commonwealth, or a governmental body or private organization with a mandate to protect the environment may appeal without having submitted written comments during the public comment period only when the claim is based on new substantive issues arising from material changes to the scope or impact of the activity and not apparent at the time of public notice. To request an adjudicatory hearing pursuant to M.G.L. c.30A, § 10, a Notice of Claim must be made in writing, provided that the request is made by certified mail or hand delivery to MassDEP, with the appropriate filing fee specified within 310 CMR 4.10 along with a DEP Fee Transmittal Form within twenty-one (21) days from the date of issuance of this Certificate, and addressed to:

Case Administrator
Department of Environmental Protection
100 Cambridge Street, 9th Floor
Boston, MA 02114

A copy of the request shall at the same time be sent by certified mail or hand delivery to the Department of Environmental Protection at:

Department of Environmental Protection
Commissioner's Office
100 Cambridge Street, Suite 900
Boston, MA 02114

b.) Contents of Hearing Request

A Notice of Claim for Adjudicatory Hearing shall comply with MassDEP's Rules for Adjudicatory Proceedings, 310 CMR 1.01(6), and shall contain the following information pursuant to 314 CMR 9.10(3):

3. the 401 Certification Transmittal Number;
4. the complete name of the applicant and address of the project;
5. the complete name, address, and fax and telephone numbers of the party filing the request, and, if represented by counsel or other representative, the name, fax and telephone numbers, and address of the attorney;
6. if claiming to be a party aggrieved, the specific facts that demonstrate that the party satisfies the definition of "aggrieved person" found at 314 CMR 9.02;
7. a clear and concise statement that an adjudicatory hearing is being requested;
8. a clear and concise statement of (1) the facts which are grounds for the proceedings, (2) the objections to this Certificate, including specifically the manner in which it is alleged to be inconsistent with the MassDEP's Water Quality Regulations, 314 CMR 9.00, and (3) the relief

sought through the adjudicatory hearing, including specifically the changes desired in the final written Certification; and

9. a statement that a copy of the request has been sent by certified mail or hand delivery to the applicant, the owner (if different from the applicant), the conservation commission of the city or town where the activity will occur, the Department of Conservation and Recreation (when the certificate concerns projects in Areas of Critical Environmental Concern), the public or private water supplier where the project is located (when the certificate concerns projects in Outstanding Resource Waters), and any other entity with responsibility for the resource where the project is located.

c.) Filing Fee and Address

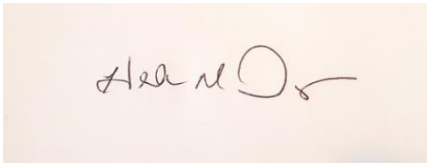
The hearing request along with a DEP Fee Transmittal Form and a valid check or money order payable to the Commonwealth of Massachusetts in the amount of one hundred dollars ($100) must be mailed to:

Commonwealth of Massachusetts
Department of Environmental Protection
Commonwealth Master Lockbox
PO Box 4062
Boston, MA 02211

The request will be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver. The filing fee is not required if the appellant is a city or town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority. MassDEP may waive the adjudicatory hearing filing fee pursuant to 310 CMR 4.06(2) for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file an affidavit setting forth the facts believed to support the claim of undue financial hardship together with the hearing request as provided above.

Should you have any questions relative to this permit, please contact myself or Ryan Hale at heidi.davis@mass.gov and ryan.hale@mass.gov.

Very truly yours,



Heidi M. Davis
Highway Unit Supervisor

Ecc: DEP WERO – Michael McHugh
USACE – Dan Vasconcelos
USACE – Kevin Newton
MassDOT – Courtney Walker
MassDOT – Melissa Lenker
Weston & Sampson – Michael Joyce
Weston & Sampson – Rhianna Sommers

Wales Conservation Commission – Sarah Ryan conservation@townofwales.net

ATTACHMENT A
PRE-CONSTRUCTION SUBMITTAL CHECKLIST

Monson Road Transportation Improvement Project
Wales, MA

THIS CHECKLIST MUST BE COMPLETED PRIOR TO THE START OF WORK. NOTE THAT SOME CONDITIONS REQUIRE THAT INFORMATION BE SUBMITTED A SPECIFIC NUMBER OF DAYS PRIOR TO THE START OF WORK OR THE PRE-CONSTRUCTION MEETING.

Condition	Required Submittal	Due Date	Date Submitted	Date Approved
PRE-CONSTRUCTION SUBMITTAL REQUIREMENTS				
2, 3, and 4	Name, contact information, and qualifications of the EM, WS, and FGM, including specific experience and years to meet requirements	Prior to Pre-Construction Meeting		
5	Name and contact information of the RE	Prior to Pre-Construction Meeting		
7	USACE Work-Start Notification Form	14 days prior to work start		
8	CP/PP	14 days prior to work start		
9	EM Verification of SWPPP Training	Prior to work start		
12	Control of Water Plan	14 days prior to work start		

重要 महत्वपूर्ण σημαντικός Important կարեւոր quan trọng مهم

Communication for Non-English-Speaking Parties

This document is important and should be translated immediately.

If you need this document translated, please contact MassDEP's Director of Environmental Justice at the telephone number listed below.

Español Spanish

Este documento es importante y debe ser traducido inmediatamente. Si necesita traducir este documento, póngase en contacto con el Director de Justicia Ambiental de MassDEP (*MassDEP's Director of Environmental Justice*) en el número de teléfono que figura más abajo.

Português Portuguese

Este documento é importante e deve ser traduzido imediatamente. Se você precisar traduzir este documento, entre em contato com o Diretor de Justiça Ambiental do MassDEP no número de telefone listado abaixo.

繁體中文 Chinese Traditional

本文檔很重要，需要即刻進行翻譯。
如需對本文檔進行翻譯，請透過如下列示電話號碼與 MassDEP 的環境司法總監聯絡。

简体中文 Chinese Simplified

这份文件非常重要，需要立即翻译。
如果您需要翻译这份文件，请通过下方电话与 MassDEP 环境司法主任联系。

Ayisyen Kreyòl Haitian Creole

Dokiman sa a enpòtan epi yo ta dwe tradui l imedyatman. Si w bezwen tradui dokiman sa a, tanpri kontakte Direktè. Jistis Anviwònmantal MassDEP a nan nimewo telefòn ki endike anba a.

Việt Vietnamese

Tài liệu này và quan trọng và phải được dịch ngay. Nếu quý vị cần bản dịch của tài liệu này, vui lòng liên hệ với Giám Đốc Phòng Công Lý Môi Trường của MassDEP theo số điện thoại được liệt kê bên dưới.

ប្រទេសកម្ពុជា Khmer/Cambodian

ឯកសារនេះមានសារៈសំខាន់
ហើយគប្បីត្រូវបានបកប្រែភ្លាមៗ។
ប្រសិនបើអ្នកត្រូវការអោយឯកសារនេះបកប្រែ
សូមទាក់ទងនាយកផ្នែកយុត្តិធម៌បរិស្ថានរបស់
MassDEPតាមរយៈលេខទូរស័ព្ទដែលបានរាយដូចខាងក្រោម។

Kriolu Kabuverdianu Cape Verdean

Es dokumentu sta important i tenki ser tradusidu immediatamenti. Se nho ta presisa ke es dokumentu sta tradisidu, por favor kontata O Diretor di Justisia di Environman di DEP ku es numero di telifoni menxionadu di baixo.

Contact Deneen Simpson 857-406-0738
Massachusetts Department of Environmental Protection
100 Cambridge Street 9th Floor Boston, MA 02114
TTY# MassRelay Service 1-800-439-2370 • https://www.mass.gov/environmental-justice
(Version revised 8.2.2023) 310 CMR 1.03(5)(a)

Русский Russian

Это чрезвычайно важный документ, и он должен быть немедленно переведен. Если вам нужен перевод этого документа, обратитесь к директору Департамента экологического правосудия MassDEP (MassDEP's Director of Environmental Justice) по телефону, указанному ниже.

العربية Arabic

هذه الوثيقة مهمة وتجب ترجمتها على الفور.

إذا كنت بحاجة إلى ترجمة هذه الوثيقة، فيرجى الاتصال بمدير العدالة البيئية في MassDEP على رقم الهاتف المذكور أدناه.

한국어 Korean

이 문서는 중대하므로 즉시 번역되어야 합니다.
본 문서 번역이 필요하신 경우, 매사추세츠 환경보호부의 "환경정의" 담당자 분께 문의하십시오. 전화번호는 아래와 같습니다.

հայերեն Armenian

Այս փաստաթուղթը կարևոր է, և պետք է անհապաղ թարգմանել այն:
Եթե Ձեզ անհրաժեշտ է թարգմանել այս փաստաթուղթը, դիմեք Մասաչուսեթսի շրջակա միջավայրի պահպանության նախարարության (MassDEP) Բնապահպանական հարցերով արդարադատության ղեկավարին (Director of Environmental Justice)՝ ստորև նշված հեռախոսահամարով

فارسی Farsi Persian

این نوشتار بسیار مهمی است و باید فوراً ترجمه شود.
اگر نیاز به ترجمه این نوشتار دارید لطفاً با مدیر عدالت محیط زیستی MassDEP در شماره تلفن ذکر شده زیر تماس بگیرید.

Français French

Ce document est important et doit être traduit immédiatement. Si vous avez besoin d'une traduction de ce document, veuillez contacter le directeur de la justice environnementale du MassDEP au numéro de téléphone indiqué ci-dessous.

Deutsch German

Dieses Dokument ist wichtig und muss sofort übersetzt werden. Wenn Sie eine Übersetzung dieses Dokuments benötigen, wenden Sie sich bitte an MassDEP's Director of Environmental Justice *(Direktor für Umweltgerechtigkeit in Massachusetts)* unter der unten angegebenen Telefonnummer.

Ελληνική Greek

Το έγγραφο αυτό είναι πολύ σημαντικό και πρέπει να μεταφραστεί αμέσως. Αν χρειάζεστε μετάφραση του εγγράφου αυτού, παρακαλώ επικοινωνήστε με τον Διευθυντή του Τμήματος Περιβαλλοντικής Δικαιοσύνης της Μασαχουσέτης στον αριθμό τηλεφώνου που αναγράφεται παρακάτω

Italiano Italian

Questo documento è importante e deve essere tradotto immediatamente. Se hai bisogno di tradurre questo documento, contatta il Direttore della Giustizia Ambientale di MassDEP al numero di telefono sotto indicato.

Język Polski Polish

Ten dokument jest ważny i powinien zostać niezwłocznie przetłumaczony. Jeśli potrzebne jest tłumaczenie tego dokumentu, należy skontaktować się z dyrektorem ds. sprawiedliwości środowiskowej MassDEP pod numerem telefonu podanym poniżej.

हिन्दी Hindi

यह दस्तावेज महत्वपूर्ण है और इसका अनुवाद तुरंत किया जाना चाहिए। यदि आपको इस दस्तावेज का अनुवाद कराने की जरूरत है, तो कृपया नीचे दिए गए टेलीफोन नंबर पर MassDEP के पर्यावरणीय न्याय निदेशक से संपर्क करें।

Contact Deneen Simpson 857-406-0738
Massachusetts Department of Environmental Protection
100 Cambridge Street 9th Floor Boston, MA 02114
TTY# MassRelay Service 1-800-439-2370 • https://www.mass.gov/environmental-justice
(Version revised 8.2.2023) 310 CMR 1.03(5)(a)

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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.

This document contains the following sections:		Pages
SECTION I	Statutory Authorities & Regulated Activities	2
SECTION II	Review Categories & Application Procedures	3-7
SECTION III	Massachusetts General Permits	8-34
SECTION IV	General Conditions	35-51
SECTION V	Mitigation Standards	52-54
SECTION VI	Federal & State Agency Contact Information & Websites	55-56
SECTION VII	Definitions & Acronyms	57-66
APPENDIX A	Guidance for Section 106 NHPA Compliance in Massachusetts	67-71
APPENDIX B	Pre-Construction Notification	72-77
APPENDIX C	Self-Verification Notification	78-81
APPENDIX D	Pre-Construction Notification Application Checklist	82-88

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	**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. 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.	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:

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