JPB

COMMONWEALTH OF MASSACHUSETTS

CONTRACT DOCUMENTS AND SPECIAL PROVISIONS

PROPOSAL NO.	606352-136278
P.V. =	$26,307,000.00
PLANS	YES

FOR

Federal Aid Project No. PRC(PRC80)-003S(925)X
Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River

in the Town of

WAREHAM

In accordance with the STANDARD SPECIFICATIONS
for HIGHWAYS and BRIDGES dated 2026

This Proposal to be opened and read: **WEDNESDAY, OCTOBER 14, 2026 at 2:00 P.M.**

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NOTICE TO CONTRACTORS

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

WENESDAY, OCTOBER 14, 2026 at 2:00 P.M. **
WAREHAM
Federal Aid Project No. PRC(PRC80)-003S(925)X
Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River

****Date Subject to Change**

PROJECT VALUE = $26,307,000.00

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

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

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

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

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

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

NOTICE TO CONTRACTORS (Continued)

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

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

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

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

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

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

NOTICE TO CONTRACTORS (Continued)

PRICE ADJUSTMENTS

This Contract contains price adjustments for hot mix asphalt and Portland cement mixtures, diesel fuel, and gasoline. For reference the base prices are as follows: liquid asphalt $712.50 per ton, Portland cement $452.13 per ton, diesel fuel $4.372 per gallon, and gasoline $3.335 per gallon, and Steel Base Price Index 378.1. MassDOT posts the **Price Adjustments** on their Highway Division's website at
https://www.mass.gov/massdot-contract-price-adjustments

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

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

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

BY: Phillip Eng, Interim MassDOT Secretary
Jonathan L. Gulliver, Undersecretary and Highway Administrator
SATURDAY, AUGUST 8, 2026

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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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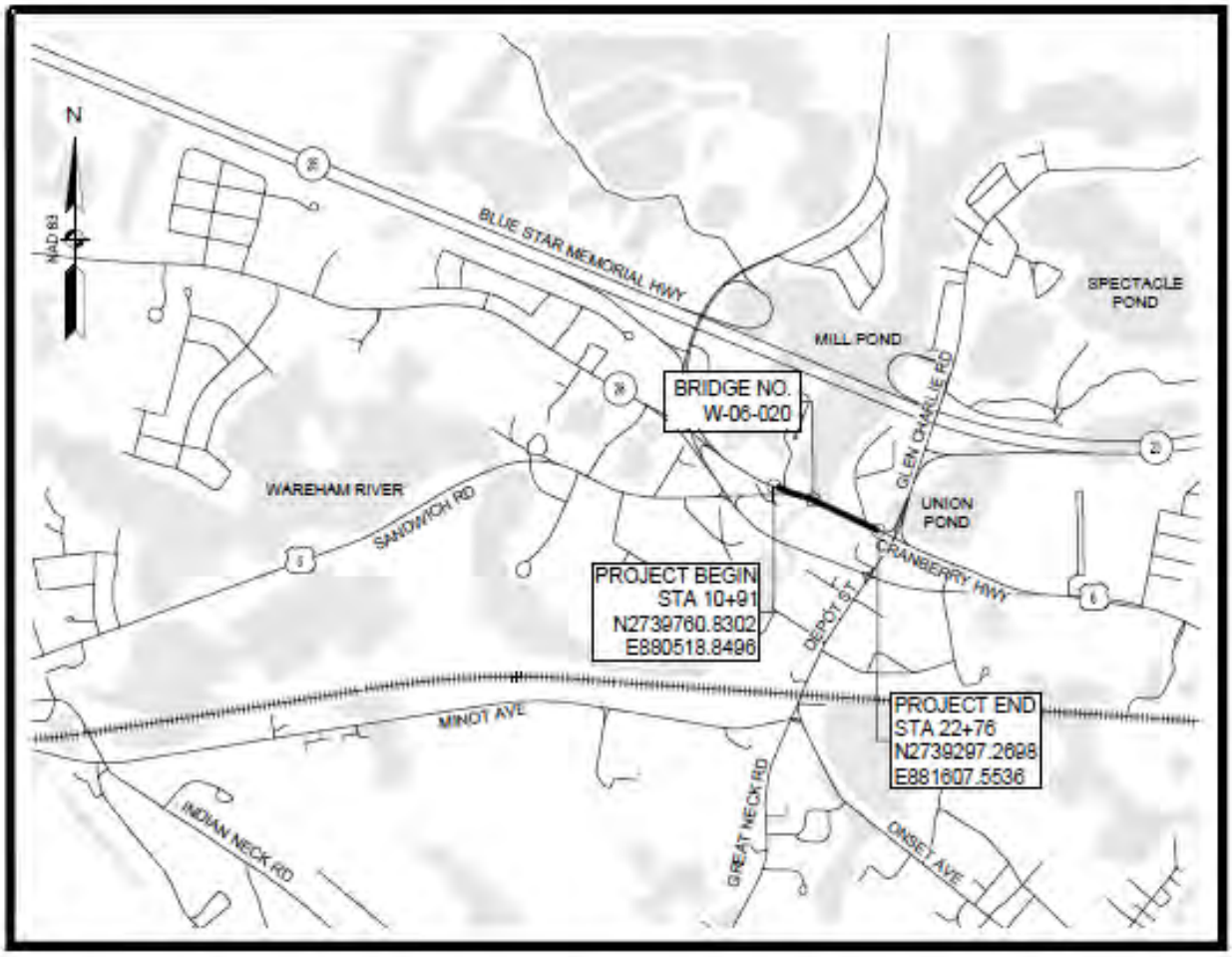
DOCUMENT 00331

LOCUS MAP

WAREHAM
Federal Aid Project No. PRC(PRC80)-003S(925)X
Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River



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DOCUMENT 00439

Final Report ☐

Interim Report ☐

CONTRACTOR PROJECT EVALUATION FORM

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

Date: _____

City/Town: _____ Contractor: _____

Project: _____ Address: _____

F.A. No. _____ Contract Number: _____

Bid Price: _____ Notice to Proceed: _____

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

Date Work Started: _____ Date Work Completed*: _____

Contractor's Superintendent: _____

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

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

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

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

_____ _____

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

_____

Contractor's Signature Acknowledging Report/Date

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

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

_____

_____

CONTRACTOR PROJECT EVALUATION FORM (Continued)

Date: _____ Contract Number:_____

INFORMATION FOR DISTRICT HIGHWAY DIRECTORS RELATING TO PREQUALIFICATION

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

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

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

I recommend a deduction for project completed late:_____

Signed: _____
District Highway Director

EXPLANATION OF RATINGS 1 – 9:_____

WORK NOT COMPLETED WITHIN SPECIFIED TIME: _____

Revised: 04/28/17

*** END OF DOCUMENT ***

DOCUMENT 00440

Final Report ☐

Interim Report ☐

SUBCONTRACTOR PROJECT EVALUATION FORM

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

Date: _____

City/Town: _____ Subcontractor: _____

Project: _____ Address: _____

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

Prime Contractor _____ Current Contract Completion Date: _____

Date Work Started: _____ Date Work Completed*: _____

Subcontractor's Superintendent: _____

Type of Work Performed by Subcontractor: _____

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

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

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

_____ _____

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

_____ _____

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

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

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

_____

_____

Contractor's Comments: _____

_____

SUBCONTRACTOR PROJECT EVALUATION FORM (Continued)

Date: _____ Contract Number:_____

INFORMATION FOR DISTRICT HIGHWAY DIRECTORS RELATING TO PREQUALIFICATION

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

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

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

I recommend a deduction for project completed late:_____

Signed: _____
District Highway Director

EXPLANATION OF RATINGS 1 – 8: _____

WORK NOT COMPLETED WITHIN SPECIFIED TIME: _____

Revised: 04/28/17

*** END OF DOCUMENT ***

DOCUMENT 00710
GENERAL CONTRACT PROVISIONS
Revised: 03-31-26

NOTICE OF AVAILABILITY

The STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES dated 2026, the SUPPLEMENTAL SPECIFICATIONS , the 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS; the 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING and the CONSTRUCTION STANDARD DETAILS are available online at https://www.mass.gov/massdot-highway-division-manuals-and-publications

SPECIAL PROVISIONS FOR RIGHT-TO-KNOW ACT REQUIREMENTS

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

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

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

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

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

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

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

ALTERNATIVE DISPUTE RESOLUTION
Forum, Choice of Law and Mediations:

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

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DOCUMENT 00715

SUPPLEMENTAL SPECIFICATIONS

JUNE 30, 2026

The 2026 *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 5.00: CONTROL OF WORK

Subsection 5.03: Conformity with Plans and Specifications
Change the MGL reference in the first sentence to Chapter 30, Section 39I (from Section 39L).

DIVISION II

CONSTRUCTION DETAILS

SECTION 200: DRAINAGE

SUBSECTION 227: DRAINAGE SYSTEM SEDIMENT

Subsection 227.30, Method of Measurement
Change the subsection number to 227.80

Subsection 227.31, Basis of Payment
Change the subsection number to 227.81

Subsection 227.31, Payment Items
Change the subsection number to 227.82

SECTION 400: SUB-BASE, BASE COURSE, SHOULDERS, PAVEMENT AND BERMS

SUBSECTION 430: CEMENT CONCRETE BASE COURSE

Subsection 430.40: General
Change Applied Crack Sealer to Hot Applied Crack Sealer.

SUBSECTION 476: CEMENT CONCRETE PAVEMENT

Subsection 476.20: Materials
Delete Preformed Bituminous Joint Filler for Concrete - M3.05.5 and add the following in M number sequence:

Preformed Expansion Joint Filler	M9.14.0

SUBSECTION 477: MILLED RUMBLE STRIPS

Subsection 477: Milled Rumble Strips
Replace this subsection with the following:

DESCRIPTION

477.20: General

The work consists of constructing rumble strips on roadways by milling grooves into finished surfaces. Milled Rumble Strips are categorized as Type A, Type B, Type C, or Type D. Type A are rectangular milled grooves at regular intervals in the paved surface, Type B rumble strips are rectangular grooves at regular intervals with designed gaps between intervals to accommodate bicyclists, and Type C and Type D rumble strips form continuous grooves in the paved surface in the form of a vertical sinusoidal wave pattern.

CONSTRUCTION METHODS

477.61: Equipment

The equipment shall self-align with the slope of the roadway surface and/or any irregularities in the roadway surface.

The Contractor shall demonstrate to the Engineer the ability to achieve the desired groove without tearing or snagging the roadway surface prior to beginning the work.

477.62: Installation of Rumble Strips

Rumble strips shall be installed in accordance with the locations, dimensions, and Type shown on the plans.

Type A and Type B rumble strips shall be installed after the longitudinal pavement markings they supplement (typically edge lines or channelizing lines) are in place. Installation of any diagonal or chevron pavement markings that cross the Type A or Type B rumble strips shall only occur after the rumble strips are in place.

Type C rumble strips shall be installed after the location of the longitudinal pavement markings they supplement (typically center lines) has been laid out, but before the pavement markings are installed. The pavement markings shall only be installed after the Type C rumble strips are in place.

Type D rumble strips shall be installed after the longitudinal pavement markings they supplement (typically center lines) are in place.

477.63: Control of the Work Area

At the end of each working day, all equipment shall be moved to a location where it does not present a hazard to traffic. The pavement shall be cleaned by sweeping and the work area shall be reopened to traffic.

Pavement millings shall become the property of the Contractor and shall be removed and disposed of off-site.

COMPENSATION

477.80: Method of Measurement

Milled Rumble Strip (Type A), Milled Rumble Strip (Type C), and Milled Rumble Strip (Type D) will be measured by the total length of installed rumble strip. Milled Rumble Strip (Type B) will be measured by the total length of installed rumble strip excluding the designed gaps. Breaks at castings, bridge decks, intersections or other breaks will not be measured for payment for all types.

477.81: Basis of Payment

Payment for Milled Rumble Strip (Type A), Milled Rumble Strip (Type B), Milled Rumble Strip (Type C), and Milled Rumble Strip (Type D) will be made at the contract unit price per foot of rumble strips, complete in place. Such payment will be full compensation for furnishing all equipment and labor for satisfactorily performing the work including cleanup and disposal of excess materials.

477.82: Payment Items

Item number	Description	Unit
477.	Milled Rumble Strip (Type A)	Foot
477.1	Milled Rumble Strip (Type B)	Foot
477.2	Milled Rumble Strip (Type C)	Foot
477.3	Milled Rumble Strip (Type D)	Foot

SUBSECTION 482: SAWCUTTING

Subsection 482.80: Method of Measurement
Replace this subsection with the following:

Sawcutting, when included in the Contract as its own bid item, will be measured for payment by the foot along the cut line, regardless of depth.

SECTION 600: HIGHWAY GUARD, FENCES AND WALLS

SUBSECTION 628: IMPACT ATTENUATORS

Subsection 628.82: Payment Items
Replace this subsection with the following:

Item number	Description	Unit
628.302	Permanent Impact Attenuator, Non-Redirective, TL-2	Each
628.303	Permanent Impact Attenuator, Non-Redirective, TL-3	Each
628.304	Temporary Impact Attenuator, Non-Redirective, TL-2	Each
628.305	Temporary Impact Attenuator, Non-Redirective, TL-3	Each
628.312	Permanent Impact Attenuator, Redirective, TL-2	Each
628.313	Permanent Impact Attenuator, Redirective, TL-3	Each
628.314	Temporary Impact Attenuator, Redirective, TL-2	Each
628.315	Temporary Impact Attenuator, Redirective, TL-3	Each
628.322	Permanent Impact Attenuator, Low-Maintenance, TL-2	Each
628.323	Permanent Impact Attenuator, Low-Maintenance, TL-3	Each

SECTION 800: TRAFFIC CONTROL DEVICES

SUBSECTION 813: WIRING, GROUNDING AND SERVICE CONNECTIONS

Subsection 813.20: General
Replace this subsection with the following:

This work shall consist of furnishing and installing wire and cable of the type and size indicated for traffic signals and other traffic control devices, ITS systems, highway lighting and related electrical systems, equipment grounding systems, new ground electrodes or connections to existing ground electrodes, power pedestals, and all materials and equipment necessary to deliver power to such systems.

Service points shown on the plans are approximate only. The Contractor shall determine exact locations for both overhead and underground service access points. The Contractor shall determine riser elevations or connections/routing to manhole facilities from the serving utility, and arrange to complete the service connections.

All work under this Subsection shall comply with the MEC and the National Electrical Safety Code.

Subsection 813.41: Grounding and Bonding Conductions
Replace this subsection with the following:

Grounding and bonding conductors shall conform to M8.16.10: Type 10 Grounding and Bonding Conductors (Solid or Stranded, Insulated or Bare).

Subsection 813.42: Ground Rods
Replace this subsection with the following:

Ground rods shall consist of driven rod(s) conforming to M8.17.0: Ground Rod or other devices approved for the purpose.

Subsection 813.44: Power Pedestal
Add this subsection in numerical order:

A Power Pedestals shall consist of a side-of-post mounted lockable load center enclosure, a load center with circuit breakers, an exterior-mounted electrical meter, signal post and base, equipment bonding, ground rod(s) conforming to 813.42: Ground Rods, and a cement concrete foundation. The enclosure, lock, circuit breakers, signal post and base, and foundation shall all be included in the Shop Drawing submission.

The enclosure shall be rated to meet or exceed NEMA 3R and be suitable for post-mounting and shall be sized appropriately to house the load center. The enclosure shall be capable of being secured with an integrated locking mechanism or by a Contractor-supplied padlock; regardless of locking mechanism, it shall be operated with a #2 key.

The circuit breakers shall be designed for single-phase, 3-wire, 120/240 VAC. Circuit breakers shall provide a means to manually operate a circuit and/or automatically open a circuit that is in overload or short circuit conditions. All circuit breakers shall be UL listed and have CSA certification.

The enclosure shall be furnished with a meter socket installed. The meter socket shall be approved by the servicing electrical utility.

The signal post and base shall conform to M10.05.1: Signal Posts and Bases and the Plans. The Contractor shall supply a square aluminum base with a natural or anodized finish and a Schedule 80 aluminum post with a brushed or spun finish, unless otherwise indicated in the Plans.

The Contractor shall supply mounting equipment recommended by the enclosure manufacturer to side-mount the cabinet to the post.

Bonding for the Power Pedestal shall utilize a #8 AWG or larger ASTM-B3 wire.

The cement concrete foundation shall conform to the Plans and M4.02.0: Concrete Produced by Stationary and Truck Mixers, M4.03.0: Concrete Produced by Volumetric Mixers, M4.06.1: Conventional Concrete, M4.09.0: Precast, Prestressed, and Prefabricated Concrete Products, M4.11.0: Evaporation Reducing Materials, and M4.12.0: Curing Materials, as applicable.

Subsection 813.64: Power Pedestal
Add this subsection in numerical order:

No work shall commence until Shop Drawings have been approved.

The Power Pedestal Cabinet shall be mounted side-of-post to the Signal Post, per the manufacturer's recommendations. The Power Pedestal Cabinet should be installed directly below the meter socket, per the Plans. If dissimilar metals are present, they shall be electrically insulated to prevent galvanic corrosion.

The Contractor shall supply the appropriate type (single pole or double pole) and number of circuit breakers included within the Power Pedestal Cabinet to provide the recommended AC power to each device receiving power from the Cabinet. The circuit breakers shall be clearly labeled as to which device they are powering (e.g. RRFB-1, RRFB-2, Warning Beacon, Speed Feedback Sign, etc.).

The Power Pedestal shall be grounded and bonded per 813.61: Equipment Grounding and Bonding and 813.62: Grounding Electrodes.

Subsection 813.80.E: Power Pedestal
Add this subsection in numerical order:

Power Pedestals will be measured by the number of Power Pedestals each furnished and installed.

Subsection 813.81.E: Power Pedestal
Add this subsection in numerical order:

Power Pedestals will be paid for at the contract unit price for each installed in place. This includes all labor and materials required for a working system.

All costs associated with grounding and bonding of Power Pedestals shall be considered incidental to the item.

All costs associated with providing service connections to Power Pedestals shall be paid for under their respective pay items.

Subsection 813.82: Payment Items
Change the unit of measure for items 813.80 and 813.81 to Each and add the following pay item:

Subsection 815.82: Payment Items
Delete payment items 818.90 to 818.94, 819.39, 819.832, 819.52, 819.53, 819.60 to 819.64, 819.70, 819.71, 819.72, 819.800, 819.801, 819.802, 819.803,:819.810, 819.811, 819.820, 819.821, 819.850, 819.851, 819.852.

Add the following payment item:

813.90	Power Pedestal	Each

SUBSECTION 819: TRAFFIC SIGNAL DETECTION

Subsection 819: Traffic Signal Detection
Add this subsection:

DESCRIPTION

819.20: General

Work under this Subsection consists of furnishing and installing detection devices for vehicles, bicycles, pedestrians, and other road users.

MATERIALS

819.40: General

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

Material	Section
Vehicle Detection Systems	M10.08.0
Passive Stop Line Detectors	M10.08.1
Passive Advanced Detectors	M10.08.2
Pedestrian Detectors	M10.09.0
Pedestrian Pushbutton Assembly	M10.09.1
APS Pushbutton Assembly	M10.09.2

The Contractor shall furnish Vehicle Detection Systems (VDS) and Pedestrian Detectors that are listed on the QTCE.

Any software, firmware, cables, or adapters required to program, adjust, fine-tune, or monitor VDS or Pedestrian Detectors shall be provided by the Contractor. VDS and Pedestrian Detectors shall have the latest versions of software and/or firmware installed prior to inspection. Manufacturer updates to software and/or firmware shall be included at no cost for the life of the products.

819.40.A: Vehicle Detection Systems

A VDS shall consist of one or more Internet Protocol (IP) -based detector/sensor assemblies and a cabinet interface device that is installed in a Traffic Signal Controller Cabinet or similar device.

Stop Line VDS shall be capable of providing motor vehicle and bicycle detection at all locations shown on the Plans. The Contractor may furnish a VDS that utilizes a single detector/sensor or multiple, as long as all stop line motor vehicle and bicycle detection zones are encompassed and the traffic signal or other device utilizing the detection can operate per the Plans. All Passive Stop Line Detectors required to provide stop line detection at an intersection shall be included in the cost of a single Stop Line Vehicle Detection System.

If the Contractor furnishes a Stop Line VDS that does not utilize an integrated video monitoring system, a separate video monitoring system per 819.41: Video Monitoring System shall be furnished and installed at no additional cost.

Advanced VDS shall be capable of providing motor vehicle detection on a single approach, at the location shown on the Plans. The Contractor Shall furnish Passive Advanced Detectors that utilize, and are compatible with, the same interface device installed in the Traffic Signal Controller Cabinet, or similar device, as the Stop Line VDS.

All VDSs shall be furnished with manufacturer-supplied mounting hardware.

If multiple VDSs over multiple locations are supplied under a single contract, all components furnished by the Contractor shall be of the same make and model.

819.40.B: Pedestrian Detectors

Pedestrian Pushbutton Assembly and Accessible Pedestrian Signal (APS) Pushbutton Assembly shall both include a pushbutton, sign, housing, manufacturer-specified mounting hardware, and wiring. The Contractor shall review the Contract Documents to determine if one or more in-cabinet control units are required to meet the pedestrian detector type and operational requirements. In-cabinet control units shall be considered incidental to the cost of the item.

The Contractor shall provide a pushbutton housing that conforms to the shape of the pole it is mounted to or shall furnish and install a manufacturer-supplied saddle to provide a flush, secure fit, at no additional cost.

An APS Pushbutton Assembly shall include a pedestrian pushbutton sign that conforms to the Plans. If the sign is not integral to the housing, separate mounting equipment shall be furnished and installed by the Contractor. All costs associated with the sign and mounting equipment shall be considered incidental to the cost of the item.

819.41: Video Monitoring System

When required by 819.40.A: Vehicle Detection Systems, the Contractor shall furnish and install a Video Monitoring System. The Video Monitoring System shall consist of one or more IP-based 4K, 1080p, H.264 dome-type CCTV cameras; mounting hardware, including but not limited to: brackets, bands, straps, posts, plates, and pole mount adapters; power distribution and conditioning equipment including surge suppression; and all necessary cabling and wiring.

All equipment provided for the Video Monitoring System shall be commercial, off-the-shelf products. Custom equipment designed specifically for the Contract will not be accepted. All cabling and wiring shall be recommended by the manufacturer and rated for outdoor use. Any special wiring or connectors required by the manufacturer shall be identified in the Shop Drawings.

The Video Monitoring System shall conform to National Electrical Manufactures Association (NEMA) standards, Underwriters' Laboratory (UL), and Military Standards (MIL), as applicable. All components of the Video Monitoring System shall be new and still under production by the manufacturer. Obsolete, no longer produced, and/or no longer supported components will not be accepted.

The Video Monitoring System shall be capable of operating in temperatures ranging from -29°F to +165°F.

The camera shall meet or exceed the requirements found in Table 819.41-1:

Table 819.41-1: Minimum Camera Requirements

Feature	Requirement
Zoom Ratio	The minimum zoom ratio shall be 30x Optical and 12x Digital
Camera Type	The camera shall be an IP-type CCTV camera.
Auto Focus	The camera shall include auto focus with a selection for manual override of auto focus.
Lens Aperture Ratio	Typical: F/1.6 to F/4.7 (wide to telephoto)
On-Screen Direction	The CCTV camera shall display on-screen azimuth indications.
Privacy Zones	The CCTV camera shall be programmable to blank out up to 8, four-sided areas to electronically block portions of the camera's field of view from being

Feature	Requirement
	displayed. These privacy zones shall move and adjust sizing synchronously with camera movements and degree of lens zooming.
On-Screen Labels, Text and Titles	The CCTV camera shall display a minimum of 20 programmable characters for on-screen camera ID, preset position, sector, and alarm titles.
On-Screen Labels, Text and Title Positioning	The position of the on-screen text shall be adjustable to appear at selectable positions on the CCTV camera screen image.
Number of Pixels	The camera shall provide a minimum of 1280H x 720V effective pixels. The camera shall be capable of being configured to operate at all standard lower resolutions down to 320H x 180V effective pixels.
Image Sensor Size	The camera shall include an image sensor of 1/1.8 in., nominal.
Lens Focal Length	The camera shall include a zoom lens of 4.3 mm to 129 mm, minimum focal length.
Color and Black & White Image Selection	The camera shall have Color and Black & White video image display modes incorporating both automatic and manual override image mode selection. The camera shall transition automatically to a Black & White mode (when in automatic mode) when the luminance level reaches a user predefined threshold. At all times the camera shall provide a full motion video output at 30 frames per second.
Image Stabilization	The CCTV camera shall incorporate electronic image stabilization to reduce the effects of vibration and wind gusts on the displayed video image.
Automatic Iris	The camera shall include both automatic iris control and an override for manual iris adjustments.
Wide Dynamic Range	The CCTV camera's wide dynamic range shall be 120 dB.
CCTV Camera Optical Sensitivity	The camera's sensitivity shall be sufficient to provide a clear, usable color video image display with a scene illumination of ≤ 0.1 lux at an aperture of F1.6, nominal.
Power Input	The power input for the CCTV camera and dome shall be PoE+.
Alarms	No alarm contacts shall be wired.

The Contractor shall mount the camera at a location that optimizes line-of-sight for all approaches. The view of each approach shall have a clear line of sight, free from obstructions from trees, overhead wires, buildings, and/or other obstructions. If the Contractor is unable to provide a clear line of sight for all approaches to the satisfaction of the Engineer, a second camera, including mounting hardware, cabling, and wiring, shall be furnished and installed on a different traffic signal structure at no additional cost.

The Contractor shall be responsible for the following items prior to installation:

- Ensure that all components are assembled and factory-tested prior to delivery to the project site.
- Fully configure the camera settings, including but not limited to: camera resolution, camera address, default settings, and pre-set and home positions, per the direction of the Engineer.
- Coordinate with the Engineer to set the camera address number to provide unique identification that is compatible with the CCTV camera addressing schema utilized by the Department.

The Contractor shall deliver the camera(s) fully assembled to the project site.

The Contractor shall provide up to 3 hard copy sets of operating manuals, service manuals, and maintenance instructions for all components of the system. At the request of the Engineer, the number of copies may be reduced if the manuals are provided in .pdf file format.

819.42: Material Warranties

All components of Vehicle Detection Systems, including Video Monitoring Systems, and Pedestrian Detectors shall include a minimum two-year manufacturer's replacement warranty that will commence upon acceptance by the Engineer. The warranty shall cover any manufacturing defects of the products.

Construction Methods

819.60: General

The Contractor shall use discretion in installing the detectors/sensors at locations that optimize the performance of the VDS and to eliminate false calls. The Contractor shall notify the Engineer if the size or location of the detection zones differs from what is shown in the Plans. At the direction of the Engineer, the Contractor will be required to readjust the location of the detection zones and/or modify the detection channels if false calls are observed or the traffic signal system is not operating per the Plans due to the performance of the VDS; this work shall be considered incidental to the cost of the item.

The Contractor shall use manufacturer-specified mounting hardware for all detectors/sensors. If mounted to mast arms or strain poles, any addition weight or wind loading from the detector/sensor shall be accounted for in the structural calculations.

The Contractor shall install the cabinet interface device in the traffic signal controller cabinet. The cabinet interface device shall be connected to the Field Monitoring Unit (FMU) or an ethernet switch in the traffic signal controller cabinet. All communication between devices shall be IP-based. Use of external communications that are not routed through the FMU is prohibited.

The Contractor shall furnish and install low voltage power cabling surge protection equipment required for all data and power lines associated with VDS, Video Monitoring Systems, and/or Pedestrian Detection Systems entering the traffic signal controller cabinet.

The Contractor shall install the manufacturer-specified cable between the detectors/sensors to the cabinet interface device in the traffic signal controller cabinet via traffic signal structures, conduit, and/or pullboxes. This shall include all connectors, sealing tape, and incidental work to complete the connection(s). All equipment installation and wiring shall be installed in a neat and orderly manner and per the manufacturer's specifications.

The VDS shall be powered through one of the power outlets available on the FMU. The VDS shall be capable of being powered down and remotely restarted through remote control of the power outlet on the FMU.

Under the supervision of the Engineer, the Contractor shall install the VDS software that allows visual confirmation of the detection zones on Department computers.

The Contractor shall install Pedestrian Detectors at the location(s) and mounting height shown on the Plans.

The Contractor shall mount and orient the APS Pushbutton Assembly in a manner so that the vibrotactile arrow is aligned parallel to the crosswalk.

Prior to acceptance, the Contractor shall furnish all passwords for Vehicle Detection Systems and Pedestrian Detectors to the Engineer. The use of default passwords is prohibited.

819.61: Programming APS Pushbuttons

Each APS Pushbutton shall have an audible walk indication during the associated walk interval. The duration of the audible walk indication shall match the duration of the walk interval unless the pedestrian signal is programmed to rest in walk. If programmed to rest in walk, the audible walk indication shall be limited to 7 seconds in length but may be recalled by a subsequent button press during the walk interval.

The APS Pushbutton locator tone and audible walk indication shall be programmed to broadcast at volume 5 dBA louder than ambient sound, except when audible beaconing is provided in response to an extended pushbutton press. The broadcast volume shall be programmed to not exceed 100 dBA at 3 ft. from the emitter, regardless of ambient noise conditions.

The locator tone shall have a duration of 0.15 seconds or less and shall repeat at 1-second intervals.

The locator tone shall be active during all signal intervals, except for the following conditions:

- When the audible walk indication is being broadcast.
- If the signal is programmed to rest in walk, the locator tone shall resume 7 seconds after the start of the walk interval.
- The locator tone shall be disabled if the traffic control signal or pedestrian hybrid beacon is operating in an emergency or fault flashing mode.

The locator tone shall be active during the flashing yellow and alternating flashing red intervals of a pedestrian hybrid beacon phasing sequence.

Upon button press, the locator tone at that pushbutton shall be interrupted and a speech message of “Wait” shall be broadcast.

The normal status of the pilot light shall be dark. The pilot light shall illuminate upon button press and stay illuminated until the start of the walk interval, when it shall return to dark. If the associated pedestrian phase is set to pedestrian recall, the pilot light shall stay illuminated for all intervals except for the walk interval.

The audible walk indication shall an audible tone unless a speech message is called for in the Plans. The audible tone shall repeat at 8 to 10 ticks per second, in multiple frequencies, with the dominant component at 880 Hz.

If a speech message is used, the following shall apply:

- For exclusive pedestrian phases, during the walk interval the speech message shall be: “walk sign is on for all crossings.” This message shall be broadcast a single instance.
- *For concurrent pedestrian phases, during the walk interval the speech message shall be: “[STREET NAME]. Walk sign is on for [STREET NAME].” This message shall be broadcast a single instance.
- If the signal is programmed to rest in walk, the concurrent pedestrian speech message shall be repeated upon each subsequent button press.

*Note: See Plans for Street Name information.

The vibrotactile arrow shall vibrate during the walk interval.

The Contractor shall include a fault relay that will default to placing a constant pedestrian call from any pushbutton assembly that fails to communicate back to the in-cabinet control unit.

The Contractor shall connect the in-cabinet control unit to the Field Monitoring Unit (FMU) via an open ethernet port.

819.62: VDS Testing and Evaluation

After the VDS is installed, but prior to acceptance, the Contractor shall conduct an evaluation of the system in the presence of the Engineer. The purpose of the evaluation is to certify the system is operating per the requirements of M10.08.0: Vehicle Detection Systems, M10.08.1: Passive Stop Line Detectors, and M10.08.2: Passive Advanced Detectors, as applicable. The Contractor shall submit their testing and evaluation plan as a part of the Shop Drawing submittal.

The testing and evaluation shall take place for a minimum of 30 minutes under moderate live traffic conditions. Testing shall not be conducted during inclement weather.

If the Engineer determines that the system does not meet the operational requirements, the Contractor will be required to adjust the location, orientation, and/or number of detector/sensors. The Contractor may also adjust the location of the detection zones at this time. Upon completion of this work, the system shall be reevaluated in the presence of the Engineer. This process shall be repeated until the operational requirements are met.

All costs associated with testing and evaluation of the VDS, including the repositioning or addition of new materials, shall be considered incidental to the item.

Compensation

819.80: Method of Measurement

Stop Line Vehicle Detection Systems will be measured as each system furnished and installed.

Advanced Vehicle Detection Systems will be measured as each system furnished and installed.

Pedestrian Pushbuttons and APS Pushbuttons will be measured as each pushbutton furnished and installed.

819.81: Basis of Payment

Stop Line Vehicle Detection Systems will be paid for each system installed at an intersection. For the purposes of this work, an intersection shall be defined as all roadway, path, and/or trail approaches controlled by a single traffic signal controller. Where a Video Monitoring System is required per 819.40: General, it shall be included in the cost of Item 819.840.

Advanced Vehicle Detection System will be paid for each system installed on an intersection approach.

Pedestrian Pushbutton and APS Pushbutton will be paid for each pushbutton assembly installed. The pedestrian sign mounted directly above the pushbutton shall be considered incidental to the item.

The unit cost of each vehicle detection system or pushbutton item shall include all wiring, cabling, mounting hardware, software, firmware, video monitoring system (if required), testing, calibrating, Department Acceptance, training, and all other labor and materials required for the system(s) to operate per the Plans.

819.82: Payment Items

Item number	Description	Unit
819.840	Stop Line Vehicle Detection System	Each
819.845	Advanced Vehicle Detection System	Each
819.850	Pedestrian Pushbutton	Each
819.855	APS Pushbutton	Each

SUBSECTION 850: TRAFFIC CONTROLS FOR CONSTRUCTION AND MAINTENANCE OPERATIONS

Subsection 850.25: Arrow Board
Subsection 850.45: Arrow Board
Subsection 850.65: Arrow Board
Delete these subsections.

Subsection 850.80: Method of Measurement
Delete the 7th paragraph beginning with "Arrow Board will be measured …"

Subsection 850.81: Basis of Payment
Delete the 7th paragraph beginning with "Arrow Board will be paid for …"

Subsection 850.82: Payment Items
Revise description and unit of item 852. to Safety Signing for Traffic Management / Square Foot.
Delete item number 856.

SUBSECTION 856: CONNECTED WORK ZONE NOTIFICATION SYSTEM AND ASSOCIATED DEVICES

Subsection 856: Connected Work Zone Notification System and Associated Devices
Add this new subsection.

DESCRIPTION

856.20: General

The Connected Work Zone Notification System (CWZNS) is a system of field devices that transmit real-time location-based data about work zones. CWZNS field device data is provided in a Work Zone Data Exchange (WZDx) Device Feed in accordance with the United States Department of Transportation (USDOT) WZDx Specification. The Device Feed is consumed by the MassDOT Work Zone Manager (WZM) application.

The Contractor shall be responsible for furnishing, installing, repositioning, operating, maintaining, and removing these CWZNS devices.

MATERIALS

856.40: General

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

Material	Section
Connected Work Zone Notification System Devices	M10.18.0
Location Marker	M10.18.1
Connected Arrow Board	M10.18.2

End Location Markers shall conform to M10.18.1: Location Marker and include power and communication status lights and an on/off switch.

856.41: Arrow Board

Arrow Boards shall consist of a matrix of yellow elements that may be illuminated in flashing or sequential patterns, on a non-reflective, black background. The light output from the Arrow Board shall meet the minimum legibility distance, per the MUTCD. The elements shall be capable of at least 50% dimming from full brilliance to avoid nighttime glare. Arrow Boards that are continuously operational in both daylight and nighttime conditions shall automatically adjust the light output based upon ambient light conditions.

The mounting height of the Arrow Board, when in operation, shall be per the Plans.

The minimum dimensions and number of elements for Arrow Boards shall be per Table 856.41-1.

Table 856.41-1: Arrow Board Dimensions and Elements

Item Numbers	MUTCD Type	Minimum Dimensions (width by height)	Minimum Number of Elements
856.060, 856.160	B	60 in. by 30 in.	13
856.096, 856.196	C	96 in. by 48 in.	15

Arrow Boards shall be capable of the following operating modes, per the MUTCD:

- Four Corners Flashing Caution
- Alternating Diamond Caution
- Flashing Arrow (left or right)
- Sequential Chevron (left or right)
- Flashing Double Arrow

Arrow Boards that are categorized as "Connected Arrow Boards" (Items 856.160 and 856.196) shall meet the requirements of M10.18.2: Connected Arrow Board in addition to the requirements of an Arrow Board described in this Subsection.

856.42: Shop Drawings

Within 30 days of the Notice to Proceed, the Contractor shall submit to the Engineer for review and approval cut sheets for each model of CWZNS device to be used. The cut sheets shall document device specifications, including details of how the CWZNS device will communicate. Work that requires the use of CWZNS devices shall not commence until the submission has been approved.

CONSTRUCTION METHODS

856.60: General

At least 15 days prior to deploying CWZNS devices, the Contractor shall visit the site to verify cellular coverage. If the devices the Contractor plans to deploy do not have coverage, the Contractor shall swap out the cellular modem, SIM card, or both to a carrier that provides coverage. If no adequate cellular coverage exists from 4G LTE or 5G providers, the Contractor shall immediately notify the Engineer.

The Contractor shall install CWZNS devices at the locations shown on the Plans.

Per the WZDx Specification Device Feed, an End Location Marker shall have a single MarkedLocation with the "type" property as "work-zone-end".

The Contractor shall install and power on the End Location Marker coinciding with the deployment of the temporary traffic control setup that calls for its use. The Contractor shall power down and remove the Location Marker at the conclusion of the removal of the temporary traffic control setup. If the location of the work moves during a work shift, the Contractor shall power down the Location Marker, relocate it, and then power it back on.

The operating mode for the Arrow Board or Connected Arrow Board shall be per the Plans. When activated, the minimum element on-time shall be 50% for the flashing mode, with equal intervals of 25% for each sequential phase. The flashing rate shall be not less than 25 or more than 40 flashes per minute.

If a Connected Arrow Board is being used to transmit its location without utilizing other arrow board functions, such as operating a Flashing Arrow, the arrow board shall remain dark and removed from the roadway or protected from approaching traffic while the data is being transmitted.

The Contractor shall be responsible for remediating any CWZNS device that is not operating as specified, at no additional cost to the Department.

CWZNS devices that are lost, stolen, vandalized, damaged, destroyed, or deemed unacceptable while their use is required on the project shall be replaced by the Contractor at no additional cost to the Department.

COMPENSATION

856.80: Method of Measurement

Arrow Boards and Connected Arrow Boards will be measured by the Day. Each period of up to 24 hours during which an Arrow Board or Connected Arrow Board is in use will be measured as one day, regardless of the number of times that the unit is positioned, repositioned, removed, or returned to service.

End Location Markers will be measured by the Day. Each period of up to 24 hours during which a End Location Marker is in use will be measured as one day, regardless of the number of times that the unit is positioned, repositioned, removed, or returned to service.

856.81: Basis of Payment

Arrow Boards and Connected Arrow Boards will be paid for at the contract unit price per day which shall include full compensation for labor and materials, positioning, repositioning, and removing or returning to service.

End Location Markers will be paid for at the contract unit price per day which shall include full compensation for labor and materials, positioning, repositioning, and removing or returning to service.

If an End Location Marker is attached to another traffic control device that is not otherwise called for in the Plans or Specifications, that ancillary device shall be considered incidental to the cost of the End Location Marker.

Licenses, fees, communication costs, power costs, and access to real-time and recorded data associated with the Device Feed for CWZNS devices shall be considered incidental to the cost of the item.

The Department will not pay for CWZNS devices that fail to operate as specified.

856.82: Payment Items

Item number	Description	Unit
856.060	Arrow Board (Type B)	Day
856.096	Arrow Board (Type C)	Day
856.160	Connected Arrow Board (Type B)	Day
856.196	Connected Arrow Board (Type C)	Day
856.201	End Location Marker	Day

SECTION 900: STRUCTURES

SUBSECTION 901: CEMENT CONCRETE

Subsection 901.20: Materials

Delete Asphaltic Materials – M3, Preformed Bituminous Fiber Joint Filler – M3.05.3 and add the following in M number sequence:

Preformed Expansion Joint Filler	M9.14.0

SUBSECTION 983: REVETMENT

Subsection 983.40: General
Delete Preformed Bituminous Fiber Joint Filler – M3.05.3 and add the following in M number sequence:

Preformed Expansion Joint Filler	M9.14.0

DIVISION III

MATERIALS SPECIFICATIONS

SECTION M3: ASPHALTIC MATERIALS

Subsection M3.05.5: Preformed Bituminous Joint Filler for Concrete
Delete this subsection.

SECTION M9: MISCELLANEOUS MATERIALS

Subsection M9.14.0: Preformed Expansion Joint Filler
Replace this subsection with the following:

Preformed expansion joint filler for concrete applications and structural construction shall meet the requirements specified herein. The Contractor shall provide certified test data which documents compliance with the required physical properties. The certified test data shall be submitted to the Engineer for approval.

Table M9.14.0-1: Types of Preformed Expansion Joint Filler

Specification	Type and Description
AASHTO M 153	Type I – Sponge Rubber Type II – Cork Type III – Self-Expanding Cork Type IV – Polyurethane-Bonded Recycled Rubber
AASHTO M 213	Type I – Asphalt-Saturated Cellulosic Fiber Type II – Asphalt Binder-Cork with Asphalt-Saturated or Glass Fiber Felt Type III – Polyurethane-Bonded Recycled Rubber
ASTM D1752	Type IV – Recycled PVC
ASTM D7174	Type I – Closed-Cell Polyethylene or Blended Polyethylene Foam
ASTM D8139	Type I – Closed-Cell Polypropylene Foam

Subsection M9.14.2: Closed Cell Foam Joint Filler
Delete this subsection:

M10.03.1: Field Monitoring Unit

All Field Monitoring Units (FMU) shall be compatible with the MassDOT Critical Operations Multi-jurisdictional Modular System (MCOMMS), cloud-based management system.

Subsection M9.14.2: Closed Cell Foam Joint Filler
Delete this subsection:

SECTION M10: TRAFFIC CONTROL DEVICES

Subsection M10.03.1: Field Monitoring Unit
Add these new subsections:

M10.03.1: Field Monitoring Unit

All Field Monitoring Units (FMU) shall be compatible with the MassDOT Critical Operations Multi-jurisdictional Modular System (MCOMMS), cloud-based management system.

FMUs shall be capable of operating independently from the brand of traffic signal controller, vehicle and pedestrian detection systems, battery backup system (BBS), and any other Ethernet-based, web accessible device present in the traffic signal controller cabinet.

M10.03.1.A: Hardware

The FMU shall communicate via an Ethernet port with an RJ45 connector and have an integrated Ethernet switch with a minimum of four ports.

The FMU shall be powered via standard 120 VAC input power. The FMU shall include an integrated battery and battery charging/monitoring circuit that will allow the FMU to fully function even if all other electrical service to the cabinet has been interrupted. The battery shall continue to supply the FMU with power for a minimum of 5 hours on a single charge.

The FMU shall have an integrated GPS that will allow for automated telemetry without additional configuration. The GPS shall be capable of providing a time sync pulse to the internal clock of a connected traffic signal controller. The FMU shall utilize the integrated GPS to geolocate itself on a map via the FMU management software.

M10.03.1.B: Software

The configuration of the FMU shall be accomplished by accessing FMU management software via an internet browser. It shall be possible to configure the FMU without any special software.

The FMU shall operate without requiring a static IP address. The only configuration required at the FMU is to enter the URL to the host of the FMU management software.

The FMU shall utilize HTTPS protocols and XML data structure for communications with the FMU management software. The data shall be scalable for future expansion; proprietary protocols shall not be used.

M10.03.1.C: Wireless Connectivity

The FMU shall be supplied with an internal 4G LTE cellular modem.

The modem shall support future upgrades to 5G service, when available, and shall be compatible with SIM cards from multiple cellular carriers.

M10.03.1.D: Remote Access

Remote access to any traffic signal cabinet component that has a web interface via the FMU shall not require the end user to create a separate Virtual Private Network (VPN) connection.

Subsection M10.08.0: Vehicle Detection Systems
Subsection M10.08.0: Vehicle Detection Systems
Subsection M10.08.0: Vehicle Detection Systems
Add theses new subsections:

M10.08.0: Vehicle Detection Systems

Vehicle Detection Systems (VDS) shall be capable of detecting the presence of all motor vehicle types and bicycles in designated areas and sending corresponding detector outputs to a traffic signal controller.

All in-cabinet components of VDS shall be compatible with the following standards:

- ATCC 5301 v02
- ATC 5201 v06
- NEMA TS2 environmental standards

Through an ethernet-based connection to the detection module and/or cabinet interface device in the field or through the internal network of the traffic signal controller cabinet, the VDS shall support remote management of motor vehicle and bicycle detection configurations and access to data including:

- The number, location, and size of detection zones.
- Configuration of the detector channel and assigned phase for each zone.
- Configuration of detection zones for signal performance measurement data collection.
- The ability to add and remove users.
- Signal performance data:
  - Monitoring and recording the status of the phase and detector channels from the traffic signal controller through the SIU bus at a frequency of no less than 10 times per second.
  - Estimation of the speed of vehicles at defined, user-configurable points, such as entering or exiting a detection zone.
  - Retrieval of the signal performance data through an http-based Application Programming Interface (API), or equivalent process, in .xml, .json, or .csv format.
  - The data shall be available in a per vehicle format, be viewable in real time, and store at least 168 hours of data locally on the device.

VDS shall be capable of supporting user-based restrictions to limit functionality, including:

- The ability to make changes to the VDS settings.
- The ability to view imagery or digital video streams.
- The ability to view and download signal performance data.

VDS shall be capable of automatically determining if the system's ability to accurately detect vehicles and shall default to a constant call state if this system error is detected.

VDS shall be capable of classifying vehicles based upon length and/or number of axles.

VDS shall be capable of performing all detection, classification, and data collection functions in the absence of an internet connection.

VDS shall be capable of providing remote access to the latest images or digital video stream of all IP video units through either an HTTP request or through a Real Time Streaming Protocol compatible with RFC2326 standards. VDS that do not utilize video shall be able to display the current state of the vehicle detection zones and approximate vehicle locations in a digital twin model of the intersection.

M10.08.1: Passive Stop Line Detectors

Passive Stop Line Detectors shall demonstrate a reliability of 99% or greater for vehicle detection functions.

Passive Stop Line Detectors shall be able to track and classify turning movements for all motor vehicle types and bicycles and shall demonstrate an accuracy of 95% or greater for turning movement counts.

M10.08.2: Passive Advanced Detectors

Passive Advanced Detectors shall be capable of detecting all motor vehicle types at a minimum distance of 600 ft upstream of the stop line.

Subsection M10.09.0: Pedestrian Detectors
Subsection M10.09.1: Pedestrian Pushbutton Assembly
Subsection M10.09.2: APS Pushbutton Assembly
Add theses new subsections:

M10.09.0: Pedestrian Detectors

Pedestrian Detectors shall be capable of detecting the presence of pedestrians and placing a corresponding call for a phase in a traffic signal controller or similar device.

Pedestrian Detectors may be pushbuttons or passive detection devices.

Components of Pedestrian Detectors shall meet NEMA TS2 compliance for temperature and humidity, mechanical shock and vibration, transient voltage protection, transient suppression, and electrical reliability.

If Pedestrian Detectors include an in-cabinet control unit, it shall meet the following requirements:

- Operate on a cabinet-supplied 120 VAC power source.
- Include labelled LED indicators for each channel operation.
- Include a 10/100BaseT, RJ45 ethernet connector port.
- Capable of communication with the Pedestrian Detectors to allow for remote programming and firmware updates via the ethernet connection.
- Capable of supporting a minimum of 4 pedestrian detectors per NEMA pedestrian phase and up to 16 pushbuttons.
- Will automatically reset upon loss of internal communication.

M10.09.1: Pedestrian Pushbutton Assembly

A Pedestrian Pushbutton Assembly shall consist of a pushbutton, a sign, and a housing to mount those devices to a post.

The pushbutton shall be a minimum of 2 in. in diameter and the force to activate it shall be no greater than 5 lbs. The pushbutton must be weather-tight and tamper-resistant.

The pushbutton shall meet one of the following criteria:

- A normally open, mechanical phenolic enclosed, positive-acting, spring-loaded, audible (i.e., click) snap-action switch with single pole, single throw contacts; or
- A piezo-driven solid state switch rated for a minimum of 50 V, a minimum of 20 million cycles, and capable of providing an audible indication of actuation.

The pushbutton shall have an operating voltage range of 12 to 36 VDC.

The housing shall be yellow.

Housings that include an integral sign mount for the pedestrian pushbutton sign shall be capable of mounting a 9 in. by 12 in. or 9 in. by 15 in. sign (width by height).

M10.09.2: APS Pushbutton Assembly

An APS Pushbutton Assembly shall meet all of the requirements of M10.09.1: Pedestrian Pushbutton Assembly, and the following.

The pushbutton shall have a vibrotactile arrow. The arrow shall have high visual contrast (light on dark or dark on light).

APS Pushbutton Assembly shall be capable of the following:

- Emitting a locator tone.
- Providing two types of audible walk indications: an audible tone in multiple frequencies and a speech message. The type of audible walk indication will be programmed by Contractor per the Plans.
- Emitting sound via one or more speakers that automatically adjust to ambient noise and shall also be capable of being capped at a preprogrammed level.
- Providing three functions as a result of an extended pushbutton press: increased crossing time, audible beaconing, and speech pushbutton information. The function of the extended pushbutton press will be programmed by the Contractor per the Plans.

APS Pushbutton Assembly shall include a latching red LED pilot light.

Subsection M10.18.: Connected Work Zone Notification System Devices
Add this new subsection.

M10.18.0: Connected Work Zone Notification System Devices

Connected Work Zone Notification System (CWZNS) devices shall include the following:

- An internal 4G LTE or 5G cellular modem. The modem shall be compatible with SIM cards from multiple cellular carriers, or the device shall be capable of using a cellular modem from more than one cellular carrier.
- An integrated GPS that will allow for automated telemetry without additional configuration.
- A self-contained power source that can be recharged without manual intervention. The power source shall enable uninterrupted operation of the CWZNS field device.
- Mounting and supporting hardware and wiring necessary to complete a working system.

CWZNS devices shall be capable of operating in temperatures ranging from -40°F to +122°F with no degradation in operation due to rain, fog, snow, ice, darkness, dust, or road debris.

CWZNS devices shall be physically and digitally secured to prevent unauthorized access.

When powered on, real-time data from CWZNS devices shall be provided in a USDOT Work Zone Data Exchange (WZDx) Specification Device Feed version 4.2. The Device Feed shall then be able to be consumed by the MassDOT Work Zone Manager (WZM) application. The Device Feed shall meet the following requirements:

- Each manufacturer of CWZNS field devices and Smart Work Zone (SWZ) field devices shall provide a single statewide Device Feed (a single URL) that consists of that manufacturer's field devices that are used by or under the direction of the Department.
- The Device Feed shall be made available via an HTTP GET request. The response shall be the WZDx Device Feed JSON object without a wrapper or paging.
- The Device Feed shall be public or use "Basic" HTTP Authentication.
- The Device Feed shall be provided over HTTPS.
- The Device Feed shall reflect changes in CWZNS field device status (e.g., display changed or device moved) no later than 60 seconds after they occur.
- For each CWZNS field device, the "update date" property shall be no older than 60 minutes, except when it has stopped communicating or is otherwise in error.
- The "id" property of each CWZNS field device feature in the Device Feed shall stay the same for the duration of the Contract and shall be a Universally Unique IDentifier (UUID) to guarantee uniqueness between feeds and over time.

M10.18.1: Location Marker

Location Markers shall meet the requirements of M10.18.0: Connected Work Zone Notification System Devices.

Location Markers may be standalone devices or an attachment to a channelizing device. Either type shall be certified to comply with the relevant minimum TL-3 testing requirements of the *Manual on Assessing Safety Hardware*.

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END OF SUPPLEMENTAL SPECIFICATIONS

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**CONTRACT PROVISIONS FOR
FEDERAL-AID CONSTRUCTION CONTRACTS**

I. General
II. Nondiscrimination
III. Davis-Bacon and Related Act Provisions
IV. Contract Work Hours and Safety Standards Act Provisions
V. Subletting or Assigning the Contract
VI. Safety: Accident Prevention
VII. False Statements Concerning Highway Projects
VIII. Implementation of Clean Air Act and Federal Water Pollution Control Act
IX. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
X. Certification Regarding Use of Contract Funds for Lobbying
XI. 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. Historically, contracting agencies using Federal-aid highway funds were required to ensure Form FHWA-1273 was physically incorporated into all contracts and subcontracts. Effective June 10, 2026, this requirement was eliminated [91 FR 25492]. Future use of Form FHWA-1273 is now optional on the part of the contracting agency using Federal-aid highway funds. FHWA continues to make Form FHWA-1273 available as a convenience to contracting agencies. Contracting agencies must continue to ensure compliance with the provisions cited in Form FHWA-1273 in accordance with the provisions regardless of the use of Form FHWA-1273. Accordingly, the contracting agency retains the authority to determine whether the contractor must use Form FHWA-1273 to physically incorporate required contract provisions in each subcontract and in lower tier contracts. Where permitted by the contracting agency, the contractor may choose other ways to include required contract provisions in each subcontract, besides incorporating Form FHWA-1273. Contract provisions in Form FHWA-1273 are not required to be physically included in subcontracts for design services on Federal-aid design-build contracts, or in purchase orders, rental agreements and other agreements for supplies or services.

The applicable provisions 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 or 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.

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.

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

The contractor and all subcontractors must comply with the following policies: 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, including any amendments thereto.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with 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, including any amendments thereto.

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.

1.Assurances Required:

a. The requirements of 49 CFR Part 26, including any amendments thereto, 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, including any amendments thereto, 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, including any amendments thereto, are incorporated by reference. 49 CFR Part 21.

III. 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 IV, 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 29 CFR part 30, including any amendments thereto.

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 III. 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 in any subcontracts the clauses set forth in paragraphs (1) through (11) of this section, 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.

IV. 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.

* $33 as of January 15, 2025 (See 90 FR 1859) 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 III 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.

V. 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 this section 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 this section 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).

VI. 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).

VII. 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."

VIII. 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.

IX. 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.

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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.

* * * * *

X. 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.

XI. 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 (40 U.S.C. sections 14501(d) and 14701 and the Appalachian Regional Commission Code as authorized under 40 U.S.C. section 14302)
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 40 U.S.C. 14501 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

August 19, 2026

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	$0.58
2	ASTM A27 (AASHTO M103) Steel Castings, H-Pile Points & Pipe Pile Shoes (See Note below.)	$0.81
3	ASTM A668 / A668M (AASHTO M102) Steel Forgings	$0.81
4	ASTM A108 (AASHTO M169) Steel Forgings for Shear Studs	$0.84
5	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Plate	$0.88
6	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Shapes	$0.83
7	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Plate	$0.88
8	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Shapes	$0.83
9	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Plate	$0.91
10	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Shapes	$0.84
11	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W 345W Structural Steel Plate	$0.91
12	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W or 345W Structural Steel Shapes	$0.84
13	ASTM A709/A709M Grade HPS 50W / AASHTO M270M/M270 Grade HPS 50W or 345W Structural Steel Plate	$0.95
14	ASTM A709/A709M Grade HPS 70W / AASHTO M270M/M270 Grade HPS 70W or 485W Structural Steel Plate	$1.03
15	ASTM A514/A514M-05 Grade HPS 100W / AASHTO M270M/M270 Grade HPS 100W or 690W Structural Steel Plate	$1.57
16	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Plate	$0.91
17	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Shapes	$0.84
18	ASTM A276 Type 316 Stainless Steel	$4.71
19	ASTM A240 Type 316 Stainless Steel	$4.71
20	ASTM A148 Grade 80/50 Steel Castings (See Note below.)	$1.62
21	ASTM A53 Grade B Structural Steel Pipe	$1.03
22	ASTM A500 Grades A, B, 36 & 50 Structural Steel Pipe	$1.03
23	ASTM A252, Grades 240 (36 KSI) & 414 (60 KSI) Pipe Pile	$0.81
24	ASTM 252, Grade 2 Permanent Steel Casing	$0.81
25	ASTM A36 (AASHTO M183) for H-piles, steel supports and sign supports	$0.86
26	ASTM A328 / A328M, Grade 50 (AASHTO M202) Steel Sheetpiling	$1.54
27	ASTM A572 / A572M, Grade 50 Sheetpiling	$1.54
28	ASTM A36/36M, Grade 50	$0.88
29	ASTM A570, Grade 50	$0.86
30	ASTM A572 (AASHTO M223), Grade 50 H-Piles	$0.88
31	ASTM A1085 Grade A (50 KSI) Steel Hollow Structural Sections (HSS), heat-treated per ASTM A1085 Supplement S1	$1.03
32	AREA 140 LB Rail and Track Accessories	$0.53

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

*** END OF DOCUMENT ***

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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: 136278 **Project No.** 606352 **Federal Aid No.:** PRC(PRC80)-003S(925)X

Location: WAREHAM

Project Description: Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River

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

MAURA HEALEY
Governor
KIM DRISCOLL
Lt. Governor

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

LAUREN JONES
Secretary
MICHAEL FLANAGAN
Director

Awarding Authority:	Massachusetts Highway	**City/Town:**	WAREHAM
Wage Request No:	20260819132740	**Job Location:**	Route 28 and Route 6, Mill Pond Dam over Agawam River
Description of Work:	WAREHAM Federal Aid Project No. PRC(PRC80)-003S(925)X Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River		
Contract Number:	136278		

§§ 26-27D Construction Project

This Prevailing Wage Schedule establishes the minimum wage rates that employees on this public works construction project must be paid. The project's Wage Request Number is listed above and on all pages of this Schedule. This schedule applies **only** to this specific project.

Awarding Authority Responsibilities

- You must include this Prevailing Wage Schedule (PWS) or an appropriate reference to it in all advertisements and calls for bids.
- The PWS must be incorporated in its entirety into all contracts for this project (G.L. c. 149, § 27).
- The wage rates on this PWS will remain in effect for the duration of the project. **Exception:** You must request an updated schedule for any multi-year construction project no later than 2 weeks before the project's yearly anniversary date.
  - For CM AT RISK projects, the anniversary date is the earlier of the signing date of: (a) the GMP Amendment; or (b) the first amendment to permit procurement of construction services.
  - For all other construction projects, the anniversary date is the date the contract was signed by the Awarding Authority and the General Contractor.
- You must also request an updated PWS if you have not opened bids or selected a contractor within 90 days of the date of issuance on this PWS.
  - For CM AT RISK projects, the earlier of (a) the signing date of the GMP Amendment; or (b) the bid for the first construction scope of work must be within 90 days of the date of issuance on this Schedule.
- You must provide any updated PWS to all contractors working on the project, including general and sub-contractors.
- You must keep the contractors' weekly certified payroll records and Statements of Compliance on file for **3 years.**
- Awarding authorities have other prevailing wage responsibilities not listed above. Learn more at: **[Prevailing wage: for awarding authorities | Mass.gov]** and G.L. c. 149, §§ 26-27D.

Contractor Responsibilities

- You must pay all employees who perform construction work on this project at least the wage rate listed on this PWS. **Warning!** If you do not follow this requirement, you can face civil fines, criminal charges, or private lawsuits.
- You must post this PWS at the worksite where it can be easily seen. (G.L. c. 149, § 27)
- You must file weekly payroll reports and a Statement of Compliance with the awarding authority (**not** DLS). You can file payroll reports by mail or email and must keep them on file for 3 years. Each weekly payroll report must include each employees' name, address, occupational classification(s), hours worked, and wages paid. Find a sample report at: mass.gov/dols/pw.
- You cannot pay any employees at the apprentice rates listed on this PWS unless they are registered with the Massachusetts Division of Apprentice Standards (DAS). Qualifying apprentices must be paid at the applicable step rate and must carry their apprentice ID card during all work hours on the project. Apprentices **not** registered with DAS must be paid at the listed journeyworker's rate, even if they are registered with a different federal/state public agency or private entity. For every week in which apprentice rates are paid, a copy of each apprentice's apprentice ID card issued by DAS shall be attached to the certified payroll records.
- If you don't know what classification or rate applies to the work being performed, you must ask DLS; paying the wrong rate subjects you to enforcement.
- Please contact DLS if you have any questions about the Prevailing Wage Schedule: (617) 626-6953 or **DLS.Feedback@mass.gov**

Employees who are **not** paid the wage listed on the Prevailing Wage Schedule (PWS) may file a complaint with the Attorney General's Fair Labor

Division: **www.mass.gov/ago/fld**; **(617) 727-3465.**

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
(2 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2026	$41.95	$16.17	$21.78	$0.00	$0.00	$79.90
	12/1/2026	$41.95	$16.17	$23.52	$0.00	$0.00	$81.64
	1/1/2027	$41.95	$16.77	$23.52	$0.00	$0.00	$82.24
(3 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2026	$42.02	$16.17	$21.78	$0.00	$0.00	$79.97
	12/1/2026	$42.02	$16.17	$23.52	$0.00	$0.00	$81.71
	1/1/2027	$42.02	$16.77	$23.52	$0.00	$0.00	$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2026	$42.14	$16.17	$21.78	$0.00	$0.00	$80.09
	12/1/2026	$42.14	$16.17	$23.52	$0.00	$0.00	$81.83
	1/1/2027	$42.14	$16.77	$23.52	$0.00	$0.00	$82.43
ADS/SUBMERSIBLE PILOT PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	1/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
For apprentice rates see "Apprentice- PILE DRIVER"							
AIR TRACK OPERATOR LABORERS LABORERS - ZONE 2	6/1/2026	$42.41	$10.90	$9.75	$9.11	$0.00	$72.17
	12/1/2026	$43.85	$10.90	$9.75	$9.11	$0.00	$73.61
	6/1/2027	$45.30	$10.90	$9.75	$9.11	$0.00	$75.06
	12/1/2027	$46.75	$10.90	$9.75	$9.11	$0.00	$76.51
	6/1/2028	$48.25	$10.90	$9.75	$9.11	$0.00	$78.01
	12/1/2028	$49.75	$10.90	$9.75	$9.11	$0.00	$79.51
For apprentice rates see "Apprentice- LABORER"							
AIR TRACK OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$42.41	$10.90	$9.75	$9.21	$0.00	$72.27
	12/1/2026	$43.85	$10.90	$9.75	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
ASBESTOS WORKER (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (SOUTHERN MASS)	12/1/2025	$44.80	$14.50	$4.30	$6.75	$0.00	$70.35
ASPHALT RAKER LABORERS LABORERS - ZONE 2	6/1/2026	$41.91	$10.90	$9.75	$9.11	$0.00	$71.67
	12/1/2026	$43.35	$10.90	$9.75	$9.11	$0.00	$73.11
	6/1/2027	$44.80	$10.90	$9.75	$9.11	$0.00	$74.56
	12/1/2027	$46.25	$10.90	$9.75	$9.11	$0.00	$76.01
	6/1/2028	$47.75	$10.90	$9.75	$9.11	$0.00	$77.51
	12/1/2028	$49.25	$10.90	$9.75	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
ASPHALT RAKER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$41.91	$10.90	$9.75	$9.21	$0.00	$71.77
	12/1/2026	$43.35	$10.90	$9.75	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.38	$17.05	$13.35	$3.25	$0.00	$93.03
	12/1/2026	$60.83	$17.05	$13.35	$3.25	$0.00	$94.48
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BACKHOE/FRONT-END LOADER	6/1/2026	$59.38	$17.05	$13.35	$3.25	$0.00	$93.03
OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.83	$17.05	$13.35	$3.25	$0.00	$94.48
OPERATING ENGINEERS LOCAL 4							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
BARCO-TYPE JUMPING TAMPER	6/1/2026	$41.91	$10.90	$9.75	$9.11	$0.00	$71.67
LABORERS	12/1/2026	$43.35	$10.90	$9.75	$9.11	$0.00	$73.11
LABORERS - ZONE 2	6/1/2027	$44.80	$10.90	$9.75	$9.11	$0.00	$74.56
	12/1/2027	$46.25	$10.90	$9.75	$9.11	$0.00	$76.01
	6/1/2028	$47.75	$10.90	$9.75	$9.11	$0.00	$77.51
	12/1/2028	$49.25	$10.90	$9.75	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
BLOCK PAVER, RAMMER / CURB SETTER	6/1/2026	$42.41	$10.90	$9.75	$9.11	$0.00	$72.17
LABORERS	12/1/2026	$43.85	$10.90	$9.75	$9.11	$0.00	$73.61
LABORERS - ZONE 2	6/1/2027	$45.30	$10.90	$9.75	$9.11	$0.00	$75.06
	12/1/2027	$46.75	$10.90	$9.75	$9.11	$0.00	$76.51
	6/1/2028	$48.25	$10.90	$9.75	$9.11	$0.00	$78.01
	12/1/2028	$49.75	$10.90	$9.75	$9.11	$0.00	$79.51
For apprentice rates see "Apprentice- LABORER"							
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY)	6/1/2026	$42.41	$10.90	$9.75	$9.21	$0.00	$72.27
LABORERS	12/1/2026	$43.85	$10.90	$9.75	$9.21	$0.00	$73.71
LABORERS - ZONE 2 (HEAVY & HIGHWAY)							
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
BOILER MAKER	1/1/2024	$48.12	$7.07	$14.60	$6.00	$0.00	$75.79
BOILERMAKERS LOCAL 29							
BOILERMAKERS LOCAL 29							

Apprentice: BOILER MAKER

Effective Date: 1/1/2024

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

Apprentice to Journeyworker Ratio: 1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)	8/1/2026	$70.15	$12.84	$15.57	$8.02	$0.00	$106.58
BRICKLAYERS LOCAL 3	2/1/2027	$71.55	$12.84	$15.57	$8.02	$0.00	$107.98
BRICKLAYERS LOCAL 3 (NEW BEDFORD)							

Construction

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

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

Effective Date: 8/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$35.08	$12.84	$15.57	$8.02	$0.00	$71.51
2	60.00	$42.09	$12.84	$15.57	$8.02	$0.00	$78.52
3	70.00	$49.11	$12.84	$15.57	$8.02	$0.00	$85.54
4	80.00	$56.12	$12.84	$15.57	$8.02	$0.00	$92.55
5	90.00	$63.14	$12.84	$15.57	$8.02	$0.00	$99.57

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

Effective Date: 2/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$35.78	$12.84	$15.57	$8.02	$0.00	$72.21
2	60.00	$42.93	$12.84	$15.57	$8.02	$0.00	$79.36
3	70.00	$50.09	$12.84	$15.57	$8.02	$0.00	$86.52
4	80.00	$57.24	$12.84	$15.57	$8.02	$0.00	$93.67
5	90.00	$64.40	$12.84	$15.57	$8.02	$0.00	$100.83

Apprentice to Journeyworker Ratio: 1:5

BULLDOZER/GRADER/SCRAPER OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
CAISSON & UNDERPINNING BOTTOM MAN LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2026	$50.40	$10.90	$9.75	$9.80	$0.00	$80.85
	12/1/2026	$51.90	$10.90	$9.75	$9.80	$0.00	$82.35
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING LABORER LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2026	$49.25	$10.90	$9.75	$9.80	$0.00	$79.70
	12/1/2026	$50.75	$10.90	$9.75	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING TOP MAN LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2026	$49.58	$10.90	$9.75	$9.80	$0.00	$80.03
	12/1/2026	$51.08	$10.90	$9.75	$9.80	$0.00	$81.53
For apprentice rates see "Apprentice- LABORER"							
CARBIDE CORE DRILL OPERATOR LABORERS LABORERS - ZONE 2	6/1/2026	$41.91	$10.90	$9.75	$9.11	$0.00	$71.67
	12/1/2026	$43.35	$10.90	$9.75	$9.11	$0.00	$73.11
	6/1/2027	$44.80	$10.90	$9.75	$9.11	$0.00	$74.56
	12/1/2027	$46.25	$10.90	$9.75	$9.11	$0.00	$76.01
	6/1/2028	$47.75	$10.90	$9.75	$9.11	$0.00	$77.51
	12/1/2028	$49.25	$10.90	$9.75	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
CARPENTER CARPENTERS CARPENTERS -ZONE 2 (Eastern Massachusetts)	3/1/2026	$50.85	$11.08	$11.47	$8.50	$0.00	$81.90
	9/1/2026	$52.10	$11.08	$11.47	$8.50	$0.00	$83.15
	3/1/2027	$53.35	$11.08	$11.47	$8.50	$0.00	$84.40

Apprentice: CARPENTER

Effective Date: 3/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$22.88	$11.08	$0.00	$1.73	$0.00	$35.69
2	45.00	$22.88	$11.08	$0.00	$1.73	$0.00	$35.69
3	55.00	$27.97	$11.08	$0.00	$3.40	$0.00	$42.45
4	55.00	$27.97	$11.08	$0.00	$3.40	$0.00	$42.45
5	70.00	$35.60	$11.08	$11.41	$5.10	$0.00	$63.19
6	70.00	$35.60	$11.08	$11.41	$5.10	$0.00	$63.19
7	80.00	$40.68	$11.08	$11.44	$6.80	$0.00	$70.00
8	80.00	$40.68	$11.08	$11.44	$6.80	$0.00	$70.00

Apprentice: CARPENTER

Effective Date: 9/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$23.45	$11.08	$0.00	$1.73	$0.00	$36.26
2	45.00	$23.45	$11.08	$0.00	$1.73	$0.00	$36.26
3	55.00	$28.66	$11.08	$0.00	$3.40	$0.00	$43.14
4	55.00	$28.66	$11.08	$0.00	$3.40	$0.00	$43.14
5	70.00	$36.47	$11.08	$11.41	$5.10	$0.00	$64.06
6	70.00	$36.47	$11.08	$11.41	$5.10	$0.00	$64.06
7	80.00	$41.68	$11.08	$11.44	$6.80	$0.00	$71.00
8	80.00	$41.68	$11.08	$11.44	$6.80	$0.00	$71.00

Apprentice to Journeyworker Ratio: 1:5

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
CARPENTER WOOD FRAME CARPENTERS CARPENTERS-ZONE 3 (Wood Frame)	10/1/2025	$27.37	$7.38	$4.47	$1.00	$0.00	$40.22
	10/1/2026	$28.47	$7.38	$4.47	$1.00	$0.00	$41.32

All Aspects of New Wood Frame Work

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$16.42	$7.38	$0.00	$0.00	$0.00	$23.80
2	60.00	$16.42	$7.38	$0.00	$0.00	$0.00	$23.80
3	65.00	$17.79	$7.38	$0.00	$1.00	$0.00	$26.17
4	70.00	$19.16	$7.38	$0.00	$1.00	$0.00	$27.54
5	75.00	$20.53	$7.38	$3.80	$1.00	$0.00	$32.71
6	80.00	$21.90	$7.38	$3.80	$1.00	$0.00	$34.08

Construction

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

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
7	85.00	$23.26	$7.38	$3.80	$1.00	$0.00	$35.44
8	90.00	$24.63	$7.38	$3.80	$1.00	$0.00	$36.81

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$17.08	$7.38	$0.00	$0.00	$0.00	$24.46
2	60.00	$17.08	$7.38	$0.00	$0.00	$0.00	$24.46
3	65.00	$18.51	$7.38	$0.00	$1.00	$0.00	$26.89
4	70.00	$19.93	$7.38	$0.00	$1.00	$0.00	$28.31
5	75.00	$21.35	$7.38	$3.80	$1.00	$0.00	$33.53
6	80.00	$22.78	$7.38	$3.80	$1.00	$0.00	$34.96
7	85.00	$24.20	$7.38	$3.80	$1.00	$0.00	$36.38
8	90.00	$25.62	$7.38	$3.80	$1.00	$0.00	$37.80

Apprentice to Journeyworker Ratio: 1:5

CEMENT MASONRY/PLASTERING PLASTERERS AND CEMENT MASONS LOCAL 534 Plasterers and Cement Masons - Zone 1	7/1/2026	$54.49	$13.35	$16.43	$7.78	$1.80	$93.85
	1/1/2027	$55.94	$13.35	$16.43	$7.78	$1.80	$95.30
	7/1/2027	$57.29	$13.35	$16.43	$7.78	$1.80	$96.65
	1/1/2028	$58.64	$13.35	$16.43	$7.78	$1.80	$98.00

Apprentice: CEMENT MASONRY/PLASTERING

Effective Date: 7/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.25	$13.35	$16.43	$0.00	$0.00	$57.03
2	60.00	$32.69	$13.35	$16.43	$7.78	$1.80	$72.05
3	65.00	$35.42	$13.35	$16.43	$7.78	$1.80	$74.78
4	70.00	$38.14	$13.35	$16.43	$7.78	$1.80	$77.50
5	75.00	$40.87	$13.35	$16.43	$7.78	$1.80	$80.23
6	80.00	$43.59	$13.35	$16.43	$7.78	$1.80	$82.95
7	90.00	$49.04	$13.35	$0.00	$7.78	$0.00	$70.17

Apprentice: CEMENT MASONRY/PLASTERING

Effective Date: 1/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.97	$13.35	$16.43	$0.00	$0.00	$57.75
2	60.00	$33.56	$13.35	$16.43	$7.78	$1.80	$72.92

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: CEMENT MASONRY/PLASTERING							
Effective Date: 1/1/2027							
Step / Percent		**Apprentice Base Wage**					
3 / 65.00		$36.36	$13.35	$16.43	$7.78	$1.80	$75.72
4 / 70.00		$39.16	$13.35	$16.43	$7.78	$1.80	$78.52
5 / 75.00		$41.96	$13.35	$16.43	$7.78	$1.80	$81.32
6 / 80.00		$44.75	$13.35	$16.43	$7.78	$1.80	$84.11
7 / 90.00		$50.35	$0.00	$16.43	$0.00	$0.00	$66.78
Apprentice to Journeyworker Ratio: 1:5							
CHAIN SAW OPERATOR	6/1/2026	$41.91	$10.90	$9.75	$9.11	$0.00	$71.67
LABORERS LABORERS - ZONE 2	12/1/2026	$43.35	$10.90	$9.75	$9.11	$0.00	$73.11
	6/1/2027	$44.80	$10.90	$9.75	$9.11	$0.00	$74.56
	12/1/2027	$46.25	$10.90	$9.75	$9.11	$0.00	$76.01
	6/1/2028	$47.75	$10.90	$9.75	$9.11	$0.00	$77.51
	12/1/2028	$49.25	$10.90	$9.75	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES	6/1/2026	$60.61	$17.05	$13.35	$3.25	$0.00	$94.26
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$62.09	$17.05	$13.35	$3.25	$0.00	$95.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
COMPRESSOR OPERATOR	6/1/2026	$37.63	$17.05	$13.35	$3.25	$0.00	$71.28
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$38.58	$17.05	$13.35	$3.25	$0.00	$72.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
DELEADER (BRIDGE)	1/1/2026	$59.56	$10.35	$12.00	$12.60	$0.00	$94.51
PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2							
Apprentice: DELEADER (BRIDGE)							
Effective Date: 1/1/2026							
Step / Percent		**Apprentice Base Wage**					
1 / 50.00		$29.78	$10.35	$0.00	$0.00	$0.00	$40.13
2 / 55.00		$32.76	$10.35	$0.00	$6.93	$0.00	$50.04
3 / 60.00		$35.74	$10.35	$0.00	$7.56	$0.00	$53.65
4 / 65.00		$38.71	$10.35	$0.00	$8.19	$0.00	$57.25
5 / 70.00		$41.69	$10.35	$12.00	$8.82	$0.00	$72.86
6 / 75.00		$44.67	$10.35	$12.00	$9.45	$0.00	$76.47
7 / 80.00		$47.65	$10.35	$12.00	$10.08	$0.00	$80.08
8 / 90.00		$53.60	$10.35	$12.00	$11.34	$0.00	$87.29
Apprentice to Journeyworker Ratio: 1:1							
DEMO: ADZEMAN	6/1/2026	$49.30	$10.90	$9.75	$9.65	$0.00	$79.60

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS LABORERS - ZONE 2	12/7/2026	$50.80	$10.90	$9.75	$9.65	$0.00	$81.10
	6/7/2027	$52.40	$10.90	$9.75	$9.65	$0.00	$82.70
	12/6/2027	$54.00	$10.90	$9.75	$9.65	$0.00	$84.30
	6/5/2028	$55.68	$10.90	$9.75	$9.65	$0.00	$85.98
	12/4/2028	$57.35	$10.90	$9.75	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS LABORERS - ZONE 2	6/1/2026	$50.30	$10.90	$9.75	$9.65	$0.00	$80.60
	12/7/2026	$51.80	$10.90	$9.75	$9.65	$0.00	$82.10
	6/7/2027	$53.40	$10.90	$9.75	$9.65	$0.00	$83.70
	12/6/2027	$55.00	$10.90	$9.75	$9.65	$0.00	$85.30
	6/5/2028	$56.68	$10.90	$9.75	$9.65	$0.00	$86.98
	12/4/2028	$58.35	$10.90	$9.75	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BURNERS LABORERS LABORERS - ZONE 2	6/1/2026	$50.05	$10.90	$9.75	$9.65	$0.00	$80.35
	12/7/2026	$51.55	$10.90	$9.75	$9.65	$0.00	$81.85
	6/7/2027	$53.15	$10.90	$9.75	$9.65	$0.00	$83.45
	12/6/2027	$54.75	$10.90	$9.75	$9.65	$0.00	$85.05
	6/5/2028	$56.43	$10.90	$9.75	$9.65	$0.00	$86.73
	12/4/2028	$58.10	$10.90	$9.75	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: CONCRETE CUTTER/SAWYER LABORERS LABORERS - ZONE 2	6/1/2026	$50.30	$10.90	$9.75	$9.65	$0.00	$80.60
	12/7/2026	$51.80	$10.90	$9.75	$9.65	$0.00	$82.10
	6/7/2027	$53.40	$10.90	$9.75	$9.65	$0.00	$83.70
	12/6/2027	$55.00	$10.90	$9.75	$9.65	$0.00	$85.30
	6/5/2028	$56.68	$10.90	$9.75	$9.65	$0.00	$86.98
	12/4/2028	$58.35	$10.90	$9.75	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: JACKHAMMER OPERATOR LABORERS LABORERS - ZONE 2	6/1/2026	$50.05	$10.90	$9.75	$9.65	$0.00	$80.35
	12/7/2026	$51.55	$10.90	$9.75	$9.65	$0.00	$81.85
	6/7/2027	$53.15	$10.90	$9.75	$9.65	$0.00	$83.45
	12/6/2027	$54.75	$10.90	$9.75	$9.65	$0.00	$85.05
	6/5/2028	$56.43	$10.90	$9.75	$9.65	$0.00	$86.73
	12/4/2028	$58.10	$10.90	$9.75	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: WRECKING LABORER LABORERS LABORERS - ZONE 2	6/1/2026	$49.30	$10.90	$9.75	$9.65	$0.00	$79.60
	12/7/2026	$50.80	$10.90	$9.75	$9.65	$0.00	$81.10
	6/7/2027	$52.40	$10.90	$9.75	$9.65	$0.00	$82.70
	12/6/2027	$54.00	$10.90	$9.75	$9.65	$0.00	$84.30
	6/5/2028	$55.68	$10.90	$9.75	$9.65	$0.00	$85.98
	12/4/2028	$57.35	$10.90	$9.75	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DIRECTIONAL DRILL MACHINE OPERATOR OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DIVER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	$78.11	$10.08	$11.62	$10.04	$0.00	$109.85
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Diver wage 70/80/90 2A $69.83, 3A $91.79,4A $102.14 Total Rate							
DIVER TENDER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	$55.79	$10.08	$11.62	$12.67	$0.00	$90.16
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Piledriver wage 70/80/90 2A $54.20, 3A $73.93,4A $82.05 Total Rate							
DIVER TENDER (EFFLUENT) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	$83.69	$10.08	$11.62	$12.67	$0.00	$118.06
For apprentice rates see "Apprentice- PILE DRIVER"							
DIVER/SLURRY (EFFLUENT) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
For apprentice rates see "Apprentice- PILE DRIVER"							
DRAWBRIDGE OPERATOR (Construction) DRAWBRIDGE - SEIU LOCAL 888 DRAWBRIDGE - SEIU LOCAL 888	7/1/2020	$26.77	$6.67	$3.93	$0.00	$0.16	$37.53
ELECTRICIAN ELECTRICIANS LOCAL 223 ELECTRICIANS LOCAL 223	9/1/2025	$52.25	$12.25	$14.86	$3.75	$0.00	$83.11
	9/1/2026	$54.72	$12.50	$15.56	$4.00	$0.00	$86.78

Apprentice: ELECTRICIAN

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.90	$12.25	$0.63	$0.00	$0.00	$33.78
2	45.00	$23.51	$12.25	$0.71	$0.00	$0.00	$36.47
3	50.00	$26.13	$12.25	$0.78	$0.00	$0.00	$39.16
4	55.00	$28.74	$12.25	$6.61	$2.50	$0.00	$50.10
5	60.00	$31.35	$12.25	$7.21	$2.50	$0.00	$53.31
6	65.00	$33.96	$12.25	$7.82	$2.50	$0.00	$56.53
7	70.00	$36.58	$12.25	$8.41	$2.50	$0.00	$59.74
8	75.00	$39.19	$12.25	$9.02	$2.50	$0.00	$62.96

Apprentice: ELECTRICIAN

Effective Date: 9/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$21.89	$12.50	$0.66	$0.00	$0.00	$35.05
2	45.00	$24.62	$12.50	$0.74	$0.00	$0.00	$37.86
3	50.00	$27.36	$12.50	$0.82	$0.00	$0.00	$40.68
4	55.00	$30.10	$12.50	$6.92	$2.75	$0.00	$52.27
5	60.00	$32.83	$12.50	$7.54	$2.75	$0.00	$55.62

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: ELECTRICIAN							
Effective Date: 9/1/2026							
Step / Percent / Apprentice Base Wage							
6 / 65.00		$35.57	$12.50	$8.18	$2.75	$0.00	$59.00
7 / 70.00		$38.30	$12.50	$8.81	$2.75	$0.00	$62.36
8 / 75.00		$41.04	$12.50	$9.43	$2.75	$0.00	$65.72
Apprentice to Journeyworker Ratio: 2:3							
ELEVATOR CONSTRUCTOR	1/1/2026	$77.26	$16.38	$11.06	$10.70	$0.00	$115.40
ELEVATOR CONSTRUCTORS LOCAL 4 ELEVATOR CONSTRUCTORS LOCAL 4	1/1/2027	$80.55	$16.48	$11.16	$11.00	$0.00	$119.19
Apprentice: ELEVATOR CONSTRUCTOR							
Effective Date: 1/1/2026							
Step / Percent / Apprentice Base Wage							
1 / 50.00		$38.63	$0.00	$0.00	$0.00	$0.00	$38.63
2 / 55.00		$42.49	$16.38	$11.06	$10.70	$0.00	$80.63
3 / 65.00		$50.22	$16.38	$11.06	$10.70	$0.00	$88.36
4 / 70.00		$54.08	$16.38	$11.06	$10.70	$0.00	$92.22
5 / 80.00		$61.81	$16.38	$11.06	$10.70	$0.00	$99.95
Apprentice: ELEVATOR CONSTRUCTOR							
Effective Date: 1/1/2027							
Step / Percent / Apprentice Base Wage							
1 / 50.00		$40.28	$0.00	$0.00	$0.00	$0.00	$40.28
2 / 55.00		$44.30	$16.48	$11.16	$11.00	$0.00	$82.94
3 / 65.00		$52.36	$16.48	$11.16	$11.00	$0.00	$91.00
4 / 70.00		$56.39	$16.48	$11.16	$11.00	$0.00	$95.03
5 / 80.00		$64.44	$16.48	$11.16	$11.00	$0.00	$103.08
Apprentice to Journeyworker Ratio: 1:1							
ELEVATOR CONSTRUCTOR HELPER	1/1/2026	$54.08	$16.38	$11.06	$10.07	$0.00	$91.59
ELEVATOR CONSTRUCTORS LOCAL 4 ELEVATOR CONSTRUCTORS LOCAL 4	1/1/2027	$56.39	$16.48	$11.16	$11.00	$0.00	$95.03
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"							
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY)	6/1/2026	$41.91	$10.90	$9.75	$9.21	$0.00	$71.77
LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$43.35	$10.90	$9.75	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY	5/1/2026	$54.40	$16.55	$13.35	$3.25	$0.00	$87.55
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	11/1/2026	$55.69	$16.55	$13.35	$3.25	$0.00	$88.84

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	5/1/2027	$57.12	$16.55	$13.35	$3.25	$0.00	$90.27
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY	5/1/2026	$56.02	$16.55	$13.35	$3.25	$0.00	$89.17
OPERATING ENGINEERS LOCAL 4	11/1/2026	$57.32	$16.55	$13.35	$3.25	$0.00	$90.47
OPERATING ENGINEERS LOCAL 4	5/1/2027	$58.77	$16.55	$13.35	$3.25	$0.00	$91.92
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY	5/1/2026	$26.28	$16.55	$13.35	$3.25	$0.00	$59.43
OPERATING ENGINEERS LOCAL 4	11/1/2026	$27.04	$16.55	$13.35	$3.25	$0.00	$60.19
OPERATING ENGINEERS LOCAL 4	5/1/2027	$27.89	$16.55	$13.35	$3.25	$0.00	$61.04
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIRE ALARM INSTALLER	9/1/2025	$52.25	$12.25	$14.86	$3.75	$0.00	$83.11
ELECTRICIANS LOCAL 223	9/1/2026	$54.72	$12.50	$15.56	$4.00	$0.00	$86.78
ELECTRICIANS LOCAL 223							
For apprentice rates see "Apprentice- ELECTRICIAN"							
FIRE ALARM REPAIR / MAINTENANCE	9/1/2025	$52.25	$12.25	$14.86	$3.75	$0.00	$83.11
/ COMMISSIONING	9/1/2026	$54.72	$12.50	$15.56	$4.00	$0.00	$86.78
ELECTRICIANS LOCAL 223							
ELECTRICIANS LOCAL 223							
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"							
FIREMAN (ASST. ENGINEER)	6/1/2026	$47.55	$17.05	$13.35	$3.25	$0.00	$81.20
OPERATING ENGINEERS LOCAL 4	12/1/2026	$48.73	$17.05	$13.35	$3.25	$0.00	$82.38
OPERATING ENGINEERS LOCAL 4							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FLAGGER & SIGNALER (HEAVY & HIGHWAY)	6/1/2026	$29.21	$10.90	$9.75	$9.21	$0.00	$59.07
LABORERS	12/1/2026	$29.21	$10.90	$9.75	$9.21	$0.00	$59.07
LABORERS - ZONE 2 (HEAVY & HIGHWAY)							
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
FLOORCOVERER	3/1/2026	$59.24	$10.33	$11.47	$8.80	$0.00	$89.84
FLOORCOVERERS LOCAL 2168	9/1/2026	$60.74	$10.33	$11.47	$8.80	$0.00	$91.34
FLOORCOVERERS LOCAL 2168 ZONE I	3/1/2027	$62.24	$10.33	$11.47	$8.80	$0.00	$92.84

Apprentice: FLOORCOVERER

Effective Date: 3/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$26.66	$10.33	$0.00	$1.76	$0.00	$38.75
2	45.00	$26.66	$10.33	$0.00	$1.76	$0.00	$38.75
3	55.00	$32.58	$10.33	$0.00	$3.52	$0.00	$46.43
4	55.00	$32.58	$10.33	$0.00	$3.52	$0.00	$46.43
5	70.00	$41.47	$10.33	$11.47	$5.28	$0.00	$68.55
6	70.00	$41.47	$10.33	$11.47	$5.28	$0.00	$68.55
7	80.00	$47.39	$10.33	$11.47	$7.04	$0.00	$76.23
8	80.00	$47.39	$10.33	$11.47	$7.04	$0.00	$76.23

Construction

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

Apprentice: FLOORCOVERER

Effective Date: 9/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$27.33	$10.33	$0.00	$1.76	$0.00	$39.42
2	45.00	$27.33	$10.33	$0.00	$1.76	$0.00	$39.42
3	55.00	$33.41	$10.33	$0.00	$3.52	$0.00	$47.26
4	55.00	$33.41	$10.33	$0.00	$3.52	$0.00	$47.26
5	70.00	$42.52	$10.33	$11.47	$5.28	$0.00	$69.60
6	70.00	$42.52	$10.33	$11.47	$5.28	$0.00	$69.60
7	80.00	$48.59	$10.33	$11.47	$7.04	$0.00	$77.43
8	80.00	$48.59	$10.33	$11.47	$7.04	$0.00	$77.43

Apprentice Notes

Steps are 750 hrs.

Apprentice to Journeyworker Ratio: 1:1

FORK LIFT/CHERRY PICKER	6/1/2026	$59.38	$17.05	$13.35	$3.25	$0.00	$93.03
OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.83	$17.05	$13.35	$3.25	$0.00	$94.48
OPERATING ENGINEERS LOCAL 4							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
GENERATOR/LIGHTING PLANT/HEATERS	6/1/2026	$37.63	$17.05	$13.35	$3.25	$0.00	$71.28
OPERATING ENGINEERS LOCAL 4	12/1/2026	$38.58	$17.05	$13.35	$3.25	$0.00	$72.23
OPERATING ENGINEERS LOCAL 4							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)	6/1/2026	$44.73	$11.20	$8.40	$6.05	$0.00	$70.38
GLAZIERS LOCAL 1333	6/1/2027	$46.73	$11.60	$8.55	$6.60	$0.00	$73.48
GLAZIERS LOCAL 1333	6/1/2028	$48.73	$12.00	$8.70	$7.20	$0.00	$76.63

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

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$22.37	$11.20	$8.40	$6.05	$0.00	$48.02
2	56.25	$25.16	$11.20	$8.40	$6.05	$0.00	$50.81
3	62.50	$27.96	$11.20	$8.40	$6.05	$0.00	$53.61
4	68.75	$30.75	$11.20	$8.40	$6.05	$0.00	$56.40
5	75.00	$33.55	$11.20	$8.40	$6.05	$0.00	$59.20
6	81.25	$36.34	$11.20	$8.40	$6.05	$0.00	$61.99
7	87.50	$39.14	$11.20	$8.40	$6.05	$0.00	$64.79
8	93.75	$41.93	$11.20	$8.40	$6.05	$0.00	$67.58

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
HOISTING ENGINEER/CRANES/GRADALLS OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.38	$17.05	$13.35	$3.25	$0.00	$93.03
OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.83	$17.05	$13.35	$3.25	$0.00	$94.48

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

Effective Date: 6/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$23.37	$11.60	$8.55	$6.60	$0.00	$50.12
2	56.25	$26.29	$11.60	$8.55	$6.60	$0.00	$53.04
3	62.50	$29.21	$11.60	$8.55	$6.60	$0.00	$55.96
4	68.75	$32.13	$11.60	$8.55	$6.60	$0.00	$58.88
5	75.00	$35.05	$11.60	$8.55	$6.60	$0.00	$61.80
6	81.25	$37.97	$11.60	$8.55	$6.60	$0.00	$64.72
7	87.50	$40.89	$11.60	$8.55	$6.60	$0.00	$67.64
8	93.75	$43.81	$11.60	$8.55	$6.60	$0.00	$70.56

Apprentice to Journeyworker Ratio: 3:1

Apprentice: HOISTING ENGINEER/CRANES/GRADALLS

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$32.66	$0.00	$0.00	$0.00	$0.00	$32.66
2	60.00	$35.63	$17.05	$13.35	$3.25	$0.00	$69.28
3	65.00	$38.60	$17.05	$13.35	$3.25	$0.00	$72.25
4	70.00	$41.57	$17.05	$13.35	$3.25	$0.00	$75.22
5	75.00	$44.54	$17.05	$13.35	$3.25	$0.00	$78.19
6	80.00	$47.50	$17.05	$13.35	$3.25	$0.00	$81.15
7	85.00	$50.47	$17.05	$13.35	$3.25	$0.00	$84.12
8	90.00	$53.44	$17.05	$13.35	$3.25	$0.00	$87.09

Apprentice: HOISTING ENGINEER/CRANES/GRADALLS

Effective Date: 12/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$33.46	$0.00	$0.00	$0.00	$0.00	$33.46
2	60.00	$36.50	$17.05	$13.35	$3.25	$0.00	$70.15
3	65.00	$39.54	$17.05	$13.35	$3.25	$0.00	$73.19
4	70.00	$42.58	$17.05	$13.35	$3.25	$0.00	$76.23
5	75.00	$45.62	$17.05	$13.35	$3.25	$0.00	$79.27
6	80.00	$48.66	$17.05	$13.35	$3.25	$0.00	$82.31
7	85.00	$51.71	$17.05	$13.35	$3.25	$0.00	$85.36
8	90.00	$54.75	$17.05	$13.35	$3.25	$0.00	$88.40

Apprentice to Journeyworker Ratio: 1:6

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 17 SHEETMETAL WORKERS LOCAL 17 - B	4/1/2026	$44.93	$15.25	$13.63	$6.15	$2.24	$82.20
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 223 ELECTRICIANS LOCAL 223	9/1/2025	$52.25	$12.25	$14.86	$3.75	$0.00	$83.11
	9/1/2026	$54.72	$12.50	$15.56	$4.00	$0.00	$86.78
For apprentice rates see "Apprentice- ELECTRICIAN"							
HVAC (TESTING AND BALANCING - AIR) SHEETMETAL WORKERS LOCAL 17 SHEETMETAL WORKERS LOCAL 17 - B	4/1/2026	$44.93	$15.25	$13.63	$6.15	$2.24	$82.20
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (TESTING AND BALANCING -WATER) PLUMBERS & PIPEFITTERS LOCAL 51 PLUMBERS & PIPEFITTERS LOCAL 51	8/25/2025	$55.24	$10.80	$16.80	$4.60	$0.00	$87.44
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HVAC MECHANIC PLUMBERS & PIPEFITTERS LOCAL 51 PLUMBERS & PIPEFITTERS LOCAL 51	8/25/2025	$55.24	$10.80	$16.80	$4.60	$0.00	$87.44
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HYDRAULIC DRILLS LABORERS LABORERS - ZONE 2	6/1/2026	$42.41	$10.90	$9.75	$9.11	$0.00	$72.17
	12/1/2026	$43.85	$10.90	$9.75	$9.11	$0.00	$73.61
	6/1/2027	$45.30	$10.90	$9.75	$9.11	$0.00	$75.06
	12/1/2027	$46.75	$10.90	$9.75	$9.11	$0.00	$76.51
	6/1/2028	$48.25	$10.90	$9.75	$9.11	$0.00	$78.01
	12/1/2028	$49.75	$10.90	$9.75	$9.11	$0.00	$79.51
For apprentice rates see "Apprentice- LABORER"							
HYDRAULIC DRILLS (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$42.41	$10.90	$9.75	$9.21	$0.00	$72.27
	12/1/2026	$43.85	$10.90	$9.75	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
INSULATOR (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (SOUTHERN MASS)	9/1/2025	$54.31	$14.75	$9.52	$10.09	$0.00	$88.67
	9/1/2026	$57.38	$14.75	$9.52	$10.09	$0.00	$91.74

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2025

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

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: INSULATOR (PIPES & TANKS)							
Effective Date: 9/1/2026							
Step / Percent		**Apprentice Base Wage**					
1 / 50.00		$28.69	$14.75	$9.27	$5.05	$0.00	$57.76
2 / 60.00		$34.43	$14.75	$9.32	$6.05	$0.00	$64.55
3 / 70.00		$40.17	$14.75	$9.37	$7.06	$0.00	$71.35
4 / 80.00		$45.90	$14.75	$9.42	$8.07	$0.00	$78.14
Apprentice to Journeyworker Ratio: 1:4							
IRONWORKER/WELDER	3/16/2021	$42.46	$7.70	$12.10	$5.00	$0.00	$67.26
IRONWORKERS LOCAL 37							
IRONWORKERS LOCAL 37							
Apprentice: IRONWORKER/WELDER							
Effective Date: 3/16/2021							
Step / Percent		**Apprentice Base Wage**					
1 / 70.00		$29.72	$7.70	$12.10	$5.00	$0.00	$54.52
2 / 75.00		$31.85	$7.70	$12.10	$5.00	$0.00	$56.65
3 / 80.00		$33.97	$7.70	$12.10	$5.00	$0.00	$58.77
4 / 85.00		$36.09	$7.70	$12.10	$5.00	$0.00	$60.89
5 / 90.00		$38.21	$7.70	$12.10	$5.00	$0.00	$63.01
6 / 95.00		$40.34	$7.70	$12.10	$5.00	$0.00	$65.14
Apprentice to Journeyworker Ratio: 1:4							
JACKHAMMER & PAVING BREAKER OPERATOR	6/1/2026	$41.91	$10.90	$9.75	$9.11	$0.00	$71.67
LABORERS	12/1/2026	$43.35	$10.90	$9.75	$9.11	$0.00	$73.11
LABORERS - ZONE 2	6/1/2027	$44.80	$10.90	$9.75	$9.11	$0.00	$74.56
	12/1/2027	$46.25	$10.90	$9.75	$9.11	$0.00	$76.01
	6/1/2028	$47.75	$10.90	$9.75	$9.11	$0.00	$77.51
	12/1/2028	$49.25	$10.90	$9.75	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
LABORER	6/1/2026	$41.66	$10.90	$9.75	$9.11	$0.00	$71.42
LABORERS	12/1/2026	$43.10	$10.90	$9.75	$9.11	$0.00	$72.86
LABORERS - ZONE 2	6/1/2027	$44.55	$10.90	$9.75	$9.11	$0.00	$74.31
	12/1/2027	$46.00	$10.90	$9.75	$9.11	$0.00	$75.76
	6/1/2028	$47.50	$10.90	$9.75	$9.11	$0.00	$77.26
	12/1/2028	$49.00	$10.90	$9.75	$9.11	$0.00	$78.76
Apprentice: LABORER							
Effective Date: 6/1/2026							
Step / Percent		**Apprentice Base Wage**					

Construction

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

Apprentice: LABORER

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.00	$10.90	$9.75	$9.11	$0.00	$54.76
2	70.00	$29.16	$10.90	$9.75	$9.11	$0.00	$58.92
3	80.00	$33.33	$10.90	$9.75	$9.11	$0.00	$63.09
4	90.00	$37.49	$10.90	$9.75	$9.11	$0.00	$67.25

Apprentice: LABORER

Effective Date: 12/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.86	$10.90	$9.75	$9.11	$0.00	$55.62
2	70.00	$30.17	$10.90	$9.75	$9.11	$0.00	$59.93
3	80.00	$34.48	$10.90	$9.75	$9.11	$0.00	$64.24
4	90.00	$38.79	$10.90	$9.75	$9.11	$0.00	$68.55

Apprentice to Journeyworker Ratio: 1:5

LABORER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$41.66	$10.90	$9.75	$9.21	$0.00	$71.52
	12/1/2026	$43.10	$10.90	$9.75	$9.21	$0.00	$72.96

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.00	$10.90	$9.75	$9.21	$0.00	$54.86
2	70.00	$29.16	$10.90	$9.75	$9.21	$0.00	$59.02
3	80.00	$33.33	$10.90	$9.75	$9.21	$0.00	$63.19
4	90.00	$37.49	$10.90	$9.75	$9.10	$0.00	$67.24

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 12/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.86	$10.90	$9.75	$9.21	$0.00	$55.72
2	70.00	$30.17	$10.90	$9.75	$9.21	$0.00	$60.03
3	80.00	$34.48	$10.90	$9.75	$9.21	$0.00	$64.34
4	90.00	$38.79	$10.90	$9.75	$9.21	$0.00	$68.65

Apprentice to Journeyworker Ratio: 1:5

LABORER: CARPENTER TENDER LABORERS	6/1/2026	$41.66	$10.90	$9.75	$9.11	$0.00	$71.42
	12/1/2026	$43.10	$10.90	$9.75	$9.11	$0.00	$72.86

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS - ZONE 2	6/1/2027	$44.55	$10.90	$9.75	$9.11	$0.00	$74.31
	12/1/2027	$46.00	$10.90	$9.75	$9.11	$0.00	$75.76
	6/1/2028	$47.50	$10.90	$9.75	$9.11	$0.00	$77.26
	12/1/2028	$49.00	$10.90	$9.75	$9.11	$0.00	$78.76
For apprentice rates see "Apprentice- LABORER"							
LABORER: CEMENT FINISHER TENDER	6/1/2026	$41.66	$10.90	$9.75	$9.11	$0.00	$71.42
LABORERS LABORERS - ZONE 2	12/1/2026	$43.10	$10.90	$9.75	$9.11	$0.00	$72.86
	6/1/2027	$44.55	$10.90	$9.75	$9.11	$0.00	$74.31
	12/1/2027	$46.00	$10.90	$9.75	$9.11	$0.00	$75.76
	6/1/2028	$47.50	$10.90	$9.75	$9.11	$0.00	$77.26
	12/1/2028	$49.00	$10.90	$9.75	$9.11	$0.00	$78.76
For apprentice rates see "Apprentice- LABORER"							
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER	6/1/2026	$41.75	$10.90	$9.75	$9.65	$0.00	$72.05
LABORERS LABORERS - ZONE 2	12/7/2026	$43.19	$10.90	$9.75	$9.65	$0.00	$73.49
	6/7/2027	$44.64	$10.90	$9.75	$9.65	$0.00	$74.94
	12/6/2027	$46.09	$10.90	$9.75	$9.65	$0.00	$76.39
	6/5/2028	$47.59	$10.90	$9.75	$9.65	$0.00	$77.89
	12/4/2028	$49.09	$10.90	$9.75	$9.65	$0.00	$79.39
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER	6/1/2026	$41.91	$10.90	$9.75	$9.11	$0.00	$71.67
LABORERS LABORERS - ZONE 2	12/1/2026	$43.35	$10.90	$9.75	$9.11	$0.00	$73.11
	6/1/2027	$44.80	$10.90	$9.75	$9.11	$0.00	$74.56
	12/1/2027	$46.25	$10.90	$9.75	$9.11	$0.00	$76.01
	6/1/2028	$47.75	$10.90	$9.75	$9.11	$0.00	$77.51
	12/1/2028	$49.25	$10.90	$9.75	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER (HEAVY & HIGHWAY)	6/1/2026	$41.91	$10.90	$9.75	$9.21	$0.00	$71.77
LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$43.35	$10.90	$9.75	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
LABORER: MULTI-TRADE TENDER	6/1/2026	$41.66	$10.90	$9.75	$9.11	$0.00	$71.42
LABORERS LABORERS - ZONE 2	12/1/2026	$43.10	$10.90	$9.75	$9.11	$0.00	$72.86
	6/1/2027	$44.55	$10.90	$9.75	$9.11	$0.00	$74.31
	12/1/2027	$46.00	$10.90	$9.75	$9.11	$0.00	$75.76
	6/1/2028	$47.50	$10.90	$9.75	$9.11	$0.00	$77.26
	12/1/2028	$49.00	$10.90	$9.75	$9.11	$0.00	$78.76
For apprentice rates see "Apprentice- LABORER"							
LABORER: TREE REMOVER	6/1/2026	$41.66	$10.90	$9.75	$9.11	$0.00	$71.42
LABORERS LABORERS - ZONE 2	12/1/2026	$43.10	$10.90	$9.75	$9.11	$0.00	$72.86
	6/1/2027	$44.55	$10.90	$9.75	$9.11	$0.00	$74.31
	12/1/2027	$46.00	$10.90	$9.75	$9.11	$0.00	$75.76
	6/1/2028	$47.50	$10.90	$9.75	$9.11	$0.00	$77.26
	12/1/2028	$49.00	$10.90	$9.75	$9.11	$0.00	$78.76
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LASER BEAM OPERATOR	6/1/2026	$41.91	$10.90	$9.75	$9.11	$0.00	$71.67
LABORERS LABORERS - ZONE 2	12/1/2026	$43.35	$10.90	$9.75	$9.11	$0.00	$73.11
	6/1/2027	$44.80	$10.90	$9.75	$9.11	$0.00	$74.56
	12/1/2027	$46.25	$10.90	$9.75	$9.11	$0.00	$76.01
	6/1/2028	$47.75	$10.90	$9.75	$9.11	$0.00	$77.51
	12/1/2028	$49.25	$10.90	$9.75	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
LASER BEAM OPERATOR (HEAVY & HIGHWAY)	6/1/2026	$41.91	$10.90	$9.75	$9.21	$0.00	$71.77
LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$43.35	$10.90	$9.75	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
MARBLE & TILE FINISHERS	8/1/2026	$53.84	$12.84	$15.57	$5.78	$0.00	$88.03
BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 - MARBLE & TILE	2/1/2027	$54.96	$12.84	$15.57	$5.78	$0.00	$89.15

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 8/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$26.92	$12.84	$15.57	$5.78	$0.00	$61.11
2	60.00	$32.30	$12.84	$15.57	$5.78	$0.00	$66.49
3	70.00	$37.69	$12.84	$15.57	$5.78	$0.00	$71.88
4	80.00	$43.07	$12.84	$15.57	$5.78	$0.00	$77.26
5	90.00	$48.46	$12.84	$15.57	$5.78	$0.00	$82.65

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 2/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.48	$12.84	$15.57	$5.78	$0.00	$61.67
2	60.00	$32.98	$12.84	$15.57	$5.78	$0.00	$67.17
3	70.00	$38.47	$12.84	$15.57	$5.78	$0.00	$72.66
4	80.00	$43.97	$12.84	$15.57	$5.78	$0.00	$78.16
5	90.00	$49.46	$12.84	$15.57	$5.78	$0.00	$83.65

Apprentice to Journeyworker Ratio: 1:5

MARBLE MASONS,TILELAYERS & TERRAZZO MECH	8/1/2026	$70.17	$12.84	$15.57	$7.99	$0.00	$106.57
BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 - MARBLE & TILE	2/1/2027	$71.57	$12.84	$15.57	$7.99	$0.00	$107.97

Apprentice: MARBLE MASONS,TILELAYERS & TERRAZZO MECH

Effective Date: 8/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$35.09	$12.84	$15.57	$7.99	$0.00	$71.49

Construction

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

Apprentice: MARBLE MASONS,TILELAYERS & TERRAZZO MECH

Effective Date: 8/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
2	60.00	$42.10	$12.84	$15.57	$7.99	$0.00	$78.50
3	70.00	$49.12	$12.84	$15.57	$7.99	$0.00	$85.52
4	80.00	$56.14	$12.84	$15.57	$7.99	$0.00	$92.54
5	90.00	$63.15	$12.84	$15.57	$7.99	$0.00	$99.55

Apprentice: MARBLE MASONS,TILELAYERS & TERRAZZO MECH

Effective Date: 2/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$35.79	$12.84	$15.57	$7.99	$0.00	$72.19
2	60.00	$42.94	$12.84	$15.57	$7.99	$0.00	$79.34
3	70.00	$50.10	$12.84	$15.57	$7.99	$0.00	$86.50
4	80.00	$57.26	$12.84	$15.57	$7.99	$0.00	$93.66
5	90.00	$64.41	$12.84	$15.57	$7.99	$0.00	$100.81

Apprentice to Journeyworker Ratio: 1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026 12/1/2026	$58.70 $60.14	$17.05 $17.05	$13.35 $13.35	$3.25 $3.25	$0.00 $0.00	$92.35 $93.79

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MECHANICS MAINTENANCE OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026 12/1/2026	$58.70 $60.14	$17.05 $17.05	$13.35 $13.35	$3.25 $3.25	$0.00 $0.00	$92.35 $93.79

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MILLWRIGHT (Zone 2) MILLWRIGHTS LOCAL 1121 MILLWRIGHTS LOCAL 1121 - Zone 2	1/5/2026	$46.86	$10.58	$11.47	$10.00	$0.00	$78.91

Apprentice: MILLWRIGHT (Zone 2)

Effective Date: 1/5/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$25.77	$10.58	$0.00	$5.50	$0.00	$41.85
2	65.00	$30.46	$10.58	$0.00	$6.50	$0.00	$47.54
3	75.00	$35.15	$10.58	$11.47	$7.50	$0.00	$64.70
4	85.00	$39.83	$10.58	$11.47	$8.50	$0.00	$70.38

Apprentice Notes

Step 1&2 Appr. indentured after 1/6/2020 receive no pension,

Apprentice to Journeyworker Ratio: 1:4

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
MORTAR MIXER LABORERS LABORERS - ZONE 2	6/1/2026	$41.91	$10.90	$9.75	$9.11	$0.00	$71.67
	12/1/2026	$43.35	$10.90	$9.75	$9.11	$0.00	$73.11
	6/1/2027	$44.80	$10.90	$9.75	$9.11	$0.00	$74.56
	12/1/2027	$46.25	$10.90	$9.75	$9.11	$0.00	$76.01
	6/1/2028	$47.75	$10.90	$9.75	$9.11	$0.00	$77.51
	12/1/2028	$49.25	$10.90	$9.75	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
OILER (OTHER THAN TRUCK CRANES,GRADALLS) OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$25.07	$17.05	$13.35	$3.25	$0.00	$58.72
	12/1/2026	$25.74	$17.05	$13.35	$3.25	$0.00	$59.39
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OILER (TRUCK CRANES, GRADALLS) OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$31.17	$17.05	$13.35	$3.25	$0.00	$64.82
	12/1/2026	$31.97	$17.05	$13.35	$3.25	$0.00	$65.62
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OTHER POWER DRIVEN EQUIPMENT - CLASS II OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PAINTER (BRIDGES/TANKS) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	1/1/2026	$59.56	$10.35	$12.00	$12.50	$0.00	$94.41

Apprentice: PAINTER (BRIDGES/TANKS)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.78	$10.35	$0.00	$0.00	$0.00	$40.13
2	55.00	$32.76	$10.35	$0.00	$6.93	$0.00	$50.04
3	60.00	$35.74	$10.35	$0.00	$7.56	$0.00	$53.65
4	65.00	$38.71	$10.35	$0.00	$8.19	$0.00	$57.25
5	70.00	$41.69	$10.35	$12.00	$8.82	$0.00	$72.86
6	75.00	$44.67	$10.35	$12.00	$9.45	$0.00	$76.47
7	80.00	$47.65	$10.35	$12.00	$10.08	$0.00	$80.08
8	90.00	$53.60	$10.35	$12.00	$11.34	$0.00	$87.29

Apprentice to Journeyworker Ratio: 1:1

PAINTER (SPRAY OR SANDBLAST, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	1/1/2026	$50.46	$10.35	$12.00	$12.60	$0.00	$85.41

Construction

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

Apprentice: PAINTER (SPRAY OR SANDBLAST, NEW) *

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$25.23	$10.35	$0.00	$0.00	$0.00	$35.58
2	55.00	$27.75	$10.35	$0.00	$6.93	$0.00	$45.03
3	60.00	$30.28	$10.35	$0.00	$7.56	$0.00	$48.19
4	65.00	$32.80	$10.35	$0.00	$8.19	$0.00	$51.34
5	70.00	$35.32	$10.35	$12.00	$8.82	$0.00	$66.49
6	75.00	$37.85	$10.35	$12.00	$9.45	$0.00	$69.65
7	80.00	$40.37	$10.35	$12.00	$10.08	$0.00	$72.80
8	90.00	$45.41	$10.35	$12.00	$11.34	$0.00	$79.10

Apprentice to Journeyworker Ratio: 1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	1/1/2026	$48.52	$10.35	$12.00	$12.60	$0.00	$83.47

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.26	$10.35	$0.00	$0.00	$0.00	$34.61
2	55.00	$26.69	$10.35	$0.00	$6.93	$0.00	$43.97
3	60.00	$29.11	$10.35	$0.00	$7.56	$0.00	$47.02
4	65.00	$31.54	$10.35	$0.00	$8.19	$0.00	$50.08
5	70.00	$33.96	$10.35	$12.00	$8.82	$0.00	$65.13
6	75.00	$36.39	$10.35	$12.00	$9.45	$0.00	$68.19
7	80.00	$38.82	$10.35	$12.00	$10.08	$0.00	$71.25
8	90.00	$43.67	$10.35	$12.00	$11.34	$0.00	$77.36

Apprentice to Journeyworker Ratio: 1:1

PAINTER / TAPER (BRUSH, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	1/1/2026	$49.06	$10.35	$12.00	$12.60	$0.00	$84.01

Apprentice: PAINTER / TAPER (BRUSH, NEW) *

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.53	$10.35	$0.00	$0.00	$0.00	$34.88
2	55.00	$26.98	$10.35	$0.00	$6.93	$0.00	$44.26
3	60.00	$29.44	$10.35	$0.00	$7.56	$0.00	$47.35

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: PAINTER / TAPER (BRUSH, NEW) *							
Effective Date: 1/1/2026							
Step / Percent		**Apprentice Base Wage**					
4 / 65.00		$31.89	$10.35	$0.00	$8.19	$0.00	$50.43
5 / 70.00		$34.34	$10.35	$12.00	$8.82	$0.00	$65.51
6 / 75.00		$36.80	$10.35	$12.00	$9.45	$0.00	$68.60
7 / 80.00		$39.25	$10.35	$12.00	$10.08	$0.00	$71.68
8 / 90.00		$44.15	$10.35	$12.00	$11.34	$0.00	$77.84
Apprentice to Journeyworker Ratio: 1:1							
PAINTER / TAPER (BRUSH, REPAINT) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	1/1/2026	$47.12	$10.35	$12.00	$12.60	$0.00	$82.07
Apprentice: PAINTER / TAPER (BRUSH, REPAINT)							
Effective Date: 1/1/2026							
Step / Percent		**Apprentice Base Wage**					
1 / 50.00		$23.56	$10.35	$0.00	$0.00	$0.00	$33.91
2 / 55.00		$25.92	$10.35	$0.00	$6.93	$0.00	$43.20
3 / 60.00		$28.27	$10.35	$0.00	$7.56	$0.00	$46.18
4 / 65.00		$30.63	$10.35	$0.00	$8.19	$0.00	$49.17
5 / 70.00		$32.98	$10.35	$12.00	$8.82	$0.00	$64.15
6 / 75.00		$35.34	$10.35	$12.00	$9.45	$0.00	$67.14
7 / 80.00		$37.70	$10.35	$12.00	$10.08	$0.00	$70.13
8 / 90.00		$42.41	$10.35	$12.00	$11.34	$0.00	$76.10
Apprentice to Journeyworker Ratio: 1:1							
PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$41.66	$10.90	$9.75	$9.21	$0.00	$71.52
	12/1/2026	$43.10	$10.90	$9.75	$9.21	$0.00	$72.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
PANEL & PICKUP TRUCKS DRIVER TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2026	$41.78	$16.17	$21.78	$0.00	$0.00	$79.73
	12/1/2026	$41.78	$16.17	$23.52	$0.00	$0.00	$81.47
	1/1/2027	$41.78	$16.77	$23.52	$0.00	$0.00	$82.07
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	$55.79	$10.08	$11.62	$12.67	$0.00	$90.16
For apprentice rates see "Apprentice- PILE DRIVER"							
PILE DRIVER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	$55.79	$10.08	$11.62	$12.67	$0.00	$90.16

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: PILE DRIVER							
Effective Date: 8/1/2024							
Step / Percent		**Apprentice Base Wage**	**Health**	**Pension**	**Annuity**	**Supplemental Unemployment**	**Total Rate**
1 / 45.00		$25.11	$10.08	$0.00	$2.53	$0.00	$37.72
2 / 55.00		$30.68	$10.08	$0.00	$5.07	$0.00	$45.83
3 / 70.00		$39.05	$10.08	$11.62	$7.60	$0.00	$68.35
4 / 80.00		$44.63	$10.08	$11.62	$10.14	$0.00	$76.47
Apprentice to Journeyworker Ratio: 1:5							
PIPELAYER	6/1/2026	$41.91	$10.90	$9.75	$9.11	$0.00	$71.67
LABORERS	12/1/2026	$43.35	$10.90	$9.75	$9.11	$0.00	$73.11
LABORERS - ZONE 2	6/1/2027	$44.80	$10.90	$9.75	$9.11	$0.00	$74.56
	12/1/2027	$46.25	$10.90	$9.75	$9.11	$0.00	$76.01
	6/1/2028	$47.75	$10.90	$9.75	$9.11	$0.00	$77.51
	12/1/2028	$49.25	$10.90	$9.75	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
PIPELAYER (HEAVY & HIGHWAY)	6/1/2026	$41.91	$10.90	$9.75	$9.21	$0.00	$71.77
LABORERS	12/1/2026	$43.35	$10.90	$9.75	$9.21	$0.00	$73.21
LABORERS - ZONE 2 (HEAVY & HIGHWAY)							
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
PLUMBER & PIPEFITTER	8/25/2025	$55.24	$10.80	$16.80	$4.60	$0.00	$87.44
PLUMBERS & PIPEFITTERS LOCAL 51							
PLUMBERS & PIPEFITTERS LOCAL 51							
Apprentice: PLUMBER & PIPEFITTER							
Effective Date: 8/25/2025							
Step / Percent		**Apprentice Base Wage**	**Health**	**Pension**	**Annuity**	**Supplemental Unemployment**	**Total Rate**
1 / 40.00		$22.10	$10.15	$2.50	$0.00	$0.00	$34.75
2 / 50.00		$27.62	$10.15	$2.50	$0.00	$0.00	$40.27
3 / 60.00		$33.14	$10.15	$8.40	$0.50	$0.00	$52.19
4 / 70.00		$38.67	$10.15	$13.44	$0.80	$0.00	$63.06
5 / 80.00		$44.19	$10.15	$16.80	$1.00	$0.00	$72.14
Apprentice to Journeyworker Ratio: 1:3							
PNEUMATIC CONTROLS (TEMP.)	8/25/2025	$55.24	$10.80	$16.80	$4.60	$0.00	$87.44
PLUMBERS & PIPEFITTERS LOCAL 51							
PLUMBERS & PIPEFITTERS LOCAL 51							
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
PNEUMATIC DRILL/TOOL OPERATOR	6/1/2026	$41.91	$10.90	$9.75	$9.11	$0.00	$71.67
LABORERS	12/1/2026	$43.35	$10.90	$9.75	$9.11	$0.00	$73.11
LABORERS - ZONE 2	6/1/2027	$44.80	$10.90	$9.75	$9.11	$0.00	$74.56
	12/1/2027	$46.25	$10.90	$9.75	$9.11	$0.00	$76.01

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	6/1/2028	$47.75	$10.90	$9.75	$9.11	$0.00	$77.51
	12/1/2028	$49.25	$10.90	$9.75	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY)	6/1/2026	$41.91	$10.90	$9.75	$9.21	$0.00	$71.77
LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$43.35	$10.90	$9.75	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
POWDERMAN & BLASTER	6/1/2026	$42.66	$10.90	$9.75	$9.11	$0.00	$72.42
LABORERS LABORERS - ZONE 2	12/1/2026	$44.10	$10.90	$9.75	$9.11	$0.00	$73.86
	6/1/2027	$45.55	$10.90	$9.75	$9.11	$0.00	$75.31
	12/1/2027	$47.00	$10.90	$9.75	$9.11	$0.00	$76.76
	6/1/2028	$48.50	$10.90	$9.75	$9.11	$0.00	$78.26
	12/1/2028	$50.00	$10.90	$9.75	$9.11	$0.00	$79.76
For apprentice rates see "Apprentice- LABORER"							
POWDERMAN & BLASTER (HEAVY & HIGHWAY)	6/1/2026	$42.66	$10.90	$9.75	$9.21	$0.00	$72.52
LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$44.10	$10.90	$9.75	$9.21	$0.00	$73.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
POWER SHOVEL/DERRICK/TRENCHING MACHINE	6/1/2026	$59.38	$17.05	$13.35	$3.25	$0.00	$93.03
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.83	$17.05	$13.35	$3.25	$0.00	$94.48
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (CONCRETE)	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (DEWATERING, OTHER)	6/1/2026	$37.63	$17.05	$13.35	$3.25	$0.00	$71.28
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$38.58	$17.05	$13.35	$3.25	$0.00	$72.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
READY-MIX CONCRETE DRIVER	8/1/2023	$25.00	$13.91	$6.90	$0.00	$0.00	$45.81
TEAMSTERS 653 TEAMSTERS 653 - Southeastern Concrete (Weymouth)							
RECLAIMERS	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
RIDE-ON MOTORIZED BUGGY OPERATOR	6/1/2026	$41.91	$10.90	$9.75	$9.11	$0.00	$71.67
LABORERS LABORERS - ZONE 2	12/1/2026	$43.35	$10.90	$9.75	$9.11	$0.00	$73.11
	6/1/2027	$44.80	$10.90	$9.75	$9.11	$0.00	$74.56
	12/1/2027	$46.25	$10.90	$9.75	$9.11	$0.00	$76.01
	6/1/2028	$47.75	$10.90	$9.75	$9.11	$0.00	$77.51
	12/1/2028	$49.25	$10.90	$9.75	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
ROLLER/SPREADER/MULCHING MACHINE	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
OPERATING ENGINEERS LOCAL 4							

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)	2/1/2026	$53.53	$14.53	$12.67	$9.03	$0.00	$89.76
ROOFERS LOCAL 33							
ROOFERS LOCAL 33							

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

Effective Date: 2/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$26.77	$14.53	$6.52	$9.03	$0.00	$56.85
2	60.00	$32.12	$14.53	$12.67	$9.03	$0.00	$68.35
3	65.00	$34.79	$14.53	$12.67	$9.03	$0.00	$71.02
4	75.00	$40.15	$14.53	$12.67	$9.03	$0.00	$76.38
5	85.00	$45.50	$14.53	$12.67	$9.03	$0.00	$81.73

Apprentice Notes

** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1

Apprentice to Journeyworker Ratio: 1:5

ROOFER SLATE / TILE / PRECAST CONCRETE	2/1/2026	$53.78	$14.53	$12.67	$9.03	$0.00	$90.01
ROOFERS LOCAL 33							
ROOFERS LOCAL 33							

For apprentice rates see "Apprentice- ROOFER"

SHEETMETAL WORKER	4/1/2026	$44.93	$15.25	$13.63	$6.15	$2.24	$82.20
SHEETMETAL WORKERS LOCAL 17							
SHEETMETAL WORKERS LOCAL 17 - B							

Apprentice: SHEETMETAL WORKER

Effective Date: 4/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$17.97	$15.25	$4.27	$0.00	$1.09	$38.58
2	45.00	$20.22	$15.25	$4.80	$0.00	$1.17	$41.44
3	50.00	$22.47	$15.25	$12.56	$0.00	$1.45	$51.73
4	55.00	$24.71	$15.25	$12.56	$0.00	$1.52	$54.04
5	60.00	$26.96	$15.25	$12.56	$3.69	$1.64	$60.10
6	65.00	$29.20	$15.25	$12.56	$4.00	$1.71	$62.72
7	70.00	$31.45	$15.25	$12.56	$4.31	$1.78	$65.35
8	75.00	$33.70	$15.25	$12.56	$4.61	$1.86	$67.98
9	80.00	$35.94	$15.25	$12.56	$4.92	$1.93	$70.60
10	85.00	$38.19	$15.25	$12.56	$5.23	$2.00	$73.23

Apprentice to Journeyworker Ratio: 1:4

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
SPECIALIZED EARTH MOVING EQUIP > 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2026	$42.53	$16.17	$21.78	$0.00	$0.00	$80.48
	12/1/2026	$42.53	$16.17	$23.52	$0.00	$0.00	$82.22
	1/1/2027	$42.53	$16.77	$23.52	$0.00	$0.00	$82.82
SPRINKLER FITTER SPRINKLER FITTERS LOCAL 550 SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 2	1/1/2026	$64.85	$13.45	$7.45	$18.25	$0.00	$104.00

Apprentice: SPRINKLER FITTER

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	0.00	$22.70	$13.45	$13.84	$0.00	$0.00	$49.99
2	0.00	$25.94	$13.45	$14.75	$0.00	$0.00	$54.14
3	0.00	$29.18	$13.45	$15.67	$0.00	$0.00	$58.30
4	0.00	$32.43	$13.45	$16.57	$0.00	$0.00	$62.45
5	0.00	$35.67	$13.45	$17.49	$0.00	$0.00	$66.61
6	0.00	$38.91	$13.45	$18.40	$0.00	$0.00	$70.76
7	0.00	$42.15	$13.45	$19.32	$0.00	$0.00	$74.92
8	0.00	$45.40	$13.45	$20.22	$0.00	$0.00	$79.07
9	0.00	$48.64	$13.45	$21.15	$0.00	$0.00	$83.24
10	0.00	$51.88	$13.45	$22.05	$0.00	$0.00	$87.38

Apprentice Notes

Apprentice entered prior 9/30/10:

Apprentice to Journeyworker Ratio: 1:3

STEAM BOILER OPERATOR OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TELECOMMUNICATION TECHNICIAN TELECOMMUNICATION TECHNICIAN ELECTRICIANS LOCAL 223 ELECTRICIANS LOCAL 223	9/1/2025	$42.52	$12.00	$12.05	$3.25	$0.00	$69.82
	9/1/2026	$44.41	$12.25	$12.59	$3.50	$0.00	$72.75
	9/1/2027	$46.51	$12.50	$13.18	$3.75	$0.00	$75.94
For apprentice rates and ratios see "Apprentice- ELECTRICIAN"							
TERRAZZO FINISHERS BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 - MARBLE & TILE	8/1/2026	$69.09	$12.84	$15.57	$8.02	$0.00	$105.52
	2/1/2027	$70.49	$12.84	$15.57	$8.02	$0.00	$106.92

Construction

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

Apprentice: TERRAZZO FINISHERS

Effective Date: 8/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$34.55	$12.84	$15.57	$8.02	$0.00	$70.98
2	60.00	$41.45	$12.84	$15.57	$8.02	$0.00	$77.88
3	70.00	$48.36	$12.84	$15.57	$8.02	$0.00	$84.79
4	80.00	$55.27	$12.84	$15.57	$8.02	$0.00	$91.70
5	90.00	$62.18	$12.84	$15.57	$8.02	$0.00	$98.61

Apprentice: TERRAZZO FINISHERS

Effective Date: 2/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$35.25	$12.84	$15.57	$8.02	$0.00	$71.68
2	60.00	$42.29	$12.84	$15.57	$8.02	$0.00	$78.72
3	70.00	$49.34	$12.84	$15.57	$8.02	$0.00	$85.77
4	80.00	$56.39	$12.84	$15.57	$8.02	$0.00	$92.82
5	90.00	$63.44	$12.84	$15.57	$8.02	$0.00	$99.87

Apprentice to Journeyworker Ratio: 1:5

TEST BORING DRILLER	6/1/2026	$53.25	$10.90	$9.75	$9.80	$0.00	$83.70
LABORERS LABORERS - FOUNDATION AND MARINE	12/1/2026	$54.75	$10.90	$9.75	$9.80	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"							
TEST BORING DRILLER HELPER	6/1/2026	$49.37	$10.90	$9.75	$9.80	$0.00	$79.82
LABORERS LABORERS - FOUNDATION AND MARINE	12/1/2026	$50.87	$10.90	$9.75	$9.80	$0.00	$81.32
For apprentice rates see "Apprentice- LABORER"							
TEST BORING LABORER	6/1/2026	$49.25	$10.90	$9.75	$9.80	$0.00	$79.70
LABORERS LABORERS - FOUNDATION AND MARINE	12/1/2026	$50.75	$10.90	$9.75	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
TRACTORS/PORTABLE STEAM GENERATORS	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TRAILERS FOR EARTH MOVING EQUIPMENT	6/1/2026	$42.82	$16.17	$21.78	$0.00	$0.00	$80.77
TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2026	$42.82	$16.17	$23.52	$0.00	$0.00	$82.51
	1/1/2027	$42.82	$16.77	$23.52	$0.00	$0.00	$83.11
TUNNEL WORK - COMPRESSED AIR	6/1/2026	$61.48	$10.90	$9.75	$10.25	$0.00	$92.38
LABORERS LABORERS (COMPRESSED AIR)	12/1/2026	$62.98	$10.90	$9.75	$10.25	$0.00	$93.88

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)	6/1/2026	$63.48	$10.90	$9.75	$10.25	$0.00	$94.38
LABORERS LABORERS (COMPRESSED AIR)	12/1/2026	$64.98	$10.90	$9.75	$10.25	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR	6/1/2026	$53.55	$10.90	$9.75	$10.25	$0.00	$84.45
LABORERS LABORERS (FREE AIR TUNNEL)	12/1/2026	$55.05	$10.90	$9.75	$10.25	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR (HAZ. WASTE)	6/1/2026	$55.55	$10.90	$9.75	$10.25	$0.00	$86.45
LABORERS LABORERS (FREE AIR TUNNEL)	12/1/2026	$57.05	$10.90	$9.75	$10.25	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"							
VAC-HAUL	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
WAGON DRILL OPERATOR	6/1/2026	$41.91	$10.90	$9.75	$9.11	$0.00	$71.67
LABORERS LABORERS - ZONE 2	12/1/2026	$43.35	$10.90	$9.75	$9.11	$0.00	$73.11
	6/1/2027	$44.80	$10.90	$9.75	$9.11	$0.00	$74.56
	12/1/2027	$46.25	$10.90	$9.75	$9.11	$0.00	$76.01
	6/1/2028	$47.75	$10.90	$9.75	$9.11	$0.00	$77.51
	12/1/2028	$49.25	$10.90	$9.75	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
WAGON DRILL OPERATOR (HEAVY & HIGHWAY)	6/1/2026	$41.91	$10.90	$9.75	$9.21	$0.00	$71.77
LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$43.35	$10.90	$9.75	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
WASTE WATER PUMP OPERATOR	6/1/2026	$59.38	$17.05	$13.35	$3.25	$0.00	$93.03
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.83	$17.05	$13.35	$3.25	$0.00	$94.48
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
WATER METER INSTALLER	8/25/2025	$55.24	$10.80	$16.80	$4.60	$0.00	$87.44
PLUMBERS & PIPEFITTERS LOCAL 51 PLUMBERS & PIPEFITTERS LOCAL 51							
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"							

Marine Drilling

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BLASTER MARINE DRILLING MARINE DRILLING	1/1/2018	$41.82	$7.63	$2.35	$1.25	$0.00	$53.05
BOAT CAPTAIN MARINE DRILLING MARINE DRILLING	1/1/2018	$33.87	$7.63	$2.35	$0.95	$0.00	$44.80
BOAT CAPTAIN / Over 1,000 hp MARINE DRILLING MARINE DRILLING	1/1/2018	$38.06	$7.63	$2.35	$1.25	$0.00	$49.29
CORE DRILLER MARINE DRILLING MARINE DRILLING	1/1/2018	$31.43	$7.63	$2.25	$0.65	$0.00	$41.96
CORE DRILLER HELPER MARINE DRILLING MARINE DRILLING	1/1/2018	$28.47	$7.63	$2.35	$0.65	$0.00	$39.10
DRILLER MARINE DRILLING MARINE DRILLING	1/1/2018	$39.70	$7.63	$2.35	$1.25	$0.00	$50.93
ENGINEER MARINE DRILLING MARINE DRILLING	1/1/2018	$39.69	$7.63	$2.25	$1.25	$0.00	$50.82
HELPER MARINE DRILLING MARINE DRILLING	1/1/2018	$34.24	$7.63	$2.35	$0.65	$0.00	$44.87
MACHINIST MARINE DRILLING MARINE DRILLING	1/1/2018	$38.88	$7.63	$2.35	$0.95	$0.00	$49.81
OILER - MARINE DRILLING MARINE DRILLING MARINE DRILLING	1/1/2018	$34.24	$7.63	$2.35	$0.65	$0.00	$44.87
TUG DECKHAND MARINE DRILLING MARINE DRILLING	1/1/2018	$27.61	$7.63	$2.35	$0.65	$0.00	$38.24
WELDER MARINE DRILLING MARINE DRILLING	1/1/2018	$38.88	$7.63	$2.35	$0.95	$0.00	$49.81

Op Eng Marine (Dredging Work)

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BOAT OPERATOR OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS - MARINE DIVISION	10/1/2017	$29.26	$7.63	$2.35	$0.95	$0.00	$40.19
CERTIFIED WELDER OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS - MARINE DIVISION	10/1/2017	$31.09	$7.63	$2.35	$1.25	$0.00	$42.32
CHIEF WELDER/ CHIEF MATE OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS - MARINE DIVISION	10/1/2017	$33.02	$7.63	$2.35	$1.25	$0.00	$44.25
DERRICK / SPIDER / SPILLBARGE OPERATOR OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS - MARINE DIVISION	10/1/2017	$33.02	$7.63	$2.35	$1.25	$0.00	$44.25
DRAG BARGE OPERATOR / WELDER / MATE OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS - MARINE DIVISION	10/1/2017	$30.24	$7.63	$2.35	$0.95	$0.00	$41.17
ENGINEER / ELECTRICIAN OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS - MARINE DIVISION	10/1/2017	$33.02	$7.63	$2.35	$1.25	$0.00	$44.25
LICENSED BOAT OPERATOR OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS - MARINE DIVISION	10/1/2017	$33.02	$7.63	$2.35	$1.25	$0.00	$44.25
LICENSED TUG OPERATOR OVER 1000HP OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS - MARINE DIVISION	10/1/2017	$38.18	$7.63	$2.35	$1.25	$0.00	$49.41
MAINTENANCE ENGINEER OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS - MARINE DIVISION	10/1/2017	$33.03	$7.63	$2.35	$1.25	$0.00	$44.26
OILER - MARINE DIVISION OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS - MARINE DIVISION	10/1/2017	$24.30	$7.63	$2.35	$0.65	$0.00	$34.93
OPERATOR / LEVERMAN OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS - MARINE DIVISION	10/1/2017	$38.18	$7.63	$2.35	$1.25	$0.00	$49.41
RODMAN / SCOWMAN OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS - MARINE DIVISION	10/1/2017	$24.30	$7.63	$2.35	$0.65	$0.00	$34.93
SHOREMAN / DECKHAND OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS - MARINE DIVISION	10/1/2017	$24.30	$7.63	$2.35	$0.65	$0.00	$34.93

Outside Electrical

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
CABLE TECHNICIAN (Power Zone)	8/31/2025	$36.55	$10.75	$1.10	$1.00	$0.00	$49.40
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/30/2026	$38.13	$11.00	$1.14	$1.00	$0.00	$51.27
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/29/2027	$39.65	$11.25	$1.19	$1.00	$0.00	$53.09
For apprentice rates see "Apprentice- LINEMAN"							
CABLEMAN (Underground Ducts & Cables)	8/31/2025	$51.78	$10.75	$1.55	$10.71	$0.00	$74.79
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/30/2026	$54.02	$11.00	$1.62	$11.14	$0.00	$77.78
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/29/2027	$56.17	$11.25	$1.69	$11.57	$0.00	$80.68
For apprentice rates see "Apprentice- LINEMAN"							
DRIVER / GROUNDMAN CDL	8/31/2025	$42.64	$10.75	$1.28	$10.45	$0.00	$65.12
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/30/2026	$44.49	$11.00	$1.33	$10.80	$0.00	$67.62
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/29/2027	$46.26	$11.25	$1.39	$11.15	$0.00	$70.05
For apprentice rates see "Apprentice- LINEMAN"							
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs)	8/31/2025	$33.51	$10.75	$1.01	$1.00	$0.00	$46.27
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/30/2026	$34.95	$11.00	$1.05	$1.00	$0.00	$48.00
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/29/2027	$36.64	$11.25	$1.09	$1.00	$0.00	$49.98
For apprentice rates see "Apprentice- LINEMAN"							
EQUIPMENT OPERATOR (Class A CDL)	8/31/2025	$51.78	$10.75	$1.55	$14.79	$0.00	$78.87
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/30/2026	$54.02	$11.00	$1.62	$15.22	$0.00	$81.86
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/29/2027	$56.17	$11.25	$1.69	$15.65	$0.00	$84.76
For apprentice rates see "Apprentice- LINEMAN"							
EQUIPMENT OPERATOR (Class B CDL)	8/31/2025	$45.69	$10.75	$1.37	$11.27	$0.00	$69.08
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/30/2026	$47.66	$11.00	$1.43	$11.65	$0.00	$71.74
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/29/2027	$49.56	$11.25	$1.49	$12.03	$0.00	$74.33
For apprentice rates see "Apprentice- LINEMAN"							
GROUNDMAN	8/31/2025	$33.51	$10.75	$1.01	$1.00	$0.00	$46.27
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/30/2026	$34.95	$11.00	$1.05	$1.00	$0.00	$48.00
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/29/2027	$36.34	$11.25	$1.09	$1.00	$0.00	$49.68
For apprentice rates see "Apprentice- LINEMAN"							
GROUNDMAN -Inexperienced (<2000 Hrs.)	8/31/2025	$27.41	$10.75	$0.82	$1.00	$0.00	$39.98
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/30/2026	$28.60	$11.00	$0.86	$1.00	$0.00	$41.46
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/29/2027	$29.74	$11.25	$0.89	$1.00	$0.00	$42.88
For apprentice rates see "Apprentice- LINEMAN"							
JOURNEYMAN LINEMAN	8/31/2025	$60.92	$10.75	$1.83	$18.00	$0.00	$91.50
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/30/2026	$63.55	$11.00	$1.91	$18.50	$0.00	$94.96
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	8/29/2027	$66.08	$11.25	$1.98	$19.00	$0.00	$98.31

Apprentice: JOURNEYMAN LINEMAN

Effective Date: 8/31/2025

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

Outside Electrical

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

Apprentice: JOURNEYMAN LINEMAN

Effective Date: 8/31/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$36.55	$10.75	$1.10	$2.50	$0.00	$50.90
2	65.00	$39.60	$10.75	$1.19	$2.50	$0.00	$54.04
3	70.00	$42.64	$10.75	$1.28	$2.50	$0.00	$57.17
4	75.00	$45.69	$10.75	$1.37	$4.00	$0.00	$61.81
5	80.00	$48.74	$10.75	$1.46	$4.00	$0.00	$64.95
6	85.00	$51.78	$10.75	$1.55	$4.00	$0.00	$68.08
7	90.00	$54.83	$10.75	$1.64	$6.00	$0.00	$73.22

Apprentice: JOURNEYMAN LINEMAN

Effective Date: 8/30/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$38.13	$11.00	$1.14	$2.50	$0.00	$52.77
2	65.00	$41.31	$11.00	$1.24	$2.50	$0.00	$56.05
3	70.00	$44.49	$11.00	$1.33	$2.50	$0.00	$59.32
4	75.00	$47.66	$11.00	$1.43	$4.00	$0.00	$64.09
5	80.00	$50.84	$11.00	$1.53	$4.00	$0.00	$67.37
6	85.00	$54.02	$11.00	$1.62	$4.00	$0.00	$70.64
7	90.00	$57.20	$11.00	$1.72	$6.00	$0.00	$75.92

Apprentice to Journeyworker Ratio: 1:2

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

Additional Apprentice Information

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

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

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

DOCUMENT 00870

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS
Revised August 19, 2026

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 (41 CFR 60-4.5 and 23 CFR Part 230) 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.

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 are in compliance with 41 CFR Part 60-3 and 23 CFR Part 230.

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.

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 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.

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 and 23 CFR Part 230.

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 00880

Revised January 12, 2022

DEPARTMENT OF LABOR

Employment Standards Administration

MINIMUM WAGES FOR FEDERAL AND FEDERALLY ASSISTED CONTRACTS

"General Decision Number: MA20260023 05/18/2026

State: Massachusetts

Construction Types: Highway

Counties: Massachusetts Counties of
Plymouth

Modification Number	Publication Date
0	01/02/2026
1	05/18/2026

CARP0330-003 09/01/2025

	Rates	Fringes
CARPENTER (INCLUDES FORM WORK)	$ 50.10	31.45

ENGI0004-027 06/01/2025

	Rates	Fringes
POWER EQUIPMENT OPERATOR GROUP 2 BULLDOZER; GRADER/BLADE; MILLING MACHINE; ROLLER 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	$ 57.18	33.70
POWER EQUIPMENT OPERATOR GROUP 1 BACKHOE/EXCAVATOR/TRACKHOE; BOBCAT/SKID STEER/SKID LOADER; BROOM/SWEEPER; CRANE; GRADALL; LOADER; POST DRIVER (GUARDRAIL/FENCES)	$ 57.83	33.70

IRON0007-026 09/16/2025

	Rates	Fringes
IRONWORKER: ORNAMENTAL AND STRUCTURAL	$ 57.87	37.67

LABO0133-001 12/01/2024

	Rates	Fringes
LABORER: CONCRETE SURFACER	$ 46.20	29.85

LABO0385-002 12/01/2024

	Rates	Fringes
LABORER LANDSCAPE	$ 38.95	29.41

LABO0385-003 12/01/2024

	Rates	Fringes
LABORER: FENCE ERECTION	$ 38.95	29.41

LABO0721-002 12/01/2024

	Rates	Fringes
LABORER: GUARDRAIL INSTALLATION	$ 38.95	29.81

LABO0876-001 06/01/2018

	Rates	Fringes
LABORER (COMMON OR GENERAL)	$ 33.25	22.92

PAIN0035-023 07/01/2024

	Rates	Fringes
PAINTER: STEEL	$ 56.76	36.00

SUMA2014-013 01/11/2017

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                                                                Rates
Fringes
TRUCK DRIVER:  FLATBED TRUCK.....................$ 48.53
0.00
TRUCK DRIVER:  DUMP TRUCK........................$ 37.35
11.00
TRUCK DRIVER:  CONCRETE TRUCK....................$ 33.69
15.79
TRAFFIC CONTROL:   LABORER-CONES/
BARRICADES/BARRELS -  SETTER/MOVER/SWEEPER.......$ 53.35
12.78
TRAFFIC CONTROL:   FLAGGER.......................$ 23.00
20.44
PAINTER: SPRAY (LINESTRIPING)....................$ 47.30
6.42
OPERATOR:  PILEDRIVER............................$ 42.56
17.34
OPERATOR:  PAVER  (ASPHALT, AGGREGATE, AND
CONCRETE)........................................$ 41.63
23.04
OPERATOR:  MECHANIC..............................$ 48.74
11.79
OPERATOR:  FORKLIFT..............................$ 64.67
0.00
LABORER:  JACK HAMMER............................$ 38.69
17.33
LABORER:  CONCRETE SAW (HAND HELD/WALK BEHIND)......$ 44.43
14.18
LABORER:  ASPHALT, INCLUDES RAKER, SHOVELER,
SPREADER AND DISTRIBUTOR.........................$ 34.32
17.35
IRONWORKER, REINFORCING..........................$ 44.52
19.36
ELECTRICIAN, INCLUDES TRAFFIC SIGNALIZATION.....$ 45.13
13.86
CEMENT MASON/CONCRETE FINISHER...................$ 56.70
21.08
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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
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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.

Note: Executive Order 13658 generally applies to contracts subject to the Davis-Bacon Act that were awarded on or between January 1, 2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does not apply to contracts subject only to the Davis-Bacon Related Acts regardless of when they were awarded. If a contract is subject to Executive Order 13658, the contractor must pay all covered workers at least $13.65 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract from May 11, 2026, through December 31, 2026. The applicable Executive Order minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a

supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than SU , UAVG , SA , or SC denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The SU identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the

year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

SU wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The SA identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the SA identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations

Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

"

General Decision Number: MA20260006 05/18/2026

State: Massachusetts

Construction Types: Heavy

Counties: Massachusetts Counties of
Barnstable, Berkshire, Bristol, Dukes,
Essex, Franklin, Hampden, Hampshire,
Middlesex, Nantucket, Norfolk, Plymouth,
Suffolk and Worcester

Massachusetts All Dredging, except self-propelled hopper dredges, on the Atlantic Coast & tributary waters emptying into the Atlantic Ocean

Modification Number	Publication Date
1	01/30/2026
2	05/18/2026

ENGI0025-001 10/01/2025

	Rates	Fringes
DREDGING: CLASS D: OILER, DECKHAND, SHOREMAN, RODMAN, SCOWMAN, COOK, MESSMAN, PORTER/JANITOR. INCENTIVE PAY: (ADD TO HOURLY RATE) OPERATOR (NCCCO LICENSE/CERTIFICATION) $1.80 LICENSED TUG OPERATOR OVER 1000 HP (ASSIGNED AS MASTER) (USCG LICENSED MASTER OF TOWING VESSELS (MOTV) $1.80; LICENSED BOAT OPERATOR (ASSIGNED AS LEAD BOAT CAPTAIN) USCG LICENSED BOAT OPERATOR $1.30; ENGINEER (QMED AND TANKERMAN ENDORSEMENT OR LICENSED ENGINEER (USCG) $1.80 OILER (QMED AND TANKERMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (TANKERMAN ENDORSEMENT ONLY) USCG $1.55; DECKHAND OR MATE (AB WITH LIFEBOATMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (LIFEBOATMAN ENDORSEMENT ONLY (USCG) $1.55; WELDER (ABS CERTIFICATION) $1.55 FOOTNOTES APPLICABLE TO ABOVE CRAFTS: A. PAID HOLIDAYS: NEW YEAR'S DAY, MARTIN LUTHER KING, JR.'S BIRTHDAY, MEMORIAL		

DAY, GOOD FRIDAY, INDEPENDENCE DAY, LABOR DAY, VETERANS' DAY, THANKSGIVING DAY AND CHRISTMAS DAY B. VACATION: EIGHT PERCENT (8%) OF THE STRAIGHT TIME RATE, MULTIPLIED BY THE TOTAL HOURS WORKED.....$ 30.86 14.15
DREDGING: CLASS C2: BOAT OPERATOR. INCENTIVE PAY: (ADD TO HOURLY RATE) OPERATOR (NCCCO LICENSE/CERTIFICATION) $1.80 LICENSED TUG OPERATOR OVER 1000 HP (ASSIGNED AS MASTER) (USCG LICENSED MASTER OF TOWING VESSELS (MOTV) $1.80; LICENSED BOAT OPERATOR (ASSIGNED AS LEAD BOAT CAPTAIN) USCG LICENSED BOAT OPERATOR $1.30; ENGINEER (QMED AND TANKERMAN ENDORSEMENT OR LICENSED ENGINEER (USCG) $1.80 OILER (QMED AND TANKERMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (TANKERMAN ENDORSEMENT ONLY) USCG $1.55; DECKHAND OR MATE (AB WITH LIFEBOATMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (LIFEBOATMAN ENDORSEMENT ONLY (USCG) $1.55; WELDER (ABS CERTIFICATION) $1.55 FOOTNOTES APPLICABLE TO ABOVE CRAFTS: A. PAID HOLIDAYS: NEW YEAR'S DAY, MARTIN LUTHER KING, JR.'S BIRTHDAY, MEMORIAL DAY, GOOD FRIDAY, INDEPENDENCE DAY, LABOR DAY, VETERANS' DAY, THANKSGIVING DAY AND CHRISTMAS DAY B. VACATION: EIGHT PERCENT (8%) OF THE STRAIGHT TIME RATE, MULTIPLIED BY THE TOTAL HOURS WORKED.....$ 37.15 14.57
DREDGING: CLASS C1: MATE, DRAG BARGE OPERATOR, ASSISTANT FILL PLACER, WELDER, STEWARD. INCENTIVE PAY: (ADD TO HOURLY RATE) OPERATOR (NCCCO LICENSE/CERTIFICATION) $1.80 LICENSED TUG OPERATOR OVER 1000 HP (ASSIGNED AS MASTER) (USCG LICENSED MASTER OF TOWING VESSELS (MOTV) $1.80; LICENSED BOAT OPERATOR (ASSIGNED AS LEAD BOAT CAPTAIN) USCG LICENSED BOAT OPERATOR $1.30; ENGINEER (QMED AND TANKERMAN ENDORSEMENT OR LICENSED ENGINEER (USCG) $1.80 OILER (QMED AND TANKERMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (TANKERMAN ENDORSEMENT ONLY) USCG $1.55; DECKHAND OR MATE (AB WITH LIFEBOATMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (LIFEBOATMAN ENDORSEMENT ONLY (USCG) $1.55; WELDER (ABS CERTIFICATION) $1.55 FOOTNOTES APPLICABLE TO ABOVE CRAFTS: A. PAID HOLIDAYS: NEW YEAR'S DAY, MARTIN LUTHER KING, JR.'S BIRTHDAY, MEMORIAL DAY, GOOD FRIDAY, INDEPENDENCE DAY, LABOR DAY, VETERANS' DAY, THANKSGIVING DAY AND CHRISTMAS DAY B. VACATION: EIGHT PERCENT (8%) OF THE STRAIGHT TIME RATE, MULTIPLIED BY THE TOTAL HOURS WORKED.....$ 38.38 14.66

DREDGING: CLASS B2: CERTIFIED WELDER. INCENTIVE PAY: (ADD TO HOURLY RATE) OPERATOR (NCCCO LICENSE/CERTIFICATION) $1.80 LICENSED TUG OPERATOR OVER 1000 HP (ASSIGNED AS MASTER) (USCG LICENSED MASTER OF TOWING VESSELS (MOTV) $1.80; LICENSED BOAT OPERATOR (ASSIGNED AS LEAD BOAT CAPTAIN) USCG LICENSED BOAT OPERATOR $1.30; ENGINEER (QMED AND TANKERMAN ENDORSEMENT OR LICENSED ENGINEER (USCG) $1.80 OILER (QMED AND TANKERMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (TANKERMAN ENDORSEMENT ONLY) USCG $1.55; DECKHAND OR MATE (AB WITH LIFEBOATMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (LIFEBOATMAN ENDORSEMENT ONLY (USCG) $1.55; WELDER (ABS CERTIFICATION) $1.55 FOOTNOTES APPLICABLE TO ABOVE CRAFTS: A. PAID HOLIDAYS: NEW YEAR'S DAY, MARTIN LUTHER KING, JR.'S BIRTHDAY, MEMORIAL DAY, GOOD FRIDAY, INDEPENDENCE DAY, LABOR DAY, VETERANS' DAY, THANKSGIVING DAY AND CHRISTMAS DAY B. VACATION: EIGHT PERCENT (8%) OF THE STRAIGHT TIME RATE, MULTIPLIED BY THE TOTAL HOURS WORKED.....$ 39.46
14.73
DREDGING: CLASS B1: DERRICK OPERATOR (180 SWING), SPIDER/SPILL BARGE OPERATOR, ENGINEER, ELECTRICIAN, CHIEF WELDER, CHIEF MATE, FILL PLACER, OPERATOR II, MAINTENANCE ENGINEER, LICENSED BOAT OPERATOR, LICENSED CREW BOAT OPERATOR. INCENTIVE PAY: (ADD TO HOURLY RATE) OPERATOR (NCCCO LICENSE/CERTIFICATION) $1.80 LICENSED TUG OPERATOR OVER 1000 HP (ASSIGNED AS MASTER) (USCG LICENSED MASTER OF TOWING VESSELS (MOTV) $1.80; LICENSED BOAT OPERATOR (ASSIGNED AS LEAD BOAT CAPTAIN) USCG LICENSED BOAT OPERATOR $1.30; ENGINEER (QMED AND TANKERMAN ENDORSEMENT OR LICENSED ENGINEER (USCG) $1.80 OILER (QMED AND TANKERMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (TANKERMAN ENDORSEMENT ONLY) USCG $1.55; DECKHAND OR MATE (AB WITH LIFEBOATMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (LIFEBOATMAN ENDORSEMENT ONLY (USCG) $1.55; WELDER (ABS CERTIFICATION) $1.55 FOOTNOTES APPLICABLE TO ABOVE CRAFTS: A. PAID HOLIDAYS: NEW YEAR'S DAY, MARTIN LUTHER KING, JR.'S BIRTHDAY, MEMORIAL DAY, GOOD FRIDAY, INDEPENDENCE DAY, LABOR DAY, VETERANS' DAY, THANKSGIVING DAY AND CHRISTMAS DAY B. VACATION: EIGHT PERCENT (8%) OF THE STRAIGHT TIME RATE, MULTIPLIED BY THE TOTAL HOURS WORKED.....$ 41.93
14.90
DREDGING: CLASS A2: CRANE OPERATOR (360 SWING) INCENTIVE PAY: (ADD TO HOURLY RATE) OPERATOR

(NCCCO LICENSE/CERTIFICATION) $1.80 LICENSED TUG OPERATOR OVER 1000 HP (ASSIGNED AS MASTER) (USCG LICENSED MASTER OF TOWING VESSELS (MOTV) $1.80; LICENSED BOAT OPERATOR (ASSIGNED AS LEAD BOAT CAPTAIN) USCG LICENSED BOAT OPERATOR $1.30; ENGINEER (QMED AND TANKERMAN ENDORSEMENT OR LICENSED ENGINEER (USCG) $1.80 OILER (QMED AND TANKERMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (TANKERMAN ENDORSEMENT ONLY) USCG $1.55; DECKHAND OR MATE (AB WITH LIFEBOATMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (LIFEBOATMAN ENDORSEMENT ONLY (USCG) $1.55; WELDER (ABS CERTIFICATION) $1.55 FOOTNOTES APPLICABLE TO ABOVE CRAFTS: A. PAID HOLIDAYS: NEW YEAR'S DAY, MARTIN LUTHER KING, JR.'S BIRTHDAY, MEMORIAL DAY, GOOD FRIDAY, INDEPENDENCE DAY, LABOR DAY, VETERANS' DAY, THANKSGIVING DAY AND CHRISTMAS DAY B. VACATION: EIGHT PERCENT (8%) OF THE STRAIGHT TIME RATE, MULTIPLIED BY THE TOTAL HOURS WORKED.....$ 43.20
14.99
DREDGING: CLASS A1: DECK CAPTAIN; MECHANICAL DREDGE OPERATOR, LEVERMAN, LICENSED TUG OPERATOR OVER 1000 HP. INCENTIVE PAY: (ADD TO HOURLY RATE) OPERATOR (NCCCO LICENSE/CERTIFICATION) $1.80 LICENSED TUG OPERATOR OVER 1000 HP (ASSIGNED AS MASTER) (USCG LICENSED MASTER OF TOWING VESSELS (MOTV) $1.80; LICENSED BOAT OPERATOR (ASSIGNED AS LEAD BOAT CAPTAIN) USCG LICENSED BOAT OPERATOR $1.30; ENGINEER (QMED AND TANKERMAN ENDORSEMENT OR LICENSED ENGINEER (USCG) $1.80 OILER (QMED AND TANKERMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (TANKERMAN ENDORSEMENT ONLY) USCG $1.55; DECKHAND OR MATE (AB WITH LIFEBOATMAN ENDORSEMENT (USCG) $1.80; ALL CLASSIFICATIONS (LIFEBOATMAN ENDORSEMENT ONLY (USCG) $1.55; WELDER (ABS CERTIFICATION) $1.55 FOOTNOTES APPLICABLE TO ABOVE CRAFTS: A. PAID HOLIDAYS: NEW YEAR'S DAY, MARTIN LUTHER KING, JR.'S BIRTHDAY, MEMORIAL DAY, GOOD FRIDAY, INDEPENDENCE DAY, LABOR DAY, VETERANS' DAY, THANKSGIVING DAY AND CHRISTMAS DAY B. VACATION: EIGHT PERCENT (8%) OF THE STRAIGHT TIME RATE, MULTIPLIED BY THE TOTAL HOURS WORKED.....$ 48.48
15.34

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.

Note: Executive Order 13658 generally applies to contracts subject
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2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does
not apply to contracts subject only to the Davis-Bacon Related Acts
regardless of when they were awarded. If a contract is subject to
Executive Order 13658, the contractor must pay all covered workers
at least $13.65 per hour (or the applicable wage rate listed on this
wage determination, if it is higher) for all hours spent performing on
the contract from May 11, 2026, through December 31, 2026. The applicable Executive Order minimum wage rate will be adjusted annually.
Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications

and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than SU , UAVG , SA , or SC denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The SU identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates

reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

SU wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The SA identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the SA identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

"General Decision Number: MA20260008 05/18/2026

State: Massachusetts

Construction Types: Heavy

Counties: Massachusetts Counties of
Barnstable, Bristol, Dukes, Essex,
Middlesex, Nantucket, Norfolk, Plymouth
and Suffolk

Heavy and Marine Construction Projects

Modification Number	Publication Date
0	01/02/2026
1	05/18/2026

BOIL0029-001 01/01/2025

	Rates	Fringes
BOILERMAKER	$ 50.62	28.82

BRMA0001-011 02/01/2023

	Rates	Fringes
BRICKLAYER/CEMENT MASON (FOXBORO CHAPTER BRISTOL (ATTLEBORO, BERKLEY, DIGHTON, MANSFIELD, NORTH ATTLEBORO, NORTON, RAYNHAM, REHOBOTH, SEEKONK, TAUNTON); NORFOLK, (BELLINGHAM, CANTON, DEDHAM, FOXBORO, FRANKLIN, NORFOLK, NORWOOD, PLAINVILLE, SHARON, WALPOLE, WESTRWOOD, WRENTHAM); AND PLYMOUTH (LAKEVILLE))	$ 60.35	34.40

BRMA0001-012 02/01/2023

	Rates	Fringes
BRICKLAYER (LOWELL CHAPTER MIDDLESEX (ACTON,		

ASHBY, AYER, BEDFORD, BILLERICA, BOXBORO, CARLISLE, CHEMSFORD, DRACUT, DUNSTABALE, FT DEVENS, GROTON, LITTLETON, LOWELL, NORTH ACTON, PEPPERELL, SHIRLEY, SOUTH ACTON, TEWKSBURY, TOWNSEND, TYNGSBORO, WEST ACTON, WESTFORD, WILMINGTON))..... $ 58.21
33.71

BRMA0001-013 08/01/2023

	Rates	Fringes
BRICKLAYER (LOWELL CHAPTER MIDDLESEX (ASHLAND, FRAMINGHAM, HOLLISTON, HOPKINTON, HUDSON, MAYNARD, NATICK, SHERBVORN, STOW); AND NORFOLK (MEDFIELD, MEDWAY, MILLIS))	$ 62.40	34.40

BRMA0003-001 08/01/2024

	Rates	Fringes
TERRAZZO FINISHER	$ 63.44	37.33
MARBLE, TILE & TERRAZZO WORKERS	$ 64.52	37.51
MARBLE & TILE FINISHER	$ 49.32	35.26

BRMA0003-003 08/01/2024

	Rates	Fringes
BRICKLAYER (BOSTON CHAPTER MIDDLESEX (ARLINGTON, CAMBRIDGE, EVERETT, MALDEN, MEDFORD, MELROSE, SOMERVILLE); NORFOLK (BROOKLINE, MILTON); AND SUFFOLK)	$ 64.50	37.54

BRMA0003-011 08/01/2024

	Rates	Fringes
BRICKLAYER/CEMENT MASON (LYNN CHAPTER ESSEX (AMESBURY, ANDOVER, BEVERLY, BOXFORD, DANVERS, ESSEX, GEORGETOWN, GLOUCESTER, GROVELAND, HAMILTON, HAVERHILL, IPSWICH, LAWRENCE, LYNN, LYNNFIELD, MANCHESTER, MARBLEHEAD, MERRIMAC, METHUEN, MIDDLETON, NAHANT, NEWBURY, NEWBURYPORT, NORTH ANDOVER, PEABODY, ROCKPORT, ROWLEY, SALISBURY, SALEM, SAUGUS, SWAMPSCOTT, TOPSFIELD, WAKEFIELD,		

WENHAM, WEST NEWBURY); AND MIDDLESEX (NORTH
READING, READING, WAKEFIELD))..... $ 64.50
37.54

BRMA0003-012 08/01/2024

Rates
Fringes
BRICKLAYER (WALTHAM CHAPTER - MIDDLESEX (BELMONT,
BURLINGTON, CONCORD, LEXINGTON, LINCOLN, STONEHAM,
SUDBURY, WALTHAM, WATERTOWN, WAYLAND, WESTON,
WINCHESTER, WOBURN))..... $ 64.50
37.54

BRMA0003-014 08/01/2024

Rates
Fringes
BRICKLAYER/CEMENT MASON (QUINCY CHAPTER PLYMOUTH
COUNTY (ABINGTON, BRIDGEWATER, BROCKTON, CARVER,
DUXBURY, EAST BRIDGEWATER, HALIFAX, HANOVER,
HANSON, HINGHAM, HULL, KINGSTON, MARSHFIELD,
MIDDLEBORO, NORWELL, PEMBROKE, PLYMOUTH, ROCKLAND,
SCITUATE, WEST BRIDGEWATER, WHITMAN)).....$ 64.50
37.54

BRMA0003-025 08/01/2024

Rates
Fringes
BRICKLAYER/CEMENT MASON (NEW BEDFORD CHAPTER
BARNSTABLE; BRISTOL (ACUSHNET, DARMOUTH, FAIRHAVEN,
FALL RIVER, FREETOWN, NEW BEDFORD, SOMERSET,
SWANSEA, WESTPORT); DUKES; NANTUCKET; PLYMOUTH
(MARION, MATTAPOISETT, ROCHESTER, WAREHAM)).....$ 64.50
37.54

BRMA0003-033 08/01/2024

Rates
Fringes
BRICKLAYER, PLASTERER (NEWTON CHAPTER MIDDLESEX
(NEWTON); NORFOLK (DOVER, NEEDHAM, WELLESLEY))..... $ 64.50
37.54

CARP0056-001 08/01/2024

Rates
Fringes
PILEDRIVERMAN (ALL OF SUFFOLK COUNTY; AND THOSE

AREAS OF BARNSTABLE, BRISTOL, ESSEX, MIDDLESEX,
NORFOLK, AND PLYMOUTH COUNTIES SITUATED INSIDE
BOSTON BELTWAY (I-495) AND NORTH OF CAPE COD CANAL.
ALL OF DUKES AND NANTUCKET COUNTIES).....$ 55.79
35.47

CARP0056-002 08/01/2024

Rates
Fringes
PILEDRIVERMAN (THE AREAS OF BARNSTABLE, BRISTOL,
PLYMOUTH, AND NORFOLK COUNTIES SITUATED OUTSIDE
BOSTON BELTWAY (I-495) AND SOUTH OF CAPE COD CANAL).$ 51.97
35.47

CARP0056-003 08/01/2024

Rates
Fringes
PILEDRIVERMAN (THOSE AREAS OF ESSEX AND MIDDLESEX
COUNTIES SITUATED OUTSIDE BOSTON BELTWAY (I-495))...$ 49.19
35.47

CARP0056-004 08/01/2024

Rates
Fringes
DIVER TENDER.....$ 61.70
35.47
DIVER.....$ 78.11
35.47

CARP0327-002 09/01/2025

Rates
Fringes
CARPENTER (MIDDLESEX (BELMONT, CAMBRIDGE, EVERETT,
MALDEN, MEDFORD, SOMERVILLE); NORFOLK (BROOKLINE,
DEDHAM, MILTON); AND SUFFOLK COUNTIES).....$ 61.19
31.55

CARP0339-002 09/01/2025

Rates
Fringes
CARPENTER (BRISTOL (ATTLEBOROUGH, NORTH
ATTLEBOROUGH); ESSEX; MIDDLESEX (EXCEPT BELMONT,
CAMBRIDGE, EVERETT, MALDEN, MEDFORD, SOMERVILLE);
AND NORFOLK (BELLINGHAM, BRAINTREE, CANTON,
COHASSETT, FOXBORO, FRANKLIN, MEDFIELD, MEDWAY,

MILLIS, NEEDHAM, NORFOLK, NORWOOD, PLAINVILLE,
QUINCY, SHARON, WALPOLE, WELLESLEY, WESTWOOD,
WEYMOUTH, WRENTHAM) COUNTIES).....$ 50.10
31.45

CARP0346-001 09/01/2025

Rates
Fringes
CARPENTER (NORFOLK (BRAINTREE, QUINCY, COHASSET,
WEYMOUTH, ETC.) PLYMOUTH (DUXBURY, HANOVER, HULL,
HINGHAM, MARSHFIELD, NORWELL, PEMBROKE ROCKLAND,
SCITUATE)).....$ 50.10
31.45

CARP0624-002 09/01/2017

Rates
Fringes
CARPENTER (DUKES; NANTUCKET).....$ 46.43
28.35

CARP0624-006 09/01/2017

Rates
Fringes
CARPENTER (BARNSTABLE; BRISTOL (EXCEPT ATTLEBORO &
NORTH ATTLEBORO); NORFOLK (AVON, HOLBROOK,
RANDOLPH, STOUGHTON); PLYMOUTH (BRIDGEWATER,
KINGSTON, LAKEVILLE, MIDDLEBORO, PLYMOUTH, S.
HANOVER, WHITMAN)).....$ 39.28
27.90

CARP1121-001 04/21/2025

Rates
Fringes
MILLWRIGHT (SUFFOLK COUNTY).....$ 50.47
33.50

CARP1121-005 04/21/2025

Rates
Fringes
MILLWRIGHT (BARNSTABLE, BRISTOL, DUKES, ESSEX,
MIDDLESEX, NANTUCKET, NORFOLK AND PLYMOUTH
COUNTIES).....$ 45.03
33.25

ELEC0096-001 09/07/2025

	Rates	Fringes
TELEDATA SYSTEM INSTALLER (MIDDLESEX (ASHBY, ASHLAND, AYER, FT. DEVENS, GROTON, HOPKINTON, HUDSON, MARLBORO, PEPPERELL, SHIRLEY, STOW, TOWNSEND))	$ 36.12	34.51
ELECTRICIAN (MIDDLESEX (ASHBY, ASHLAND, AYER, FT. DEVENS, GROTON, HOPKINTON, HUDSON, MARLBORO, PEPPERELL, SHIRLEY, STOW, TOWNSEND))	$ 48.16	36.20

ELEC0099-001 06/01/2025

	Rates	Fringes
TELEDATA SYSTEM INSTALLER (BRISTOL (ATTLEBORO, NORTH ATTLEBORO, SEEKONK))	$ 42.09	19.71
ELECTRICIAN (BRISTOL (ATTLEBORO, NORTH ATTLEBORO, SEEKONK))	$ 56.11	24.74

ELEC0103-002 09/01/2025

	Rates	Fringes
ELECTRICIAN (ESSEX (AMESBURY, ANDOVER, BOXFORD, GEORGETOWN, GROVELAND, HAVERHILL, LAWRENCE, MERRIMAC, METHUEN, NEWBURY, NEWBURYPORT, NORTH ANDOVER, ROWLEY, SALISBURY, WEST NEWBURY); MIDDLESEX (BEDFORD, BILLERICA, BOXBORO, BURLINGTON, CARLISLE, CHELMSFORD, DRACUT, DUNSTABLE LITTLETON, LOWELL, NORTH READING, TEWKSBURY, TYNGSBORO, WESTFORD, WILMINGTON))	$ 66.17	37.08

ELEC0103-004 09/01/2025

	Rates	Fringes
ELECTRICIAN (ESSEX (BEVERLY, DANVERS, ESSEX, GLOUCESTER, HAMILTON, IPSWICH, MANCHESTER, MARBLEHEAD, MIDDLETON, PEABODY, ROCKPORT, SALEM, TOPSFIELD, WENHAM))	$ 66.17	37.08

ELEC0103-005 09/01/2025

Rates
Fringes
ELECTRICIAN (ESSEX (LYNN, LYNNFIELD, NAHANT,
SAUGUS, SWAMPSCOTT); MIDDLESEX (ACTON, ARLINGTON,
BELMONT, CAMBRIDGE, CONCORD, EVERETT, FRAMINGHAM,
HOLLISTON, LEXINGTON, LINCOLN, MALDEN, MAYNARD,
MEDFORD, MELROSE, NATICK, NEWTON, READING,
SHERBORN, SOMERVILLE, STONEHAM, SUDBURY, WAKEFIELD,
WALTHAM, WATERTOWN, WAYLAND, WESTON, WINCHESTER,
WOBURN); NORFOLK (BELLINGHAM, BRAINTREE, BROOKLINE,
CANTON, COHASSET, DEDHAM, DOVER, FOXBORO,
FRANKLOIN, MEDFIELD, MEDWAY, MILLIS, MILTON,
NEEDHAM, NORFOLK, NORWO.....$ 66.17
37.08

ELEC0104-001 09/01/2024

Rates
Fringes
LINE CONSTRUCTION: LINEMAN A. PAID HOLIDAYS:
NEW YEAR'S DAY; MEMORIAL DAY; INDEPENDENCE DAY;
LABOR DAY; THANKSGIVING DAY; CHRISTMAS DAY AND
COLUMBUS DAY, PROVIDED THE EMPLOYEE HAS BEEN
EMPLOYED 5 WORKING DAYS PRIOR TO ANY ONE OF THE
LISTED HOLIDAYS.....$ 58.41
30.19
LINE CONSTRUCTION: GROUNDMAN A. PAID HOLIDAYS:
NEW YEAR'S DAY; MEMORIAL DAY; INDEPENDENCE DAY;
LABOR DAY; THANKSGIVING DAY; CHRISTMAS DAY AND
COLUMBUS DAY, PROVIDED THE EMPLOYEE HAS BEEN
EMPLOYED 5 WORKING DAYS PRIOR TO ANY ONE OF THE
LISTED HOLIDAYS.....$ 32.13
12.70
LINE CONSTRUCTION: EQUIPMENT OPERATOR A. PAID
HOLIDAYS: NEW YEAR'S DAY; MEMORIAL DAY;
INDEPENDENCE DAY; LABOR DAY; THANKSGIVING DAY;
CHRISTMAS DAY AND COLUMBUS DAY, PROVIDED THE
EMPLOYEE HAS BEEN EMPLOYED 5 WORKING DAYS PRIOR TO
ANY ONE OF THE LISTED HOLIDAYS.....$ 49.65
26.72
LINE CONSTRUCTION: CABLEMAN A. PAID HOLIDAYS:
NEW YEAR'S DAY; MEMORIAL DAY; INDEPENDENCE DAY;
LABOR DAY; THANKSGIVING DAY; CHRISTMAS DAY AND
COLUMBUS DAY, PROVIDED THE EMPLOYEE HAS BEEN
EMPLOYED 5 WORKING DAYS PRIOR TO ANY ONE OF THE
LISTED HOLIDAYS.....$ 58.41
30.19

ELEC0223-002 09/01/2024

Rates
Fringes
ELECTRICIAN (BARNSTABLE, BRISTOL (EXCEPT ATTLEBORO, NORTH ATTLEBORO, SEEKONK); DUKES; NANTUCKET; PLYMOUTH (EXCEPT HINGHAM AND HULL TWPS); NORFOLK (AVON, HALBROOK, RANDOLPH, SLOUGHTON))..............$ 50.02
31.05

ENGI0004-009 06/01/2025

Rates
Fringes
POWER EQUIPMENT OPERATORS: GROUP 6 OILER (ON TRUCK CRANES AND GRADALLS) HOURLY PREMIUM FOR BOOM LENGTHS (INCLUDING JIB): OVER 150 FT. +2.18 OVER 185 FT. +3.84 OVER 210 FT. +5.39 OVER 250 FT. +8.16 OVER 295 FT. +11.29 OVER 350 FT. +13.14 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......$ 30.85
33.70
POWER EQUIPMENT OPERATORS: GROUP 5 OILER (OTHER THAN TRUCK CRANES AND GRADALLS) HOURLY PREMIUM FOR BOOM LENGTHS (INCLUDING JIB): OVER 150 FT. +2.18 OVER 185 FT. +3.84 OVER 210 FT. +5.39 OVER 250 FT. +8.16 OVER 295 FT. +11.29 OVER 350 FT. +13.14 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.....$ 25.02
33.70
POWER EQUIPMENT OPERATORS: GROUP 4 ASSITANT ENGINEER (FIREMAN) HOURLY PREMIUM FOR BOOM LENGTHS (INCLUDING JIB): OVER 150 FT. +2.18 OVER 185 FT. +3.84 OVER 210 FT. +5.39 OVER 250 FT. +8.16 OVER 295 FT. +11.29 OVER 350 FT. +13.14 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.....$ 46.52
33.70
POWER EQUIPMENT OPERATORS: GROUP 3 PUMPS (1-3 GROUPED); COMPRESSOR; WELDING MACHINES (1-3 GROUPED); GENERATOR; SIGHTING PLANT; HEATERS (POWER DRIVEN, 1- 5); SYPHON-PULSOMETER; CONCRETE

MIXER; VALVES CONTROLLING PERMANENT PLANT AIR
STEAM, CONVEYOR, WELLPOINT SYSTEM (OPERATING)
HOURLY PREMIUM FOR BOOM LENGTHS (INCLUDING JIB):
OVER 150 FT. +2.18 OVER 185 FT. +3.84
OVER 210 FT. +5.39 OVER 250 FT. +8.16
OVER 295 FT. +11.29 OVER 350 FT. +13.14
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.....$ 37.02
33.70
POWER EQUIPMENT OPERATORS: GROUP 2 SONIC OR
VIBRATORY HAMMER; GRADER; SCRAPER; TANDEM SCRAPER;
BULLDOZER; TRACTOR; MECHANIC - MAINTENANCE; YORK
RAKE; MULCHING MACHINE; PAVING SCREED
MACHINE;STATIONARY STEAM BOILER; PAVING CONCRETE
FINISHING MACHINE; GROUT PUMP; PORTABLE STEAM
BOILER; PORTABLE STEAM GENERATOR; ROLLER; SPREADER;
ASPHALT PAVER; LOCOMOTIVES OR MACHINES USED IN
PLACE THEREOF; TAMPER (SELF PROPELLED OR
TRACTOR-DRAW); CAL TRACKS; BALLAST REGULATOR;RAIL
ANCHOR MACHINE; SWITCH TAMPER; TIRE TRUCK HOURLY
PREMIUM FOR BOOM LENGTHS (INCLUDING JIB): OVER
150 FT. +2.18 OVER 185 FT. +3.84 OVER 210
FT. +5.39 OVER 250 FT. +8.16 OVER 295 FT.
+11.29 OVER 350 FT. +13.14 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.....$ 57.18
33.70
POWER EQUIPMENT OPERATORS: GROUP 1 POWER SHOVEL;
CRANE; TRUCK CRANE; DERRICK; PILE DRIVER; TRENCHING
MACHINE; MECHANICAL HOIST PAVEMENT BREAKER; CEMENT
CONCRETE PAVER; DRAGLINE; HOISTING ENGINE; THREE
DRUM MACHINE; PUMPCRETE MACHINE; LOADERS; SHOVEL
DOZER; FRONT END LOADER; MUCKING MACHINE; SHAFT
HOIST; STEAM ENGINE; BACKHOE; GRADALL; CABLE WAY;
FORK LIFT; CHERRY PICKER; BORING MACHINE; ROTARY
DRILL; POST HOLE HAMMER; POST HOLE DIGGER; ASPHALT
PLANT ON JOB SITE; CONCRETE BATCHING AND/OR MIXING
PLANT ON JOB SITE; CRUSHER PLANT ON JOB SITE;
PAVING CONCRETE MIXER; TIMBER JACK HOURLY PREMIUM
FOR BOOM LENGTHS (INCLUDING JIB): OVER 150 FT.
+2.18 OVER 185 FT. +3.84 OVER 210 FT.
+5.39 OVER 250 FT. +8.16 OVER 295 FT.
+11.29 OVER 350 FT. +13.14 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.....$ 57.83
33.70

IRON0007-001 09/16/2025

	Rates	Fringes
IRONWORKER: (AREA 2)	$ 53.46	37.67
IRONWORKER: (AREA 1)	$ 57.87	37.67

IRON0007-010 09/16/2025

	Rates	Fringes
IRONWORKER (MIDDLESEX (ASHBY, ASHLAND, AYER, BOXBORO, HOLLISTON, HOPKINTON, HUDSON, MARLBORO, SHIRLEY, STOW, TOWNSEND); NORFOLK (MEDWAY))	$ 57.57	37.67

IRON0037-002 09/16/2025

	Rates	Fringes
IRONWORKER (BARNSTABLE; BRISTOL (ACUSHNET, ATTLEBORO, BERKLEY, DARTMOUTH, DIGHTON, FAIRHAVEN, FALL RIVER, FREETOWN, MANSFIELD, NEW BEDFORD, NORTH ATTLEBORO, NORTON, RAYNHAM, REHOBOTH, SEEKONK, SOMERSET, SWANSEA, TAUNTON, WESTPORT); DUKES; NANTUCKET; NORFOLK (BILLINGHAM, FRANKLIN, PLAINVILLE, WRENTHAM); PLYMOUTH (LAKEVILLE, MARION, MATTAPOISETT, MIDDLEBORO, ROCHESTER, WAREHAM))	$ 43.03	33.53

LABO0022-006 12/01/2024

	Rates	Fringes
LABORERS: GROUP 6- ASBESTOS ABATEMENT; TOXIC AND HAZARDOUS WASTE LABORERS (SUFFOLK COUNTY (BOSTON, CHELSEA, REVERE, WINTHROP, DEER & NUT ISLANDS); MIDDLESEX COUNTY (ARLINGTON, BELMONT, BURLINGTON, CAMBRIDGE, EVERETT, MALDEN, MEDFORD, MELROSE, READING, SOMERVILLE, STONEHAM, WAKEFIELD, WINCHESTER, WINTHROP AND WOBURN ONLY); NORFOLK		

COUNTY (BROOKLINE, DEDHAM, AND MILTON ONLY)).....$ 46.20
29.70
LABORERS: GROUP 5- FLAGGER (SUFFOLK COUNTY
(BOSTON, CHELSEA, REVERE, WINTHROP, DEER & NUT
ISLANDS); MIDDLESEX COUNTY (ARLINGTON, BELMONT,
BURLINGTON, CAMBRIDGE, EVERETT, MALDEN, MEDFORD,
MELROSE, READING, SOMERVILLE, STONEHAM, WAKEFIELD,
WINCHESTER, WINTHROP AND WOBURN ONLY); NORFOLK
COUNTY (BROOKLINE, DEDHAM, AND MILTON ONLY)).....$ 27.01
29.70
LABORERS: GROUP 4- BLASTER; POWDERMAN (SUFFOLK
COUNTY (BOSTON, CHELSEA, REVERE, WINTHROP, DEER &
NUT ISLANDS); MIDDLESEX COUNTY (ARLINGTON, BELMONT,
BURLINGTON, CAMBRIDGE, EVERETT, MALDEN, MEDFORD,
MELROSE, READING, SOMERVILLE, STONEHAM, WAKEFIELD,
WINCHESTER, WINTHROP AND WOBURN ONLY); NORFOLK
COUNTY (BROOKLINE, DEDHAM, AND MILTON ONLY)).....$ 46.20
29.70
LABORERS: GROUP 3- AIR TRACK OPERATOR; BLOCK PAVER;
RAMMER; CURB SETTER (SUFFOLK COUNTY (BOSTON,
CHELSEA, REVERE, WINTHROP, DEER & NUT ISLANDS);
MIDDLESEX COUNTY (ARLINGTON, BELMONT, BURLINGTON,
CAMBRIDGE, EVERETT, MALDEN, MEDFORD, MELROSE,
READING, SOMERVILLE, STONEHAM, WAKEFIELD,
WINCHESTER, WINTHROP AND WOBURN ONLY); NORFOLK
COUNTY (BROOKLINE, DEDHAM, AND MILTON ONLY)).....$ 46.20
29.70
LABORERS: GROUP 2- ASPHALT RAKER; FENCE AND GUARD
RAIL ERECTOR; LASER BEAM OPERATOR; MASON TENDER;
PIPELAYER; PNEUMATIC DRILL OPERATOR; PNEUMATIC TOOL
OPERATOR; WAGON DRILL OPERATOR (SUFFOLK COUNTY
(BOSTON, CHELSEA, REVERE, WINTHROP, DEER & NUT
ISLANDS); MIDDLESEX COUNTY (ARLINGTON, BELMONT,
BURLINGTON, CAMBRIDGE, EVERETT, MALDEN, MEDFORD,
MELROSE, READING, SOMERVILLE, STONEHAM, WAKEFIELD,
WINCHESTER, WINTHROP AND WOBURN ONLY); NORFOLK
COUNTY (BROOKLINE, DEDHAM, AND MILTON ONLY)).....$ 46.20
29.70
LABORERS: GROUP 1- LABORERS; CARPENTER TENDERS;
CEMENT FINISHER TENDERS (SUFFOLK COUNTY (BOSTON,
CHELSEA, REVERE, WINTHROP, DEER & NUT ISLANDS);
MIDDLESEX COUNTY (ARLINGTON, BELMONT, BURLINGTON,
CAMBRIDGE, EVERETT, MALDEN, MEDFORD, MELROSE,
READING, SOMERVILLE, STONEHAM, WAKEFIELD,
WINCHESTER, WINTHROP AND WOBURN ONLY); NORFOLK
COUNTY (BROOKLINE, DEDHAM, AND MILTON ONLY)).....$ 46.20
29.70

LABO0022-012 12/01/2024

Rates
Fringes
LABORERS: GROUP 6- ASBESTOS ABATEMENT; TOXIC AND HAZARDOUS WASTE LABORERS (COUNTIES OF BARNSTABLE; BRISTOL; DUKES; ESSEX; NANTUCKET; PLYMOUTH; MIDDLESEX (WITH THE EXCEPTION OF ARLINGTON, BELMONT, BURLINGTON, CAMBRIDGE, EVERETT, MALDEN, MELROSE, READING, SOMERVILLE, STONEHAM, WAKEFIELD, WINCHESTER, WINTHROP AND WOBURN); NORFOLK (WITH THE EXCEPTION OF BROOKLINE, DEDHAM, AND MILTON)).....$ 46.10
29.70
LABORERS: GROUP 5- FLAGGER (COUNTIES OF BARNSTABLE; BRISTOL; DUKES; ESSEX; NANTUCKET; PLYMOUTH; MIDDLESEX (WITH THE EXCEPTION OF ARLINGTON, BELMONT, BURLINGTON, CAMBRIDGE, EVERETT, MALDEN, MELROSE, READING, SOMERVILLE, STONEHAM, WAKEFIELD, WINCHESTER, WINTHROP AND WOBURN); NORFOLK (WITH THE EXCEPTION OF BROOKLINE, DEDHAM, AND MILTON)).....$ 27.01
29.70
LABORERS: GROUP 4- BLASTER; POWDERMAN (COUNTIES OF BARNSTABLE; BRISTOL; DUKES; ESSEX; NANTUCKET; PLYMOUTH; MIDDLESEX (WITH THE EXCEPTION OF ARLINGTON, BELMONT, BURLINGTON, CAMBRIDGE, EVERETT, MALDEN, MELROSE, READING, SOMERVILLE, STONEHAM, WAKEFIELD, WINCHESTER, WINTHROP AND WOBURN); NORFOLK (WITH THE EXCEPTION OF BROOKLINE, DEDHAM, AND MILTON)).....$ 38.95
29.70
LABORERS: GROUP 3- AIR TRACK OPERATOR; BLOCK PAVER; RAMMER; CURB SETTER; HYDRAULIC & SIMILAR SELF POWERE DRILLS (COUNTIES OF BARNSTABLE; BRISTOL; DUKES; ESSEX; NANTUCKET; PLYMOUTH; MIDDLESEX (WITH THE EXCEPTION OF ARLINGTON, BELMONT, BURLINGTON, CAMBRIDGE, EVERETT, MALDEN, MELROSE, READING, SOMERVILLE, STONEHAM, WAKEFIELD, WINCHESTER, WINTHROP AND WOBURN); NORFOLK (WITH THE EXCEPTION OF BROOKLINE, DEDHAM, AND MILTON)).....$ 38.95
29.70
LABORERS: GROUP 2- ASPHALT RAKER; FENCE AND GUARD RAIL ERECTOR; LASER BEAM OPERATOR; MASON TENDER; PIPELAYER; PNEUMATIC DRILL OPERATOR; PNEUMATIC TOOL OPERATOR; WAGON DRILLPERATOR (COUNTIES OF BARNSTABLE; BRISTOL; DUKES; ESSEX; NANTUCKET; PLYMOUTH; MIDDLESEX (WITH THE EXCEPTION OF ARLINGTON, BELMONT, BURLINGTON, CAMBRIDGE, EVERETT, MALDEN, MELROSE, READING, SOMERVILLE, STONEHAM, WAKEFIELD, WINCHESTER, WINTHROP AND WOBURN); NORFOLK (WITH THE EXCEPTION OF BROOKLINE, DEDHAM,

AND MILTON))..... $ 38.95
29.70
LABORERS: GROUP 1- LABORERS; CARPENTER TENDERS;
CEMENT FINISHER TENDERS (COUNTIES OF BARNSTABLE;
BRISTOL; DUKES; ESSEX; NANTUCKET; PLYMOUTH;
MIDDLESEX (WITH THE EXCEPTION OF ARLINGTON,
BELMONT, BURLINGTON, CAMBRIDGE, EVERETT, MALDEN,
MELROSE, READING, SOMERVILLE, STONEHAM, WAKEFIELD,
WINCHESTER, WINTHROP AND WOBURN); NORFOLK (WITH THE
EXCEPTION OF BROOKLINE, DEDHAM, AND MILTON))..... $ 38.95
29.70

LABO0022-013 12/01/2024

Rates
Fringes
LABORERS:(TUNNELS, CAISSON & CYLINDER WORK IN
COMPRESSED AIR), GROUP 6 HAZARDOUS WASTE WORK
WITHIN THE ""HOT"" ZONE. (A PREMIUM OF TWO DOLLARS
$2.00 PER HOUR OVER THE BASIC WAGE RATE. FOOTNOTE
FOR LABORERS: A. PAID HOLIDAYS: NEW YEAR'S DAY,
WASHINGTON'S BIRTHDAY, PATRIOT'S DAY, MEMORIAL DAY,
INDEPENDENCE DAY, LABOR DAY, COLUMBUS DAY,
VETERAN'S DAY, THANKSGIVING DAY, AND CHRISTMAS DAY $ 58.43
29.70
LABORERS: LABORERS; TOP MAN ((OPEN AIR CASSONS,
UNDERPINNING AND TEST BORING INDUSTRIES):)..... $ 41.18
29.70
LABORERS: LABORERS; TOP MAN ((OPEN AIR CASSONS,
UNDERPINNING AND TEST BORING INDUSTRIES):)..... $ 46.20
29.70
LABORERS: LABORER ((OPEN AIR CASSONS, UNDERPINNING
AND TEST BORING INDUSTRIES):)..... $ 41.18
29.70
LABORERS: LABORER ((OPEN AIR CASSONS, UNDERPINNING
AND TEST BORING INDUSTRIES):)..... $ 46.20
29.70
LABORERS: GROUP 5 (ROCK SHAFT, CONCRETE LINING OF
SAME AND TUNNEL IN FREE AIR)..... $ 47.48
29.70
LABORERS: GROUP 5 (ROCK SHAFT, CONCRETE LINING OF
SAME AND TUNNEL IN FREE AIR)..... $ 52.50
29.70
LABORERS: GROUP 5 ((TUNNELS, CAISSON & CYLINDER
WORK IN COMPRESSED AIR))..... $ 53.41
29.70
LABORERS: GROUP 5 ((TUNNELS, CAISSON & CYLINDER
WORK IN COMPRESSED AIR))..... $ 58.43
29.70
LABORERS: GROUP 4 (ROCK SHAFT, CONCRETE LINING OF

SAME AND TUNNEL IN FREE AIR).....$ 45.48
29.70
LABORERS: GROUP 4 (ROCK SHAFT, CONCRETE LINING OF
SAME AND TUNNEL IN FREE AIR).....$ 50.50
29.70
LABORERS: GROUP 4 ((TUNNELS, CAISSON & CYLINDER
WORK IN COMPRESSED AIR)).....$ 53.41
29.70
LABORERS: GROUP 4 ((TUNNELS, CAISSON & CYLINDER
WORK IN COMPRESSED AIR)).....$ 58.43
29.70
LABORERS: GROUP 3 (ROCK SHAFT, CONCRETE LINING OF
SAME AND TUNNEL IN FREE AIR).....$ 45.48
29.70
LABORERS: GROUP 3 (ROCK SHAFT, CONCRETE LINING OF
SAME AND TUNNEL IN FREE AIR).....$ 50.50
29.70
LABORERS: GROUP 3 ((TUNNELS, CAISSON & CYLINDER
WORK IN COMPRESSED AIR)).....$ 53.41
29.70
LABORERS: GROUP 3 ((TUNNELS, CAISSON & CYLINDER
WORK IN COMPRESSED AIR)).....$ 58.43
29.70
LABORERS: GROUP 2 (ROCK SHAFT, CONCRETE LINING OF
SAME AND TUNNEL IN FREE AIR).....$ 45.48
29.70
LABORERS: GROUP 2 (ROCK SHAFT, CONCRETE LINING OF
SAME AND TUNNEL IN FREE AIR).....$ 50.50
29.70
LABORERS: GROUP 2 (CLEANING CONCRETE AND CAULKING
TUNNEL (Both New & Existing)).....$ 45.48
29.70
LABORERS: GROUP 2 (CLEANING CONCRETE AND CAULKING
TUNNEL (Both New & Existing)).....$ 50.50
29.70
LABORERS: GROUP 2 ((TUNNELS, CAISSON & CYLINDER
WORK IN COMPRESSED AIR)).....$ 53.41
29.70
LABORERS: GROUP 2 ((TUNNELS, CAISSON & CYLINDER
WORK IN COMPRESSED AIR)).....$ 58.43
29.70
LABORERS: GROUP 2 ((FREE AIR OPERATION): SHIELD
DRIVEN AND LINER PLATE IN FREE AIR)).....$ 50.50
29.70
LABORERS: GROUP 1 (ROCK SHAFT, CONCRETE LINING OF
SAME AND TUNNEL IN FREE AIR).....$ 42.93
29.70
LABORERS: GROUP 1 (ROCK SHAFT, CONCRETE LINING OF
SAME AND TUNNEL IN FREE AIR).....$ 47.95
29.70

LABORERS: GROUP 1 (CLEANING CONCRETE AND CAULKING
TUNNEL (Both New & Existing))....................$ 45.48
29.70
LABORERS: GROUP 1 (CLEANING CONCRETE AND CAULKING
TUNNEL (Both New & Existing))....................$ 50.50
29.70
LABORERS: GROUP 1 ((TUNNELS, CAISSON & CYLINDER
WORK IN COMPRESSED AIR))........................$ 42.93
29.70
LABORERS: GROUP 1 ((TUNNELS, CAISSON & CYLINDER
WORK IN COMPRESSED AIR))........................$ 47.95
29.70
LABORERS: GROUP 1 ((FREE AIR OPERATION): SHIELD
DRIVEN AND LINER PLATE IN FREE AIR))............$ 50.50
29.70
LABORERS: DRILLER ((OPEN AIR CASSONS, UNDERPINNING
AND TEST BORING INDUSTRIES):)...................$ 42.58
29.70
LABORERS: DRILLER ((OPEN AIR CASSONS, UNDERPINNING
AND TEST BORING INDUSTRIES):)...................$ 50.20
29.70
LABORERS: BOTTOM MAN ((OPEN AIR CASSONS,
UNDERPINNING AND TEST BORING INDUSTRIES):)......$ 42.33
29.70
LABORERS: BOTTOM MAN ((OPEN AIR CASSONS,
UNDERPINNING AND TEST BORING INDUSTRIES):)......$ 47.35
29.70
((OPEN AIR CASSONS, UNDERPINNING AND TEST BORING
INDUSTRIES):)...................................$ 41.18
29.70
((OPEN AIR CASSONS, UNDERPINNING AND TEST BORING
INDUSTRIES):)...................................$ 42.33
29.70
((OPEN AIR CASSONS, UNDERPINNING AND TEST BORING
INDUSTRIES):)...................................$ 42.58
29.70

LABO1421-001 12/02/2024

Rates
Fringes
LABORERS:, WRECKING: GROUP 6 ASBESTOS, LEAD PAINT,
TOXIC AND HAZARDOUS WASTE.....................$ 46.25
29.70
LABORERS:, WRECKING: GROUP 5 YARDMAN, BURNERS,
SAWYERS.....................................$ 45.35
29.70
LABORERS:, WRECKING: GROUP 4 YARDMAN (SALVAGE YARD
ONLY).......................................$ 42.25
29.70

LABORERS:, WRECKING: GROUP 3 SMALL BACKHOES,
LOADERS ON TRACKS, BOBCAT TYPE LOADERS, HYDRAULIC
""BROCK"" TYPE HAMMER OPERATORS, CONCRETE CUTTING
SAWS.....$ 47.25
29.70
LABORERS:, WRECKING: GROUP 2 BURNERS, JACKHAMMERS...$ 47.00
29.70
LABORERS:, WRECKING: GROUP 1 ADZEMAN, WRECKING
LABORER.....$ 46.25
29.70

PAIN0035-001 07/01/2024

Rates
Fringes
PAINTER BRIDGE (BARNSTABLE BRISTOL; DUKES; ESSEX;
NANTUCKET; PLYMOUTH (Remainder of NORFOLK;
MIDDLESEX AND SUFFOLK COUNTIES)).....$ 56.76
36.00

PAIN0035-015 07/01/2024

Rates
Fringes
PAINTER SPAY NEW CONSTRUCTION: SANDBLAST.....$ 47.66
36.00
PAINTER REPAINT: SPRAY, SANDBLAST.....$ 45.72
36.00
PAINTER BRUSH, TAPER (Repaint).....$ 44.32
36.00
PAINTER BRUSH, TAPER (NEw Construction).....$ 46.26
36.00
PAINTER BRIDGE (MIDDLESEX (Cambridge, Everett,
Malden, Medford, Sommerville) SUFFOLK COUNTY
(Boston, Chelsea) NORFOLK COUNTY (Brookline)).....$ 56.76
36.00

PLAS0534-001 07/01/2024

Rates
Fringes
CEMENT MASON/CONCRETE FINISHER (ESSEX; MIDDLESEX;
NORFOLK AND SUFFOLK COUNTY).....$ 49.19
40.86

PLUM0004-001 09/01/2025

Rates
Fringes
PLUMBERS AND PIPEFITTERS (MIDDLESEX (ASHBY,

AYER-WEST OF GREENVILLE BRANCH OF BOSTON AND MAINE
RAILROAD, FT. DEVENS, GROTON, SHIRLEY, TOWNSEND))...$ 55.00
31.57

PLUM0012-001 03/02/2025

Rates
Fringes
PLUMBER (ESSEX (AMES, ANDOVER, BEVERLY, BOXFORD,
BYFIELD, DANVERS, ESSEX, GEORGETOWN, GLOUCESTER,
GROVELAND, HAMILTON, HAVERHILL, IPSWICH,
LAWRENCE,MANCHESTER, MARBLEHEAD, MERRIMAC, METHUEM,
MIDDLETON, NEWBURY, NEWBURYPORT, NORTH ANDOVER,
PEABODY, ROCKPORT, ROWLEY, SALEM, SALISBURY,
TOPSFIEILD, WENHAM, WEST NEWBURY))..................$ 69.84
36.43

PLUM0012-003 03/02/2025

Rates
Fringes
PLUMBER, PIPEFITTER, STEAMFITTER (ESSEX (AMES,
ANDOVER, BEVERLY, BOXFORD, BYFIELD, DANVERS, ESSEX,
GEORGETOWN, GLOUCESTER, GROVELAND, HAMILTON,
HAVERHILL, IPSWICH, LAWRENCE, MANCHESTER,
MARBLEHEAD, MERRIMAC, METHUEN, MIDDLETON, NEWBURY,
NEWBURYPORT, NORTH ANDOVER, PEABODY, ROCKPORT,
ROWLEY, SALEM, SALISBURY, TOPSFIELD, WENHAM, WEST
NEWBURY))..$ 69.84
36.43

PLUM0012-006 03/02/2025

Rates
Fringes
PLUMBER (ESSEX (LYNN, LYNNFIELD, NAHANT, SAUGUS,
AND SWAMPSCOTT); MIDDLESEX (ACTON, ARLINGTON,
ASHLAND, AYER - EXCEPT W. OF GREENVILLE BRANCH OF
BOSTON & MAINE RR, BEDFORD, BELMONT, BILLERICA,
BOXBORO, BURLINGTON, CAMBRIDGE, CARLISLE,
CHELMSFORD, CONCORD, DRACUT, DUNSTABLE, EVERETT,
FRAMINGHAM, HUDSON, HOLLISTON, HOPKINTON,
LEXINGTON, LINCOLN, LITTLETON, LOWELL, MALDEN,
MARLBORO, MAYNARD, MEDFORD, MELROSE, NATICK,
NEWTON, NORTH READING, PEPPERELL, READING,
SHERBORN, SOMERVILLE, STONEHAM, S..................$ 69.84
36.43

PLUM0051-005 08/26/2024

Rates
Fringes
PLUMBERS AND PIPEFITTERS (BARNSTABLE; BRISTOL;
DUKES; NANTUCKET; NORFOLK (AVON, HOLBROOK,
RANDOLPH, STOUGHTON) PLYMOUTH(REMAINDER OF COUNTY)).$ 52.49
33.60

PLUM0537-001 03/01/2025

Rates
Fringes
PIPEFITTER (MIDDLESEX (ARLINGTON, CAMBRIDGE,
EVERETT, MALDEN, MEDFORD, MELROSE, READING,
WAKEFIELD, WINCHESTER AND WOBURN); NORFOLK
(BELLINGHAM, BRAINTREE, BROOKLINE, CANTON
CASHASSET, DEDHAM, FOXBORO, FRANKLIN, MILLIS,
MILTON, SHARON, WALPOLE, WESTWOOD, AND WRENTHAN);
PLYMOUTH (HINGHAM, HULL, SCITUATE); ESSEX (AMES,
ANDOVER, BEVERLY, BOXFORD, BYFIELD, DANVERS, ESSEX,
GEORGETOWN, GLOUCESTER, GROVELAND, HAMILTON,
HAVERHILL, IPSWICH, LAWRENCE,LYNN, LYNNFIELD,
MANCHESTER, MARBLEHEAD, MERRIMAC, MET.....$ 66.58
39.22

TEAM0379-001 06/01/2025

Rates
Fringes
TRUCK DRIVERS: GROUP 7 TRAILERS FOR EARTH MOVING
EQUIPMENT (DOUBLE HOOKUP) POWER TRUCKS $.25
DIFFERENTIAL BY AXLE TUNNEL WORK (UNDERGROUND
ONLY) $.40 DIFFERENTIAL BY AXLE HAZARDOUS
MATERIALS (IN HOT ZONE ONLY) $2.00 PREMIUM
FOOTNOTES: A. PAID HOLIDAYS: NEW YEAR'S DAY,
WASHINGTON'S BIRTHDAY, MEMORIAL DAY, INDEPENDENCE
DAY, LABOR DAY, PATRIOT'S DAY, COLUMBUS DAY,
VETERAN'S DAY, THANKSGIVING DAY AND CHRISTMAS DAY
  B. PAID VACATION: EMPLOYEES WITH 4 MONTHS TO 1
YEAR OF SERVICE RECEIVE 1/2 DAY'S PAY PER MONTH; 1
WEEK VACATION FOR 1 - 5 YEARS OF SERVICE; 2 WEEKS
VACATION FOR 5 - 10 YEARS OF SERVICE; AND 3 WEEKS
VACATION FOR MORE THAN 10 YEARS OF SERVICE.....$ 41.82
37.35
TRUCK DRIVERS: GROUP 6 SPECIALIZED EARTH MOVING
EQUIPMENT OVER 35 TONS POWER TRUCKS $.25
DIFFERENTIAL BY AXLE TUNNEL WORK (UNDERGROUND
ONLY) $.40 DIFFERENTIAL BY AXLE HAZARDOUS
MATERIALS (IN HOT ZONE ONLY) $2.00 PREMIUM
FOOTNOTES: A. PAID HOLIDAYS: NEW YEAR'S DAY,
WASHINGTON'S BIRTHDAY, MEMORIAL DAY, INDEPENDENCE

DAY, LABOR DAY, PATRIOT'S DAY, COLUMBUS DAY,
VETERAN'S DAY, THANKSGIVING DAY AND CHRISTMAS DAY
B. PAID VACATION: EMPLOYEES WITH 4 MONTHS TO 1
YEAR OF SERVICE RECEIVE 1/2 DAY'S PAY PER MONTH; 1
WEEK VACATION FOR 1 - 5 YEARS OF SERVICE; 2 WEEKS
VACATION FOR 5 - 10 YEARS OF SERVICE; AND 3 WEEKS
VACATION FOR MORE THAN 10 YEARS OF SERVICE.....$ 41.53
37.35
TRUCK DRIVERS: GROUP 5 SPECIALIZED EARTH MOVING
EQUIPMENT UNDER 35 TONS OTHER THAN CONVENTIONAL
TYPE TRUCKS; LOW BED; VACHUAL; MECHANICS, PAVING
RESTORATION EQUIPMENT POWER TRUCKS $.25
DIFFERENTIAL BY AXLE TUNNEL WORK (UNDERGROUND
ONLY) $.40 DIFFERENTIAL BY AXLE HAZARDOUS
MATERIALS (IN HOT ZONE ONLY) $2.00 PREMIUM
FOOTNOTES: A. PAID HOLIDAYS: NEW YEAR'S DAY,
WASHINGTON'S BIRTHDAY, MEMORIAL DAY, INDEPENDENCE
DAY, LABOR DAY, PATRIOT'S DAY, COLUMBUS DAY,
VETERAN'S DAY, THANKSGIVING DAY AND CHRISTMAS DAY
B. PAID VACATION: EMPLOYEES WITH 4 MONTHS TO 1
YEAR OF SERVICE RECEIVE 1/2 DAY'S PAY PER MONTH; 1
WEEK VACATION FOR 1 - 5 YEARS OF SERVICE; 2 WEEKS
VACATION FOR 5 - 10 YEARS OF SERVICE; AND 3 WEEKS
VACATION FOR MORE THAN 10 YEARS OF SERVICE.....$ 41.24
37.35
TRUCK DRIVERS: GROUP 4 FOUR AND FIVE AXLE EQUIPMENT
POWER TRUCKS $.25 DIFFERENTIAL BY AXLE TUNNEL
WORK (UNDERGROUND ONLY) $.40 DIFFERENTIAL BY AXLE
HAZARDOUS MATERIALS (IN HOT ZONE ONLY) $2.00
PREMIUM FOOTNOTES: A. PAID HOLIDAYS: NEW
YEAR'S DAY, WASHINGTON'S BIRTHDAY, MEMORIAL DAY,
INDEPENDENCE DAY, LABOR DAY, PATRIOT'S DAY,
COLUMBUS DAY, VETERAN'S DAY, THANKSGIVING DAY AND
CHRISTMAS DAY B. PAID VACATION: EMPLOYEES
WITH 4 MONTHS TO 1 YEAR OF SERVICE RECEIVE 1/2
DAY'S PAY PER MONTH; 1 WEEK VACATION FOR 1 - 5
YEARS OF SERVICE; 2 WEEKS VACATION FOR 5 - 10 YEARS
OF SERVICE; AND 3 WEEKS VACATION FOR MORE THAN 10
YEARS OF SERVICE.....$ 41.14
37.35
TRUCK DRIVERS: GROUP 3 THREE AXLE EQUIPMENT AND
TIREMAN POWER TRUCKS $.25 DIFFERENTIAL BY AXLE
TUNNEL WORK (UNDERGROUND ONLY) $.40 DIFFERENTIAL BY
AXLE HAZARDOUS MATERIALS (IN HOT ZONE ONLY) $2.00
PREMIUM FOOTNOTES: A. PAID HOLIDAYS: NEW
YEAR'S DAY, WASHINGTON'S BIRTHDAY, MEMORIAL DAY,
INDEPENDENCE DAY, LABOR DAY, PATRIOT'S DAY,
COLUMBUS DAY, VETERAN'S DAY, THANKSGIVING DAY AND
CHRISTMAS DAY B. PAID VACATION: EMPLOYEES
WITH 4 MONTHS TO 1 YEAR OF SERVICE RECEIVE 1/2

DAY'S PAY PER MONTH; 1 WEEK VACATION FOR 1 - 5
YEARS OF SERVICE; 2 WEEKS VACATION FOR 5 - 10 YEARS
OF SERVICE; AND 3 WEEKS VACATION FOR MORE THAN 10
YEARS OF SERVICE.....$ 41.02
37.35
TRUCK DRIVERS: GROUP 2 TWO AXLE EQUIPMENT; &
FORKLIFT OPERATOR POWER TRUCKS $.25 DIFFERENTIAL
BY AXLE TUNNEL WORK (UNDERGROUND ONLY) $.40
DIFFERENTIAL BY AXLE HAZARDOUS MATERIALS (IN HOT
ZONE ONLY) $2.00 PREMIUM FOOTNOTES: A.
PAID HOLIDAYS: NEW YEAR'S DAY, WASHINGTON'S
BIRTHDAY, MEMORIAL DAY, INDEPENDENCE DAY, LABOR
DAY, PATRIOT'S DAY, COLUMBUS DAY, VETERAN'S DAY,
THANKSGIVING DAY AND CHRISTMAS DAY B. PAID
VACATION: EMPLOYEES WITH 4 MONTHS TO 1 YEAR OF
SERVICE RECEIVE 1/2 DAY'S PAY PER MONTH; 1 WEEK
VACATION FOR 1 - 5 YEARS OF SERVICE; 2 WEEKS
VACATION FOR 5 - 10 YEARS OF SERVICE; AND 3 WEEKS
VACATION FOR MORE THAN 10 YEARS OF SERVICE.....$ 40.95
37.35
TRUCK DRIVERS: GROUP 1 STATION WAGONS; PANEL
TRUCKS; AND PICKUP TRUCKS POWER TRUCKS $.25
DIFFERENTIAL BY AXLE TUNNEL WORK (UNDERGROUND
ONLY) $.40 DIFFERENTIAL BY AXLE HAZARDOUS
MATERIALS (IN HOT ZONE ONLY) $2.00 PREMIUM
FOOTNOTES: A. PAID HOLIDAYS: NEW YEAR'S DAY,
WASHINGTON'S BIRTHDAY, MEMORIAL DAY, INDEPENDENCE
DAY, LABOR DAY, PATRIOT'S DAY, COLUMBUS DAY,
VETERAN'S DAY, THANKSGIVING DAY AND CHRISTMAS DAY
  B. PAID VACATION: EMPLOYEES WITH 4 MONTHS TO 1
YEAR OF SERVICE RECEIVE 1/2 DAY'S PAY PER MONTH; 1
WEEK VACATION FOR 1 - 5 YEARS OF SERVICE; 2 WEEKS
VACATION FOR 5 - 10 YEARS OF SERVICE; AND 3 WEEKS
VACATION FOR MORE THAN 10 YEARS OF SERVICE.....$ 40.78
37.35

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.

Note: Executive Order 13658 generally applies to contracts subject
to the Davis-Bacon Act that were awarded on or between January 1,
2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does
not apply to contracts subject only to the Davis-Bacon Related Acts
regardless of when they were awarded. If a contract is subject to
Executive Order 13658, the contractor must pay all covered workers
at least $13.65 per hour (or the applicable wage rate listed on this
wage determination, if it is higher) for all hours spent performing on
the contract from May 11, 2026, through December 31, 2026. The applicable Executive Order minimum wage rate will be adjusted annually.
Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than SU , UAVG , SA , or SC denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The SU identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal

number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

SU wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The SA identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the SA identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

DOCUMENT A00801

SPECIAL PROVISIONS

WAREHAM
Federal Aid Project No. PRC(PRC80)-003S(925)X
Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River

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 *2026 Standard Specifications for Highways and Bridges, the Supplemental Specifications* contained in this book, the *Construction Standard Details* in effect as of May 2026, the *1990 Standard Drawings for Signs and Supports*, the 2015 *Overhead Signal Structure and Foundation Standard Drawings*, the *11th Edition of the Manual on Uniform Traffic Control Devices (MUTCD)* and the *January 2026 Massachusetts Amendments to the MUTCD*, *the 1968 Standard Drawings for Traffic Signals and Highway Lighting*, the latest edition of The *American Standard for Nursery Stock*, the Plans and these Special Provisions.

The work to be done under this contract involves the construction of Bridge No. W-06-020 (CCV), which carries U.S. Route 6 Westbound and State Route 28 Northbound, also known as Cranberry Highway, over Agawam River, construction of a new spillway, construction of a new fish ladder, reconstruction of the existing upstream fishway, and reconstruction of the embankments of Mill Pond Dam. The work includes the demolition of the existing primary and secondary spillways, existing fish ladder, storage shed, and removal trees and brush from the embankments of the dam and dike. The work shall include realignment and improvements to the roadway and sidewalk at the approach and across the proposed structure, including a buffered bicycle lane, stormwater treatment, and landscape enhancements.

The proposed bridge will consist of a single span steel stringer and concrete slab bridge on concrete abutments. The structure will consist of ten W27x146 steel stringers carrying an 8-inch-thick reinforced concrete deck slab, a 3-inch Superpave asphalt wearing surface, cast in place concrete sidewalks, and steel S3-TL4 bridge rails with protective screens. The proposed superstructure will be supported by a reinforced concrete cantilever abutment with a monolithic slab between the stems which will convey flow from the adjacent spillway upstream. The proposed spillway will be constructed upstream of the proposed bridge and will consist of an arched crested weir that will convey flow to the monolithic spillway/abutment footing slab. The proposed fish ladder will consist of a downstream step and pool section constructed of reinforced concrete and stone veneer. This section will continue to a reinforced concrete step and pool ladder under the proposed bridge and upstream of the bridge into Mill Pond. A reinforced concrete eel ramp will be built adjacent to the downstream training wall and fish ladder.

SCOPE OF WORK (Continued)

Additional work includes installation of a secant cutoff wall through the dam and dike, relocation of overhead and underground utilities, temporary control of water and support of excavation, reconstruction and demolition of portions of the existing fishway, and construction of wingwalls, training walls, and retaining walls.

The work includes, but is not limited to, the following:

1. Clearing and grubbing of the dam and dike embankments and installation of riprap embankment protection, and installation of the downstream grouted riprap scour apron.

2. Roadway safety upgrades include realignment of the roadway, installation of a buffered bicycle lane, installation of MASH compliant approach guardrail, and sidewalk realignment and reconstruction.

3. Landscape improvements including loam and seed, and wetland and upland plantings.

4. Installation of temporary traffic controls including temporary concrete barriers and temporary traffic signs and message boards to notify the public of the construction and lane shifts.

5. Installation of warning signage and buoys upstream of the dam in Mill Pond.

The roadway work includes, but is not limited to, unclassified excavation, full depth Superpave asphalt pavement, dense graded crushed stone, highway guardrail, erosion controls, signs, modified rockfill, and other incidental work listed in the proposal.

Construction will be phased in to maintain one or two lanes of traffic throughout construction. The bridge will be constructed in two phases, starting with the downstream (south) portion. The upstream portion of the bridge will be constructed in the same phase as the proposed spillway. After completing the spillway construction, flow from the pond can be diverted to the spillway to allow the remaining phases of construction to continue in the downstream area, and the main spillway can be decommissioned while maintaining two lanes of traffic. To accommodate phasing, a temporary bridge will be constructed to maintain two lanes of travel while the upstream portion of the bridge is being built. Additionally, a temporary utility bridge supporting a temporary gas bypass will be required to be constructed in the downstream area while the downstream portion of the bridge is being built.

The Contractor shall be responsible for inspecting and examining the site prior to bidding. The Contractor shall conduct their own investigation and research existing conditions and measurements affecting the work to be done and shall make their bid in sole reliance thereon.

SUBSECTION 7.05 INSURANCE REQUIREMENTS

The insurance requirements set forth in this subsection are in addition to the requirements of the Standard Specifications.

7.05.B: Public Liability Insurance 4.

Asbestos Liability Insurance shall be obtained for this project.

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 proposal number and municipality is to be placed in the subject line.

NONCONFORMING COMPRESSIVE STRENGTH OF CEMENT CONCRETE

Concrete with compressive strength test results failing to attain the limits specified in Table 901.64-3 of 901.64.B: Acceptance Testing shall be evaluated for structural adequacy and serviceability at the Contractors' expense. The Department will review all production records, the concrete test records, petrographic analysis report, field notes, and the placement records for the concrete in question. If the Engineer determines the material is found to be adequate to remain in place, payment shall be adjusted in accordance with the following formula:

$$P = \frac{2(fc - f'c)(UP)(Q)}{f'c}$$

Where:

P = pay adjustment for substandard concrete
$f'c$ = specified minimum compressive strength at 28 days
fc = substandard concrete cylinder compressive strength at 56 days
Q = quantity of concrete represented by the acceptance cylinders tested
UP = unit contract price or the lump sum breakdown price per cubic yard for the class of concrete involved complete in place

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.

SOIL STOCKPILING DIRECTIVE P-22-001

Any stockpiling of soil must be performed in compliance with Policy Directive P-22-001, Off-Site Stockpiling of Soil from MassDOT Construction Projects. This directive limits the allowable locations for off-site stockpiling of soil generated during MassDOT projects and includes various requirements that must be satisfied by the contractor prior to off-site stockpiling. The Contractor is responsible for identifying a suitable stockpile location.

SUBSECTION 8.02 SCHEDULE OF OPERATIONS

Replace this subsection with the following:

An integrated cost and schedule controls program shall be implemented by the Contractor to track and document the progress of the Work from Notice to Proceed (NTP) through the Contractor Field Completion (CFC) Milestone. The Contractor's schedules will be used by the Engineer to monitor project progress, plan the level-of-effort required by the Department's work force and consultants and as a critical decision-making tool. Accordingly, the Contractor shall ensure that it complies fully with the requirements specified herein and that its schedules are both accurate and updated as required by the specification throughout the life of the project. Detailed requirements are provided in Division II, Section 722 Construction Scheduling.

TRUCK SAFETY DEVICES

(Supplementing Subsection 7.04: Motor Vehicles)

All motor vehicles subject to Section 7 of Chapter 90 to be operated under this Contract shall be equipped with safety devices as provided therein and in 540 CMR 4.00.

The Contractor shall certify to the Registry of Motor Vehicles, in a manner prescribed by the Registrar, that all applicable vehicles are equipped with Lateral Protective Devices, Convex Mirrors, Cross Over Mirror(s) and Back Up Cameras in accordance with the requirements of 540 CMR 4.00.

The Contractor shall provide evidence satisfactory to the Department to demonstrate compliance with the above certification requirement for all applicable vehicles operated under this Contract by the Contractor and its subcontractors and vendors in a manner set forth by the Department. Thereafter, the Contractor shall have an affirmative obligation to continue to provide such evidence of compliance on an ongoing basis and no later than 7 days after certification with the Registry of Motor Vehicles of any additional vehicles operated under this Contract by the Contractor and its subcontractors and vendors.

Non-compliance with respect to a vehicle that is subject to 540 CMR 4.00 may subject the Contractor to statutory fines as established in M.G.L. c. 90, § 7 and/or contractual remedies up to and including termination of the Contract.

SUBSECTION 8.14 UTILITY COORDINATION, DOCUMENTATION, AND MONITORING RESPONSIBILITIES

A. GENERAL

In accordance with the provisions of Section 8.00 Prosecution and Progress, utility coordination is a critical aspect to this Contract. This section defines the responsibility of the Contractor and MassDOT, with regard to the initial utility relocation plan and changes that occur as the prosecution of the Work progresses. The Engineer, with assistance from the Contractor shall coordinate with Utility companies that are impacted by the Contractor's operations. To support this effort, the Contractor shall provide routine and accurate schedule updates, provide notification of delays, and provide documentation of the steps taken to resolve any conflicts for the temporary and/or permanent relocations of the impacted utilities. The Contractor shall provide copies to the Engineer of the Contractor communication with the Utility companies, including but not limited to:

- Providing advanced notice, for all utility-related meetings initiated by the Contractor.
- Providing meeting minutes for all utility-related meetings that the Contractor attends.
- Providing all test pit records.
- Request for Early Utility work requirements of this section (see below).
- Notification letters for any proposed changes to Utility start dates and/or sequencing.
- Written notification to the Engineer of all apparent utility delays within seven (7) Calendar Days after a recognized delay to actual work in the field – either caused by a Utility or the Contractor.
- Any communication, initiated by the Contractor, associated with additional Right-of-Way needs in support of utility work.
- Submission of completed Utility Completion Forms.

B. PROJECT UTILITY COORDINATION (PUC) FORM

The utility schedule and sequence information provided in the Project Utility Coordination Form (if applicable) is the best available information at the time of the bid and has been considered in setting the contract duration. The Contractor shall use all of this information in developing the bid price and the Baseline Schedule Submission, inclusive of the individual utility durations sequencing requirements, and any work that has been noted as potentially concurrent utility installations.

C. INITIATION OF UTILITY WORK

The Engineer will issue all initial notice-to-proceed dates to each Utility company based on either the:

1) Contractor's accepted Baseline Schedule
2) An approved Early Utility Request in the form of an Early Utility sub-net schedule (in accordance with the requirements of this Subsection)
3) An approved Proposal Schedule

C.1 - BASELINE SCHEDULE – UTILITY BASIS

The Contractor shall provide a Baseline Schedule submission in accordance with the requirements of Subsection 8.02 and inclusive of all of the information provided in the PUC Form that has been issued in the Contract documents. This is to include the utility durations, sequencing of work, allowable concurrent work, and all applicable considerations that have been depicted on the PUC Form.

SUBSECTION 8.14 (Continued)

C.2 – EARLY UTILITY REQUEST – (aka SUBNET SCHEDULE) PRIOR TO THE BASELINE
All early utility work is defined as any anticipated/required utility relocations that need to occur prior to the Baseline Schedule acceptance. In all cases of proposed early utility relocation, the Contractor shall present all known information at the pre-construction conference in the form of a 'sub-net' schedule showing when each early utility activity needs to be issued a notice-to-proceed. The Contractor shall provide advance notification of this intent to request early utility work in writing at or prior to the Pre-Construction meeting. Prior to officially requesting approval for early utility work, the Contractor shall also coordinate with MassDOT and all utility companies (private, state or municipal) which may be impacted by the Contract. If this request is acceptable to the Utilities and to MassDOT, the Engineer will issue a notice-to-proceed to the affected Utilities, based on these accepted dates.

C.3 – PROPOSAL SCHEDULE - CHANGES TO THE PUC FORM
If the Contractor intends to submit a schedule (in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02) that contains durations or sequencing that vary from those provided in the Project Utility Coordination (PUC) Form, the Contactor must submit this as an intended change, in the form of a Proposal Schedule and in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02. These proposed changes are subject to the approval of the Engineer and the impacted utilities, in the form of this Proposal Schedule and a proposed revision to the PUC form. The Contractor shall not proceed with any changes of this type without written authorization from the Engineer, that references the approved Proposal Schedule and PUC form changes. The submission of the Baseline Schedule should not include any of these types of proposed utility changes and should not delay the submission of the Baseline Schedule. As a prerequisite to the Proposal Schedule submission, and in advance of the utility notification(s) period, the Contractor shall coordinate the proposed utility changes with the Engineer and the utility companies, to develop a mutually agreed upon schedule, prior to the start of construction.

D. UTILITY DELAYS
The Contractor shall notify the Engineer upon becoming aware that a Utility owner is not advancing the work in accordance with the approved utility schedule. Such notice shall be provided to the Engineer no later than seven (7) calendar days after the occurrence of the event that the Contractor believes to be a utility delay. After such notice, the Engineer and the Contractor shall continue to diligently seek the Utility Owner's cooperation in performing their scope of Work.

In order to demonstrate that a critical path delay has been caused by a third-party Utility, the Contractor must demonstrate, through the requirements of the monthly Progress Schedule submissions and the supporting contract records associated with Subsection 8.02, 8.10 and 8.14, that the delays were beyond the control of the Contractor.

SUBSECTION 8.14 (Continued)

All documentation provided in this section is subject to the review and verification of the Engineer and, if required, the Utility Owner. In accordance with MassDOT Specifications, Division I, Subsection 8.10, a Time Extension will be granted for a delay caused by a Utility, only if the actual duration of the utility work is in excess of that shown on the Project Utility Coordination Form, and only if;

1) proper Notification of Delay was provided to MassDOT in accordance with the time requirements that are specified in this Section
2) the utility delay is a critical path impact to the Baseline Schedule (or most recently approved Progress Schedule)

E. LOCATION OF UTILITIES

The locations of existing utilities are shown on the Contract drawings as an approximation only. The Contractor shall perform a pre-construction utility survey, including any required test pits, to determine the location of all known utilities no later than thirty (30) calendar days before commencing physical site work in the affected area.

F. POST UTILITY SURVEY – NOTIFICATION

Following completion of a utility survey of existing locations, the Contractor will be responsible to notify the Engineer of any known conflicts associated with the actual location of utilities prior to the start of the work. The Engineer and the Contractor will coordinate with any utility whose assets are to be affected by the Work of this Contract. A partial list of utility contact information is provided in the Project Utility Coordination Form.

G. MEETINGS AND COOPERATION WITH UTILITY OWNERS

The Contractor shall notify the Engineer in advance of any meeting they initiate with a Utility Owner's representative to allow MassDOT to participate in the meeting if needed.

Prior to the Pre-Construction Meeting, the Contractor should meet with all Utility Owners who will be required to perform utility relocations within the first 6 months of the project, to update the affected utilities of the Project Utility Coordination Form and all other applicable Contract requirements that impact the Utilities. The Contractor shall copy the Engineer on any correspondence between the Utility Owner and the Contractor.

H. FORCE ACCOUNT / UTILITY MONITORING REQUIREMENTS

The Engineer will be responsible for recording daily Utility work force reports. The start, suspension, re-start, and completion dates of each of the Utilities, within each phase of the utility relocation work, will be monitored and agreed to by the Engineer and the Contractor as the work progresses.

I. ACCESS AND INSPECTION

The Contractor shall be responsible for allowing Utility owners access to their own utilities to perform the relocations and/or inspections. The Contractor shall schedule their work accordingly so as not to delay or prevent each utility from maintaining their relocation schedule.

COMPLIANCE WITH THE NATIONAL DEFENSE AUTHORIZATION ACT

(Supplementing Subsection 7.01)

On all projects, the "Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment" Regulation (2 CFR 200.216) prohibits the Contractor from using or furnishing the following telecommunications equipment or services:

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- Telecommunications or video surveillance services provided by such entities or using such equipment.
- Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

This prohibition applies to all products manufactured by the aforementioned companies, including any individual components or parts.

By submitting a bid on a project, the Contractor certifies that all work will be in compliance with the terms of 2 CFR 200.216. The Contractor shall submit a COC indicating compliance with the above provisions for all telecommunications equipment or services included in the Contract.

Payment for the item in which the materials are incorporated may be withheld until these COCs are received. Any cost involved in furnishing the certificate(s) shall be borne by the Contractor.

BIDDERS LIST

Pursuant to the provisions of 49 CFR Part 26.11 all official bidders will be required to report the names, addresses and telephone numbers of all firms that submitted bids or quotes in connection with this project. Failure to comply with a written request for this information within 15 business days may result in a recommendation to the Prequalification Committee that prequalification status be suspended until the information is received.

The Department will survey all firms that have submitted bids or quotes during the previous year prior to setting the annual goal and shall request that each firm report its age and gross receipts for the year.

BUILD AMERICA BUY AMERICA PREFERENCE

On Federally-aid projects the Buy America (23.CFR § 635.410) and Build America, Buy America Act. 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

(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.

BUILD AMERICA BUY AMERICA PREFERENCE (Continued)

All articles, materials, and supplies should be classified as an iron or steel product, a manufactured product, or another product as specified by law or in 2 CFR part 184 (such other products specified by law or in 2 CFR part 184 include "excluded materials" and "construction materials"); an article, material, or supply must not be considered to fall into multiple categories.

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/her intention to commence operations 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.

Before commencing work on service connections, the Contractor shall be responsible for contacting the Electric Company servicing the area to obtain construction requirements, standards, and to give adequate notice of commencement of work.

During the progress of the work, the Contractor shall cooperate with the Owners of the utilities and permit their representative's access to the work to determine if their utilities are being endangered in any way.

The Contractor shall schedule his construction to allow for a coordinated highway and utility effort. The Contractor's attention is called to the temporary overhead wire relocations, and shall coordinate any excavation, piling installation, or other construction activities with the affected utilities so that the temporary utility relocations can be made prior to commencement of any parts of the work that rely on these temporary relocations. Upon award, the Contractor shall notify all utilities relative to the anticipated construction start date. Immediately following the Pre-construction Conference, the Contractor shall initiate any survey layout required for utilities.

The District Office maintains a list of utility contact persons, addresses and telephone numbers for each town, which may be requested by the Contractor for each location of work. Additionally, a list of public and private utilities can be found on the MassDOT website at:

https://www.mass.gov/info-details/utility-contacts-by-district-and-municipality

Select District 5 on the webpage,
Select the City/Town, and then locate the utility.

The utility contact list is for guidance only and is not guaranteed to be complete or up to date
Town officials are shown at the website http://www.mass.gov under the "for Government" tab, select "City/Town official directory" under "Online Services" heading. Enter the city/town on the left of the webpage and locate the official to contact.

NOTICE TO OWNERS OF UTILITIES (Continued)

Wareham Highway Department Dave Menard 95 Charge Pond Road Wareham, MA 02571 (508) 295-5300	**Verizon** Karen Mealey 385 Myles Standish Boulevard Taunton, MA 02780 (774) 409-3160 karen.m.mealey@verizon.com
Wareham Police Department Chief Walter Correia 2515 Cranberry Highway Wareham, MA 02571 (508) 295-1212	**Comcast Cable Corporation** Wendy Brown P.O. Box 6505, 5 Omni Way Chelmsford, MA 01824 (978) 848-5163 Wendy_Brown@comcast.com
Wareham Fire Department/Fire Alarm Chief John Kelley 273 Main Street Wareham, MA 02571 (508) 295-2973	**National Grid Gas** Melissa Owens 170 Data Drive Waltham, MA 02451 (781) 907-2845 melissa.owens@nationalgrid.com
Wareham Water Department Andrew Cunnigham 2550 Cranberry Highway Wareham, MA 02571 (508) 295-0450	**Enbridge** Kathy M. Aruda 8 Wilson Way Westwood, MA 02090 (508) 938-7728 kathleen.aruda@enbridge.com
Eversource Electric Brian Mello 50 Duchaine Blvd. New Bedford, MA 01745 (508) 441-5832 brian.mello@eversrouce.com	**Eversource Fiber** Bechir Khoury 247 Station Drive Westwood, MA 02090 (781) 441-3864 bechir.khoury@eversource.com
Open Cape Rick Forman P.O. Box 1148 Barnstable, MA 02630 (508) 362-2224 rick@opencape.org	**Verizon Wireless Small Cell** Liz Glidden 20 Alexander Drive Wallingford, CT 06492 elizabeth.glidden@verizonwireless.com

NOTICE TO OWNERS OF UTILITIES (Continued)

During the progress of work, the Contractor shall cooperate with the Owners of the utilities and permit their representative's access to the work to determine if their utilities are being endangered in any way.

The Contractor shall schedule his construction to allow for a coordinated highway and utility effort. Upon Notice to proceed, the Contractor shall notify all utilities relative to the anticipated construction start date. Immediately following the Pre-construction Conference, the Contractor shall initiate any survey layout required for utilities.

NATIONAL GRID EMERGENCY TELEPHONE NUMBERS

GAS:
Emergency: 1-800-233-5325
New Service: 1- 877-696-4743
Customer Support: 1-800-732-3400

EVERSOURCE EMERGENCY TELEPHONE NUMBERS

ELECTRIC:
Outage/ Emergency: 800-592-2000 or 844-726-7562
New Service: 1-888-633-3797 (1-888-need pwr)
Customer Support: 1-800-340-9822

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.

WORK IN OR NEAR STREAMS, RIVERS, AND IMPOUNDMENTS

(Supplementing Subsection 7.02 E)

No in-water, silt-producing work shall occur during the Time of Year (TOY) restriction between the dates of March 15th to July 15th and September 1st to November 15th of any year. A TOY incursion waiver may be requested of Massachusetts Division of Marine Fisheries (MA DMF) if the proposed turbidity barriers and cofferdams are installed prior to this TOY period and there is sufficient uninterrupted flow for fish passage.

Best management practices for erosion and sedimentation control must be adhered to for all phases of construction to minimize potential impacts to the fisheries resources. Traditional hay and/or straw bales should be avoided in favor of compost filter tubes. To the greatest extent practicable, all in-stream work should be conducted during low flow periods throughout the year. Times of year when stream flow is high due to extended rain and/or snow melt events should be avoided.

Refueling, washing, and cleaning of equipment shall not take place within 50 feet of water or wetland resources or in a location where a spill will reach surface waters. Stockpiles shall be located no less than 50 feet from waterbodies and wetland resources, catch basins, or other drainage conveyances that discharge to protected waters/wetlands.

PIGEON WASTE

The Contractor shall remove and dispose of the pigeon waste and any other debris accumulated on the steel members and bridge seats in areas where work is being performed. Pigeon waste and debris material contaminants will require special handling and disposal in accordance with all Federal, state, and local requirements. No separate payment will be made for removal and disposal of pigeon waste. Cost shall be incidental to the contract pay items.

WORK DONE BY OTHERS

Relocation and/or resetting to new grades of all private utilities, including utility poles, and gas lines made necessary by the construction of this project, will be accomplished by the respective utility companies. Adjusting gas gates to grade will also be conducted by the respected utility.

National Grid Gas is anticipated to relocate the existing gas main as part of the project. The Contractor shall be aware that the site may need to be shared and shall coordinate with National Grid.

GENERAL REQUIREMENTS FOR DEMOLITION AND WORK INVOLVING PAINTED STEEL

(02/06/2020)

Demolition and work involving painted steel shall conform to the requirements of Subsection 961 of the Standard Specifications.

Work Involving Painted Steel

Hazardous materials shall be removed in the immediate area of any intended welding, heating, saw cutting or burning of steel. Hazardous material removal is required to allow the demolition of structural steel, railings, drainage systems, utility supports, steel lamp posts, etc.

The contractor shall assume that the coatings on the steel contain lead (Pb), unless otherwise determined by testing. The contractor shall certify in writing to the Engineer the results of all testing, and shall also certify that any lead (Pb) coated steel removed from the project was not reused or buried, but was sent to a scrap metal recycling facility.

Implement and maintain programs and procedures, which comply with the requirements of this specification and all applicable standards and regulations. Comply with all applicable regulations even if the regulation is not specifically referenced herein. If a state or local regulation is more restrictive than the regulation of this specification, follow the more restrictive requirements.

This requirement is intended only for the demolition and preparation prior to repair and does not include provisions for recoating of steel.

Environmental

All applicable portions of Subsections 961.65 “Worker Protection” and 961.66 “Environmental Protection and Monitoring” shall be followed when performing this work.

During chemical stripping a hand washing facility may be used in lieu of a decontamination/changing facility.

Hazardous material shall be collected during the disassembly and disposed of as outlined in Subsection 961.68 “Handling of Hazardous Waste and Reporting Release Programs”.

The applicable submittals shall be according to Subsection 961.69 “Submittals”.

GENERAL REQUIREMENTS FOR DEMOLITION AND WORK INVOLVING PAINTED STEEL (Continued)

Cleaning/Removal

Cutting Or Burning Of Steel

All surfaces to be welded, heated, saw cut or burned shall be cleaned so as to remove all contaminants and/or hazardous materials, which could be discharged to the environment as a function of the subsequent operations.

Lead paint shall be removed in its entirety in an area prescribed by a 6 inch (15 cm) minimum offset from the required work. The paint removal operation may be dry abrasive blasting, wet abrasive blasting or chemical stripping.

Proper level of containment shall be used when performing this work in accordance with Subsection 961.67 "Containment". Full containment is not required during chemical stripping operation however; the Contractor shall install proper shielding and/or tarpaulins under the chemical stripping operations in order to catch all debris generated during this procedure. A cleaned area must be inspected and approved before the demolition operations are started.

During cleaning operations the Contractor shall be required to furnish and erect temporary floodlights illuminating the steel surface at a minimum of 30-foot candles. This lighting shall be used in areas where there is insufficient lighting for proper cleaning operations and inspection. The Contractor shall supply electrical power.

The Contractor shall provide support for interim and final inspection of the bridge during cleaning operations. This support shall include the necessary traffic controls and safe access to the work.

Mechanical Disassembly Of Steel

All surfaces to be mechanically disassembled by shear cutting or removing bolts or rivets shall not require deleading. When shear cutting or removing bolts or rivets, the Contractor shall not use any method that will cause dust and/or particles to be emitted and/or dispersed into the environment to an extent that would expose the workers above the Action Levels of 30µg/m3.

For purposes of limiting the lead (Pb) dust, the Contractor will be required to dampen the lead paint work areas.

The contractor shall install a proper shielding and/or tarpaulins under all lead-paint-coated surfaces to be shear cut or bolts or rivets ordered removed in order to catch any loose lead paint chips, dust or particles.

MATERIAL OPTIONS

The Contractor shall inform the Engineer of his option prior to the installation of the material. Once the option is designated, all material for the option item(s) shall remain the same throughout the job.

Item Number	Item Description	Unit
265.04	4 Inch Pipe Subdrain - Option	Foot
265.06	6 Inch Pipe Subdrain - Option	Foot

Pipe Options
Perforated Corrugated Plastic Pipe (Subdrain)
Perforated Corrugated Metal Pipe (Subdrain) - 1310 microns
Porous Concrete Pipe

SPECIAL PROVISIONS FOR EXCAVATION, EMBANKMENTS, & EROSION CONTROL (Supplementing the Standard Specifications)

The Contractor is cautioned that prior to commencing any operation that will expose the soil and render it subject to erosion; necessary silt fence & compost filter tubes shall be positioned in all locations required as directed by the Engineer.

All slopes shall be covered with hay mulch and seeded. Slopes shall be seeded when practicable to keep the area of soil open to the elements at a minimum.

The Mill Pond (hereinafter referred to as the "pond") and the Agawam River (hereinafter referred to as the "river") are the bodies of water that flows below the proposed Bridge No. W-06-020 replacement. The following conditions shall be adhered to:

1. Bank stability shall be maintained in the area of construction. In the event the bank is altered in any fashion, proper steps must be taken to restabilize the area. Compost filter tubes, haybales, silt fences, and other standard forms of erosion prevention should be used to prevent brook siltation. To ensure continued bank stability after construction is complete, the area will be monitored by MassDOT every 3 months for one year and after flood events that cause water levels of seasonal highs or greater.

2. All planned slope improvements at the bridge shall be done during a favorable period when it is forecast that the brook will be at a low stage during the period that the bank is cut back and re-sloped.

SPECIAL PROVISIONS FOR EXCAVATION, EMBANKMENTS, & EROSION CONTROL (Supplementing the Standard Specifications)

3. No chemicals (cement mortar, etc.) shall be mixed or poured into the brook. All debris from construction that falls into the brook, and all construction related debris along the banks shall be removed.

4. Silt barriers are to be used between bank work and the brook. Silt barriers shall be checked daily and repaired as needed.

5. Run of brook flows shall always be maintained.

6. All disturbed areas should be replanted before October 15 to ensure the establishment of ground cover.

7. No equipment or personnel shall enter or cross the brook during construction.

GUARDRAIL BACK-UP PLATES

Back-up plates at intermediate posts shall not be used on guardrail installations where wood or plastic offset blocks are used.

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 4.4Million 18-kip (80-kn) ESALs.

PROSECUTION OF WORK (Supplementing Subsection 8.03)
Add/amend the following at the end of the Section:

Contractual Milestones:

This Contract contains the following Contractual Milestones that are to be included in the Contractor's Baseline Contract Progress Schedule submission. The contractor shall identify the completion of the work pertaining to each Contractual Milestone through the inclusion of a Finish Milestone in the accepted baseline Contract Progress Schedule.

- **MS#01 – Contractor Completion:** The Contractor shall achieve Contractor Completion within **1486 calendar days from Notice to Proceed**.

  Contractor Completion is defined as the completion of all physical contract work including the completion of the punch list work and the Contractor has fully de-mobilized from the field operations.

- **MS#02 – Substantial Completion:** The Contractor shall achieve Substantial Completion within **1451 calendar days from Notice to Proceed**.

Substantial Completion shall be described as the date that a walkthrough of the entire contract work has been performed by the Resident Engineer, and the Work required by the Contract, including paperwork, has been completed, except for work having a contract price of less than one percent of the adjusted contact price, including overruns, underruns and all contact amendments. All Material submittals must have been received by the District Materials Lab.

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 AND TRICOLORED BAT PROTECTION

The northern long-eared bat (*Myotis septentrionalis*; NLEB) and tricolored bat (*Perimyotis subflavus*; TCB) are listed as federally endangered or proposed endangered, respectfully, under the Endangered Species Act (ESA). The U.S. Fish and Wildlife Service (USFWS) developed this guidance to address ESA compliance and promote conservation of NLEB and TCB. This project has been consulted with the USFWS through the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and Federal Transit Administration (FTA) Programmatic Biological Opinion/Conference Opinion for Transportation Projects in the Range of the Indiana bat, northern long-eared bat, and tricolored bat, dated December 13, 2024. and generated a May Affect, Not Likely to Adversely Affect (NLAA) determination (see **Document A00870 USFWS NLAA**). Subsequently, the project has completed Section 7 consultation under the ESA.

In advance of the uplisting of the TCB to endangered under the ESA, the following Avoidance and Minimization Measures (AMMs) must be strictly adhered to in order to protect NLEB and TCB and to be in compliance with the ESA. Contact MassDOT Environmental Services - Wildlife Unit Supervisor for questions about project limits, restrictions, or conservation measures.

General AMM

- The Contractor shall ensure all personnel working in on the project site are aware of all environmental commitments related to NLEB and TCB, including all applicable AMMs. NLEB and TCB information (https://www.fws.gov/midwest/endangered/mammals/nleb/ and https://www.fws.gov/species/tricolored-bat-perimyotis-subflavus) shall be made available to all personnel.
- On July 27, 2023, MassDOT Highway Division Environmental Services conducted a northern long-eared bat summer presence/absence survey, in accordance with the 2023 survey guidelines. The survey did not confirm the presence of NLEB and/or TCB. If work is proposed by the Contractor past July 27, 2028, additional review is required by the MassDOT Highway Division's Environmental Services Section, and additional review and restrictions may be required by the USFWS.

Lighting AMMs

- Direct temporary lighting away from suitable habitat during the active season: **April 15 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).

NORTHERN LONG-EARED BAT AND TRICOLORED BAT PROTECTION (Continued)

Bridge AMM

- On December 12, 2024, MassDOT Highway Division Environmental Services, conducted a northern long-eared bat bridge/structure bat assessment, in accordance with the USFWS guidelines. The assessment did not find presence of, or evidence of use by bats, and as stated within the guidelines, the assessment is valid for two years. If bridge work is not complete December 12, 2026, assessment of the bridge for the presence of, or evidence of use by, bats shall be completed by the MassDOT Wildlife Unit prior to continuing bridge work. The Contractor shall notify the MassDOT Wildlife Unit no later than fourteen (14) days prior to December 12, 2026 to provide adequate time for inspection. If bats are found to be present, or, if there is evidence of bat usage, work at the bridge shall not commence until after the MassDOT Wildlife Unit has completed coordination with the US Fish and Wildlife Service to determine the appropriate follow up or mitigation actions.

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

      b. meets 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. shows 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.

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.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

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.

ENVIRONMENTAL PERMITTING

The proposed work does occur in jurisdictional wetland resources subject to section 401 or section 404 of the Clean Water Act; therefore, the project does require a Water Quality Certification from the Massachusetts Department of Environmental Protection or authorization from the US Army Corps of Engineers. The proposed work qualifies for the bridge exemption authorized in the Transportation Bond Bill and is therefore not subject to the Massachusetts Wetlands Protection Act, the Massachusetts Public Waterfront Act (Chapter 91), or the Massachusetts Environmental Policy Act.

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 5 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 5 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.

The Massachusetts Department of Environmental Protection (MADEP) Water Quality Certification (WQC) has additional requirements for the Contractor before, during, and after construction, including but not limited to, additional construction oversight and submittals. The Contractor shall familiarize themselves with the additional MADEP requirements in the provided WQC documentation.

ENVIRONMENTAL PERMITTING (Continued)

Below is a summary of the MADEP WQC Pre-Construction submittal requirements:

Required Submittal	Due
USACE Work-Start Notification Form	14 days prior to start of work
Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan (CP/PP)	14 days prior to start of work
Verification of (CP/PP) Training	Prior to start of work
Control of Water Plan	14 days prior to start of work
Flood Contingency Plan	Prior to start of work within 100-year flood zone
Invasive Plant Management Strategy	Prior to Pre-Construction Meeting
Dredge Material Dewatering Plan	21 days prior to start of dredge activities
Dredged Sediment Sampling Data & LSP Determination	Prior to transport of material

The Contractor shall provide these submittals for MADEP review and approval before related construction activities begin.

Dredged sediment shall be sampled to determine the suitability for reuse or if offsite disposal is required. Sampling data including sampling methods and laboratory QA/QC data shall be provided to MassDEP within 48 hours once available from the analytical laboratory for review. Results of the chemical analysis shall be compared to the reuse levels in Policy COMM-97-001-Reuse and Disposal of Contaminated Soil at Massachusetts Landfills for reuse as landfill daily cover and to the Massachusetts Contingency Plan (MCP) RCS-1 criteria. The Licensed Site Professional (LSP) will review the data to determine if the sediment exceeds these criteria and requires disposal at an out-of-state facility within ten calendar days. The data and LSP determination shall be submitted to MassDEP prior to transportation of this material.

MassDOT Environmental Services will provide an Environmental Monitor (EM) and Fish Passage Engineer (FPE) to provide a pre-construction meeting, on-site oversight during construction, and assistance during construction to ensure the proposed project is constructed as shown on the Plans, as required by these Special Provisions and in accordance with permit requirements.

At least 30 days prior to the commencement of construction, the Contractor shall coordinate with David Paulson (MassDOT Wildlife Unit Supervisor, (508) 389-6366 / david.j.paulson@state.ma.us) to set up an (virtual or in person) pre-construction meeting with MassDOT's EM, FPE, and Resident Engineer (RE). At this meeting, the EM and FPE will provide an overview of the work that they will be providing oversight and inspection. The Contractor should be prepared to discuss the anticipated means, methods, and schedule of the work, highlighting work that will impact vegetated wetlands and in-water operations, as well as the fish ladder decommissioning and construction, and streambed restoration.

ENVIRONMENTAL PERMITTING (Continued)

The EM and FPE with the RE will provide inspection during activities as required in the approved permits and discussed at the pre-construction meeting. The project must be habitable by fish and other aquatic organisms during and following construction to receive final approval from the RE, EM and FPE. The project will be monitored throughout construction to ensure that aquatic migration and habitats are maintained to limit the disruption to wildlife through coordination between the Contractor and MassDOT Environmental Services staff and representatives. After the completion of these construction activities, the EM, FPE and RE will provide final inspection of the structures and areas of the site to ensure they meet the standards outlined in the plans, specifications, and permits. The Contractor shall address any issues found during the construction oversight and the final inspection to meet the requirements of the permits and construction documents.

NOTIFICATION OF FUNDING SOURCES FOR WORK TO BE PAID BY OTHERS

This contract contains work that shall be paid by the ***City and/ or Town of Wareham or by another entity (public/ or private)*.*** The said ***City and/ or Town or entity*** shall be responsible for construction costs associated with a Non-Participating Agreement with MassDOT.

ITEM 100.4 STORAGE FACILITY OR BUILDING LUMP SUM

The Work under this Item shall conform to the relevant provisions of the Standard Specifications and these Special Provisions, and the Massachusetts Building Code 780 CMR.

This Item shall include all materials, equipment, and labor needed to construct the complete proposed timber framed storage building, which includes the following: excavation, earthen and stone fill materials, reinforced concrete foundation and slab, timber framing for walls and roof, concrete anchors, timber fasteners and ties, roofing and siding materials, vinyl trim, vents, gutters and downspouts, garage door, and steel exterior door.

MATERIALS

Timber

All timber products shall meet the requirements of the Standard Specification Sections M9.05.1 and M9.05.5.

Building Envelope

The roof shall be covered with architectural asphalt shingles over roofing felt. The shingles shall be a dark gray color.

The siding for the structure shall be white cedar shingles. All trim and molding required for doors, corners, soffits, and fasciae shall be brown vinyl.

The gutters shall be 5-inch K-Style brown aluminum. Downspouts shall be 3-inch by 4-inch brown aluminum.

Concrete

The concrete shall meet the requirements of Section M4 of the Standard Specifications.

Doors

The garage door shall be uninsulated steel, painted white. A ½ HP garage door opener with keypad shall be installed to operate the garage door.

The exterior entry door shall be steel and painted white with PVC jambs. The door shall be double bored, and a dead bolt and locking handle shall be installed following installation of the door.

ITEM 100.4 (Continued)

SUBMITTALS

The Contractor shall submit roof truss plans and design calculations to the Engineer for review and approval prior to fabrication of the trusses. The calculations and plans shall be stamped by a Professional Engineer licensed in the Commonwealth of Massachusetts. The Contractor shall also submit information about the timber ties and anchors connecting timber components for review and approval of the Engineer.

BASIS OF PAYMENT

Item 100.4 will be paid for at the Contract unit price per LUMP SUM which price shall include full compensation for all labor, tools, equipment, materials, testing, loading, delivery, transportation, storage, approvals, and permits required to complete the work.

ITEM 102.2 TREE TRIMMING LUMP SUM

Work to be done shall conform to the relevant provisions of Section 101 of the Standard Specifications. The work consists of removing all dead, dying, broken and certain other limbs and branches as described hereinafter and the removal of all stubs of limbs and branches from all designated trees located within the limits of the State Highway in this contract and the satisfactory disposal of all such removed debris.

All pruning and tree work shall be in conformance with the most current version of the American National Standards Institute (ANSI) Standard Z-133.1 and A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance.

All work under this item will be performed or supervised by the Massachusetts Certified Arborist.

Contractor shall be required to provide a crew, consisting of a bucket truck with operator and grounds man for pruning and removal. The minimum crew shall consist of the following: a supervisor and three tree-trimmers/laborers. The crew shall be equipped with all necessary equipment needed to complete the work including, but not limited to, pickup trucks, chippers, gas powered chain saws, hand saws, loppers, shears, pruners, branch trimmers, ladders, tree-climbing equipment, etc. Fuel for equipment shall also be considered incidental to this item.

SUBMITTALS

Prior to start of work, the Contractor shall submit to the Engineer the name, certification number and resume of the Massachusetts Certified Arborist referenced herein. Cost for Certified Arborist for all activities pertaining to these Items shall be incidental to this item.

Incidental to this item, the Contractor shall provide to the Engineer one (1) copy of the most current version 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.

DECSCRIPTION OF WORK

TREE: Shall be defined as having a diameter of 4 inches or over, measured at a point 3 feet above the average ground.

LIMBS AND BRANCHES: Shall be defined as wood having a diameter of ½ inch or over and wood that has a diameter of less than ½ inch shall be considered a TWIG.

A DYING LIMB OR BRANCH: May have live growth at some point, but shall be removed if found to be in an unhealthy condition.

While it is not the intent that every dead, dying and/or broken twig be removed from trees requiring trimming, the tree worker will be required to remove all such twigs accessible in the areas of the tree in which he/she is working.

If directed by the Engineer, specific trees or parts thereof which are so located that damage may result from dropping shall be reduced by rope or cable lowering.

ITEM 102.2 (Continued)

Tree shaping may be required on trees, where up-branching done under this contract has distorted the natural symmetry of the tree. Tree shaping shall consist of the removal of limbs and branches from other locations of the tree where removal is desirable to restore natural symmetry.

All sucker growth on all tree trunks within the limits of the contract shall be removed from the ground level to the beginning of the main branch system.

Any and all branches extending directly below a street luminaire as to limit the light reaching the street or path/sidewalk surfaces shall be removed and all branches shall be cut back to afford a minimum of 5 foot clearance on all sides of the luminaire. The path/sidewalk surface shall be considered as the area from the edge of the roadway surface to the edge of the path/sidewalk surface farthest from the roadway.

Recognized tree surgery practices direct that all limbs and branches which require removal and all stubs regardless of age be cut NEARLY flush, either to a union with the next larger sound limb, or branch, or NEARLY flush to the trunk of the tree.

By cutting NEARLY, but not quite, flush with the trunk, limb or branch, the "collar" is left at the top of the wound (in the crotch of the union). This will permit the callus growth to cover the wound in a shorter period of time.

BASIS OF PAYMENT

This work will be paid for at the contract unit price per LUMP SUM, which price shall include full compensation for all labor, materials, equipment, apparatus, tools and all incidental cost required to complete the work.

ITEM 102.3 HERBICIDE TREATMENT OF INVASIVE PLANTS HOUR

This work must be performed by persons who meet the qualifications below and are approved by the Landscape Design Section.

Work under this item consists of herbicide treatment of invasive plants currently existing within the project limits and as directed. An Invasive Plant Management Strategy (IPMS) shall be submitted to the Engineer for review and approval and the IPMS shall be implemented on-site. The IPMS shall be written and submitted per Item 102.33 Invasive Plant Management Strategy and shall be measured and paid for under that Item.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation items.

Payment is per hour on-site and there shall be compensation for a minimum crew of 2 licensed applicators, 2 back-pack sprayers and mist-blowers, a properly equipped spray truck with spray hoses, and a tank with sufficient capacity for a full day of work. If there is only one applicator, hourly payment shall be adjusted to 50 percent of the unit price.

Date and time stamped photos indicating start and stop time of work must be submitted if requested.

This item is not intended for manual removal of plants.

Management of plants determined to have been introduced to the site via imported loam, compost, mulch, plants, equipment, or other construction activities will be the Contractor's responsibility and at the Contractor's expense.

Herbicide should be applied during daytime hours only.

Measures to prevent the introduction of invasive plant species to the site and to address introduction due to construction-related activities shall be covered under the Standard Specifications, Division I - Subsections 7.01(D) Plant Pest Control and 7.13 Protection and Restoration of Property as amended in these Special Provisions

The definition of invasive plant species shall be as described by Massachusetts Invasive Plant Advisory Group (MIPAG): "non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems."

ITEM 102.3 (Continued)

Control of invasive plants shall begin immediately with the initiation of construction activities and prior to any clearing or site disturbance. Treatment areas shall include stockpile locations and may, upon approval of the Engineer, extend outside the project limit. Treatment shall be done each consecutive year for the duration of the contract unless specified otherwise in the IMPS or unless directed otherwise by the MassDOT invasive species contact. Work shall be done during the growing season from May – October unless otherwise specified in the IPMS.

Areas identified for vegetation control measures shall be as shown on the plans and as determined in the field by the Engineer and a MassDOT Landscape Architect. Contact at MassDOT Landscape Design Section may be contacted at: tara.mitchell@dot.state.ma.us.

QUALIFICATIONS

The applicators shall submit and meet the qualifications outlined below. A list of contractors specializing in invasive management and approved by MassDOT Landscape Design Section is available on the following website: https://www.mass.gov/lists/landscape-design-and-roadside-maintenance under Invasive Plant Management.

Requirements

1. Company must provide proof of qualifications by providing the following:
    a. Narrative describing the company, its expertise and experience with invasive plant control.
    b. Demonstrate experience with herbicide treatment as part of restorations and in sensitive areas.
    c. Describe the company's technical qualifications and past performance.

2. Company must meet licensing requirements:
    a. All crew applicators must have a Massachusetts Commercial Applicator License (CORE).
    b. At least one or more applicators must have a ROW certification, if required for work.
    c. The company must provide name(s) of applicator(s) and Applicator License/Certification number for all contractor crew leaders working on the project.
    d. The company must provide documentation of any warnings, penalties or fines received in the last three (3) years.
3. Company must provide proof of experience with invasive plant control and include following:
    a. At least five (5) references from prior invasive plant control work completed in last five (5) years. Provide contact information including address, phone number and email.
    b. Provide a summary of each of these projects including nature of the problem, specific invasive vegetation treated, dates and period of treatment, methodologies used, and summary of success or not in terms of meeting performance objectives. Include a summary of equipment used.
    c. Photo documentation of these projects.
    d. GPS coordinates project locations, if available.

ITEM 102.3 (Continued)

4. Crew leader must have expertise with invasive plant control and provide the following:
   a. Have held Core license for at least five (5) years.
   b. Resume listing five (5) or more years of experience applying pesticides with the company or with another company specializing in vegetation management.

SUBMITTALS

No work shall begin without approval of the submittals.

Submittals include the following items:

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to proposed treatment the IPMS shall be submitted for approval by the Engineer and MassDOT Landscape Architect. All chemicals, methods and work done under this item shall be consistent with the IPMS. The IPMS shall be as described under Item 102.33.

Herbicide Use Report

Within two (2) weeks after each application, the Contractor shall provide to the Engineer and the MassDOT Landscape Architect a completed and signed MassDOT Herbicide Use Report.

Photo Documentation

Digital photos with date and time of herbicide application work, showing start time and completion time, are required and must be submitted for measurement of payment upon request.

MATERIALS

All proposed herbicides shall be as approved in the IPMS. Herbicides shall be labeled for the method of treatment and shall meet all federal, state and local regulation requirements. Application rates will depend on herbicide proposed and shall be per the manufacturer's label for specific application.

METHODS

All methods used shall be as approved in the IPMS which shall be determined during the Initial Site Walk as described under Item 102.33 Invasive Plant Management Strategy.

The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

ITEM 102.3 (Continued)

The Contractor shall notify the Engineer a minimum of 3 days prior to date of expected herbicide application. Applicators shall notify the Engineer upon arriving on-site and upon leaving the site.

Herbicide Applications

All herbicide application shall conform to Massachusetts Pesticide Laws and Regulations per the Massachusetts Department of Agricultural Resources (MDAR) Pesticide Bureau.

Mixing, applying and/or disposing of herbicides shall always be in accordance with instructions on their labels and all applicable federal, state, and local regulations. Mixing shall not occur within sensitive areas, wetlands, or buffer zones.

Contractor shall not spray 2 hours prior to precipitation, during rain, or during windy conditions. The Contractor shall be responsible for monitoring weather conditions and adjusting the work schedule as appropriate for the herbicide and application method to be used.

Targeted vegetation shall be identified and marked prior to treatment. Plants treated by foliar spray, injection or glove application or other methods that leave standing vegetation, as opposed to cut-stump application, shall remain clearly marked for identification through the contract period.

Desirable vegetation shall be protected from both spray and other physical damage.

The contractor is responsible for any damage to vegetation not designated for removal or treatment. The damaged vegetation shall be restored. Cost of replacement plants and/or restoration shall be borne by the Contractor.

The contractor shall ensure that the public does not enter a work area while herbicide application or spraying is underway.

Disposal Of Invasive Plant Material

All material to be cleared shall become the property of the Contractor. The satisfactory disposal of all cleared plant material (seeds, roots, woody vegetation, associated soils, etc.) shall be the Contractor's responsibility.

The Contractor shall take measures to prevent viable plant material from leading to further infestations (seeds, roots, woody material, etc.) while stockpiled, in transit, or at final disposal locations. All precautions shall be taken to avoid contamination of natural landscapes with invasive plants or invasive plant material.

Chipping, shredding, or on-site burning of plant material must be approved by the Engineer and included in the IMPS.

For plant material taken to an incinerating facility per the IPMS, receipt from that facility shall be submitted to the Engineer as proof of disposal.

ITEM 102.3 (Continued)

Where feasible, it is preferable to dispose of plants on-site or to bury them on-site with on-going monitoring for re-sprouting. Disposal locations and methods must be approved and included in the IPMS. Site work such as grading and seeding to stabilize and restore disposal area shall be incidental to this item.

The Contractor shall be responsible for treating or otherwise managing areas of re-growth due to improper disposal. Treatment shall be at the Contractor's expense.

Follow-Up Treatment

Plants and areas shall be re-treated as necessary and as appropriate to the time of year. Treatment shall be for the duration of the contract and per the IPMS.

MEASURE OF SUCCESS

The expectation is a minimum of 85-95 percent control achieved after the first treatment, depending on plants targeted and extent of population, and based on the expectations laid out in the IPMS. The expectation for the contract duration is 95-100% eradication by the end of the treatment period, unless otherwise specified in the IPMS.

METHOD OF MEASUREMENT

Item 102.3 will be measured for payment by the Hour of verified crew time spent on the project doing herbicide application as and where specified herein and in the IPMS. A crew shall be defined as a minimum of two licensed applicators each equipped with (at minimum) back-pack sprayer and mist blower. The crew shall also have a properly equipped spray truck with hoses and a tank with sufficient capacity for a full day of work.

BASIS OF PAYMENT

Item 102.3 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work.

Payment will be based upon verified time spent on the project doing herbicide application as and where specified in the IPMS and upon receipt and approval of submittals. Payment will not include travel time to and from the Contractor's place of business and nor time for investigative field trips.

If there is only one applicator, hourly payment shall be adjusted to 50 percent of the unit price.

The Invasive Plant Management Strategy will be paid for under Item 102.33

ITEM 102.33 INVASIVE PLANT MANAGEMENT STRATEGY HOUR

This item consists of providing an Invasive Plant Management Strategy (IPMS) for the control of invasive plants currently existing on the project site and/or as directed and shall be coordinated with Item 102.3 Herbicide Treatment of Invasive Plants. Unless otherwise approved, the IPMS shall be submitted in the form of the MassDOT Invasive Plant Management Strategy Report Form.

The IPMS shall be submitted for review and approval by the MassDOT Landscape Design Section or their representative, and the IPMS shall be implemented on-site.

The Invasive Plant Management Strategy Report Form is available online at https://www.mass.gov/lists/landscape-design-and-roadside-maintenance under Invasive Plant Management.

Herbicide treatment for invasive plants shall be as described under Item 102.3 Herbicide Treatment of Invasive Plants and shall be compensated per that Item.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation as relevant to the project.

Individual attending the site walk and determining the Invasive Plant Management Strategy must demonstrate expertise with vegetation management and invasive plant control and submit qualifications as described below.

QUALIFICATIONS

Individuals shall be from the same company as that providing services for Item 102.3 Herbicide Treatment of Invasive Plants and shall submit the following, if not submitted under Item 102.3:

- Submit copy of current Core license.
- Submit a resume listing five (5) or more years of experience managing invasive plants with a company specializing in vegetation management.
- References shall be submitted if requested.

SUBMITTALS

Task Summary & Reports

For measurement of payment, the contractor shall submit the total sum and a breakdown of hours for the tasks performed. At a minimum, the tasks shall include the Initial Site Walk, submittal of an approved IPMS, and if requested to accommodate project or site changes, a Follow-up Site Inspection and accompanying IPMS Amendment.

ITEM 102.33 (Continued)

Interim Site Monitoring Reports and/or a Final Report shall be submitted if requested by the MassDOT Landscape Design contact. The MassDOT Landscape Design contact must be notified to attend the site inspection walk when an Interim or Final Report has been requested.

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to construction activities and/or any proposed treatment, the contractor shall submit the IPMS for approval by the Engineer and MassDOT Landscape Architect. All chemicals and methods proposed shall be consistent with the applicable Massachusetts Wetlands Protection Act Order of Conditions.

The IPMS shall be completed in coordination with the Prime Contractor and the Engineer and shall include the following as appropriate and applicable to the project and to the IPMS Report Form questions and Guidance:

I. **Project Information**
   a. Company writing the IPMS and performing the herbicide application.
   b. Date of site walk
   c. Attendees at site walk
   d. Expected end date of contract and expected last treatment (month/season)

II. **Brief Description of Conditions**
   a. Provide a free-hand sketch on construction plans or aerial image showing species, location, and as relevant, show or note extent of population as relevant to Strategy (i.e., population extends off ROW preventing eradication, small population and eradication deemed feasible within contract schedule, etc.).

III. **Coordination with Roadway Contractor regarding other work**
   a. Tree Work: Note coordination to be implemented with tree removal, clearing, and clearing and grubbing as applicable to the project.
   b. Wetland Mitigation - Include management proposed for wetland mitigation areas in the IPMS, if and as required.
   c. Planting: If there will be planting in areas proposed for treatment, propose treatment and schedule to avoid herbicide damage to plants.
   d. Mowing: If coordination is required with state mowers, note need in IPMS.

IV. **Soil Management**
   a. Provide specifics on how soil with invasive plant roots (in particular) or seeds will be handled (i.e., separate stockpiles, plant material will be buried on-site, re-used on-site, disposed off-site and if so, where?).
   b. Show stockpile locations on plan and include treatment schedule.
   c. Note measures that will be implemented to avoid spread through equipment, including how and where equipment will be cleaned.

ITEM 102.33 (Continued)

V. **Invasive Plant Treatment & Management**

a. Proposed chemical and methods of treatment for each species or area.
b. Time of treatment based on target plant species.
c. Submit product label including application methods and rates (entire MSDS information need not be submitted if available online).
d. Proposed performance metrics or measure of treatment success if different from that specified under Item 102.3.
e. Method for disposing invasive plant material. This includes material that may result in spread (i.e., seeds, roots) and material that has been treated and/or is not viable (foliage, dead wood, etc.). Methods may include grinding in place, stockpiling and treating, and incinerating offsite.
f. Expected follow-up treatment for duration of contract.

VI. **Monitoring Schedule** if requested by MassDOT.

Note: The IPMS is critical for identifying pre-construction conditions as well as strategies for minimizing import or spread of invasive plants. Failure to provide an approved IPMS may jeopardize this item, in which case, the contractor will be responsible for management of invasive plants found on-site at no cost to the contract.

Photo Documentation

Digital photos of site conditions, typical species, and extent of infestation must be provided with the IPMS and with any follow-up monitoring or reporting. Photos of follow-up monitoring and reporting must be date and time stamped for acceptance.

METHODS

Initial Site Walk

Prior to any construction activities and soil disturbance, the Contractor shall walk the site with the Engineer and the MassDOT Landscape Architect to determine the IPMS. During the site walk the Contractor shall identify limits of work and, as necessary, mark locations of areas designated for treatment and individual plants targeted for treatment or removal. The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

IPMS Follow-up Amendment

The IPMS may be amended to address additional concerns or adjust to conditions if required by the MassDOT Landscape Architect. The amended IPMS shall be submitted to the Engineer and MassDOT Landscape Architect for approval at least fourteen (14) days prior to any proposed treatment.

ITEM 102.33 (Continued)

Interim Site Monitoring Inspection Reports

If required by the MassDOT Landscape Architect and Engineer, Interim Site Monitoring and an accompanying report shall be conducted. Interim Reports must include time and date stamped photos showing treated locations and species.

Final Inspection

A final inspection and report documenting the status of the invasive control may be required for regulatory purposes or for instances where control will be continued by others. The report shall include photo documentation of pre-construction (existing) and post-treatment conditions, notations on a plan or aerial image of area treated, summary of treatment performed, and control achieved. Final reports submittal must include time and date stamped photos.

METHOD OF MEASUREMENT

Item 102.33 will be measured for payment by the Hour. The basis for measurement shall be per the completion of tasks as approved under the Task Summary submittal and acceptance of submittals and photos described above.

BASIS OF PAYMENT

Item 102.33 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work. Payment shall not include travel time to and from the Contractor's place of business.

ITEM 102.511 TREE PROTECTION – ARMORING & PRUNING EACH

The work under this item shall conform to the relevant provisions of Sections 771 of the Standard Specifications and the following:

Tree protection – armoring and pruning shall be used for instances where construction activity (the use of heavy equipment), comes within proximity to potentially damage tree trunk(s) or limbs.

The work shall include the furnishing and installing of temporary tree trunk protection, minor limb pruning, or removal of lower tree limbs to prevent injury to the tree from construction equipment and activities; as shown on the Drawings; and/or as required by the Engineer.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the latest edition of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and

Other Woody Plant Maintenance: Part 1-Pruning and Part 5-Construction Management Standard. Provision of reference shall be incidental to this item.

MATERIALS

Trunk armoring should be such that it prevents damage to the trunk from construction equipment. Material used for trunk armoring or mounting shall be such that installation and removal shall not damage the trunk.

Acceptable trunk armoring materials shall include two by four (2x4) wood cladding, mounted with wire or metal strapping, or when duration of construction activities is less than three months, slotted corrugated plastic pipe, mounted with duct tape. Eight (8) once untreated burlap shall be used to wrap the tree trunk prior to installation of cladding.

Alternative armoring methods or materials may be acceptable if approved by the Engineer.

The height of tree trunk cladding shall be measured from the base of the tree (including root flare) to the bottom of the first branch, or to a height of eight (8) feet, or as may be required by the Engineer.

METHODS OF WORK

Prior to construction activities, the Engineer, Contractor, and the Arborist (if item is included in the contract), shall review trees noted on the Drawings to be protected. Final decision and selection of trees to be armored and/or pruned shall be per the Engineer.

Care shall be taken to avoid damage to the bark during installation and removal of armoring. Trunk armoring shall be maintained such that it is effective for as long as required or replaced when materials are found to be damaged or ineffective, as determined by the Engineer. Replacement, if required, shall be incidental to the work. Armoring shall be removed immediately upon completion of work activities adjacent to the protected tree(s).

ITEM 102.511 (Continued)

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

DAMAGES OR LOSS

If trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense, secure the services of an Arborist, described in Item 102.55. The Arborist shall be approved by MassDOT.

If, based on the recommendation of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury; soil compaction remediation; pruning; soil injection fertilization; and/or watering; the damage shall be repaired as soon as possible, within the appropriate season for such work and according to industry standards.

If, based on the recommendation of the Arborist, the Engineer determines that damages are irreparable, or that the damages are such that the tree is sufficiently compromised to pose a future safety hazard, the tree shall be removed. Tree removal shall include cleanup of all wood, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil. Such tree removal(s), grinding, debris removal, and topsoil filling, shall be at the Contractor's expense.

Tree removal from improper or inadequate tree protection shall result in the Engineer assessing the Contractor monetary damages consistent with industry standards for assessed value and/or replacement.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.511 will be measured and paid at the contract unit price per EACH tree to be armored and pruned. This will include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract or as required by the Engineer.

Payment for work under this item will be scheduled as follows:

- 40% of the value shall be paid upon installation of trunk armoring and completion of pruning work, if required.

- 60% of the value shall be paid at the end of construction operations that would potentially damage the tree and after protection materials have been removed and properly disposed of by the Contractor. In the event of repairable damage, payment shall be made after the completion of remediation measures.

No separate payment will be made for costs of remedial actions, including Arborist services, tree removal, but all costs in connection therewith shall be included in the Contract unit price bid.

Tree damages assessed, due to lack of or improper tree and plant protective measures being taken, shall be deducted from the contract price of the work.

ITEM 102.522 TREE AND PLAN PROTECTION FENCE- CHAIN LINK FOOT

The work under this Item shall conform to the relevant provisions of Sections 644 and 771 of the Standard Specifications and the following:

Work under this item shall consist of furnishing, installing, and maintaining vertical and stable chain link fence for tree and plant protection; removing and resetting fence(s) 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.

Chain link fencing for tree and plant protection shall remain in place for the duration of the construction activities, unless otherwise required by the Engineer.

MATERIALS

Chain link fence for tree and plant protection shall be six (6) foot tall metal chain-link, set-in metal frame panels on movable core drilled concrete blocks of sufficient size to hold the fence erect. Panels should be such that they create a barrier to encompass the entire TPPZ or root zone area, to the extent possible.

Unless otherwise indicated, the following types of chain link fence are acceptable:

- New materials or previously used salvaged chain link fencing in good condition, subject to inspection and approval by the Engineer.
- Posts: Galvanized steel pipe of diameter to provide rigidity.
- Fabric: Woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.

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 for construction areas, staging areas, and stockpile areas as shown on the plans, or as required by the Engineer, to establish the TPPZ.

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 102.522 (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 as shown on the plans and details. The drip Line is defined as the limit of tree canopy.

The Contractor shall not engage in any construction activity within the TPPZ without the approval of the Engineer, including operating, moving or storing equipment; storing supplies or materials; 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 panels, posts, and anchoring materials, 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-inch depth of wood chips or approved matting for root protection, pruning of branches, and/or trunk protection. These protection measures will be paid under applicable items.

Landscaping work specified within the TPPZ shall be accomplished by hand tools. In the event that handwork is not feasible, work shall be conducted with the smallest mechanized equipment necessary to do the work, with permission of the Engineer.

TREE AND PLANT DAMAGES 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) to secure the area. Costs of furnishing and installing additional or more durable barrier(s) shall be borne by the Contractor.

In such cases of encroachment, soils shall be considered compacted and tree root damage will be assumed. Action shall be taken as specified below.

ITEM 102.522 (Continued)

In the event that trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense, secure the services of an Arborist, described under Item 102.55. The Arborist shall be approved by MassDOT.

In the event of spills, compaction or damage, 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 damages can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering; the damage shall be repaired as soon as possible, within the appropriate season for such work, and according to industry standards.

If the recommendation determines that damages are irreparable, or that the damages are such that the tree is sufficiently compromised to pose a future safety hazard, the tree shall be removed. Tree removal shall include cleanup of all wood, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil. Such removal(s) and related activities 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 in the amount based upon industry standards per diameter inch at breast height (DBH) per tree.

Shrubs removals from improper or inadequate protection of the TPPZ shall be replaced with plants of similar species and equal size or the largest size plants reasonably available. The Engineer shall approve the size, quality, and quantity of the replacement plant(s). Each replacement shall include a minimum of one year of watering and establishment care, specified under Section 771.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.522 Tree and Plant Protection Fence–Chain Link will be measured and paid for payment by the FOOT, complete in place.

This will include all labor, materials, equipment, maintenance, resetting, final removal/disposal of the protective fence(s), damage repair, and all incidental costs required to complete the work.

ITEM 102.522 (Continued)

Payment for work under this item will be 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 removed and disposed of off-site.

No separate payment will be made for costs of remedial actions, including addition of more durable barriers, Arborist services, tree or plant removal, shrub replacement and establishment, but all costs in connection therewith shall be included in the Contract unit price bid.

Tree damages assessed, due to lack of or improper tree and plant protective measures being taken, shall be deducted from the contract price of the work

ITEM 107.94 STEEL GRATING FOR WALK SQUARE FOOT
ITEM 107.941 ALUMINUM GRATING FOR WALK SQUARE FOOT

The work under this Item includes the procurement and complete installation of the grating at the Low-Level Outlet Chamber, Fish Ladder Exit and eel ramp, including the mounting hardware and concrete anchors.

The grating shall be designed for a minimum uniform load of 300 lb./sf and a maximum deflection of ½ inch for the spans and configurations shown on the Plans. The top of the grating shall be serrated. Steel grating shall be galvanized. The Contractor shall verify all dimensions prior to fabrication and installation of the grating components.

QUALITY ASSURANCE

All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 10 years of experience designing and manufacturing galvanized steel grating.

The Contractor shall warrantee all components for a period of 2 years after project completion.

SUBMITTALS

The Contractor shall submit Shop Drawings that include the following:

1. Complete description in sufficient detail to permit item by item comparison with the Contract Documents.
2. Dimensions.
3. Weights.
4. Capacity.
5. Maximum support reactions.
6. Performance characteristics.
7. Layout drawing for all equipment showing installation details.
8. Deviations from Drawings and Specifications.
9. Manufacturer's installation instructions.
10. Affidavits of compliance with referenced standard and codes.
11. Manufacturer's standard guarantee.

MATERIALS

The grating shall meet all applicable requirements of section M7 and M8 for the 2026 Edition of the Massachusetts Department of Transportation Standard Specifications.

STORAGE, HANDLING, AND DELIVERY

Damage present on the grating or components upon delivery from the Manufacturer shall immediately be documented with each the Engineer and Manufacturer upon the State's receipt of the grating. Damage to the grating prior to release to the State shall immediately be repaired by the Manufacturer at the Manufacturer's sole expense in accordance with Manufacturer standard repair recommendations and procedures.

ITEMS 107.94 AND 107.941 (Continued)

Upon receiving the grating, the Contractor will be responsible for protecting the grating and its components from damage. Damage to the grating after the Contractor has taken delivery of the grating shall be repaired at the Contractor's sole expense in accordance with Manufacturer repair recommendations and procedures.

The grating and components shall be stored in such a way to prevent any damage and weathering to the structure and components of the grating. The grating shall be stored at a secure location to prevent theft and/or vandalism.

The grating shall be picked in accordance with the manufacturer's recommendations. Equipment used to move the grating shall be adequately sized and capable of lifting the stated loads without damaging the grating.

The grating shall only be delivered to the site when the Contractor is ready to install the grating as shown on the attached plans. The grating will not be allowed to stay on-site overnight without being installed unless it is stored in a secure enclosure.

INSTALLATION

Installation of the grating and appurtenances shall be done in a workmanlike manner. It shall be the responsibility of the Contractor to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's recommendations.

The Contractor shall review the installation drawings and installation instruction prior to installing the grating.

METHOD OF MEASUREMENT

Items 107.94 and 107.941 will be measure for payment per square foot.

BASIS OF PAYMENT

Items 107.94 and 107.941 will be paid for respectively at the Contract unit price per SQUARE FOOT which price shall include full compensation for all labor, tools, equipment, materials, testing, loading, delivery, delivery, transportation, storage, approvals, and permits and all incidental costs required to complete the work.

ITEM 107.99 ALUMINUM SLIDE GATES LUMP SUM

The work under this Item includes the procurement, complete installation, and testing of the proposed aluminum slide gates at the Low-Level Outlet Chamber and Fish Ladder Exit, including the gates, frames, stems, mounting hardware and manual gate operators as shown on the plans. The gates shall be configured for manual operation via removable hand cranks.

The low-level outlet gate is a non-self-contained system and is to be installed on the upstream face of the new concrete walls at the low-level outlet intake and fish ladder exit. The gate at the Low-Level Outlet chamber shall have an embedded wall mount. The gates and appurtenances shall be installed in accordance with the latest edition of AWWA C561 as modified herein. The allowable leakage rate for the Aluminum slide gates in this specification shall be in accordance with the allowable leakage listed in the latest revision of American Water Work Association C561.

The Contractor shall verify all dimensions prior to installation of the gate components.

The gates and appurtenances shall be installed in accordance with the latest edition of AWWA C561 as modified herein. The allowable leakage rate for the Aluminum slide gates in this specification shall be in accordance with the allowable leakage listed in the latest revision of American Water Work Association C561.

QUALITY ASSURANCE

All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 10 years of experience designing and manufacturing water control gates. The manufacturer shall have manufactured water control gates for a minimum of 100 projects.

The Contractor shall warrantee all system components for a period of 2 years after project completion.

The slide gates system shall comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1.ASTM A276, stainless and heat-resisting steel bars and shapes.
2. ASTM B209, aluminum sheet and plate.
3. ASTM B221 and B308, aluminum extruded shapes.
4. ASTM B584, copper alloy and sand castings for general application.
5. ASTM D4020, U.H.M.W. polyethylene molding and extrusion material.
6. ASTM D2000, standard classification system for rubber products in automotive applications.
7. ASTM B26, aluminum alloy sand castings.

SUBMITTALS

The Contractor shall submit Shop Drawings showing the following:

ITEM 107.99 (Continued)

1. Complete description in sufficient detail to permit item by item comparison with the Contract Documents.
2. Dimensions.
3. Weights.
4. Capacity.
5. Maximum support reactions.
6. Performance characteristics.
7. Layout drawing for all equipment showing installation details.
8. Deviations from Drawings and Specifications.
9. Manufacturer's installation and testing instructions.
10. Affidavits of compliance with referenced standard and codes.
11. Manufacturer's standard guarantee.

The Contractor shall provide Operations and Maintenance Manuals furnished by the manufacturer of the slide gate system.

1. Required Operation Data:
   a. Complete, detailed operating instructions for each piece of equipment.
   b. Explanations of all safety considerations relating to operation.
2. Required Maintenance Data:
   a. Include all the information and instructions required to keep equipment properly lubricated and adjusted so that it functions economically throughout its full design life.
   b. Explanation with illustrations as necessary for each maintenance task.
   c. Recommended spare parts list.
   d. Recommended schedule of maintenance tasks.
   e. Lubrication charts and table of alternate lubricants.
   f. Troubleshooting instructions.
   g. List of special maintenance tools and equipment.
   h. Name, address and phone number of manufacturer and manufacture's local service.
   i. Include copies of all approved Shop Drawings.

MATERIALS

ALUMINUM SLIDE GATE

A. General:
   1. Gate Assembly:
      a. Type: Non-self-contained gate with manual hand crank operators, unless otherwise specified.
      b. Leakage not to exceed AWWA C561 Standard latest edition during normal loading conditions. During usual loading conditions (seating head), shop tested leakage shall not exceed 0.025 gpm per foot of seal. Field leakage shall not exceed 0.05 gpm per each foot of seal perimeter.

ITEM 107.99 (Continued)

c. All structural components of the frame and slide shall be fabricated of aluminum having a minimum thickness of 1/4-inch and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.

d. Gates shall be designed such that the water pressure provides a "seating head" unless otherwise approved by the Engineer.The gate shall utilize self-adjusting seals. A gate that utilizes adjustable wedges, wedging devices or J-seals, P-seals are not acceptable.

d. All welds shall be performed by welders with American Welding Society certification.

2. Actuators:
   a. Gate shall be upward rising gate.
   b. Manual operating effort shall not exceed 40 lbs. when opening or closing the gate at maximum head.

3. Materials:

Components	Materials
Frame Guides, Yoke and Invert Member	6061-T6 Aluminum
Slide and Stiffeners	6061-T6 Aluminum
Stem	Stainless Steel, Type 304, ASTM A276
Anchor Studs, Fasteners and Nuts	Stainless Steel, Type 316, ASTM A276
Invert Seal	Neoprene ASTM D-2000 or EPDM
Seat/Seal and Facing	Ultra-High Molecular Weight Polyethylene ASTM D4020
Lift Nuts	Bronze ASTM B584
Pedestal	6061-T6 Aluminum, or Stainless Type 304L, ASTM A-276
Operator Housing	Cast aluminum or ductile iron

B. FRAME
   1. The frame guides, invert member and yoke members shall be constructed of extruded aluminum shapes with a minimum thickness of 1/4-inch.
      a. Frame design shall allow for embedded side mounting or side mounting directly to a wall with stainless steel anchor bolts and grout. Mounting style shall be as shown on the Contract Drawings.
      b. The frame guides shall have a minimum weight of 4 lbs. per foot of length for wall mounted and 3 lbs. per foot for embedded or in-channel mounted.
      c. The frame guides shall extend to accommodate the entire height of the slide when the slide is in the fully opened position on upward opening slide gates or downward opening weir gates.

ITEM 107.99 (Continued)

d.

e. A rigid extruded aluminum invert member shall be provided across the bottom of the opening. The invert member shall be of the flush-bottom type on upward opening gates and shall have a minimum weight of 4 lbs. per foot of length for wall mounted and 3 lbs. per foot for embedded or in-channel mounted.

f. Frames which are attached with epoxy anchor bolts shall be provided with bolts conforming with ICBO report 4285 regarding number of bolts, size, and placement.

g. The stainless-steel center support beam shall be designed and provided by the gate manufacturer.

h. Frames shall be in one piece, consisting of left and right guide, invert member and header member, all welded together for one piece framed construction and shipped with the slide gate in frame. Gate frames bolted together for field assembly will not be acceptable.

i. All support frameworks shall be stamped by a professional engineer registered in the Commonwealth of Massachusetts.

C. SEALS

1. Each gate shall be provided with a self-adjusting seal system to restrict leakage on all three sides of the gate in accordance with the requirements listed in this specification.
   a. Each gate shall be equipped with UHMW polyethylene seat/seals to restrict leakage and to prevent metal to metal contact between the frame and slide.
   b. The seat/seals shall extend to accommodate the 1-1/2 x the height of the slide when the slide is in the fully closed or fully opened position.
   c. All upward opening gates shall be provided with a replaceable, resilient seal to seal the bottom portion of the gate. The seal shall be attached to the invert member of the frame or the bottom of the slide.
   d. All seals shall be attached to the frame within a dovetail slot.
   e. The seal system shall be durable and should be designed to accommodate high velocities and frequent cycling without loosening or suffering damage.
   f. The seals shall be mounted so as not to obstruct the water way opening.
   g. Gates that utilize rubber “J” seals or “P” seals are not acceptable.

ITEM 107.99 (Continued)

D. SLIDE
   1. The slide and reinforcing stiffeners shall be constructed of aluminum plate with a minimum thickness of 1/4-inch.
      a. The slide shall limit the maximum deflection to less than 1/360 of the span or 1/16 inch, whichever is smaller, and limit the maximum stress to 7500 PSI, under the maximum design head.
      b. The portion of the slide that engages the frame shall have a minimum material thickness of 1/2-inch.
      c. Reinforcing stiffeners shall be welded to the slide and mounted horizontally. Two vertical stiffeners shall be welded on the outside of the horizontal stiffeners for additional reinforcement.
      d. The stem connector shall be constructed of two angles or plates. The stem connector shall be welded to the slide. A minimum of two bolts shall connect the stem to the stem connector.

E. STEMS
   1. A threaded rising operating stem shall be utilized to connect the operating mechanism to the slide.
      a. The threaded portion of the stem shall have a minimum outside diameter of 1-1/2 inches. Stem extension pipes are not acceptable.
      b. The stem shall be constructed of solid stainless-steel bar for the entire length, the metal having a tensile strength of not less than 75,000 psi.
      c. The stem shall be 304 stainless steel.
      d. The stem shall be threaded to allow full travel of the slide unless the travel distance is otherwise shown in the Contract Drawings.
      e. Maximum L/R ratio for the unsupported part of the stem shall not exceed 200.
      f. The stem shall be designed to transmit in compression at least 2.5 times the output of the manual actuator with a 40 lb. effort or 1.43 times the stall thrust on electric motor actuators, using the Euler column formula.
      g. The stem shall be designed to withstand the tension load caused by the application of a 40 lb. effort on the operating wrench without exceeding 1/5 of the ultimate tensile strength of the stem material.
      h. The threaded portion of the stem shall have machine rolled threads of the full Acme type with a 16-microinch finish or better. Stub threads are not acceptable.
      i. Stems of more than one section shall be joined by stainless steel or bronze couplings. The coupling shall be bolted to the stems.
      j. A field adjusted threaded cast aluminum stop collar shall be provided on all stems with manual actuators to limit downward travel of the slide.

ITEM 107.99 (Continued)

STEM GUIDES

1. Providing integral frame mounted stem guides to limit the L/R ration of the operating stem to 200 or less.
2. Stem guide brackets shall be constructed of aluminum or stainless steel with a minimum thickness of 1/4-inch and shall be outfitted with UHMW or bronze bushings.
3. Stem guides shall be adjustable in two directions.

F. STEM COVERS

1. All rising stem gates shall be provided with clear lexan or butyrate stem covers
2. The stem covers shall be properly vented and closed at the top with a plastic cap.
3. The stem covers shall be provided with field mounted mylar travel indicator strips.

G. ANCHOR BOLTS

1. Provide adhesive anchors equal to Ramset/Red Head Epcon System or Hilti HIT System.
2. Provide anchor bolts of no less than ½" diameter.
3. Provide all anchor bolts with ample cross section to withstand the force created by operation of the gate.
4. Anchor bolts shall be provided by the gate manufacturer for mounting the gates and appurtenances.
   a. Quantity and location shall be determined by the gate manufacturer.
   b. If epoxy type anchor bolts are provided, the gate manufacturer shall provide the studs and nuts.
5. Install anchor bolts per manufacturer's instructions. PAINTING

1. All cast iron parts shall be shop coated with a high-grade primer, and the top coated with a high-grade black enamel finish.

H. MANUAL ACTUATORS

1. The actuators shall be as shown in the Contract Drawings, provided that the effort to operate does not exceed a 40 lb. pull when the gate is subjected to the maximum unbalanced head. If the effort exceeds a 40 lb. pull, a gearbox with sufficient gear ratio shall be supplied to reduce the effort to 40 lb. pull.
2. An arrow with the word "OPEN" shall be permanently attached or cast onto the operator to indicate the direction or rotation to open the gate.
3. Gearboxes shall be fully enclosed and shall have a cast aluminum or ductile iron housing.
   a. Gearboxes shall have either single or double gear reduction depending upon the lifting capacity required.
   b. Gearboxes shall be provided with a threaded cast bronze lift nut to engage the operating stem.
   c. Bearings shall be provided above and below the flange on the operating nut to support both opening and closing thrusts.
   d. Gears shall be steel with machined cut teeth designed for smooth operation.
   e. The pinion shaft shall be stainless steel and shall be supported on ball or tapered roller bearings.

ITEM 107.99 (Continued)

f. Positive mechanical seals shall be provided on the operating nut and the pinion shafts to exclude moisture and dirt and prevent leakage of lubricant out of the hoist.

4. The gate shall be operable via removable hand cranks.
5. The gate shall be operated from atop the concrete operator floor located above the gate location.
6. Coordination of gates and operators shall be the responsibility of the manufacturer. Gate offsets of up to 1-foot shall be permissible.
7. Provide 2-inch square nut for operations were called.
   a. The square nut shall be constructed of Cast iron or stainless steel.
   b. Provide two aluminum T-handle wrenches for operation. T-wrench shall be hollow to allow for operation of the operating nut with the stem rising through the center of the wrench.
8. Remote actuators shall be provided to allow for removable hand crank operators at the heights specified.

STORAGE, HANDLING, AND DELIVERY

Damage present on the slide gate or components upon delivery from the Manufacturer shall immediately be documented with each the Engineer, and Manufacturer upon the State's receipt of the slide gate. The damage to the slide gate prior to release to the State shall immediately be repaired by the Manufacture at the Manufacturer's sole expense in accordance with Manufacturer standard repair recommendations and procedures.

Upon receiving the slide gate, the Contractor will be responsible for protecting the slide gate and its components from damage. Damage to the slide gate after the Contractor has taken delivery of the slide gate shall be repaired at the Contractor's sole expense in accordance with Manufacturer repair recommendations and procedures.

The slide gate and components shall be stored in such a way to prevent any damage and weathering to the structure and components of the slide gate. The slide gate should be stored at a secured location to prevent theft and/or vandalism of slide gate components.

The slide gate should be picked from approved pick points in accordance with the manufacturer's recommendations. Equipment used to move the slide gate shall be adequately sized and capable of lifting the stated loads without damaging the slide gate.

The slide gate shall only be delivered to the site when the Contractor is ready to install the slide gate as shown on the attached drawing. The slide gate will not be allowed to stay on-site overnight without being installed unless it is stored in a secure enclosure.

ITEM 107.99 (Continued)

INSTALLATION

Prior to gate installation, Contractor shall implement a bench test of the system complete to demonstrate full operability and functionality of the system. The contractor shall provide Owner/Engineer with the opportunity to witness the bench test.

Installation of the gates and appurtenances shall be done in a workmanlike manner. It shall be the responsibility of the Contractor to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's recommendations.

The Contractor shall review the installation drawings and installation instruction prior to installing the gates.

The gates assemblies shall be installed in a true vertical plane, square and plumb.

The Contractor shall fill the void in between the gate frames and the walls with non-shrink grout as shown on the installation drawing and in accordance with the manufacturer’s recommendations.

Alternatively, for the low-level outlet gate the Contractor can order and install a custom fit steel thimble in accordance with manufacture recommendations.

FIELD TESTING

After installation, all gates shall be field tested in the presence of the Engineer and Owner to ensure that all items of equipment are in full compliance with this Section. Each gate shall be cycled to confirm that they operate without binding, scraping, or distorting. The effort to open and close manual operators shall be measured and shall not exceed the maximum operating effort specified above. The gate shall be water tested by the Contractor, and observed by the Engineer and Owner, to confirm that leakage does not exceed the specified allowable leakage.

BASIS OF PAYMENT

Item 107.99 will be paid for at the Contract unit price per LUMP SUM which price shall include full compensation for all labor, tools, equipment, materials, testing, loading, delivery, transportation, storage, approvals, and permits and all incidental costs required to complete the work.

ITEM 112.99 SHED DISPOSAL LUMP SUM

The work under this Item includes the complete removal and disposal of all of the materials comprising the entire existing storage shed, including concrete foundation components and concrete harvesting pad, and shall conform to the relevant provisions of Subsection 112 of the Standard Specifications and the following:

This item shall include all costs for sampling, laboratory testing, loading, transportation and disposal of the treated wood, if present in the storage shed structure. The Contractor is required to submit disposal manifests to the Engineer prior to the completion of the project. All material and debris shall become the property of the Contractor and shall be recycled, reused or disposed of in accordance with all applicable local, state and federal requirements.

The Massachusetts Department of Transportation does not guarantee or represent that the shed materials will actually coincide with any descriptions contained herein or represented on the plans. The Contractor shall make his own investigation of the existing shed including the size, shape, and connections of the materials that make up the structure and the structure's stability under demolition and construction loadings. No additional compensation, other than the lump sum price bid for this Item, shall be made if the materials or work provided is different than that inferred or described herein or shown on the plans.

Prior to demolition of the storage shed, MassDOT Hazardous Materials shall be notified to perform a survey to determine if asbestos containing materials are present. Abatement of asbestos containing materials shall be covered under Item 182.3.

The Contractor shall submit his proposed method of demolition including equipment, tools, devices, etc. to the Engineer for approval. The demolition procedure and work shall follow the requirements given for erection in Section 960.61, D. Erection, of the Standard Specifications. The demolition procedure and any necessary calculations and drawings shall bear the stamp of a Professional Engineer registered in the Commonwealth of Massachusetts certifying that all existing structural members are suitably braced and supported throughout the demolition process. Work shall not commence until the Engineer has given written approval of the method of demolition.

Debris from construction must be carefully contained within the work zones and prevented from falling into the waterway below. No foreign material or debris resulting from the Contractor's operations shall be permitted to enter or remain in the waterway. The Contractor shall be required to remove any debris generated from construction from the site immediately and to restore portions of the site affected by the operation to their original undisturbed condition or better. Removal of debris generated by demolition and construction will be performed at the Contractor's own expense. The Contractor shall be responsible for dust control resulting from the demolition operations.

The Contractor shall provide for the protection of the waterway and adjacent areas during demolition. This shall be accomplished by the utilization of adequate shielding placed beneath and adjacent to the existing structure prior to demolition. The Contractor shall not allow debris, tools, or incidental equipment of any kind to swing over areas where vehicular or pedestrian traffic exists.

ITEM 112.99 (Continued)

BASIS OF PAYMENT

Item 112.99 will be paid for at the Contract unit price per LUMP SUM which price shall include full compensation for all labor, tools, equipment, materials, testing, loading, transportation, disposal, storage, approvals, and permits and all incidental costs required to complete the work.

ITEM 115.1	**DEMOLITION OF BRIDGE NO. W-06-020 (9LH)**	**LUMP SUM**
ITEM 115.2	**DEMOLITION OF BRIDGE NO. W-06-020 (8M1)**	**LUMP SUM**
ITEM 115.3	**DEMOLITION OF BRIDGE NO. W-06-020 (8KD)**	**LUMP SUM**
ITEM 115.4	**DEMOLITION OF TEMPORARY BRIDGE**	**LUMP SUM**

The work under this Item includes the complete removal and satisfactory disposal of all of the materials comprising the existing culverts and temporary bridge, and shall conform to the relevant provisions of Subsection 112 of the Standard Specifications and the following:

GENERAL

The culvert is defined as all buried bridge elements including but not limited to decks, walls, footings and any other material and appurtenances connected to or considered part of the culvert. The temporary bridge structure is defined as the entire superstructure and substructure including but not limited to decks, beams, bearings, barrier, walls, footings and any other material and appurtenances connected to or considered part of the temporary bridge. It is presumed that any existing steel components contain lead-based paint. All work shall be in accordance with the "General Requirements for Demolition and Work Involving Painted Steel" included elsewhere in these Contract Documents.

Within 30 days of the Notice to Proceed, the Contractor shall perform the following:

a. The Contractor shall coordinate with the Engineer so that soil samples shall be taken to a depth of six inches and shall be tested for lead contamination.
b. If any of the samples test positive for lead contamination, a Massachusetts Licensed Site Professional (LSP) shall be hired by the Contractor.
c. Any contaminants detected shall be addressed by an amendment to the Contractor's Health and Safety Plan.

The Contractor's LSP shall be responsible for monitoring and handling of contaminated soil to re-used on site or disposed of off-site. Any contaminated material disposed of as surplus or unsuitable shall be additionally sampled, tested and disposed of in accordance with the disposal requirements contained elsewhere in the Special Provisions. The work associated with testing, monitoring, and disposing of contaminated soils shall be paid for under the respective items of work, as outlined in the various Items contained in the Special Provisions.

The Massachusetts Department of Transportation does not guarantee or represent that the bridge materials will actually coincide with any descriptions contained herein or represented on the plans. The Contractor shall make his own investigation of the existing bridges including the size, shape, and connections of the materials that make up the structure and the structure's stability under demolition and construction loadings. No additional compensation, other than the lump sum price bid for this Item, shall be made if the materials or work provided are different than that inferred or described herein or shown on the plans.

ITEMS 115.1, 115.2, 115.3, AND 115.4 (Continued)

The Contractor shall submit his proposed method of demolition including equipment, tools, devices, etc. to the Engineer for approval. The demolition procedure and work shall follow the requirements given for erection in Section 960.61, D. Erection, of the Standard Specifications. The demolition procedure and any necessary calculations and drawings shall bear the stamp of a Professional Engineer registered in the Commonwealth of Massachusetts certifying that all existing structural members are suitably braced and supported throughout the demolition process. Work shall not commence until the Engineer has given written approval of the method of demolition.

Debris from construction must be carefully contained within the work zones and prevented from falling into the waterway below. No foreign material or debris resulting from the Contractor's operations shall be permitted to enter or remain in the waterway. The Contractor shall be required to remove any debris generated from construction from the site immediately and to restore portions of the site affected by the operation to their original undisturbed condition or better. Removal of debris generated by demolition and construction will be performed at the Contractor's own expense. The Contractor shall be responsible for dust control as a result of the demolition operations.

The Contractor shall provide for the protection of the waterway and adjacent areas during demolition of the existing bridge. This shall be accomplished by the utilization of adequate shielding placed beneath and adjacent to the existing structure prior to demolition. The Contractor shall not allow debris, tools, or incidental equipment of any kind to swing over areas where vehicular or pedestrian traffic exists.

The Contractor shall be responsible for adequately protecting any existing utility lines during his operations. If any utilities are damaged due to the Contractor's negligence, he shall make repairs at his own expense. The Department makes no assurances regarding the presented conditions, dimensions, and materials of the existing structure as shown on the Contract Drawings. The Contractor shall verify all existing conditions and construction features of the bridge to be demolished, as necessary, for the proper planning and completion of the work. The Contractor shall base its bid on his/her own findings without any additional compensation for variances from the Plans or these Special Provisions regarding actual conditions for the items to be removed.

The Contractor shall prepare and submit a plan indicating its proposed demolition procedures including dust control, and methods to be used including equipment, tools, devices, crane capacity and location, schedule of operations, methods of utility protection, shielding design, disposal location, traffic management procedures, etc., to the Engineer for approval.

Work under this item may not commence until the Engineer has given written approval. The Contractor shall be responsible for dust control as a result of the demolition operations.

The Contractor shall make adequate provisions for the protection of public or private property adjacent to and underneath the bridge due to the concrete excavation operations. The Contractor shall submit his proposed method of demolition including equipment, tools, devices, shielding, etc. to the Engineer for approval. The shielding design, temporary supports (if required), and any necessary calculations and drawings shall be stamped by a Professional Engineer registered in Massachusetts. Work under this item may not commence until the Engineer has given written approval of the method of shielding.

ITEMS 115.1, 115.2, 115.3, AND 115.4 (Continued)

The protective shielding shall be installed under the bridge, extending the full length of the bridge span and extend and adequate width along the existing bridge width, and a sufficient distance beyond the bridge edge and vertically at the fasciae to an elevation above the beam seat. The shielding shall have all spaces along the perimeter and at the seams sealed to prevent any dust or debris from escaping and falling into the waterway below.

Shielding shall be designed to safely withstand all the loads that it will be subjected to. The permissible design stresses shall be in accordance with the AASHTO LRFD Bridge Design Specifications, Tenth Edition with the latest interims. The design shall include a complete description of equipment and construction methods proposed for the deck removal and the maximum size of deck area that will be removed (i.e., 12-inch x 12-inch jack hammered sections, or 6-foot x 2-foot saw cut sections). Shielding shall also be designed to withstand the impact imparted by the maximum sized piece of excavated concrete should it fall during excavation or removal.

All material and debris shall become the property of the Contractor and shall be recycled, reused or disposed of in accordance with all applicable local, state and federal requirements.

BASIS OF PAYMENT

Items 115.1, 115.2, 115.3 and 115.4 will be paid for respectively at the Contract unit price per LUMP SUM. which price shall include full compensation for all labor, tools, equipment, materials, testing, loading, transportation, disposal, submittals, approvals, and permits and all incidental costs required to complete the work including any costs associated with special handling and proper disposal of the treated wood products .

The Contractor will make his own investigation of the structure to be demolished including the materials that are part of or may be stored in the structure. No increase will be made to the bid price due to the nature of the materials involved in the demolition. All costs for permits, dump fees, taxes, special handling of hazardous materials shall be included in the bid price of the demolition item.

No separate payment will be made for temporary shielding but all costs in connection therewith shall be included in the Contract unit price bid.

Soil testing is not included in this item. Soil testing shall be paid for according to Item 180.03.

ITEM 120.1 UNCLASSIFIED EXCAVATION CUBIC YARD

The work under this item shall conform to the relevant provisions of Subsection 120 of the Standard Specifications and the following:

The work shall include the excavation of material of every description regardless of the type encountered, including the excavation of bituminous concrete pavement from within the project limits as shown on the drawings and as directed by the Engineer, except materials under the items of Bridge Excavation, Channel Excavation, Class A Trench Excavation and Concrete Excavation, and except those materials for which excavation is included with the work specified to be performed under other items of this Contract.

The work shall also include the removal of any existing pavements. Also included shall be the removal and disposal of existing cobbles, bollards, water and gas mains and all other materials not designated to be reused on the project or to be removed and stacked. The Engineer shall determine the disposition of all materials with respect to removal and disposal. Additionally, this item includes the removal and disposal of crushed stone placed for the temporary access roadway.

Edges of excavations made in existing pavements shall be squared by saw cutting with power drive tools to provide a neat, clean edge for joining new pavement as shown on the plans.

Ragged, uneven edges shall not be accepted. Pavement areas, which have been broken or undermined, shall be edged neatly with minimum disturbance to the remaining pavement.

The Contractor shall perform all excavation in such a manner as to maintain slopes, longitudinally and laterally and to ensure proper and continuous drainage at all times.

To avoid damage to trees which have parts of their root system in roadways or planting areas designated for excavation, such excavation shall be accomplished as carefully as possible or as directed by the Engineer.

This work shall also include all clearing and grubbing of plant material within the excavation limits.

The sawcutting of hot mix asphalt pavement, removal and disposal of bollards, removal and disposal of crushed stone placed for access roadway and removal and disposal of any a gas and water mains removed during relocation shall be included under this item.

ITEM 120.1 (Continued)

METHOD OF MEASUREMENT

Item 120.1 will be measured for payment in accordance with Subsection 120.80 of the Standard Specifications.

BASIS OF PAYMENT

Item 120.1 will be paid in accordance with Subsection 120.81 of the Standard Specifications.

No separate payment will be made for the off-site disposal of all existing material unsuitable for reuse in the proposed work, but all costs in connection therewith shall be considered incidental to the Contract and no additional compensation shall be allowed, therefore.

ITEM 127.1 REINFORCED CONCRETE EXCAVATION CUBIC YARD

The work under this item shall conform to the relevant provisions of Subsections 120 and 140 of the Standard Specifications and the following:

This work shall consist of the demolition, removal and satisfactory disposal of all materials making up the portions of the spillways and portions of the spillway training walls designated to the limits shown on the plans. The work under this item includes portions of the existing primary and auxiliary spillway components, screw chamber, head walls and retaining walls requiring removal of concrete masonry to permit construction of the new bridge components including any materials cast or embedded in the concrete masonry, and all other materials considered an integral part of the structure if so designated on the plans. Excavations beyond the above limits will be paid for under item 140, Bridge Excavation.

The Contractor shall visit the site prior to submitting bids to get familiar with the scope of work and bridge conditions. The Contractor shall verify all conditions, dimensions and materials in the field and shall base their bid on their own findings without any additional compensation for variances from the Plans or these Special Provisions regarding actual conditions for the materials to be removed.

MassDOT does not guarantee or represent that the bridge materials will coincide with any descriptions contained herein or represented on the Drawings. No additional compensation, other than the cubic yard price bid for the Item, shall be made if the materials or work provided is different than that inferred or described herein or shown on the Drawings.

The Contractor’s operations shall not cause damage to any components on the existing dam, spillway and training/retaining walls that have been designated to remain.

During the prosecution of the work, the Engineer may reject the use of any method or equipment which causes undue vibration or possible damage to the remaining structure or any part thereof.

The Contractor shall not remove any concrete beyond the specified limits unless ordered to do so by the Engineer. Any existing concrete designated to remain in the proposed construction that is damaged by the Contractor’s operation shall be repaired or replaced at the Contractor’s expense.

The Contractor shall obtain approval from the Engineer for his/her methods of accomplishing the work under this item before commencing work.

This work shall include the making of transverse and/or longitudinal saw cuts across the existing structures as indicated on the plans, as required for the contractor’s operations or as established by the Engineer, and it shall include the cutting and removal of any embedded materials when encountered within the limits of concrete designated to be removed.

The cost of repairing existing concrete damaged by the Contractor's operations shall be at his own expense. The re-securing and possible additional tying of the exposed reinforcing steel to remain in place shall be considered incidental to this Item and shall be done at no additional compensation. All repairs will be to the full satisfaction of the Engineer.

ITEM 127.1 (Continued)

Hand tools such as hammers and chisels shall be provided for the removal of final particles of concrete or to achieve the required depth. The Contractor shall take all measures necessary to protect the final cut surface from damage. The Engineer may reject the use of any method or equipment that may cause any damage to the existing structure which is to remain.

Upon completion of the excavation the Contractor shall inspect the final surface of the portions of the structure to remain for any cracks or other damage resulting from demolition operations.

The width of cracks shall be determined by the Engineer. Any cracks found greater than 1/16" shall be repaired by the Contractor without additional compensation.

All excavated material shall become the property of the Contractor. The Contractor will be required to dispose of all material resulting from the excavation off the job site at a suitable location at his own expense. The disposal location shall conform to all applicable City, State and Federal statutes and it shall be the Contractor's responsibility to obtain all permits necessary for this disposal. The Contractor shall also take extreme caution during the excavation operations to keep material from falling into the waterway and adjacent property. Should any material fall into the waterway or adjacent property, it shall be the Contractor's responsibility to remove such material at his own expense. The Contractor shall also take extreme caution to ensure no damage to existing buildings, foundations and structures occurs as a result of the Contractor's operations. Should any damage occur to these existing structures designated to remain, it shall be the Contractor's responsibility to repair such damage as directed by engineer and at the Contractor's expense.

METHOD OF MEASUREMENT

Item 127.1will be measured for payment per CUBIC YARD of concrete actually demolished and removed from the site based on the limits indicated on the plans and as required by the Engineer.

BASIS OF PAYMENT

Item 127.1 will be paid at the Contract unit price per CUBIC YARD, which price shall include full compensation for all materials, labor, tools and equipment, sawcutting, protective shielding, removal and disposal of concrete and all incidental costs required to complete the work as required by the Engineer.

ITEM 180.01 ENVIRONMENTAL HEALTH AND SAFETY PROGRAM LUMP SUM

The work shall consist of ensuring the health and safety of the Contractor's employees and subcontracting personnel, the Engineer, their representatives, the environment, and public welfare from any on-site chemical contamination present in air, soil, water, and sediment.

The Contractor shall prepare and implement a site-specific Environmental Health and Safety Plan (EHASP) which has been approved and stamped by a Certified Industrial Hygienist (CIH) and includes the preparer's name and work experience. The EHASP shall include appropriate components required by OSHA Standard 29 CFR 1910.120(b) and the Massachusetts Contingency plan (MCP) 310 CMR 40.0018 and must comply with all applicable state and federal laws, regulations, standards and guidelines, and provide a degree of protection and training appropriate for implementation on the project. The EHASP shall be a dynamic document with provision for change to reflect new information, new practices or procedures, changing site environmental conditions or other situations which may affect site workers and the public. The EHASP shall be developed and implemented independently from the standard construction HASP required to work on all MassDOT construction projects.

Health and safety procedures provided by the Contractor shall comply with all the appropriate regulations that address employee working conditions, including but not limited to standards established by OSHA and National Institute for Occupational Safety and Health (NIOSH). Equipment used for the purpose of health and safety shall be approved by and meet pertinent standards and specifications of the appropriate regulatory agencies.

A copy of the most up-to-date version of the EHASP shall always be maintained on-site 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.

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.

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.

ITEM 180.01 (Continued)

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 comply with the EHASP and all appropriate regulations and/or standards for employee working conditions.

Personal Protection Level C Upgrade will be measured and paid only upon upgrade to Level C and will be at the contract unit price, per hour, per worker, required in Level C personal protection. No payment will be made to the Contractor to provide Level D PPE.

ITEM 180.03 LICENSED SITE PROFESSIONAL SERVICES HOUR

Within limited areas of the project site, media (i.e. soils, sediments, surface water and/or groundwater) requiring evaluation and/or management under the Massachusetts Contingency Plan (MCP) may be encountered. A Licensed Site Professional (LSP) shall be required to provide the services necessary to comply with the requirements of the MCP. These services may include a site walk, field screening, sampling, analysis and characterization of potentially contaminated media, preparation and implementation of Immediate Response Action (IRA) Plans, Utility-Related Abatement Measure (URAM) and Release Abatement Measure (RAM) Plans, Imminent Hazard Evaluations, status reports, transmittal forms, release notification forms, risk assessments, completion statements, and related documents required pursuant to the MCP. LSP services shall also be necessary to temporarily move material generated on the project to an off-site storage location.

The name and qualifications of the LSP and all environmental technicians to be assigned to the project shall be submitted to the Engineer for approval at least four weeks prior to initial site activities. The LSP shall have a current, valid license issued by the Massachusetts Board of Registration of Hazardous Waste Site Cleanup Professionals. The LSP shall have significant experience in the oversight of MCP activities at active construction sites. Qualification packages for the LSP and each technician shall include a resume, all recent work assignments with responsibilities identified (previous 5 years), and applicable training and certifications. A list of all Notices of Noncompliance, Notice of Audit Findings and Enforcement Orders issued by the Massachusetts Department of Environmental Protection (DEP) shall be submitted for all work assignments listed for the LSP and environmental technicians. Upon approval of the LSP Qualifications, the LSP will be designated as the LSP of Record unless MassDOT designates in writing otherwise. The LSP of Record will serve as the primary point of contact for all hazardous material matters on the project.

The LSP shall evaluate soil and/or sediment with discoloration, odor, elevated field screening results, presence of petroleum liquid or sheen on the groundwater surface, or any abnormal gas or materials in the ground which are known or suspected to be oil or hazardous materials. Excavated soil and sediment which is suspected of petroleum contamination shall be field screened using the jar headspace procedures according to established DEP Guidance. All field screening equipment must be pre-approved by the Engineer. The LSP shall ensure proper on-site calibration of all field screening instrumentation.

The Engineer shall be contacted immediately when observations or any field screening results verify contamination requiring further analysis, and/or enhanced management of suspect media. Any enhanced management of contaminated soil to ensure proper stockpiling and storage is incidental to the LSP Services item. The LSP shall evaluate the need for confirmatory sampling prior to backfill in areas where contaminated material has been excavated and disposed off-site for compliance with applicable regulatory requirements. The Engineer shall approve the locations of the testing sites prior to the sampling.

Contaminated media shall be handled in accordance with all applicable state and federal statutes, regulations, and policies. The LSP shall adequately evaluate contaminated media for compliance with the requirements of the MCP and Department Policies.

ITEM 180.03 (continued)

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations and both shall be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations. The LSP shall maintain written records in a clear and concise tabular format which tracks the excavation, stockpiling, analysis and reuse/disposal of all known/suspect contaminated media. These records shall be up-to-date and submitted to the Engineer on a bi-weekly basis. The LSP shall review and summarize the laboratory data from any analyses performed on contaminated media in a tabular format and compare the results to applicable reporting thresholds. A report shall be delivered to the Engineer outlining the material sampling methods, laboratory analysis results, evaluation of applicable regulatory exemptions, reporting obligations, and proposed course of action. The laboratory report together with Chain of Custody forms for all analytical results shall be submitted to the Engineer within 14 days after completion of such analyses.

The LSP and Contractor shall be held responsible for the submission of all MCP-related documents to the Engineer at least 14 days in advance of any timeframe specified in the MCP and for the timely submission of data and tracking information as noted within this Item. All documents prepared under this Item must be reviewed and signed by the approved LSP. The Contractor and LSP shall be responsible for all fines, damages, and enforcement requirements imposed by applicable regulatory agencies for failure to meet regulatory and contract timeframes. No compensation will be provided for such fines, damages, and enforcement actions.

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations and shall both be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations.

If the Contractor causes a release of OHM, the Contractor shall be responsible for assessing and remediating the release in accordance with all pertinent State and Federal regulations, including securing the services of a LSP, at his own expense.

The LSP shall coordinate all activities involving both MassDOT and the DEP through the Engineer. Any notification of release shall be approved by the Engineer before submittal to the DEP, except if an imminent hazard condition exists as defined in 309 CMR 4.03(4)(b).

LABORATORY TESTING IN SUPPORT OF LSP SERVICES

Laboratory testing provides for analytical testing in support of LSP services related to maintaining MCP compliance, such as delineating the extent and type of contamination present. Sampling and testing for disposal purposes are not included and are incidental to Items 181.11-181.14.

ITEM 180.03 (continued)

In order to maintain compliance with the MCP and Department Policies or other regulatory requirements, the LSP shall request approval from the Engineer to obtain samples from various locations and depths within the project area and to perform laboratory analyses on those samples. No sampling shall be conducted without prior approval from the Engineer. The samples shall be delivered to a DEP-certified laboratory using proper chain-of-custody documentation for analyses which, depending upon site conditions and suspected and/or identified contaminants of concern, may include, but are not limited to, metals, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polycyclic aromatic hydrocarbons (PAHs), extractable petroleum hydrocarbons (EPHs) and volatile petroleum hydrocarbons (VPHs). Subsequent testing, depending upon initial results, may be required for Toxicity Characteristic Leaching Procedure (TCLP) analyses (EPA Method 1311) for metals.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

LSP Services for work under this item will be measured per person, per hour of service provided by LSP, Environmental Technicians and other approved personnel. Travel time shall not be included in the billable hours.

The quantity and type of laboratory tests must be approved by the Engineer beforehand. The Contractor will be reimbursed upon satisfactory written evidence of payment. The Contractor may be required to obtain cost estimates from three DEP certified laboratories for the Engineer to choose the service provider.

LSP Services will be paid at the Contractor bid price for each hour, or fraction thereof, spent to perform the work as described above. The bid price shall be a blended rate that includes the cost of the LSP, environmental technicians and other personnel, the performance of all work tasks and field screening, including required equipment, materials and instrumentation, and production of all documentation described above. All requests for payment must be accompanied by the following information: the names of the personnel associated with the work charged under LSP Services, dates and hours worked, work conducted, including, where appropriate, locations as identified on the construction plans, and a copy of the field diary for the dates submit Laboratory Testing will be reimbursed upon receipt of paid invoices for testing approved by the Engineer.

Laboratory testing will be reimbursed upon receipt of paid invoices for testing approved by the Engineer.

This item is for LSP work for compliance with the MCP and Department Policies. LSP hours and any laboratory testing related to off-site disposal of excess soil and sediment is incidental to Items 181.11-181.14 (including, but not limited to, disposal characterization, disposal package preparation, landfill acceptance, shipment paperwork preparation, field screening, and tracking).

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 soil 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.

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.

ITEMS 181.11 through 181.14 (Continued)

This type of facility shall be approved/permitted by the State in which it operates to accept the class of contaminated soil in accordance with all applicable local, state and federal regulations.

HAZARDOUS WASTE consists of materials which must be disposed of at a facility permitted and operated in full compliance with Federal Regulation 40 CFR 260-265, Massachusetts Regulation 310 CMR 30.000, Toxic Substances Control Act (TSCA) regulations, or the equivalent regulations of other states, and all other applicable local, state, and federal regulations. All excavated materials classified as hazardous waste shall be disposed of at an out-of-state permitted facility. This facility shall be a RCRA hazardous waste or TSCA facility, or RCRA hazardous waste incinerator. This type of facility shall be approved/permitted by the State in which it operates to accept hazardous waste in accordance with all applicable local, state and federal regulations and shall be permitted to accept all contamination which may be present in the soil excavation. The Contractor shall ensure that, when needed, the facility can accept TSCA waste materials i.e., polychlorinated biphenyls (PCBs). Hazardous waste must be removed from the site for disposal or treatment via an LSP approved Manifest.

MONITORING/SAMPLING/TESTING REQUIREMENTS

The Contractor shall be responsible for monitoring, sampling and testing during and following excavation of contaminated soils to determine the specific class of contaminated material. Monitoring, sampling and testing frequency and techniques should be performed in accordance with Item 180.03 – LSP Services. Additional sampling and analysis may be necessary to meet the requirements of the disposal facility license. The cost of such additional sampling and analysis shall be included in the bid cost for the applicable disposal items. The Contractor shall obtain sufficient information to demonstrate that the contaminated soil meets the disposal criteria set by the receiving facility that will accept the material.

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.

ITEMS 181.11 through 181.14 (Continued)

If the proposed disposition of the material is for reuse within the project construction corridor, the Contractor shall cooperate with MassDOT to obtain a suitable representative sample(s) of the material to establish its structural characteristics in order to meet the applicable structural requirements as fill for the project.

All material transported off-site shall be loaded by the Contractor into properly licensed and permitted vehicles and transported directly to the selected disposal or recycling facility and be accompanied by the applicable shipping paper. At a minimum, truck bodies must be structurally sound with sealed tail gates, and trucks shall be lined, and loads covered with a liner, which shall be placed to form a continuous waterproof tarpaulin to protect the load from wind and rain.

DECONTAMINATION OF EQUIPMENT

Tools and equipment which are to be taken from and reused off site shall be decontaminated in accordance with applicable local, state, and federal regulations. This requirement shall include, but not be limited to, all tools, heavy machinery and excavating and hauling equipment used during excavation, stockpiling and handling of contaminated material. Decontamination of equipment is considered incidental to the applicable excavation item.

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, because of the Contractor's failure to adhere to the regulations, specifications, recognized standard practices, etc., that relate to contaminated material handling, transportation and disposal.

ITEMS 181.11 through 181.14 (Continued)

SUBMITTALS

(a) 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 base plan to record this information.

The Sampling Results will be presented in tabular format. Each sample will be identified by appropriate identification matching the sample identification shown on the Chain of Custody Record. The sample must also be identified by location (e.g., grid number or stockpile number). For each sample, the following information must be listed: the classification (unregulated, regulated, etc.), proposed disposal option for the stockpile or unit of material represented, and all analytical results.

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.

ITEMS 181.11 through 181.14 (Continued)

Disposal and Recycling Facilities:

1. Provide the name, address, applicable licenses and approved waste profile for disposal and/or recycling location(s) where contaminated soil will be disposed. Present information substantiating the suitability of proposed sites to receive classifications of materials intended to be disposed there, including the ability of the facility to accept anticipated volumes of material.

2. Provide a summary of the history of compliance actions for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. Material should not be sent to facilities which are actively considered by the DEP, USEPA or other responsible agency to be in violation of federal, state or local hazardous waste or hazardous material regulations. MassDOT reserves the right to reject any facility on the basis of poor compliance history.

Transportation:
The name, address, applicable license and insurance certificates of the licensed hauler(s) and equipment and handling methods to be used in excavation, segregation, transport, disposal or recycling.

III. Material Tracking and Analytical Documentation for Reuse/Disposal.

The following documents are required for all excavation, reuse and disposal operations and shall be in the format described. At least two weeks prior to the start of any excavation or demolition activity, the Contractor shall submit the tracking templates required to present the information as stipulated below. Excavation or demolition will not begin until the format is acceptable to MassDOT.

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.

ITEMS 181.11 through 181.14 (Continued)

Soil/Sediment:
Soil excavation will be identified based on the station-offset of the excavation location limits. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations, quantity, and stockpile number/location. For each unit of material tracked, the table will also track reuse of the material on-site and disposal of the material off-site using the same categories identified for demolition debris above.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Disposal of contaminated soil shall be measured for payment by the TON of actual and verified weight of contaminated materials removed and disposed of. The quantities will be determined only by weight slips issued by and signed by the disposal facility. The most cost-effective, legal disposal method shall be used. The work of the LSP for disposal under all 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 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 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 182.2 REMOVAL OF ASBESTOS FOOT

The work shall include the removal and satisfactory disposal of existing asbestos. The Contractor's attention is directed to the fact that existing asbestos shall be inspected and tested prior to removal, to determine if special removal and disposal is required. The Contractor shall follow all the rules and regulations stated in "ITEM 182.1 INSPECTION AND TESTING FOR ASBESTOS". If asbestos is present, the Contractor shall follow all the rules and regulations stated in the section "REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS", under this item. The Contractor should notify and coordinate his/her efforts with the proper utility accordingly.

REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

This section specifies the requirements for the handling and removal of asbestos containing material. The Contractor must perform all asbestos handling and removal work in accordance with these specifications and the following additional requirements.

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA) including but not limited to:

29 CFR 1910 Section 1001 and 29 CFR 1926 Section 58 Occupational exposure to Asbestos, Tremolite, Anthophyllite and Actinolite, Final Rule
29 CFR 1910 Section 134 Respiration Protection
29 CFR 1926 Construction Industry
29 CFR 1910 Section 2 Access to Employee Exposure and Medical Records
29 CFR 1910 Section 1200 Hazard Communication
29 CFR 1910 Section 145 Specifications for Accident Prevention Signs and Tags

U.S. Environmental Protection Agency, (EPA) including but not limited to:

40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50 no.134, July 12, 1985 p.28530 - 28540 Asbestos Abatement Projects Rule
40 CFR 61 Subpart A Regulation for Asbestos
40 CFR 61 Subpart M (Revised Subpart B) National Emission Standard for Asbestos

U.S. Department of Transportation 49 CFR 172 and 173

Massachusetts Department of Labor Standards, (DLS) including but not limited to:

454 CMR 28.00 Removal, Containment and Encapsulation of Asbestos

Massachusetts Department of Environmental Protection (DEP) including but not limited to (supplementing subsection 7.01):

310 CMR 7.00, Section 7.09 Odor and Dust, Section 7.10 Noise, Section 7.15 Air Pollution Control Regulations
310 CMR 18.00 and 19.00 Solid Waste Regulations

ITEM 182.2 (Continued)

Massachusetts Division of Industrial Safety 45 CMR 10.00

Local Requirements including but not limited to those of Health Departments, Fire Departments and Inspection Services Departments

Wherever there is a conflict or overlap of the above references, the most stringent provision shall apply.

All asbestos material shall be removed and properly disposed of by a contractor or subcontractor with a current Massachusetts Abatement Contractors License issued by the Department of Labor Standards. Work shall be supervised by a competent person as required by OSHA in 29 CFR 1926 to ensure regulatory compliance. This person must have completed a course at an EPA Training Center or equivalent course in asbestos abatement procedures, have had a minimum of four years on-the-job training and meet any additional requirements set forth in 29 CFR 1926 for a Competent Person. This person must also be certified by the Commonwealth as an Asbestos Supervisor and Asbestos Project Designer as required by 454 CMR 28.00.

Asbestos removal work shall be coordinated with all other work under the contract and shall be completed prior to performing any activities which could disturb the asbestos material or produce airborne asbestos fibers.

Dust suppression in the form of light water sprays, foams, dust suppressants and calcium chloride will be implemented as required to control dusting during trenching and excavation. Alternatively, intrusive activities may be reduced or curtailed under high wind or heavy rain conditions, which in the opinion of the Health and Safety Plan (HASP) may pose a safety hazard to the workers.

NOTIFICATION AND PERMITS
The Contractor shall prepare a formal pre-notification form at least ten (10) days prior to the start of asbestos removal work. This form must be submitted to the appropriate Regional Office of the Massachusetts Department of Environmental Protection and to the U.S. Environmental Protection Agency Region I Air and Hazardous Material Division. A copy of the submitted forms must be provided to the Engineer and kept at the work site.

Prior to starting any work, the Contractor shall also obtain any required asbestos removal permit(s) from the city/town. A copy of the permit(s) must be provided to the Engineer and posted at the work site.

The Contractor shall also obtain and pay all other applicable asbestos waste transportation and disposal permits, licenses and fees.

ITEM 182.2 (Continued)

STANDARD OPERATING PROCEDURES
The standard operating procedure shall ensure the following:

1. Proper site security including posting of warning signs and restricting access to prevent unauthorized entry into the workspaces.

2. Proper protective clothing and respiratory protection prior to entering the workspace.

3. Safe work practices include provisions for communications; exclusion of eating, drinking, smoking, or use of procedures or equipment that would in any way reduce the effectiveness of respiratory protection or other engineering controls.

4. Proper exit practices from the workspace though the showering and decontamination facilities.

5. Removing asbestos containing material in ways that minimize release of fibers.

6. Packing, labeling, loading, transporting and disposing of contaminated material in a way that minimizes or prevents exposure and contamination.

7. Emergency evacuation of personnel, for medical or safety (fire and smoke) so that exposure will be minimized.

8. Safety from accidents in the workspace, especially from electrical shocks, slippery surfaces and entanglements in loose hoses and equipment.
9. Provisions for effective supervision and OSHA - specified personnel air monitoring for exposure during work.

REQUIRED SUBMITTALS

The Contractor shall submit to the Engineer the following listed items at least ten (10) calendar days prior to the start of asbestos work. No asbestos removal work activities shall commence until these items are reviewed by the Engineer, unless otherwise waived. Submittals shall be clearly labeled and in sufficient detail to enable the Engineer to form an opinion as to its conformity to the specifications.

1. Name, experience and DLS certification of proposed Supervisors and Foreman responsible for asbestos work.

ITEM 182.2 (Continued)

2. Summary of workforce by disciplines and a notarized statement documenting that all proposed workers, by name, have received all required medical exams and have been properly trained and certified for asbestos removal work, respirator use and appropriate Massachusetts DLS, EPA and OSHA standards.
3. Notarized statement that workers are physically fit and able to wear and use the type of respiratory protection proposed for the project. Notarized certification signed by an officer of the abatement contracting firm that exposure measurements, medical surveillance and worker training records are being kept in conformance with 29 CFR 1926.
4. Written plan of action and standard operating procedures (HASP) to include: location and layout of decontamination areas; sequencing of asbestos work; detailed schedule of work activities by date and interface with other project activities which affect work performance; methods used to assure safety and security; worker protection and exposure monitoring; contingency and emergency evacuation procedures; detailed description of methods to be employed to control pollution; waste handling procedures.
5. Written respiratory protection program specifying level of protection intended for each operation required by the project and details of daily inspection and maintenance elements.
6. Copies of the U.S. EPA, State and local asbestos removal pre-notification forms. If applicable, lists and copies of all permits, licenses, or manifests which will be applied for and used.
7. Name, location and applicable approval certificates for primary and secondary landfill for disposal of asbestos-containing or asbestos contaminated waste. Name, address and licenses number(s) of hauler permitted to transport waste. (Submit copies of completed manifests upon disposal).

The Contractor must provide copies of daily inspection and record logs upon request of the Engineer, at any time during project. This information will include but is not limited to work area entry data, respirator inspections and maintenance, HEPA-exhaust inspections and maintenance and other work applicable activities or reports of accidents or unusual events.

METHOD OF MEASUREMENT

ITEM 182.2 will be measured for payment by the FOOT for the complete removal and disposal of the asbestos containing material.

BASIS OF PAYMENT

Item 182.2 will be paid for at the Contract unit price per FOOT, which price shall include all labor, materials, tools, equipment, and all incidental costs required to complete the work specified above and as required by the Engineer.

No separate payment will be made for the protection of general public, private property, the proper inspecting and testing of the material, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 182.3 ASBESTOS ABATEMENT FOR BUILDING DEMOLITION LUMP SUM

SCOPE OF WORK

The work to be performed under these items consists of asbestos related abatement activities, and associated response actions. These activities include, but are not limited to, removal, and disposal of asbestos-containing materials (ACM). The work to be performed shall consist of the submission of all required notifications and permits, furnishing all materials, equipment and labor to perform the necessary work.

CONTRACT REQUIREMENTS

The work under these items shall consist of abatement of identified ACM from areas within the interior or on the exterior of buildings to be demolished. The Contractor must perform all ACM handling and abatement work in accordance with these specifications and the following additional requirements:

1. U. S. Department of Labor, Occupational Safety and Health Administration (OSHA) including but not limited to:
   a. 29 CFR 1910.1001 and 29 CFR 1926.1101 Occupational Exposure to Asbestos, Tremolite, Anthophyllite and Actinolite, Final Rule.

   b. 29 CFR 1910.134 Respiratory Protection 29 CFR 1926 Construction Industry 29 CFR 1910.02 Access to Employee Exposure and Medical Records 29 CFR 1910.1200 Hazard Communication.

   c. 29 CFR 1910.145 Specification for Accident Prevention Signs and Tags.

2. U. S. Environmental Protection Agency, (EPA) including but not limited to:
   a. 40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50 no. 134, July 12, 1985 p.28530-28540 Asbestos Abatement Projects Rule.

   b. 40 CFR 61 Subpart A, Regulations for Asbestos.

   c. 40 CFR 61 Subpart M (Revised Subpart B) National Emission Standard for Asbestos.

3. U. S. Department of Transportation 49 CFR 172 and 173.

4. Massachusetts Department of Labor Standards, (DLS) including but not limited to:
   a. 454 CMR 28.00 Removal, Containment and Encapsulation of Asbestos.

5. Massachusetts Department of Environmental Protection, (DEP) including but not limited to:
   a. 310 CMR 7.00, 7.15 Air Pollution Control Regulations.

   b. 310 CMR 18.00 and 19.00 Solid Waste Regulations.

ITEM 182.3 (Continued)

6. Massachusetts Division of Industrial Safety 45 CMR 10.00.

7. Local Requirements including but not limited to those of Health Departments, Fire Departments and Inspection Services Departments.

8. All provisions of this item relating to the health and safety of the workers and the public and protection of the environment are minimum standards. The Contractor is responsible for determining whether any additional and/or more stringent protective measures are necessary by legal requirements or prudent conservative practice and for implementing such measures. Nothing in this Specification shall be deemed to relieve the Contractor from any liability with respect to any legal requirement of prudent conservative practice.

9. The Contractor shall deliver all materials to the site in the original containers bearing the name of the manufacturer and details for proper storage and usage.

10. All materials, tools, and equipment must comply, at a minimum, with this specification, and relevant federal, state and local standards and codes.

11. All boxes and equipment shall be clean of asbestos fibers before arriving on-site and before exiting a Work Area. This cleaning, where necessary, will be done so there will be no confusion as to the origin of any dust or debris.

EXECUTION OF WORK

An Asbestos Consulting Firm (ACF), retained and directed by the Department under a separate contract and having no affiliation with the abatement Contractor, will provide third party oversight of all abatement activity and associated response actions to determine conformance with applicable Federal, State or local regulatory requirements governing this activity.

ASBESTOS CONSULTING FIRM

The ACF will be available on-site during the handling of asbestos-containing material, at no cost to the Contractor, to provide the following services:

1. Consultation with the Department and the Contractor on the technical aspects of asbestos removal and repair.

2. Review of preparation and isolation of Work Area, personnel protection and industrial hygiene practices.

3. Testing adequacy of HEPA-filtered exhausts in maintaining negative differential pressure within all Work Areas.

4. Air monitoring inside and outside the Work Area during asbestos removal to determine that acceptable low levels of fiber concentrations are maintained.

ITEM 182.3 (Continued)

5. Visual inspection for the removal of visible asbestos and debris and testing and certifying that the Work Area is at an acceptable fiber/cc concentration following asbestos removal.

6. The air monitoring by the Asbestos Consultant Firm shall not relieve the Contractor of his obligations under all-applicable Federal and State regulations and requirements.

ADMINISTRATIVE REQUIREMENTS

Minimum administrative and supervisory requirements necessary for coordination of work on the project, include, but are not necessarily limited to, the following:

A. The Contractor must provide a full-time Project Manager who is experienced in administration and supervision of asbestos abatement projects, including work practices, protective measures for building and personnel, disposal procedures, etc. This person shall be available to the Engineer, the District Asbestos Coordinator and the ACF as the Contractor's primary contact at all times while work is in progress.

B. The Contractor must provide a full-time licensed supervisor for all asbestos abatement work who is experienced in the supervision of asbestos abatement projects, including work practices, protective measures for building and personnel, disposal procedures, etc. This person shall remain at the work site at all times while work is in progress. This person must have completed a course at an EPA Training Center or equivalent certificate course in supervisor asbestos abatement procedures, have a minimum of four (4) years on-the job training and meet any additional requirements set forth in 29 CFR 1926 for a competent person. This person must also be certified by the Commonwealth of Massachusetts as an Asbestos Supervisor and as required by 454 CMR 28.00. This person is the Competent Person as required by OSHA in 29 CFR 1926 for the Contractor, and is the Contractor's representative responsible for compliance with all applicable Federal, state and local regulations, particularly those relating to asbestos-containing materials.

C. The Contractor will attend meetings, called by the Department as deemed necessary. Costs for a site meeting shall be considered incidental to the contract.

D. The Contractor will be provided with results of any asbestos survey performed by the Department for the buildings to be demolished.

ASSIGNMENT OF WORK

No work shall be performed until specifically authorized by the Department.

Contract SUBMITTALS

ITEM 182.3 (Continued)
PRE-CONSTRUCTION SUBMITTALS

1. Proof of certification by the Massachusetts Department of Labor Standards of the Abatement Entity.

2. Descriptions and references of similar asbestos control work, and a list of the supervisory personnel who may be assigned to this item, if awarded, including descriptions of their experience and qualifications in asbestos control work.

3. A list of equipment available to be used. This list should include a description of all Highly Efficient Particulate Air (HEPA) filtered exhaust units including make, model number and capacity and National Institute for Occupational Safety and Health (NIOSH) certification of the respirators that will be used by the Contractor's workers.

PRE-ASSIGNMENT REQUIREMENTS

SUBMITTALS

A. The Contractor shall be responsible for submitting notifications and obtaining all necessary permits, licenses and approvals before any asbestos abatement can begin. The Contractor must use an EPA approved landfill for disposal of asbestos waste and must use properly placarded vehicles when transporting the asbestos waste to the landfill. The Contractor will make all necessary notifications at least ten (10) working days prior to the scheduled start date determined by the Department. Notifications will be sent to the following agencies:

   1. US Environmental Protection Agency, Region 1
   2. Massachusetts Department of Environmental Protection
3. Massachusetts Department of Labor Standards.

B. Prior to starting any work, the Contractor shall also obtain any required asbestos removal permit(s) from the Town or City. A copy of the notifications and permit(s) if applicable shall be provided to the Engineer and the ACF.

C. If requested, by the Engineer or District Asbestos Coordinator, the Contractor shall develop and submit to the ACF for approval a detailed Asbestos Abatement Plan. Such a plan shall include, but not be limited to, the precise personal protective equipment to be used, the location of containments and/or regulated areas including; clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal method, interface of trades, sequencing of removal related work, disposal plan, type of wetting agents to be used, locations of local exhaust equipment and planned air monitoring strategies. The plan shall also include both fire and medical emergency response plans. This Asbestos Abatement Plan shall be submitted for approval prior to the start of any abatement activity. The Contractor and the ACF shall meet with the Engineer and the District Asbestos Coordinator to discuss, in detail, the Asbestos Abatement Plan, including work procedures and safety precautions. Once approved, the plan will be enforced as if and addition to this specification. Costs for the Asbestos Abatement Plan and meetings shall be considered incidental to the contract.

ITEM 182.3 (Continued)

D. The Contractor shall be responsible for installing his/her own electric panel for abatement activities. An electrician licensed by the Commonwealth of Massachusetts shall perform installation of the electrical panels.

ON-SITE RESPONSIBILITIES

GENERAL REQUIREMENTS

A. All materials or equipment delivered to the site shall be unloaded, temporarily stored, and transferred to the Work Area in a manner which shall not interfere with construction.

B. Unloading temporary storage sites, and transfer routes must be approved in advance by the Engineer or District Asbestos Coordinator.

C. Damaged or deteriorated materials or equipment may not be used and must be promptly removed from the premises. Materials, which become contaminated with asbestos shall be packaged and legally disposed of as ACM in an EPA approved, secure landfill.

D. Debris shall not be permitted to accumulate in the work area, and the immediate adjacent areas shall be kept clean. Debris shall be removed from the site and legally disposed of by the Contractor. No disposal shall be made on the property of the Commonwealth of Massachusetts or project site. The Contractor shall make his own arrangements for disposal subject to the approval of the Engineer or District Asbestos Coordinator.

E. Contractor's electrical equipment shall be protected by ground fault circuit interrupters (GFCI), which shall be provided by the Contractor.

F. All labor and material costs for connections to existing services, installation of GFCI, temporary lighting, and other work necessary to supply electricity will be the Contractor's responsibility and shall be considered incidental to this contract.

G. The Contractor shall provide electricity, water and sanitary equipment.

H. The Contractor shall coordinate all activities with Department.

H. The Contractor shall perform air monitoring as required to meet OSHA requirements for maintenance of Time Weighted Average (TWA) fiber concentrations for types of respiratory protection provided.

J. Workers will not be allowed to openly carry their respiratory protective equipment outside the Work Area.

K. The Contractor shall provide access and personal protective equipment, with the exception respirators, as necessary, to Department personnel, their representatives or others having authorization to visit the Work Area.

ITEM 182.3 (Continued)

L. It shall be the Department's responsibility or others having authorization to visit the Work Area to provide their own respiratory protective devices, and to ensure that the necessary instructions and training requirements of OSHA Standard 29 CFR 1926.1101 have been met.

FIRE PROTECTION (As Applicable)

A. The Contractor shall supply and maintain an adequate number of fire extinguishers (Class A, B and C) ready for immediate use and distribute them throughout the work site.

B. Internal combustion engines may not be operated inside any building. No gasoline or other flammable liquids may be stored inside any building, nor may any flammable liquids be dispensed or handled within any building.

C. Temporary fire exit signs shall be prominently displayed in the Work Area and to designated exits. Fire exits shall not be locked, chained or restricted in any way so as to prevent exit during an emergency. However, fire exit doorways directly outside the Work Area may be taped or covered with double 6-mil polyethylene plastic sheeting to prevent contamination outside the Work Area. The Contractor shall tape a retractable utility knife adjacent to the fire exit.

SECURITY (As Applicable)

The Contractor shall control the point of entry to the Work Area to prohibit unauthorized entry and to log in all workers, and authorized/certified personnel entering and leaving the Work Area. One employee of the Contractor must remain outside of the containment area to maintain control at this point of entry.

B. A log shall be maintained on-site noting entry and exit of all personnel. A copy of this log shall be made available to the Engineer at the completion of the Contractor's asbestos abatement work. The log shall be available for inspection by the Engineer, District Asbestos Coordinator or ACF upon request.

C. The Contractor shall keep the Work Area secure from unauthorized entry during the time when the Contractor is not on site.

D. Under no circumstances shall workers appear outside of containment wearing respirators and asbestos-related protective clothing.

ITEM 182.3 (Continued)

MATERIALS AND EQUIPMENT

A. Negative Air Machines - The Contractor shall supply an adequate number of HEPA air filtration units to the site to produce airflow meeting Federal and State standards.

B. Respiratory Protection Equipment - The Contractor shall supply the necessary respiratory protection equipment (approved by the National Institute for Occupational Safety and Health [NIOSH]) as required for this project in accordance with Work Area Protection specified under Project Procedures.

C. Polyethylene Plastic Sheeting - All polyethylene plastic sheeting shall be a minimum thickness of 6-mil and be fire retardant.

D. Surfactant (Amended Water) - All water used for removal and wet wiping of asbestos contaminated materials during cleanup operations shall be amended through the addition of a surfactant.

E. Encapsulant - All surfaces from which asbestos-containing materials have been removed shall be sealed with an approved encapsulant, mixed and applied in accordance with manufacturer's instructions. The encapsulant must be compatible with any installation of new material or finishes. The proposed brand and product shall be submitted to the Engineer or District Asbestos Coordinator for approval.

F. Waste Containers - Provide labeled 6-mil polyethylene bags and/or fiber drums labeled with the appropriate warnings in accordance with Federal regulations and identifying the waste generator and the generator's location.

G. Miscellaneous Material and Equipment - All other materials to be used on the project (i.e., duct tape, spray glue, expanding foam, ladders, power tools, brushes, etc.) should be in good working order and considered to be industry standard.

POST ASSIGNMENT RESPONSIBILITIES

It is the condition of final payment for this contract that the Contractor provides the Engineer with original or notarized copies of waste manifests or detailed landfill receipts signed by the landfill operator demonstrating disposed of properly. In addition, the ACF shall be provided with copies of employee certifications, training, medical and fit tests, accident reports, on-site job logs, and personal air monitoring results for inclusion in the assignment report.

ITEM 182.3 (Continued)

BASIS OF PAYMENT

Item 182.3 will be paid for at the Contract Lump Sum unit price, which price shall include full compensation for confirmatory surveys of structures to be demolished for asbestos identification, necessary permits, insurance, and all equipment, labor, mobilization costs, for personnel protection air monitoring, and all incidental costs related to abatement work and for materials needed to complete the abatement work in a workmanlike manner and to legally dispose of all debris. Final clearance testing in accordance with all regulations shall be provided by Mass Highway. The initial testing fail, cost for subsequent re-cleaning and testing shall be incidental to this Item without additional compensation.

All asbestos materials removed shall be disposed of as asbestos-containing waste in accordance with all applicable regulations. All other debris shall be disposed of in accordance with applicable regulations.

ITEM 265.04	**4 INCH SUBDRAIN- OPTION**	**FOOT**
ITEM 265.06	**6 INCH SUBDRAIN OPTION**	**FOOT**

Work, materials and construction under this item shall conform to the relevant provisions of Subsection 260 of the Standard Specifications.

METHOD OF MEASUREMENT

Items 265.04 and 265.06, will be measured for payment per Foot of Pipe installed

BASIS OF PAYMENT

Items 265.04 and 265.06 will be paid for respectively at the contract unit price per FOOT, which price shall constitute full compensation for all labor, tools, equipment, materials, including excavation, pipe, filter fabric, installation of cleanouts, crushed stone and installation of pip complete in place as required by the Engineer.

Trench excavation greater than 5 feet in depth and rock excavation will be paid for under the respective bid items 142. Class B Trench Excavation and 144. Class B Rock Excavation.

ITEM 305.12	**12 INCH DUCTILE IRON INSULATED PIPE (BRIDGE)**	**FOOT**

Work under this item shall conform to the relevant provisions of Subsection 300 of the Standard Specifications and the Wareham Fire District Rules and Regulations for Planning, Material, and Construction Specifications, updated June 2025 at:
http://warehamfiredistrict.org/images/Final_WFD_Rules_Regs_Updated_060325.pdf
and the following:

METHOD OF MEASUREMENT

Item 305.12 will be measured for payment per FOOT of insulated pipe installed.

BASIS OF PAYMENT

Items 305.12 will be paid for at the contract unit price per FOOT of insulated pipe installed, which price shall constitute full compensation for all labor, tools, equipment, materials, hardware, and all incidental costs required to complete the work as detailed on the Contract Drawings.

All structural steel utility supports required for Item 305.12 shall be paid for under Item 995.01.

ITEM 325.910 10 INCH STEEL CASING FOR GAS PIPE FOOT

The work under these items shall conform to the relevant provisions of Subsection 301 of the Standard Specifications and the following:

These items shall be used as casings for the gas line to be installed at the proposed bridge as shown on the Plans.

SUBMITTALS

The Contractor shall provide a certificate to the Engineer furnished by the pipe manufacturer that all pipe delivered to the project complies in all respects with the applicable standard specifications listed herein. Certification of piping materials shall be provided to and approved by the Engineer prior to shipment of piping to the job site.

For all pipe submit a schedule complete with manufacturer's brochure/parts list, manufacturer specifications and thickness class/rating of materials.

MATERIALS

Steel Casing

The Contractor shall furnish and install steel casing for pipelines where shown on design plans. Steel casing shall be capable of withstanding overburden live and dead loads. The Contractor shall be responsible for determining required casing strength and thickness and shall also be responsible for casing structural integrity. The steel casing shall have a minimum wall thickness of 0.375 inch and a minimum yield point strength of 35,000 psi.

Casing shall be new steel pipe having inside diameter as required by the plans. Steel casing shall meet ASTM Designation A-139 requirements with bitumastic coating on the outside.

Contractor may request substitution of larger diameter casing pipe than shown on the plans, for consideration by Engineer. If such a substitution request is approved, no additional compensation will be provided for the larger steel casing.

Casing End Seals

The ends of all casings shall be sealed to prevent foreign material from entering the annular specs between the carrier pipe and the casing pipe. The end seal shall be manufactured with 1/8" min synthetic rubber or other flexible material intended for direct burial use. The material shall be inert to contaminants commonly found in the ground and groundwater. The end seal shall securely connect and overlap pipe casing and carrier pipe per manufacturers direction.

ITEMS 325.910 (Continued)

CONSTRUCTION

All pipe shall be laid in close conformity to line and grade and shall have a full, firm and even bearing at each joint and along the entire length of pipe.

Handling and Assembly of Pipe: All pipe shall be handled and assembled in accordance with the manufacturer's instructions. Great care shall be used in unloading pipe from the trucks. No pipe shall be allowed to be dropped from the trucks or to be slid out and one end allowed to drop. Pipe shall be rolled off on skids and let down slowly and carefully. Care shall be taken to prevent pipe from being knocked against each other.

Movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be done at the Contractor's risk.

METHOD OF MEASUREMENT

Item 325.910, will be measured for payment per FOOT of 10” Steel Casing installed. Complete in place.

BASIS OF PAYMENT

Item 325.910 wil be paid for at the contract unit price per FOOT of 10” Steel Casing installed, which price shall constitute full compensation for all labor, tools, equipment, materials, hardware, and all incidental costs required to complete the work as detailed on the Contract Drawings.

ITEM 350.99 24 INCH TIDE INLINE CHECK VALVE EACH

The work under these items shall conform to the relevant provisions of Subsection 301 of the Standard Specifications and the following:

The work for this item includes providing and installing inline check valves at the locations indicated on the plans, Contract Documents and/or as directed by the Engineer.

MATERIALS

Inline check valves are to be all rubber and the flow operated check type with slip-in connection, no mechanical parts which can wear, corrosion resistant, and frost proof. The entire valve shall fit within the pipe inside diameter**.** The design should allow for the valve to be installed without having to do any modifications to the existing pipe and should not produce any areas or voids that can collect or trap debris.

Hidden internal clamps if required to secure check valve in place shall be stainless steel. The port area of the saddle shall contour into a circumferential sealing (the "bill") are that is concentric with the pipe with shall allow passage of flow in one direction while preventing revers flow.

SUBMITTALS

The Contractor is required to submit product literature to the Engineer that includes information on the performance and operation of the valve, materials of construction, dimensions and weights, elastomer characteristics, flow data, head loss data, and pressure ratings.

CONSTRUCTION METHODS

The check valves shall be stored and installed in accordance with manufacturer's written installation and operation manual and approved submittals. The valve must be easily installed in pipes with poor end condition without the need to modify or utilize the headwall or structure to seal and anchor the valve. Once installed the valve shall not protrude beyond the face of the structure or end of pipe.

Contractor should ensure the manufacturer makes customer service available directly from the factory in addition to authorized representatives for assistance during installation and start-up. The manufacture, and train personnel in the operation, maintenance and troubleshooting of the valve.

Each installation shall be supervised and certified as correct upon completion by a representative of the device manufacturer or by an employee of the Contractor who is a certified installer

ITEM 350.99(Continued)

METHOD OF MEASUREMENT

Item 350.99 "24 Inch Tide Inline Check Valve" shall be measured for payment per EACH unit actually installed complete in place and approved in accordance with the Contract Documents and/ or as required by the Engineer.

BASIS OF PAYMENT

Item 350.99 "24 Inch Tide Inline Check Valve" will be paid for at the contract unit price bid per EACH. This price shall constitute full and complete compensation for all labor, tools, materials and equipment, including furnishing and installing check valves, clamps, bolts and washers, manufacturer customer service, and all incidental costs required to complete the work as required by the Engineer.

ITEM 358.1 GATE BOX REMOVED AND STACKED EACH

The work under these items shall conform to the relevant provisions of Subsection 301. of the Standard Specifications and Wareham Fire District Rules and Regulations for Planning, Material, and Construction Specifications, updated June 2025 at:
http://warehamfiredistrict.org/images/Final_WFD_Rules_Regs_Updated_060325.pdf
and the following:

The Contractor shall carefully remove transport and stack gates, and gate boxes as directed by the Engineer and/or the Wareham Water Department. All gate boxes removed and stacked shall be transported to the Wareham Water Department located at 2550 Cranberry Highway, Wareham, MA 02571. This includes any damaged or broken gate or service boxes.

METHOD OF MEASUREMENT

Item 358.1 Gate Box Removed and Stacked will be measured for payment by EACH.

BASIS OF PAYMENT

Item 358.1 Gate Box Removed and Stacked will be paid for at the Contract Unit Price EACH, which price will include all transportation to the Wareham Water Department, labor, equipment, materials and all incidental costs required to complete the Work

ITEM 371.12 12 INCH COUPLING EACH

The work under these items shall conform to the relevant provisions of Subsection 301 of the Standard Specifications and the following:

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement and payment for Item 371.12, will be paid for at the contract unit price per EACH of insulated pipe installed, which price shall constitute full compensation for all labor, tools, equipment, materials, hardware, and other incidentals required for installation as detailed on the Contract Drawings.

ITEM 376.1 HYDRANT-EXCLUDING THE COST OF THE HYDRANT EACH

The work under these items shall conform to the relevant provisions of Subsection 301. of the Standard Specifications and the following:

The Contractor shall install the hydrant per the manufacturer's specifications and as directed by the Engineer and/or the Wareham Fire District.

MATERIALS

The hydrant will be furnished by the Town of Wareham and provided to the Contractor for installation.

METHOD OF MEASUREMENT

Item 376.1 will be measured for payment by EACH installed complete in place excluding the cost of the hydrant.

BASIS OF PAYMENT

Item 376.1 will be paid for at the Contract Unit Price per EACH hydrant installed, which price will include all materials, except for the hydrant, labor, equipment, and all incidental costs required to complete the Work.

ITEM 376.3 HYDRANT-REMOVED AND STACKED EACH

The work under these items shall conform to the relevant provisions of Subsection 301. of the Standard Specifications and the following:

The Contractor shall carefully remove the hydrant so as not to damage the hydrant and shall transport the hydrant to the Wareham Fire District located at 2550 Cranberry Highway Wareham, MA 02571. This includes any damaged or broken hydrants.

METHOD OF MEASUREMENT

Item 376.3 will be measured for payment by EACH hydrant removed and stacked.

BASIS OF PAYMENT

Item 376.3 will be paid for at the Contract Unit Price per EACH, which price will include all labor, equipment, materials and all incidental costs required to complete the Work

ITEM 381.2 SERVICE BOX REMOVED AND STACKED EACH

The work under this item shall conform to the relevant provisions of Subsection 301. of the Standard Specifications and Wareham Fire District Rules and Regulations for Planning, Material, and Construction Specifications, updated June 2025 at:
http://warehamfiredistrict.org/images/Final_WFD_Rules_Regs_Updated_060325.pdf
and the following:

The Contractor shall carefully remove transport and stack gates, and service boxes as directed by the Engineer and/or the Wareham Water Department. All gate boxes removed and stacked shall be transported to the Wareham Water Department located at 2550 Cranberry Highway, Wareham, MA 02571. This includes any damaged or broken gate or service boxes.

METHOD OF MEASUREMENT

Item 381.2 will be measured for payment by EACH service box removed and stacked.

BASIS OF PAYMENT

Item 381.2 will be paid for at the Contract Unit Price per EACH service box removed and stacked, which price will include all transportation to the Wareham Water Department, labor, equipment, materials and all incidental costs required to complete the Work

ITEM 450. GRAVEL FOR SURFACING CUBIC YARD

The work under these items shall conform to the relevant provisions of Section 400. of the Standard Specifications and the following:

The work under this item consists of repair the existing gravel parking lot on the southern side of the project area as shown on the Drawings and details and further described herein.

SUBMITTALS

Submit a 1-pound sample of the proposed gravel for review and approval.

MATERIALS

Crushed Stone Aggregate
Aggregate shall be one-inch crushed stone (#57 stone), consisting of inert angular material derived from a stone quarry that is hard, durable, washed stone, and free of deleterious materials. Stone shall be generally light gray in color. Crushed stone surfacing shall conform to the following gradation:

Sieve Size	% Passing by Weight
1-1/2" (37.5 mm)	100
1" (25 mm)	95-100
1/2" (12.5 mm)	25-60
#4 (4.75 mm)	0-10
#8 (2.38 mm)	0-5

CONSTRUCTION METHODS

Excavate the area to a three-inch to six-inch depth so that finished grade can be established as noted on the Drawings. The Contractor shall confirm that the subgrade has been graded and compacted prior to installation of gravel surfacing. Place crushed stone in one lift to supplement

the existing gravel in the area shown on the Drawings. Meet adjacent pavement and lawn in flush conditions. Blend the stone with the adjacent gravel parking area.

Measurement of compaction of the gravel surfacing is not practical. Gravel surfacing shall be compacted with at least 6 passes of a vibratory plate compactor to a dense and unyielding condition. Final, compacted stone shall have no dips or abrupt changes in elevation. Supplement stone and re-compact as necessary to achieve a continuous surface.

ITEM 450. (Continued)

METHOD OF MEASUREMENT

Item 450. Gravel for Surfacing will be measured for payment by CUBIC YARD for gravel placed, graded, and compacted, complete in place,

BASIS OF PAYMENT

Item 450. will be paid at the Contract Unit price per CUBIC YARD, which price shall be full compensation for all labor, tools, equipment, materials, and all incidental costs required to complete the work as required by the Engineer, and as shown on the Contract Drawings.

ITEM 622.1 GUARDRAIL – WOOD, DOUBLE RAIL FOOT

The work under these items shall conform to the relevant provisions of Subsection 601. of the Standard Specifications and the following:

The work under this item is to construct double-rail wood guardrails as shown on the Contract Drawings

SUBMITTALS

The contractor shall submit the following:

1. Product data and source for wood including pressure treatment
2. Product data for hardware
3. Installation details

MATERIALS

Wood

Wood shall be pressure treated southern yellow pine uniform in treatment and appearance. Sizes shall be as noted on the Contract Drawings. All wood shall be from a single source.

Grade Certification: Each piece of wood shall bear grade mark in accordance with the latest edition of Rules of Southern Pine Inspection Bureau or certified as to grade by a licensed subscriber or SPIB.

Grade: Grade shall conform to Southern Pine SPIB Standards, latest edition, and in conformance with the following size and use applications:

Use Category	Nominal Size	SPIB Minimum Grade
Wood Rails	4" x 6"	No. 1 and Better
Wood Posts	8" x 8"	No. 1 and Better

Size: All wood shall be surfaced, planed or dressed by a planing machine on four sides, S4S in accordance with American Lumber Standard SPR-16-53.

Moisture Content: Wood shall be air dried for 90-120 days to the maximum moisture content specified below to prevent excessive surface checking prior to preservative treatment. Timbers larger than (2x) nominal dimension: 25 percent maximum moisture content.

Pressure Treatment: Wood shall be preservative treated by pressure methods and each piece marked in accordance with the AWPA and AWPB Standards. Wood shall be pressure-treated with water-borne preservative conforming in all respects to AWPA Standard P29-08 for ACQ-D treatment. Minimum retention of preservative shall be 0.40 lbs. per cubic foot in accordance with AWPB Standards. Field cuts shall be treated in accordance with AWPA Standards. Retention shall be per the following requirements:

ITEM 622.1 (Continued)

Above Ground Support	0.25 – 0.40 LBS/CF Retention
Ground Contact Fresh Water	0.40 LBS/CF Retention
Permanent Wood Foundations	0.60 LBS/CF Retention

Note: The minimum water repellent retention for all applications is 0.25 lbs. per cubic foot.

Hardware

All hardware shall be fashioned from steel and galvanized in accordance with requirements of ASTM A123, and/or A153. Bolts and nuts shall conform to ASTM A307. Carriage bolts shall be 5/8-inch diameter threaded bolts with smooth rounded head. Length as needed to meet the joined dimensions of rail and post. Nuts and washers shall be sized to match the carriage bolts.

Concrete Footing

Cast-in-place concrete shall conform to the requirements and applicable provisions of Section 701 of the Standard Specification, and the materials shall be specified in Subsection M4.02.00 of Division III, Materials of the Standard Specifications. Minimum 28-day compressive strength shall be 4,000 pounds per square inch, as indicated on the Contract Drawings.

Gravel Base

Gravel base shall conform to M1.03.0 of the Standard Specifications and shall be installed to the depth as indicated on the Contract Drawings.

CONSTRUCTION METHODS

Preparation

Before proceeding with the installation of the guardrail, the contractor shall examine the areas to receive the work for compliance with the requirements for installation tolerances and other conditions, which may affect performance. Proceed with the installation of the guardrail only after unsatisfactory conditions have been corrected at the direction of and to the satisfaction of the Engineer.

Installation

Wood Construction: All wood shall receive pressure treatment. Any cuts made in the field shall be treated as specified in this Section. Observe all handling precautions for pressure-treated wood in accordance with the supplier's instructions.

Construct all wood items as shown on the Contract Drawings and as directed by the Engineer. Wood cutting and jointing shall be workmanlike, square, and true. No split or blistered wood pieces will be allowed.

Posts shall be set plumb and shall be equally spaced for each run of guardrail. Excavate for footings as shown on the Contract Drawings. Install and compact the gravel base prior to setting posts and concrete footing. Top of concrete footing shall slope away from the post.

ITEM 622.1 (Continued)

Rails shall follow grade and shall be parallel to one another. Where rails are adjoined to continue the run of guardrail, the joint shall be one-eighth inch wide for expansion and shall be centered vertically on the post. No joints adjoining rails shall occur between posts. Exposed ends of rails shall be chamfered as indicated on the Contract Drawings.

Each rail shall be secured to each post with two carriage bolts as shown on the Contract Drawings. Edges of the carriage bolt heads shall be flush with the surface of the rails. The end of the carriage bolts shall be countersunk with the nut on the rear side of the posts. Once the nut is tightened, cut threaded end of bolt flush with nut. Bolts shall not protrude from the rear of the post.

METHOD OF MEASUREMENT

Item 622.1 Guardrail – Wood, Double Rail will be measured for payment by the FOOT, complete in place.

BASIS OF PAYMENT

Item 622.1 will be paid at the Contract Unit bid price per FOOT, which price shall be full compensation for all labor, tools, equipment, materials, and all incidental costs required to complete the work as required by the Engineer, and as shown on the Contract Drawings.

ITEM 655.3 ORNAMENTAL PICKET FENCE AND GATE FOOT

Work under this item shall conform to the relevant provisions of Subsection 660 of the Standard Specifications and the following:

The item includes all design, delivery, storage, labor, materials, and all appurtenances necessary for the installation of the industrial ornamental steel fence system to the limits shown on the Plans. All fencing and gate components installed, including all connections, shall be designed to adequately resist all forces acting upon it, including, but not limited to, pedestrian live loads and wind loads. Loading shall meet all requirements specified in the most recent edition of the AASHTO LRFD Bridge Design Specifications and the MassDOT Highway Division LRFD Bridge Manual. The Contractor shall provide a submittal with design, materials, and fabrication information for review and approval by MassDOT. The Contractor shall also provide a mock up of the fence for inspection by MassDOT prior to installation at the final location.

All posts including end, corner, and intermediate brace posts, all gates, gateposts, locks, and anchorages shall be included in the cost. The fencing height shall be 42 inches with a smooth top rail, and a black powder coated finish.

Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 10 years from the date of original purchase.

Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of original purchase.

MATERIALS

Steel material for fence framework (i.e. tubular pickets, rails and posts), shall be galvanized prior to forming in accordance with the requirements of ASTM A653/A653M, with minimum yield strength of 45,000 psi (310 MPa). The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft2 (276 g/m2), Coating Designation G-90.

Material for pickets shall be 14 Ga. tubing. The cross-sectional shape of the rails shall conform to the manufacturer's design with outside cross-section dimensions of 1.75" square and a minimum thickness of 14 Ga. Pickets shall be spaced per AASHTO pedestrian railing requirements.

ITEM 655.3 (Continued)

FABRICATION

Pickets, rails and posts shall be precut to specified lengths. Rails shall be prepunched to accept pickets. Pickets shall be predrilled to accept retaining rods.

Grommets shall be inserted into the prepunched holes in the rails and pickets shall be inserted through the grommets so that predrilled picket holes align with the internal upper raceway of the rails. Retaining rods shall be inserted into each rail so that they pass through the predrilled holes in each picket.

The manufactured galvanized framework shall be subjected to the thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including, as a minimum, a six-stage pretreatment/wash, an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The base coat shall be a thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2 mils (0.0508mm). The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color shall be black. The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2.

Panels shall be biasable to a 25% change in grade.

Swing gates shall be fabricated using 14ga rail, 12ga. gate ends, and 14ga. pickets. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding.

Pedestrian swing gates shall be self-closing. Integrated hinge-closer shall be ADA compliant that shall include a variable speed and final snap adjustment with compact design (no greater than 5" x 6" footprint). Hinge-closer shall be tested to a minimum of 500,000 cycles and capable of self-closing gates up to a maximum gate weight of 260 lbs. and maximum weight load capacity of 1,500 lbs. Hinge-closer device shall be externally mounted with tamper-resistant security fasteners, with full range of adjustability, horizontal (.5" - 1.375") and vertical (0 - .5"). Maintenance free hinge-closer set shall be tested to operate in temperatures of negative 20 F to 200 F degrees, and swings to negative 2 degrees to ensure reliable final lock engagement.

INSTALLATION

Fence post shall be spaced according to the Manufacturer's requirements. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set per manufacturer's requirements and can include post embedment in the concrete walls or base plates with anchors embedded in the concrete walls. The post set and anchorage shall meet the design requirements of the most recent edition of the AASHTO LRFD Bridge Design Specifications and the MassDOT Highway Division LRFD Bridge Manual.

ITEM 655.3 (Continued)

When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color.

Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer's recommendations.

METHOD OF MEASUREMENT

Item 655.3, "Ornamental Picket Fence and Gate" will be measured for payment per FOOT of fence installed.

BASIS OF PAYMENT

Item 655.3, "Ornamental Picket Fence and Gate" will be paid for at the contract unit price per FOOT of fence installed, including gates, which price shall constitute full compensation for all labor, tools, equipment, materials, hardware and all incidental costs complete in place and required by the Engineer.

ITEM 657. TEMPORARY FENCE FOOT

Work under this item shall conform to the relevant provisions of Subsections 644 and 665 of the Standard Specifications and the following:

The purpose of the fence is to better secure the construction area, particularly when construction activities have ceased for nights and weekends. Work shall include furnishing, installing, and maintaining a temporary chain link fence as required. Removing and resetting the temporary fence for daily access to the work zone shall be incidental to this item.

The Contractor will be responsible for providing the Engineer with an acceptable method for fence installation. Posts may be required to be set in the ground. All fencing components installed, including all connections, shall be designed to adequately resist all forces acting upon it, including, but not limited to, pedestrian live loads, wind loads, and construction live loads. Loading shall meet all requirements specified in the most recent edition of the AASHTO LRFD Bridge Design Specifications and the MassDOT Highway Division LRFD Bridge Manual.

All posts including end, corner, and intermediate brace posts, all gates, gateposts, locks, and anchorages shall be included in the cost. The fencing height shall be six (6) feet. Materials need not be new, but shall not be deteriorated, nor in any way jeopardize the security and safety purposes intended. All fencing shall be subject to the approval of the Engineer.

The Contractor shall be responsible for maintaining the temporary fence and shall be responsible and cognizant that it remains secure and that bridge work zones are always sealed off to the public. If the fence is vandalized or damaged by other means, the Contractor shall be responsible for replacing such, by end of same workday, to the Engineer's satisfaction. Fence fabric shall be placed on the face of the post away from the work area. A top tension wire rather than a pipe top rail shall be used. The top of the fabric shall be finished with a “knuckled” selvage.

Gates shall be locked always when there is no construction or watch personnel present. The contractor shall coordinate and provide the Monson Highway Department keys for emergency access to the flow control gate during non-working hours.

METHOD OF MEASUREMENT

Item 657, “Temporary Fence” will be measured for payment per FOOT of temporary fence installed and removed.

BASIS OF PAYMENT

Item 657. Temporary Fence will be paid for at the contract unit price per FOOT of temporary fence installed and removed, which price shall constitute full compensation for all labor, tools, equipment, materials, and all incidental costs required for installation, relocation as detailed on the Contract Drawings, and removal of the fence.

Twenty (20) percent of the bid price will be retained until the fence is removed.

ITEM 685.9	**STONE MASONRY VENEER**	**SQUARE YARD**
ITEM 690.9	**STONE MASONRY WALL REMOVED AND REBUILT IN CEMENT MORTAR**	**CUBIC YARD**
ITEM 690.91	**STONE MASONRY REMOVED AND STACKED**	**CUBIC YARD**

The work under these items shall conform to the relevant provisions of Subsections 685 and 690 of the Standard Specification and the following:

The Work shall consist of the removal and rebuilding existing stone masonry and pointing and grouting open or deteriorated areas in existing stone masonry walls of the upstream fishway, removal and stockpiling of the stone masonry walls in the downstream area, removal and stockpiling of granite railings, and walls and piers on the dam and dike, and constructing a stone veneer on the proposed downstream portion of the proposed fish ladder using the stockpiled stones. The construction of new stone masonry shall compose approved stone, laid in mortar beds and constructed in such shapes, and to the lines, grades, dimensions, and cross-sections indicated in the Plans or as directed by the Engineer in accordance with these Special Provisions.

The Contractor shall visit the site prior to submitting bids to familiarize themselves with the condition and extent of the existing stone masonry walls. The Contractor shall verify all conditions, dimensions and materials in the field and shall base their bid on their findings without any additional compensation for variances from the Plans or these Special Provisions regarding actual conditions for the materials to be removed.

The Massachusetts Department of Transportation (MassDOT) does not guarantee or represent that the materials will actually coincide with any descriptions contained herein or represented on the Drawings. No additional compensation, other than the cubic yard price bid for the Item, shall be made if the materials or work provided is different than that inferred or described herein or shown on the Drawings.

MATERIALS

To the maximum extent practical, reconstructed stone masonry and stone masonry veneer shall be constructed with existing stones retrieved and stockpiled on site during removal of portions of the existing stone masonry walls, or encountered during excavation activities.

Prior to the start of the work, all new and existing stones proposed to be used in the work shall be approved by the MassDOT Cultural Resources Unit. It is the Contractor's responsibility to obtain this approval and provide access to the site and stockpiles if requested by the above-mentioned parties.

Stones for Rebuilt Walls and Stone Veneer:
If an insufficient number of existing stones are available on site, new stones shall conform to the stones found in the existing walls relative to shape, color, size, texture, and geological composition, in addition to the requirements of Subsection M.9.04.4 of the Standard Specifications. Stones used below grade, for the core, or for the back of walls where not exposed need not meet these special criteria but must conform to Section M9.04.4 and be sized and shaped to allow for proper interlocking with the rest of the stonework.

ITEM 685.9, 690.9 AND 690.91 (Continued)

Stones for Repairs to Existing Walls:
At all locations where repairs to existing walls are indicated on the Plans, the Contractor shall provide stones that conform to the shape, size, color, texture and geological composition of the existing stone masonry. At the approval of the Engineer, the Contractor may reclaim and reinstall the existing stones located at the base of the wall. The stones to be reclaimed are those which have fallen out of the existing masonry walls and have not been so rounded by erosion that they have lost their shape and/or no longer match the appearance of the stones remaining in the wall.

Stone Masonry Removed and Stacked
Stone masonry and granite features, such as the granite railings and walls, shall be removed and stockpiled with care so as not to damage the blocks. Refer to the subsequent work items, demolition plans, and landscape plans for locations and details for the removal and reuse of these materials.

Mortar:
For stone joints and bedding, mortar material shall be mixed in accordance with Subsection M.4.02.15 of the Standard Specifications. Mortar that has been mixed and unused for more than 30 minutes shall be considered unusable and shall be discarded. Retempering is not permitted.

CONSTRUCTION

The requirements regarding weather limitations shall be adhered to as stipulated in Standard specifications, except that no work shall be constructed when temperatures are expected to fall below 40 °F within 36 hours of placement or repair, unless written permission is granted by the Engineer. The Contractor shall submit for approval cold weather construction materials and methods and shall adhere to conditions set forth by the Engineer. The materials and work associated with weather limitations are considered incidental and no additional compensation will be allowed.

Care should be taken during resetting existing stone to keep weathered stone faces exposed. Additional stones shall be blended with the existing stones in order to reduce any incompatibility in the appearance of the finished wall surface. Mortar joints in exposed faces shall be recessed as detailed so that no mortar is visible, so that the exposed surface matches the existing dry laid abutment stones. For all hidden faces, mortar joints shall be troweled flush with the surface. All surfaces shall be cleaned as required such that they are clean of all dirt, debris, and organics prior to setting. The Contractor shall ensure that an adequate supply of fresh, potable water is available at all times when it is required to perform the work. Stream water or storm water is not permitted for use in any part of the work, including, but not limited to, cleaning, mixing, or curing mortar or grout.

ITEM 685.9, 690.9 AND 690.91 (Continued)

Construction of Rebuilt Walls and Stone Veneer:

Stone veneer shall be secured to the concrete wall with dovetail slots cast into the concrete and dovetail ties between layers of veneer. Dovetail slots shall be 16 gauge, hot-dip galvanized steel. Dovetail ties shall be corrugated ties, 12-gauge hot dip galvanized steel. Sheet metal shall meet the requirements of ASTM A1008. All galvanized components shall meet the requirements of Specification M7.10.0.

Repairs to Existing Walls:

The cavities in the existing walls and all surfaces against which masonry will be constructed shall be thoroughly cleaned of loose stones, mortar, vegetation, and miscellaneous debris. The methods of removing loose stones, mortar, and debris shall be submitted for approval by the Engineer, in advance of commencing the work. The recommended method of cleaning surfaces of organic matter and dirt is pressure washing. Care is to be exercised so as not to damage sound masonry. No dirt, debris, or wash water is allowed to enter the waterway.

Removal of existing stones set in mortar or concrete shall be accomplished with handheld tools approved by the Engineer. Concrete or mortar removal around fieldstones shall be accomplished with chipping hammers weighing no more than 15 pounds. Hand tools such as hammers and chisels shall be provided for the removal of final particles of mortar or to achieve the required depth. The Engineer may reject the use of any method or equipment that may cause any damage to the existing stone masonry which is to remain. All stones removed from the wall shall be stockpiled for reuse in the construction of new returns for the existing abutments, rebuilding the existing walls and use in the stone gabion walls. Stockpile locations shall be on site and approved by the Engineer.

Joints to be pointed out shall be cleaned of all loose or unsound mortar, dirt, vegetation, or other foreign materials. All loose mortar or stone shall be raked out to a minimum depth of six inches. Joints exceeding 1½ inches in width shall be packed with stones, angular in shape, to fill excessive voids. Grout material shall be thoroughly packed to fill the depths of the void in accordance with the details shown on the Plans, or as directed by the Engineer. Excess grout shall be cleaned from adjacent stonework.

Contractor Qualifications

Not less than thirty (30) days prior to the start of any masonry construction work, the Contractor shall submit evidence that the stone mason has demonstrated experience in comparable historic masonry construction. The stone mason must be approved by the Engineer, in consultation with the MassDOT Cultural Resources Unit.

The masonry contractor must construct an initial sample of both a stone masonry repair and a five (5) foot long sample section of reconstructed, free-standing stone wall. The Engineer, in consultation with the MassDOT Cultural Resources Unit to approve the stone, joint construction, and overall character of installation of the sample sections. The approved samples may be part of the finished work. A rejected sample must be demolished and rebuilt to the approval of the Engineer, at no additional cost.

ITEM 685.9, 690.9 AND 690.91 (Continued)

METHOD OF MEASUREMENT

Item 685.9 Stone Masonry Veneer will be measured for payment by the SQUARE YARD installed complete in place.

Items 690.9 Stone Masonry Wall Removed and Rebuilt in Cement Mortar and 690.91 Stone Masonry Remove and Staked will be measured for payment respectively by the CUBIC YARD compete in place

BASIS OF PAYMENT

Items 690.9 and 690.91 will be paid respectively at the Contract unit price per Cubic Yard, which price shall constitute full compensation for all labor, tools, materials, and equipment including removal of loose stone and mortar, reclaiming stones from the base of the wall and/or embankment, cleaning, cutting and shaping of stones, pointing of new and repaired walls, and all incidental costs required to complete the Work, as required by the Engineer.

No payment shall be made for work exceeding the limiting dimensions shown on the plans unless the work has been authorized in writing by the Engineer.

Item 685.9 Stone Masonry Veneer will be paid at the Contract unit price per Square Yard installed. This price shall constitute full compensation for furnishing all labor, tools, equipment, materials (including cleaning and preparing joints, and protection of masonry), and all incidental costs to complete the Work, as required by the Engineer

ITEM 690.2 SALVAGED GRANITE LANDSCAPE CURB FOOT
ITEM 690.3 SALVAGED GRANITE BLOCK WALL FOOT

The work under these items shall conform to the relevant provisions of Subsections 685 and 690 of the Standard Specification and the following:

The work to be done under these items shall consist of furnishing from onsite sources, fabricating and installing landscape curb and block wall with salvaged granite in accordance with the Contract Drawings and the following:

SUBMITTALS

Shop Drawings & Product Literature
Submit the following for approval by the Engineer:

1. Landscape Curb and Walls: Submit shop drawings showing concrete footing and reinforcement where applicable, if different than the Contract Drawings.
2. Submit concrete mix and reinforcement materials for footings and cradle.
3. Submit mortar product literature.
4. Submit PVC weep hole product literature.
5. Submit geotextile fabric product literature.
6. Submit sieve analysis for crushed stone.

Mockup
The contractor shall erect a 6’ long x 2’ tall x 2’ wide mockup of the salvaged granite block wall for review and approval. The mockup shall include a mix of salvaged stones assembled to illustrate tight joints and patterns. The mockup may be erected on a temporary compacted stone base or in the final location. The approved mockup shall remain in place during construction of the final wall to serve as a model (or as part of the final wall).

MATERIALS

General
There shall be one salvaged granite block wall and one salvaged granite landscape curb in the locations shown on the Contract Drawings.

Salvaged Stone for Granite Landscape Curb & Granite Block Wall
Landscape curb and wall shall be constructed of granite blocks which have been salvaged and stockpiled from existing materials on the site. Sources of existing granite for reuse include existing freestanding and retaining stone walls, fish ladder walls, wall caps, posts from the existing granite guardrail, and an existing “1850” engraved granite block all within the boundaries of the existing site and noted for disposition. The wall consists of multiple courses of salvaged granite block in a random stacked configuration. Landscape curb consists of a single course of salvaged blocks. All salvaged granite shall be reviewed by the Consulting Landscape Architect onsite to determine which stones may be used for certain applications. The Contractor shall organize and stockpile the salvaged stone according to its intended reuse.

ITEMS 690.2 AND 690.3 (Continued)

Landscape Curb: Salvaged stones for landscape curb shall be formerly cut stone in a block shape (not fieldstone). Height and width shall be similar between adjoining blocks comprising the curb. Block lengths may vary between 18 inches to 3 feet in length and shall be arranged to follow the radius indicated on the Contract Drawings.

Block Wall: The salvaged stones shall be a mix of formerly cut stone in block shape and available fieldstone from existing walls within the project limits. Stones shall vary in length and height but shall be assembled to follow the dimensions and radii shown on the Contract Drawings. An existing granite stone engraved with "1850" is to be reused as part of the Block Wall and shall be located as shown on the Contract Drawings.

Mortar Setting Bed

Setting bed mortar shall conform to ASTM C 270, Type S, except that latex polymer additive shall be mixed with the cementitious materials and aggregate in lieu of water.

Cement: Shall be an American Portland cement conforming to ASTM C150, Type I or II, except Type III may be used for cold-weather construction, as selected by the Engineer and shall exhibit no efflorescence when cast into 2-inch x 7-inch x ½ inch (50 mm x 178 mm x 13 mm) slabs comprising the mortar under test.

Water: Clean, fresh and potable, from the public water system.

Sand: Clean, washed, uniformly well-graded, conforming to ASTM C144 with 100 percent passing No. 8 sieve (2.37 mm), and not more than 35 percent passing No. 50 sieve (300 um), with a fineness modulus maintained at 2.25 plus or minus 0.10.

Hydrated Lime: Provide plastic hydrate, conforming to ASTM C207, Type "S" as approved by the Engineer.

Integral Waterproofing: For all mortar use Master Builder's "Omicron Mortar-proofing", Sonneborn "Hydrocide", or Pardee "Drycrete".

Mortar Pigments: Shall be pure, non-fading mineral pigmented mortar cement equal to Medusa, Flamingo or Hydroment as approved by the Engineer. Use only pigments with record of satisfactory performance in masonry mortars. Color materials shall not exceed 2 percent of weight of cement used. Color shall be as selected by the Engineer.

Anti-freeze admixtures and accelerators shall not be used in mortar.

Concrete Base with Reinforcing

Cast-in-place concrete shall conform to the requirements and applicable provisions of Section 701 of the Standard Specification and the materials shall be specified in Subsection M4.02.00 of

Division III, Materials of the Standard Specifications. Minimum 28-day compressive strength shall be 4,000 pounds per square inch, as indicated on the Contract Drawings. Reinforcing Bars shall be new, #5 deformed billet steel bars, conforming to ASTM A615, Grade 60 deformed, coated.

ITEMS 690.2 AND 690.3 (Continued)

Gravel Base

Gravel base shall conform to M1.03.0 of the Standard Specifications and shall be installed to depth as indicated on the Contract Drawings.

Crushed Stone Drainage Backfill, Weep Hole & Geotextile Fabric

Crushed drainage stone wrapped in geotextile fabric shall be continuous along the retained side of the Salvaged Granite Block Wall.

Stone: Crushed stone shall be 1" crushed stone consisting of inert angular material derived from a stone quarry that is hard, durable, washed stone, free of deleterious materials, and complying with ASTM D2321. Gradation shall conform to M2.01.4, and the following:

Sieve Size		% Passing by Weight
1"	(25 mm)	100
3/4"	(19 mm)	90-100
1/2"	(12.5 mm)	10-50
3/8"	(9.5 mm)	0-20
#4	(4.75 mm)	0-5

Geotextile Fabric: Geotextile fabric to wrap drainage stone shall be a high modulus, non-woven polypropylene fabric with a minimum tensile strength not less than 120 lbs in accordance with ASTM D 4632. Fabric shall be Mirafi 140N, Skaps GT142, Propex Geotex 401, or approved equal.

Weep Hole: Weep holes shall be 1" diameter PVC schedule 40 tube spaced at three feet on center and pitched to drain toward the face of the wall. Bottom of weep hole shall be two inches above finished grade.

CONSTRUCTION METHODS

Delivery, Handling, and Storage

The contractor shall carefully stockpile and relocate all salvaged granite blocks to the respective locations within the project site. Salvaged granite shall be carefully handled to prevent chipping, breakage, soiling, or other damage. Pinch or wrecking bars shall not be used without protecting edges of stone with wood or other rigid materials. Stone units shall be lifted with wide-belt type slings wherever possible; wire rope or ropes containing tar or other substances which might cause staining or damage to stone finish shall not be used.

If salvaged granite blocks are damaged during construction and deemed unsatisfactory by the Engineer and/or Consulting Landscape Architect, additional stone meeting the approximate dimensions and color of the damaged stone may need to be sourced by the contractor.

ITEMS 690.2 AND 690.3 (Continued)

Manufactured items: Deliver all manufactured products in their original containers, plainly marked with product identification and manufacturer's name.

Preparation

Before proceeding with the installation of the granite landscape curb and granite block wall, the contractor shall examine the areas to receive the work for compliance with the requirements for installation tolerances and other conditions, which may affect performance. Proceed with the installation of the stonework only after unsatisfactory conditions have been corrected at the direction of and to the satisfaction of the Engineer.

Excavation and Footings

Excavation for the construction of the wall and curb shall include trenching, stabilization, and removal of excavated material. Footings shall be constructed as shown on the Contract Drawings. Footings shall have a form finish, and the top shall be level to receive the salvaged granite blocks.

Granite Block Wall Construction

1. Construct gravel base and reinforced concrete foundation as shown on the Contract Drawings, approved Shop Drawings, and as required by the Engineer.
2. Prior to installation, all salvaged granite blocks should be cleaned before setting by scrubbing with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh fillers or abrasives.
3. Salvaged granite blocks shall be laid out according to the respective wall details shown on the Contract Drawings and a mockup shall be erected by the contractor. The mockup and general stone layout shall be approved by the Consulting Landscape Architect in the field.
4. Stone should be set with tight horizontal and vertical joints so that no mortar is visible on the vertical face. Mortars shall be used to backfill between interior voids. Surficial joints shall be filled with small stones for tight joints. Stones may be chiseled to provide tight joints where necessary. All joints on the top of the wall shall be mortared flush with the surface of the stones.
5. The mortar setting bed on the concrete footing shall be thickened as necessary to accommodate variations in the stones. Mortar shall be wedged into the joints to limit exposure and visibility. Stone chinks may be used to level the courses. Chinks shall be of a similar stone color and appearance. Every effort shall be made to conceal stone chinks as much as possible.
6. Mortar that has begun to set or which is not used within 2-1/2 hours after initial mixing shall be discarded. Mortar that has stiffened due to evaporation within the 2-1/2 hour period shall be re-tempered to restore its workability. Re-tempering mortar that has partially hardened without additional cement aggregate or water, will not be permitted.
7. Vertical joints shall be as tight as possible (half inch +/-). Protruding edges of salvaged blocks may be chiseled and eased in order to achieve tight and consistent joints, both vertically and horizontally.
8. Vertical faces of walls shall be plumb. All exposed faces and ends of walls shall be finished with salvaged stone.

ITEMS 690.2 AND 690.3 (Continued)

Weep holes shall be aligned within wall joints and their appearance shall be minimized.

Crushed Stone Drainage Backfill, Weep Hole & Geotextile Fabric

Crushed drainage stone wrapped in geotextile fabric shall be continuous along the retained side of the Salvaged Granite Block Wall and shall conform to the dimensions shown on the Contract Drawings. Stone shall be completely wrapped in geotextile fabric. Where multiple rolls of fabric need to be joined, the fabric shall be lapped 12 inches minimum.

Final Cleaning

After mortar is thoroughly set and cured and before Final Completion at a time approved by the Engineer, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. All cleaning operations shall proceed from the top down.
3. Final cleaning work shall be performed only when atmospheric temperature is above 40 degrees Fahrenheit and rising.
4. Perform final cleaning by scrubbing granite blocks with stiff bristle fiber brushes and water. Rinse all surfaces thoroughly with clean water.
5. Remove from the site and legally dispose of all cartons, rubbish and debris resulting from work under this Section not less often than once per week.

METHOD OF MEASUREMENT

Items 690.2 and 690.3 will be measured for payment respectively by FOOT for all materials complete in place.

BASIS OF PAYMENT

Items 609.1 and 690.3 will be paid respectively at the Contract unit bid prices per foot which prices shall be full compensation for excavation, compaction, placement of gravel base, construction of concrete footing with reinforcement, backfilling, cleaning and setting salvaged stone, mortar, weep holes, drainage stone and geotextile fabric installed, and all labor, tools, equipment, materials, and all incidental costs to complete the work , as required by the Engineer.

ITEM 690.5 SALVAGED GRANITE PIER EACH

The work under these items shall conform to the relevant provisions of Subsections 685 and 690 of the Standard Specification and the following:

The work to be done under this item shall consist of reinstalling granite piers in accordance with the Contract Drawings and the following:

SUBMITTALS

Submit concrete mix for footing.

MATERIALS

Salvaged Granite Piers

Granite piers shall be two salvaged granite piers from the site to be stockpiled, cleaned, and reinstalled in the locations shown on the Contract Drawings. A photograph of the two existing poers included with the detail on the Contract Drawings for reference.

Concrete Footing

Cast-in-place concrete shall conform to the requirements and applicable provisions of Section 701 of the Standard Specification and the materials shall be specified in Subsection M4.02.00 of Division III, Materials of the Standard Specifications. Minimum 28-day compressive strength shall be 4,000 pounds per square inch, as indicated on the Contract Drawings.

Gravel Base

Gravel base shall conform to M1.03.0 of the Standard Specifications and shall be installed to depths as indicated on the Contract Drawings.

CONSTRUCTION METHODS

Handling and Storage

The contractor shall carefully stockpile and relocate two salvaged granite piers to the proposed locations within the project site. Salvaged granite shall be carefully handled to prevent chipping, breakage, soiling, or other damage. Pinch or wrecking bars shall not be used without protecting edges of stone with wood or other rigid materials. Stone units shall be lifted with wide-belt type slings wherever possible; wire rope or ropes containing tar or other substances which might cause staining or damage to stone finish shall not be used.

If salvaged granite blocks are damaged during construction and deemed unsatisfactory by the Engineer and/or Consulting Landscape Architect, the contractor will be required to source and fabricate new piers to match the existing ones.

Preparation

Before proceeding with the installation of the salvaged granite piers, the contractor shall examine the areas to receive the work for compliance with the requirements for installation tolerances and other conditions, which may affect performance. Proceed with the installation of the stonework only after unsatisfactory conditions have been corrected at the direction of and to the satisfaction of the Engineer.

ITEM 690.5 (Continued)

Coordinate the installation of the piers with the adjacent walls and metal picket fencing to ensure the placement and dimensions of above-grade and below-grade improvements, including footings, allow for the finished condition to match the design intent illustrated on the Contract Drawings

Excavation and Footings

Excavation for the construction of the pier footings shall include trenching, stabilization, and removal of excavated material. Footings shall be constructed as shown on the Contract Drawings and shall be coordinated with required fence footings and the adjacent walls. Footings shall have a form finish, and the top shall be set below the adjacent salvaged granite paving and concrete paving.

Installation

Footings shall be set on compacted gravel base. Salvaged granite piers shall be set plumb and to an equal, matching height as per the Contract Drawings. The piers shall be oriented so that a flat face is parallel to the adjacent fencing. Piers shall be secured in their concrete footings with no leaning or movement.

Final Cleaning

At the completion of installation, clean piers of all dust and debris with water for final acceptance.

METHOD OF MEASUREMENT

Item 690.5 Salvaged Granite Pier will be measured for payment by EACH for all materials complete in place including excavation, compaction, placement of gravel base, backfilling, cleaning and setting salvaged granite pier with concrete footing complete in place in accordance with the Contract Drawings, as specified herein and as required by the Engineer.

BASIS OF PAYMENT

Item 690.5 will be paid at the Contract unit bid price per each, which price shall be full compensation for all excavation, compaction, placement of gravel base, backfilling, cleaning and setting salvaged granite pier with concrete footing and all labor, tools, equipment, materials, and all incidental costs to complete the work as required by the Engineer.

ITEM 690.6 GRANITE CAPSTONE FOOT

The work under these items shall conform to the relevant provisions of Subsections 685 and 690 of the Standard Specification and the following:

The work to be done under these items shall consist of furnishing, fabricating and installing granite wall caps with salvaged granite in accordance with the drawings and the following:

MATERIALS

If sufficient quantity exists on site, granite wall cap shall be constructed of granite blocks which have been salvaged and stockpiled from existing materials on the site. Sources of existing granite for reuse include existing freestanding and retaining stone walls, fish ladder walls, wall caps, and posts from the existing granite guardrail within the boundaries of the existing site and noted for disposition. All salvaged granite shall be reviewed by the Consulting Landscape Architect onsite to determine which stones may be used for certain applications. The Contractor shall organize and stockpile the salvaged stone according to its intended reuse. If additional granite caps are required due to limited stock available on site, the Consulting Landscape Architect will review the products that will be brought to the site for use as granite wall cap.

Mortar Setting Bed
Setting bed mortar shall conform to ASTM C 270, Type S, except that latex polymer additive shall be mixed with the cementitious materials and aggregate in lieu of water.

Cement: Shall be an American Portland cement conforming to ASTM C150, Type I or II, except Type III may be used for cold-weather construction, as selected by the Engineer and shall exhibit no efflorescence when cast into 2-inch x 7-inch x ½ inch (50 mm x 178 mm x 13 mm) slabs comprising the mortar under test.

Water: Clean, fresh and potable, from public water system.

Sand: Clean, washed, uniformly well-graded, conforming to ASTM C144 with 100 percent passing No. 8 sieve (2.37 mm), and not more than 35 percent passing No. 50 sieve (300 um), with a fineness modulus maintained at 2.25 plus or minus 0.10.

Hydrated Lime: Provide plastic hydrate, conforming to ASTM C207, Type "S" as approved by the Engineer. Integral waterproofing: for all mortar use Master Builder's “Omicron Mortar-proofing”, Sonneborn “Hydrocide”, or Pardee “Drycrete”.

CONSTRUCTION METHODS

Delivery, Handling, and Storage
The contractor shall carefully stockpile and relocate all salvaged granite blocks to the respective locations within the project site. Salvaged granite shall be carefully handled to prevent chipping, breakage, soiling, or other damage. Pinch or wrecking bars shall not be used without protecting edges of stone with wood or other rigid materials. Stone units shall be lifted with wide-belt type slings wherever possible; wire rope or ropes containing tar or other substances which might cause staining or damage to stone finish shall not be used.

ITEM 690.6 (Continued)

If salvaged granite blocks are damaged during construction and deemed unsatisfactory by the Engineer and/or Consulting Landscape Architect, additional stone meeting the approximate dimensions and color of the damaged stone may need to be sourced by the contractor.

Manufactured items: Deliver all manufactured products in their original containers, plainly marked with product identification and manufacturer's name.

Final Cleaning

After mortar is thoroughly set and cured and before Final Completion at a time approved by the Engineer, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. All cleaning operations shall proceed from the top down.
3. Final cleaning work shall be performed only when atmospheric temperature is above 40 degrees Fahrenheit (14 degrees Centigrade) and rising.
4. Perform final cleaning by scrubbing granite blocks with stiff bristle fiber brushes and water. Rinse all surfaces thoroughly with clean water.
5. Remove from the site and legally dispose of all cartons, rubbish and debris resulting from work under this Section not less often than once per week.

METHOD OF MEASUREMENT

Item 690.6 Granite Wall Cap will be measured for payment by FOOT for all materials complete in place including excavation, compaction, placement of gravel base, backfilling, cleaning and setting salvaged granite curb with concrete cradle installed complete in place in accordance with the Contract Drawings, as specified herein and as required by the Engineer.

BASIS OF PAYMENT

Item 690.6 will be paid at the contact unit price per foot which price shall be full compensation for all excavation, compaction, placement of gravel base, backfilling, cleaning and setting salvaged granite curb with concrete cradle installed labor, tools, equipment, materials, and all incidental costs to complete the work, as required by the Engineer Drawings.

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 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 dispose of accumulated debris as required. Silt sacks, which become damaged during construction operations, shall be repaired or replaced immediately at no additional cost to the Department.

When emptying the silt sack, the Contractor shall take all due care to prevent sediment from entering the structure. Any silt or other debris found in the drainage system at the end of construction shall be removed at the Contractor's expense. The silt and sediment from the silt sack shall be legally disposed of offsite. Under no condition shall silt and sediment from the insert be deposited on site and used in construction.

All curb 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
ITEM 698.4 GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL SQUARE YARD

The work performed under this Item shall consist of furnishing and installing geotextile fabric in conjunction with the details as shown on the Plans or as directed by the Engineer.

The geotextile fabric shall be listed on the MassDOT QCML and conform to the requirements of AASHTO M288 for fabric used as Permanent Erosion Control, and fabric used for separation. Woven Monofilament Geotextile shall be Class 2 and all others shall be Class 1. Construction and installation shall be in accordance with AASHTO M288 and the following:

Atmospheric exposure of the geotextile fabric to the elements following laydown shall be a maximum of 14 days. If laid under water, the covering rock fill or crushed stone shall be placed on the same day as the geotextile.

For seams that are sewn in the field, the Contractor shall provide at least a six (6) feet length of sample sewn seam for the approval by the Engineer before the geotextile 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 Contractor shall submit the seam assembly description along with the seam samples. This description shall include the seam type, stitch type, sewing thread, and stitch density.

The geotextile shall be placed in intimate contact with the soil without wrinkles or folds, and it 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 the geotextile.

The geotextile shall be placed so that the machine direction is horizontal and runs along the slope. Adjacent geotextile sheets shall be joined by either sewing or overlapping. Overlapped seams at roll ends shall be overlapped a minimum of 12 inches except if placed underwater. In such instances the overlap shall be a minimum of three (3) feet. Overlaps of adjacent rolls shall be a minimum of 12 inches in all instances.

Care shall be taken during installation so as to avoid damage to the geotextile because of the installation process. Should the geotextile be damaged during installation, a geotextile patch shall be placed over the damaged area extending three (3) feet beyond the limits of the damage.

The slope protection placement shall begin at the toe of the slope and proceed up the slope. Placement shall take place to avoid stretching and subsequent tearing of the geotextile.

Crushed stone, rock fill or riprap shall not be dropped from a height exceeding three (3) feet. All void spaces in the armor stone shall be backfilled with small stone to ensure full coverage.

Field monitoring shall be performed to verify that the crushed stone placement does not damage the geotextile. Any geotextile damaged during backfill placement shall be replaced as directed by the Engineer, at the Contractor's expense.

ITEMS 698.3 and 698.4 (Continued)

METHOD OF MEASUREMENT

Item 698.3 and 698.4 be measured for payment respectively by the SQUARE YARD complete in place.

BASIS OF PAYMENT

Items 698.3 and 698.4 will be paid for respectively at the contract unit price per SQUARE YARD, which price includes full compensation for all labor, equipment and materials and all incidental costs to complete the work as specified. The area of geotextile folded over the top of the crushed stone will be included in the quantity measurement.

ITEM 706.7 SALVAGED GRANITE PLANK PAVING SQUARE FOOT

The work under this item shall conform to the relevant provisions of Section 700 of the Standard Specifications, and the following:

The work to be done under this item shall consist of installing plank paving from onsite salvaged granite in accordance with the Contract Drawings and the following:

SUBMITTALS

Shop Drawings & Product Literature
Submit the following for approval by the Engineer:

1. Submit shop drawings showing setting for plank paving, if different from the Contract Drawings.
2. Submit polymeric sand product literature and color chart.
3. Submit stone dust (setting bed) product literature.
4. Submit sieve analysis for crushed stone base.

MATERIALS

Salvaged Stone for Granite Plank Paving
Stone for reuse as granite plank paving shall be sourced from the project site. There will be quantities of salvaged granite from the site due to the removal of these features during construction.

The source of granite for plank paving shall be the existing top rail stones from the granite guardrail that exists on the north side of Cranberry Highway (Routes 6 & 28). These stones are approximately 6 inches thick, 12 inches wide, and range in length from 3 feet to 6 feet.

All salvaged granite shall be reviewed by the Consulting Landscape Architect onsite to determine which stones shall be used for plank paving. The Contractor shall organize and stockpile the salvaged stone according to its intended reuse.

Polymeric Sand Joints for Granite Plank Paving
Joint filler in paving plank joints shall be a sand meeting ASTM C 33. Sand mixture shall contain coloring additive to be selected to match the salvaged granite.

1. Sand shall be from a single source. Source of supply shall not be changed during course of job without the written permission of the Engineer.
2. Coloring additive for sand joint filler shall be SGS Colors, as manufactured by Solomon Colors, Laticrete, Ardex, or approved equal. Coloring additives shall be a chemically inert, finely ground mineral oxide pigment and shall be certified by a supplier to be resistant to alkali, light, and weather, and shall be of a chemical composition unaffected by cement and free of water and soluble salts.

ITEM 706.7 (Continued)

Stone Dust Setting Bed

Granite plank paving shall be set on a stone dust setting bed as indicated on the Contract Drawings. Stone dust shall be a finely graded crushed granite with gradation in accordance with ASTM C136:

Typical Gradation

Sieve	Percent Passing (Wt)
3/8”	100
# 4	90-100
# 8	75-80
# 16	55-65
# 30	40-50
# 50	25-35
# 100	15-20
# 200	10-15

Gravel Base

Gravel base for granite plank paving shall conform to M1.03.0 of the Standard Specifications and shall be installed to depths as indicated on the Contract Drawings. Material for processed gravel base shall conform to the MassDOT Standard Specification for Item 151. GRAVEL BORROW.

CONSTRUCTION METHODS

Delivery, Handling, and Storage

The contractor shall carefully stockpile and relocate all salvaged granite to the respective locations within the project site. Salvaged granite shall be carefully handled to prevent chipping, breakage, soiling, or other damage. Pinch or wrecking bars shall not be used without protecting edges of stone with wood or other rigid materials. Stone units shall be lifted with wide-belt type slings wherever possible; wire rope or ropes containing tar or other substances which might cause staining or damage to stone finish shall not be used.

If salvaged granite planks are damaged during construction and deemed unsatisfactory by the Engineer and/or Consulting Landscape Architect, additional stone meeting the approximate dimensions and color of the damaged stone may need to be sourced by the contractor.

Manufactured items: Deliver all manufactured products in their original containers, plainly marked with product identification and manufacturer's name.

Preparation

Before proceeding with the installation of the granite plank paving the contractor shall examine the areas to receive the work for compliance with the requirements for installation tolerances and other conditions, which may affect performance. Proceed with the installation of the stonework only after unsatisfactory conditions have been corrected in the direction of and to the satisfaction of the Engineer.

ITEM 706.7 (Continued)

Excavation, Subgrade and Base Material

Areas to be paved shall be compacted and brought approximately to subgrade elevation as specified, under the work of Item 120.1 UNCLASSIFIED EXCAVATION, before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be specified, under the Item 120.1 UNCLASSIFIED EXCAVATION, of this Specification.

Construct the gravel base as shown on the Contract Drawings, approved Shop Drawings, and as required by the Engineer. The base shall be placed and compacted in four-inch lifts until the final depth shown on the Contract Drawings is achieved. The base stone shall extend 6 inches beyond the edges of the paving and held below loam for adjacent lawns.

Placing Salvaged Granite

Prior to installation, all salvaged granite shall be cleaned before setting by scrubbing with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh fillers or abrasives.

Granite shall be set on a stone dust setting bed as shown on the Contract Drawings. The setting bed depth shall be adjusted as necessary to accommodate variations in the surfaces of each stone.

Salvaged granite shall be generally laid out as shown on the Contract Drawings. The limits of the paving shall conform to the Contract Drawings, but the locations of joints and the widths of the runs of paving planks may vary from the Contract Drawings. The general stone layout shall be approved by the Consulting Landscape Architect in the field including the placement of joints and the locations of cuts to achieve the desired pattern and layout.

Stone shall be set with tight joints. Horizontal joints between granite planks in each run shall be staggered with the joints in the adjacent runs of granite planks by a minimum of one foot. Joints shall be filled with polymeric sand flush with the surface. Wet sand periodically and sweep into joints until polymeric sand has hardened. If sand settles in the joints, the contractor shall install additional polymeric sand until the joint is stable and flush with the surface of the granite. Protruding edges of salvaged planks may be chiseled and eased in order to achieve tight and consistent joints.

Final Cleaning & Acceptance

After completion of the installation, the contractor shall complete the following:

1. Sweep paving clean of any debris and loose polymeric sand. If polymeric sand has settled in the joints, install additional sand for acceptance.
2. Stones shall be stable and firm on the compacted base. If any stones are loose, the contractor shall remove them, adjust the setting bed and base, and reinstall the stones until they are firmly in place.
3. Remove all dust and debris from stones, ensuring no damage occurs to the stone and joint sand. All cleaning operations shall proceed from the top down.

ITEM 706.7 (Continued)

METHOD OF MEASUREMENT

Item 706.7 Salvaged Granite Plank Paving will be measured for payment by SQUARE FOOT for all materials complete in place.

BASIS OF PAYMENT

Item 706.7 will be paid for at the Contract unit bid price per Square Foot which price shall be full compensation for all labor, tools, equipment, materials, a including excavation, compaction, placement of gravel base, setting bed, backfilling, cleaning and setting salvaged granite with polymeric sand joints and all incidental costs to complete the work, as required by the Engineer..

ITEM 707.13 BENCH – 6 FEET EACH

GENERAL

The work to be done under this item shall consist of furnishing and installing benches in accordance with the details included in the Contract Drawings, as specified in this Special Provision and as required by the Engineer. Benches shall be located and in the quantities as required per the Contract Drawings.

SUBMITTALS

The Contractor shall submit manufacturer's literature, color chart, and installation details for bench.

MATERIALS

Bench
Benches shall be supplied in 6-foot nominal length with back and end armrests and shall be provided in the quantity and locations shown in the Contract Drawings. All benches shall match and be from a single manufacturer and shall be one of the following:

1. "Homestead Collection", model 2, backed bench with end armrests as manufactured by Victor Stanley, Inc., (800) 368-2573, www.victorstanley.com.

2. "Gretchen" 6-foot model, backed with loop arms as manufactured by Landscape Forms Inc., (800) 521-2546, www.landscape-forms.com.

3. "Avondale Pedestal Mount" model AV1-1022, backed bench with end armrests as manufactured by SiteScapes, Inc., (888) 331-9464, www.sitescapesonline.com.

Materials
Bench frame and armrests shall be cast aluminum, or steel shotblasted, etched, phosphatized, preheated and electrostatically powder coated. End armrests shall be welded to the back support and leg. Benches with mechanically fastened armrests and/or end supports will not be accepted. Seat and back slats shall be 2" x 4" nom. horizontal Ipe wood slats. Benches shall be surface mounted.

Finish
Benches shall receive a polyester powder coat finish. Color shall be Black. Primer shall consist of a rust inhibitor.

Hardware:
Bench anchoring hardware shall be vandal-resistant, stainless steel anchor bolts and shall be provided in sizes and lengths as recommended by the manufacturer and as necessary to install as detailed with the adjacent surfaces shown in the Contract Drawings. Provide all miscellaneous hardware and appurtenances required to complete the anchoring system.

ITEM 707.13 (Continued)

Equal Status
Proposed substitutions shall be equal in materials, similar design and construction, and equivalent warranty. All benches shall be sourced from a single manufacturer.

Epoxy Grout
Grout, if recommended by the bench manufacturer at anchor bolts, shall be a non-staining, non-shrink epoxy grout, containing no metals and conforming to ASTM C-827. Grout shall be one of the following, or approved equal:

1. Five Star HP Epoxy Grout
   Five Star Products, Inc.
   750 Commerce Drive
   Fairfield, CT 06825
   (800) 243-2206 or (203) 336-7900
2. Sika Grout Sikadur
   Sika U.S. Headquarters
   201 Polito Avenue
   Lyndhurst, NJ 07071
   (201) 933-7452
3. Masterflow
   A.H. Harris & Sons Inc.
   425 Dorchester Avenue
   Boston, MA 02127
   (617) 269-4800

CONSTRUCTION METHODS

Preparation
Before proceeding with the installation of the benches, the Contractor shall submit to the Engineer for approval, product literature and shop drawings from the manufacturer for review and approval prior to ordering.

The Contractor shall examine the areas to receive the benches for compliance with the requirements for installation tolerances and other conditions, which may affect performance. Proceed with the installation of the benches only after unsatisfactory conditions have been corrected at the direction of and to the satisfaction of the Engineer.

Installation
Benches shall be installed in accordance with and in the locations shown on the Contract Drawings and as per the manufacturer's instructions. Benches shall be installed level and plumb;
shim as necessary to achieve. The contractor shall provide all necessary appurtenances to install benches. No field welding will be permitted.

The Contractor shall be responsible for timing the delivery of site furnishings to minimize on-site storage time prior to installation. All stored materials and items must be protected from weather, careless handling and vandalism.

ITEM 707.13 (Continued)

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 707.13 Bench – 6 Feet will be measured in units of EACH bench complete in place, in accordance with the Contract Drawings, as specified herein and as required by the Engineer.

The unit price for Item 707.13 shall be full compensation for all labor, tools, equipment, materials, transport and all incidental labor and materials necessary to furnish and complete the work as specified herein, as required by the Engineer, and as shown and detailed on the Contract Drawings.

No separate payment will be made for excavation, concrete footings, anchor bolts, and gravel borrow, but all costs in connection therewith shall be included in the Contract unit prices bid.

ITEM 708.1 INTERPRETIVE PANEL METAL FRAME EACH
ITEM 708.13 INTERPRETIVE PANEL EACH

The work to be done under these items shall consist of furnishing, fabricating and installing interpretive panel metal frames and interpretive panels (as separate bid items) in accordance with the Contract Drawings and the following:

SUBMITTALS

Samples:
The following samples must be submitted and approved by the Engineer prior to placing the final order for the interpretive panels:

1. Submit one full-size paper proof of each interpretive panel face.
2. Submit a 12-inch by 12-inch sample of the DHPL showing a portion of one of the approved panel faces to confirm quality, clarity, and colors.

Shop Drawings:
Submit shop drawings or product literature showing elevation of entire sign panel frame, details of all connections with descriptions of materials, fabrication methods to be used in executing the work, and footing details.

MATERIALS

Interpretive Panel Metal Frame (Item 708.1)
Signs shall be National Park Service (NPS) style, cantilevered sign. Design consists of two end posts with bend, metal frame with removable top edge for the sign panel, and base covers over surface-mounted post bases.

The sign frame shall be constructed from aluminum plate and shall conform to ASTM-B209, Alloy 6061-T6 to the thickness shown on the Contract Drawings. Aluminum extrusions for all sign supports and components shall conform to ASTM-B221 Alloy 6061-T6 to the dimensions and thickness shown on the Contract Drawings. Aluminum shall be of the best commercial quality, and their various forms shall be straight and true with no scratches, scars, creases or buckles.

Cast aluminum shall be solid aluminum, free of porosity with sharp corners, flat and accurate profiles. All exposed welds shall be filled smooth with all tool marks removed by fine abrasive grain air blasting or other approved method. All burrs and rough spots shall be removed, and faces shall be polished to a uniform high luster finish. Aluminum shall be mechanically sanded and degreased prior to receiving finish. All coatings shall be true to form with no irregularities.

Where aluminum is shop-fabricated, all joints and returns shall be properly joined together, and welded edges shall be ground smooth to proper aluminum finish. All visible connections shall be fully welded and ground flush and smooth. All burrs and rough spots shall be removed.

Posts shall have a flat base plate welded to the bottom of each post. Base plates shall contain four pre-drilled holes for anchor bolts. Square aluminum base covers shall be provided for each post and shall be fastened to the base plate with concealed, vandal resistant bolts.

ITEMS 708.1 AND 708.13 (Continued)

Welding: Welding materials and practices shall conform to the requirements of the latest edition of the American Welding Society (AWS) code for steel and aluminum. Shop welders shall be certified by AWS. Welding rods shall be of a composition compatible to the base metal being welded. Fabrication shall be accomplished using the highest standards of workmanship.

Finish: The sign frame, posts, and base covers shall be finished with acrylic polyurethane semi-gloss enamel. Paint products must be compatible products suited for coating aluminum. Color shall be Black.

Hardware: High strength bolts, nuts and washers shall conform to ASTM-A325. Where mechanical fasteners and hardware are required, they should be of adequate thickness, length and construction to properly secure the sign unit. Any visible portion of any mounting hardware shall be finished to match the adjacent sign frame, unless otherwise specified. Metal fasteners and hardware in contact with dissimilar metals shall have a protective coating or neoprene shields to prevent electrolytic action.

Interpretive Panel (Item 708.13)

Interpretive panels shall be constructed of Digital High-Pressure Laminate (DHPL) and shall be fabricated such that they may be inserted into the interpretive panel metal frame noted under Item 708.1.

Materials: Digital graphic surface papers encapsulated with melamine resins are pressed over recycled post-consumer paper core sheets impregnated with phenolic resin. Sheets are bonded at pressures greater than 1200 pounds per square inch at a temperature of 300 degrees Fahrenheit. Graphics must be made using 12-Color High-Definition printing technology.

Size: DHPL panel shall be sized as shown on the Contract Drawings. The Contractor shall submit a sample of the DHPL panel with the approved color graphic prior to fabrication.

Color Graphics: The DHPL panel shall be a color graphic as supplied to the Contractor by MassDOT through another consultant. There shall be two custom interpretive panels which are designed by another consultant. The contractor is only responsible for fabrication and installation of the interpretive panels and the interpretive panel metal frames. Each panel shall be printed double-sided with the same graphic on each side. The contractor shall coordinate with MassDOT on receipt of the graphic files to coordinate timing of delivery for installation.

CONSTRUCTION METHODS

Interpretive Panel Metal Frame (Item 708.1)

Preparation: All surfaces to receive work shall be prepared and finished by the respective trades. The scheduling of the interpretive panel metal frame and panels installation shall be timed to limit onsite storage time and shall not interfere with remaining work to be completed. Repair or replacement of damaged metal frames and panels because of construction shall be the responsibility of the Contractor.

ITEMS 708.1 AND 708.13 (Continued)

Workmanship: All work shall be clean, straight, sharply defined lines, free from defects impairing strength, durability and aesthetics. All signage fabrication shall occur in a shop and not in the field. Finished work shall be approved by the Engineer.

Fabrication: Members shall be shop-fabricated, and where practical, all work shall be delivered to the site pre-assembled. All joints of fabricated works shall be completely smooth and shall exhibit a tight fit. All members shall be continuous lengths without seams. Where material lengths require joints, all joints shall be flush.

Installation: All work shall be installed plumb, straight, square, level and in the proper elevation plane, location, alignment, and orientation to adjacent work. Following installation, the historical and wayfinding signs shall be cleaned with non-abrasive cleaning agents without damage to panel surfaces.

Interpretive Panel (Item 708.13)

Preparation: All interpretive metal frames to receive the interpretive panels shall be cleaned and dry prior to installation of panels to avoid trapping dirt and moisture.

Workmanship: Panels shall be rigid and sized according to the Contract Drawings and approved shop drawings with well bonded edges (no fraying or delamination). Colors shall be as represented on the approved sample and the clarity, quality, and crispness of the graphics and text shall be equal to the approved sample.

Installation: At their respective locations as determined by the Engineer, insert the panels into the metal frames by removing the end of the metal frame. Panels shall fit snug within the frame, with modest room for expansion and contraction. Secure the frame and tighten all hardware.

Cleaning: Clean the surface of the panels with water (no abrasive cleaners) to remove any dirt and debris. Dispose of legally offsite all packing materials.

METHOD OF MEASUREMENT & BASIS OF PAYMENT

Item 708.1 Interpretive Panel Metal Frame will be measured in units of EACH metal frame complete in place, in accordance with the Contract Drawings, as specified herein and as required by the Engineer.

Item 708.13 Interpretive Panel will be measured for payment per EACH panel complete in place, in accordance with the Contract Drawings, as specified herein and as required by the Engineer.

The respective unit price bids for Items 708.1 and 708.13 shall be full compensation for all labor, tools, equipment, materials, and all incidental costs to complete the work specified herein, as required by the Engineer, and as shown on the Contract Drawings.

ITEM 708.15 AGAWAM HERRING RUN SIGN EACH

The work to be done under this item shall consist of furnishing, fabricating and installing an "Agawam Herring Run" sign in accordance with the Contract Drawings and the following:

SUBMITTALS

Shop Drawings:
Submit shop drawings and color proof showing sign dimensions, content, colors, and material for approval.

MATERIALS

Materials
Sign: Signs shall be constructed from aluminum plate conforming to ASTM-B209, Alloy 6061-T6. Aluminum plate sign shall be .125 inches thick. Aluminum shall be best commercial quality, straight and true, free of scratches, scars, creases or buckles.

Size: Sign shall be 6'-0" long x 2'-6" tall with 2-inch radial corners. Edges of the aluminum sign shall be free of sharp edges. Anchoring holes shall be pre-drilled with one hole in each corner, two interim holes in the top and bottom sides of the sign (each), and one interim hole in the left and right sides of the sign (each). Holes shall be located 2 inches from edge of sign.

Graphics: Sign graphics shall be supplied to the Contractor in electronic format. Graphics shall be printed on Scotchcal vinyl as manufactured by 3M Company, St. Paul, MN or approved equal, and shall be bonded to the aluminum plate sign with adhesive.

Content: The sign content will be updated according to the final ownership of the site and tailored to their design standards. Content shall include the name "Agawam Herring Run" and key dates including "Established 1838" and "In Operation Since 1632". Sign may include the municipal/agency name and logo.

Colors and Typeface:

1. Typeface: All typefaces on signage shall be Optima LT Std
2. Colors:
   a. Background color – "Light Blue"
      CMYK: C =77%, M = 41%, Y = 0%, K = 0%
   b. Text and Underline – "White"
   c. Border – "White"

Mounting Hardware
High strength bolts, nuts and washers shall conform to ASTM-A325. Where mechanical fasteners and hardware are required, they shall be of adequate thickness, length and construction to properly secure the sign unit as shown in the Contract Drawings. Any visible portion of any mounting hardware shall be painted to match the sign face background color.

ITEM 708.15 (Continued)

CONSTRUCTION METHODS

Preparation
All surfaces to receive work shall be prepared and finished by the respective trades. The scheduling of the sign installation shall be timed to limit onsite storage time and shall not interfere with remaining work to be completed. Repair or replacement of a damaged sign because of construction shall be the responsibility of the Contractor with no additional cost to the Owner.

Workmanship
All work shall be clean, straight, sharply defined lines, free from defects impairing strength, durability and aesthetics. Sign colored graphics shall be clear and crisp, and fully adhered to the aluminum plate without bubbles, creases, or other surface blemishes. All signage fabrication shall occur in a shop and not in the field. Finished work shall be approved by the Engineer.

Installation
The sign shall be mounted to the new shed in the orientation and location shown on the Contract Drawings. Anchor holes shall be pre-drilled in the cedar shake siding to avoid splitting the shakes. Washers shall be installed as needed between the back of the sign and the face of the cedar shake siding so that the sign is plumb while accounting for the variation in the siding. There shall be an air gap between the back of the sign and the shed siding to allow moisture to exit. Bolts shall be threaded tightly so the sign is secure, level and plumb. The heads of the bolts shall be painted to match the color of the sign background.

Cleaning
After installation, the sign face shall be gently cleaned with water to remove dust and debris. No abrasive cleaners shall be used.

METHOD OF MEASUREMENT & BASIS OF PAYMENT

Item 708.15 Agawam Herring Run Sign will be measured for payment per EACH sign installed complete in place, in accordance with the Contract Drawings, as specified herein and as required by the Engineer.

The unit price bid for Item 708.15 shall be full compensation for all labor, tools, equipment, materials, and all incidental costs to complete the work specified herein, as required by the Engineer, and as shown on the Contract Drawings.

ITEM 715.1 MAILBOX REMOVED AND RESET EACH

This work consists of removing and resetting present mailboxes and posts at the locations shown on the plans, and as directed by the Engineer.

The mailboxes identified on the plans shall be removed with the existing post(s), and the post holes filled with suitable material and properly tamped.

If necessary, during the construction the mailboxes shall be set in temporary locations as directed, so that they are easily accessible to the mail carrier.

METHOD OF MEASUREMENT

Item 715.1 Mailbox Removed and Reset shall be measured by EACH mailbox removed and reset.

BASIS OF PAYMENT

Item 715.1 Mailbox Removed and Reset will be paid for at the contract unit price per EACH mailbox and post actually removed and reset, which price includes full compensation for all labor, equipment and materials including setting of mailboxes in temporary locations and all incidental costs to complete the work as specified.

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 751.7 COMPOST BLANKET CUBIC YARD

The work under this Item shall conform to the relevant provisions of Subsection 751 and M1.06.0 Compost of the Standard Specifications and the following:

Work shall consist of furnishing and pneumatically applying compost as a thin mulch blanket (1/2-1 inch depth) over prepared soil to provide temporary soil stabilization and organic matter for plant growth.

SUBMITTALS AND MATERIALS

No materials shall be delivered until the required submittals have been approved by the Engineer. Delivered materials shall match the approved samples. Approval of test results does not constitute final acceptance.

Contractor shall submit to the Engineer samples and certified test results no sooner than 60 days prior to application of compost. Vender certification that material delivered meets the test results shall be submitted if requested.

Compost shall meet the requirements for M1.06.0: Compost, Type 2, as referenced in the MassDOT– Highway Division Standard Specifications for Highways and Bridges, Division III: Materials Specifications, latest edition.
The Engineer shall approve the Contractor's equipment for application.

CONSTRUCTION METHODS

Application of compost material shall not begin until the Engineer has approved the site and soil conditions. Soil preparation shall be as specified under the applicable item for soil placement or for seeding. The Contractor shall notify the Engineer when areas are ready for inspection and application of compost.

Compost blankets shall be pneumatically applied (blown on) to a minimum depth of one half to one inch. Where shown on the plans or when directed by the Engineer depth may be increased to provide berms for sediment control or to otherwise prevent slope erosion.

When compost blanket is proposed with seeding, seed shall be broadcast and shall occur in conjunction with compost blanket, as specified under the relevant item for seeding.

When compost blanket is proposed for areas with planting, compost (and seed if applicable) shall be applied after planting. If compost and seed occur prior to planting, areas shall be regraded, and compost and seed reapplied to the satisfaction of the Engineer and at the Contractor’s expense.

ITEM 751.7 (Continued)

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 751.7 will be measured and paid for at the Contract unit price per Cubic Yard which price shall include all labor, materials, equipment, and all incidental costs required to complete the work of pneumatically applying compost.

Surface preparation of substrate receiving compost blanket shall be compensated under the applicable item for placement of loam, sand, ordinary borrow, wetland soil, topsoil rehandled and spread, tilled existing soil, or other specified substrate.

Seeding, if utilized, will be compensated for under the appropriate seeding items

ITEM 751.765 COMPOSTED MULCH OVER MODIFIED ROCK CUBIC YARD

GENERAL

The work under this Item shall conform to the relevant provisions of Subsection 751, 767, and 765 of the Standard Specifications and the following.

Work shall consist of furnishing and pneumatically applying compost in conjunction with the specified native seed on designated areas of modified rock and achieving satisfactory establishment of seeded species as specified herein.

QUALIFICATIONS

Compost application and seeding shall be done by a company having a minimum of five years of experience with native seed establishment. Prior to beginning work, the seeding Contractor shall furnish proof of qualifications to the Engineer for approval. Proof of qualifications shall include providing documentation (photos and contacts) to demonstrate knowledge and expertise with native seeding and establishment and proof of having completed successful native seeding projects.

MATERIAL AND SUBMITTALS

Compost

Compost shall meet the relevant provisions for Type 2 Compost, found in Section M1.06 of the Supplemental Standard Specifications.

- The Engineer shall approve the Contractor's equipment for application.

Seed Mix

Seed Mixes and Submittals shall be per the item(s) for the permanent seed mix. Mix shall be:

SEEDING SEASON

The season for seeding native mixes is April 1 - May 15 and October 1 - December 1 for dormant seeding. Written approval must be obtained for seeding outside the seeding season and, if approved, the permanent seed rate shall be increased by 50%

CONSTRUCTION METHODS

Methods of application and equipment to be used shall be reviewed and approved by the Engineer prior to placement of material.

Placement of Compost

Compost shall be placed as shown on the Plans and in the Detail and as required by the Engineer. Material shall be placed so that the settled material is at or slightly below the surface plane of the stone. The Contractor shall ensure that there will be adequate quantity, including adjustment for settlement.

ITEM 751.765 (Continued)

For purposes of estimation, required compost quantities should be 300 cubic yards per acre to achieve the target depth.

Seeding

For areas smaller than half an acre, unless otherwise approved by the Engineer, seeding shall be done by broadcast method. Seeding shall be done in conjunction with or immediately following Compost application. Alternative seeding methods must be submitted and approved by the Engineer 14 days in advance of compost and seed application.

Hydroseeding

Hydroseeding may be used for sites over half an acre in size or when the rock slope does not permit safe application via a broadcasting method. Hydroseed shall be per the manufacturer's directions and as follows.

Tank and hoses shall be cleaned from all previous hydro-seeding and hydro mulching projects. Seed shall be mixed into the slurry immediately before application and applied within 30 minutes after seeds have been placed in the tank. Once seed has been placed in the tank, tank shall be agitated only enough to mix the seeds and keep slurry from separating.

When Seeding Occurs after Application of Compost or after December 1

When seeding is done more than 3 days after Compost application or when Compost is applied after December 1, seeding rate shall be increased by 50%.

Over-Seeding

Large extents of bare area (greater than 5-6 feet and depending on modified rock slope conditions) shall be over-seeded with the specified mix during the appropriate season for seeding. Rates, methods, and submittals shall be as specified under the relevant Seed Mix Item and Materials above.

Over-seeding, mulch, watering, and all work for over-seeding shall be incidental.

Determining Satisfactory Establishment

A reasonably well-established stand of the specified seeded species as determined by the Engineer and the MassDOT Landscape Architect or designated Specialist will be required for Final Acceptance. The expectation is that an acceptable number and variety of the desired permanent seeded species will be visible. For seeding with compost over modified rock this shall generally be:

ITEM 751.765 (Continued)

- A minimum of 50% coverage by the specified permanent seeded species after one growing season (considered June-September 15). Of that percentage, generally, depending on the mix species:
  - At least 2 types of permanent seeded grass species shall be visible.
  - At least 2 species of wildflowers shall be visible.
- There will be no more than 25% coverage by weed species.
- There will be no invasive or aggressive species within the stand at the time of acceptance.
- There shall be no evidence of seed from non-native mixes (ex., clover) due to using an incorrect or modified mix or due to failure to clean the hydroseeding tank if a hydroseeder is used.

Invasive and aggressive weeds (such as mugwort, vetch, knapweed, and chicory) must be cut, pulled with roots removed, or treated with herbicide by a licensed and approved applicator prior to going to seed for Interim Acceptance. Weed removal shall be coordinated with MassDOT Landscape Architect. No herbicides shall be used without approval and coordination with MassDOT Landscape Design Section.

Acceptance of Seeding and Establishment Work

Conditional Acceptance shall be based on approval of seed mix submittals and proper application of seed as specified herein.

Final Acceptance of Seed Establishment shall be given upon satisfactory Establishment as described above. If the seeded area fails to meet the requirements of Establishment by the end of the growing season, contractor shall propose and implement remediations and site shall be inspected during the following growing season after July 1st. Otherwise, Contractor shall forego the payment for Final Acceptance. All remediation shall be at the contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Composted Mulch over Modified Rock will be measured and paid for at the Contract unit price per Cubic Yard which price shall include all labor, materials, equipment, site preparation, and all incidental costs required to complete the work.

Native Seed Mix shall be compensated at the bid price per the specified seed mix item by pound.

Schedule of payment shall be as follows:

60% upon approval of Compost application and Conditional Acceptance of seeding as specified above

40% upon Final Acceptance of Seed Establishment

ITEM 756. NPDES STORM WATER POLLUTION PREVENTION PLAN LUMP SUM

This Item addresses the preparation and implementation of a Storm Water Pollution Prevention Plan required by the National Pollutant Discharge Elimination System (NPDES) and applicable Construction General Permit (CGP) issued by the U.S. Environmental Protection Agency (EPA).

Pursuant to the Federal Clean Water Act, construction activities which disturb one acre or more are required to apply to the EPA for coverage under the NPDES General Permit for Storm Water Discharges from Construction Activities. The Contractor shall be fully responsible for compliance with the most recently issued CGP and any subsequent revisions. Should a fine or damages be assessed against it, or MassDOT, as a result of a local, state, or federal enforcement action due to non-compliance with the CGP, the Contractor shall take full responsibility.

The NPDES CGP requires the submission of a Notice of Intent (NOI) to the EPA prior to the start of construction (defined as any activity which disturbs land, including clearing and grubbing). There is a fourteen (14) day review period commencing from the date on which EPA enters the Notice into their database. Based on the review of the NOI, EPA may require additional information, including but not limited to, the submission of the Storm Water Pollution Prevention Plan (SWPPP) for review. Work may not commence on the project until final authorization has been granted by EPA. Any additional time required by EPA for review of submittals will not constitute a basis for claim of delay.

In addition, if the project discharges to an Outstanding Resource Water, vernal pool, or is within a coastal ACEC as identified by the Massachusetts Department of Environmental Protection (DEP), a separate notification to DEP is required. DEP may also require submission of the Storm Water Pollution Prevention Plan for review and approval. Filing fees associated with the notification to DEP and, if required, the SWPPP filing to DEP shall be paid by the Contractor.

The CGP also requires the preparation and implementation of a SWPPP in accordance with the afore-mentioned statutes and regulations. The Plan will include the CGP conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. The contractor shall prepare the SWPPP and update it as necessary. The Contractor shall submit the Plan to the Engineer for approval at least four (4) weeks prior to any site activities. It is the responsibility of the Contractor to comply with the CGP conditions and the conditions of any state Wetlands Protection Act Order, Water Quality Certification, Corps of Engineers Section 404 Permit and other environmental permits applicable to the project and to include in the SWPPP the methods and means necessary to comply with applicable conditions of said permits.

It is the responsibility of the Contractor to complete the SWPPP in accordance with the EPA CGP, provide all information required, and obtain all certifications as required by the CGP. Any amendments to the SWPPP required by site conditions, schedule changes, revised work, regulations, construction methodologies, and the like are the responsibility of the Contractor. Amendments will require the approval of the Engineer prior to implementation.

ITEM 756. (Continued)

In addition to the CGP requirements for inspections, MassDOT requires inspection of all erosion controls and site conditions on a weekly basis. Inspections are also required at portions of sites that discharge 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.

The work under this item shall also include the preparation, submission and implementation of a Flood Contingency Plan. The plan shall address the potential need for the temporary relocation of construction and auxiliary equipment situated within the 1% annual chance of flooding zone to designated upland locations above the Base Flood Elevation during flood events. The Flood Contingency Plan shall address any additional MassDEP-required information requirements, as applicable. The Flood Contingency Plan shall be submitted to the Engineer for review and approval at the same time as the SWPPP.

This Item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, preparation of monthly reports and Flood Contingency Plan. In addition, any erosion controls beyond those specified in bid items which are selected by the 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 workday following the day when earth-disturbing activities have temporarily or permanently ceased) and for Complete Stabilization Activities (no later than 14 calendar days after the initiation of stabilization). Stabilization criteria for vegetative and non-vegetative measures are provided in the CGP.

The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved, as well as removal and proper disposal of all construction materials, waste and waste handling devices, removal of all equipment and construction vehicles, removal of all temporary stormwater controls, etc. Approval of final stabilization by the Engineer and confirmation of submission of the NOT will be required prior to submission of the Resident Engineer's Final Estimate. The permittee shall use EPA's website to prepare and submit the NOT.

BASIS OF PAYMENT

Item 756 will be paid for at the Contract unit price Lump Sum, which price shall include all labor, materials, equipment, SWPPP & Flood Contingency Plan preparation, revisions/addenda during construction, monthly reports, filing fees, and all incidental costs required to complete the work.

Payment of 50% of the Lump Sum price of this item will be made upon acceptance of the NPDES Stormwater Pollution Prevention Plan & Flood Contingency Plan.

Payment of 40% of the Lump Sum price of this item will be paid in equal monthly installments distributed across the time remaining in the accepted baseline schedule until substantial completion.

The remaining 10% of the Lump Sum price of this Item will be paid following accepted submission of a Notice of Termination (NOT) when final stabilization has been achieved.

ITEM 757.02 BIORETENTION SOIL MEDIA CUBIC YARD

This work consists of furnishing and installing bioretention soil media in accordance with the Plans, and as directed by the Engineer.

MATERIALS

Amended soil shall be in accordance with the plans. The soil shall consist of 5% maximum Very Coarse Sand/Gravel, 80%-90% Sand, 15% maximum Silt, 5% maximum Clay and 3-10% Organics Matter. The soil shall be classified as a USDA Loamy Sand or Sandy Loam. Compost shall not be used as organic. Acceptable organic soil amendments or matter shall include sphagnum peat, wood derivative, or media amendments such as zero- valent iron and/or drinking water treatment residuals (alum) to enhance phosphorus sorption.

Seeding shall be Roadside Riverbank Seed Mix or approved equivalent, applied at a rate of 15 lbs./ acre PLS.

METHOD OF MEASUREMENT

Item 757.02 Bioretention Soil Media will be measured for payment by the CUBIC YARD furnished and installed complete in place.

BASIS OF PAYMNENT

Item 757.02 Bioretention Soil Media will be paid for at the contract unit price per CUBIC YARD of material placed, which price includes full compensation for all labor, equipment and materials for furnishing and installing , excavation to a depth appropriate to receive the specified material, and the legal disposal of all surplus excavated and/or unsuitable materials, scarify subgrade, installation of amended soil mix and all incidental costs required to complete the work as required by the Engineer.

Roadside Riverbank Seed Mix will be paid for separately under item 765.442 Roadside Riverbank Mix.

ITEM 765.21 ANNUAL COVER CROP FOR NATIVE SEEDING POUND

Work under this item shall conform to the relevant provisions of Subsection 765 of the Standard Specifications and the following.

DESCRIPTION

Work consists of furnishing and applying the appropriate annual grass to be seeded as a cover crop in conjunction with upland native seeding and at the rate specified herein.

A cover crop shall be used for following conditions:

- when specified under Application Rate for the permanent native upland seed mix
- for slopes 2:1 or steeper and an annual is not already specified as part of the permanent mix
- when seeding out of season and the native seed mix does not already specify an annual
- as required to prevent erosion until the permanent seed establishes.

A cover crop is not necessary for wetland seeding and is not typically necessary for soil stabilization when seeding in conjunction with a compost blanket application.

Annual rye (Lolium multiflorum) will not be accepted as an annual cover crop.

Using annual rye or exceeding the application rate such that a dense stand of annual grasses prevents germination of the native grasses will require mowing of annual grasses. In this instance, mowing of cover crop will be incidental to this item.

Seed and Application Rate

Add 30 pounds/acre of the following seed based on seeding season:

Avena sativa (Grain Oats): 1 January to 31 July
Cecale cereale (Grain Rye): 1 August to 31 December

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Annual Cover Crop will be measured for payment per pound of seed, complete in place.

Annual Cover Crop will be paid at the contract unit price per pound upon approval of seed bag tags or other documentation of correct application rate and species, and upon acceptance of a satisfactory stand of annual grasses three weeks following seeding.

Application and care of cover crop will be paid for separately under Item 765.635 Native Seeding and Establishment

ITEM 765.421 MID HEIGHT GRASSLAND MIX POUND
ITEM 765.442 ROADSIDE RIVERBANK MIX POUND

Work under this item shall consist of furnishing the mix(es) specified below in the required quantity.

SUBMITTALS

1) Pre-Verification of Seed Availability. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species in the required quantities and for the anticipated date of seeding. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. Species not expected to be available should be noted and substitutions recommended.

2) Final Verification of Seed Availability. No earlier than 21 days prior to ordering, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species and in the required quantities. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section. Substitutions or changes in the mix at this time must be approved by MassDOT Landscape Design Section.

3) Seed Worksheet provided herein shall be submitted to the Engineer prior to ordering seed to determine the number of pounds of Pure Live Seed required.

4) Seed Tags. The contractor shall submit original seed tags from each bag of seed used on the project or ensure that each tag is photo documented by the Engineer while on the unopened bag.

5) Number of tags submitted must correspond to number of bags delivered.

6) Species listed on the seed tag shall match the Final Verification of Seed Availability (Submittal #2) unless approved otherwise. Tag must include variety and species name; lot number; purity; percentage of inert matter; percentage of weeds, noxious seeds, and other crop seeds; germination, dormant or hard seed; total viability; origin of seed; germination test date, net weight, and name and address of seller. The origin of seed must be listed on the seed tag for all species in the mix to provide verification of original (generation 0) seed source. The smallest known geographic area (township, county, ecotype region, etc.) shall be listed. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section.

7) Verification of Seed Delivery. Prior to payment, the contractor shall submit the Seed Delivery Verification form contained within the contract or the Supplier's Verification on company letterhead or a bill of lading. Supplier verification must include all information requested on the Verification form within this contract. The bill of lading must include variety and species name, lot number, net weight shipped, date of sale, invoice, project or seeding location, and name and address of Supplier. All information must be filled in and complete for acceptance. Information must match the seed tags and quantity of seed used on the job. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section.

ITEMS 765.421 AND 765.442 (Continued)

8) Seed Sample. If requested or if seed is from a previously opened bag, the contractor may be asked to submit to the Engineer a sample of seed from the seed bag (1-2 cups) at the time of seeding.

SEEDING SEASON

The appropriate seeding seasons are:
Spring: April 1 - May 15
Fall: October 1 - December 1 for dormant seeding

PERMANENT SEED MIX(ES)

Calculating Pure Live Seed (PLS)

Quantities specified are PURE LIVE SEED. Greater quantities of ordered seed may be required to achieve actual specified seeding rates.

Pure Live Seed (PLS) is defined as a percentage calculated by multiplying the percent of pure seed by the percent of viable seed (total germination, hard seed, and dormant seed). For example:

If a seed label indicates 90% purity, 78% germination, 10% hard seed, and 2% dormancy, it is calculated to be 90% x [78 + 10 + 2]% = 81% PLS.

Therefore, each pound of PLS would need 1 pound / 0.81 = 1.2 pounds of seed with a 90% purity and 90% total germination

Seed Mix(es) shall be as specified below. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

ITEMS 765.421 AND 765.442 (Continued)

765.421 Mid-Height Grassland Mix

Botanical Name	Common Name	% Mix By Weight (PLS)
Grass		
Schizachyrium scoparium 'Albany Pine'	Little Bluestem 'Albany Pine'	47.5%
Elymus virginicus	Virginia Wild Rye	22.0%
Elymus canadensis	Canada Wild Rye	8.0%
Tridens flavus	Purpletop	6.0%
Panicum virgatum	Switch Grass	5.0%
Dichanthelium clandestinum 'Tioga'	Deertongue grass 'Tioga'	2.0%
Agrostis perennans	Upland Bentgrass	1.2%
		91.7%
Herb/Forb		
Chamaecrista fasciculata	Partridge Pea	3.0%
Geum canadense	White Avens	1.0%
Liatris scariosa	Northern Blazing Star	0.5%
Monarda fistulosa	Wild Bergamot	0.5%
Asclepias syriaca	Common Milkweed	0.3%
Pycnanthemum tenuifolium	Slender Mountain Mint	0.3%
Baptisia tinctoria	Wild Indigo	0.3%
Lespedeza capitata	Roundhead Bush Clover	0.3%
Verbena hastata	Blue Vervain	0.3%
Aster laevis NY Ecotype	Smooth Aster NY Ecotype	0.2%
Aster lateriflorus	Calico Aster	0.2%
Solidago juncea	Early Goldenrod	0.2%
Solidago nemoralis	Grey Goldenrod	0.2%
Penstemon digitalis	Beard-tongue	0.2%
Asclepias incarnata	Swamp Milkweed	0.2%
Solidago bicolor	White Goldenrod	0.2%
Aster prenanthoides	Zig Zag Aster	0.2%
Euthamia graminifolia	Grass-leaved Goldenrod	0.1%
Aster pilosus	Heath Aster	0.1%
		8.3%
Seeding Rate: 18.0 lbs PLS/Acre		**100.0%**

***Used for upland slope restoration and dike area**

ITEMS 765.421 AND 765.442 (Continued)

765.442 Roadside Riverbank Mix

Botanical Name	Common Name	% Mix By Weight (PLS)
Grass		
Elymus virginicus	Virginia Wild Rye	27.0%
Schizachyrium scoparium 'Albany Pine'	Little Bluestem 'Albany Pine'	22.5%
Andropogon gerardii NY Eco	Big Bluestem NY Eco	14.0%
Elymus riparius	Riverbank Wild Rye	14.0%
Panicum virgatum	Switch Grass	5.0%
Dichanthelium clandestinum 'Tioga'	Deertongue grass 'Tioga'	5.0%
Carex vulpinoidea	Fox Sedge	2.0%
Agrostis perennans	Upland Bentgrass	1.5%
Carex vulpinoidea	Fox Sedge	0.5%
Poa palustris	Fowl Bluegrass	0.3%
Juncus effusus	Soft Rush	0.1%
Juncus tenuis	Path Rush	0.1%
		92.0%
Herb/Forb		
Chamaecrista fasciculata	Partridge Pea	3.0%
Penstemon digitalis	Beard-tongue	1.0%
Vernonia noveboracensis	New York Ironweed	0.6%
Helenium autumnale	Common Sneezeweed	0.5%
Verbena hastata	Blue Vervain	0.4%
Aster puniceus	Aster - Swamp	0.4%
Aster cordifolius	Blue Wood Aster	0.3%
Asclepias incarnata	Swamp Milkweed	0.3%
Monarda fistulosa	Wild Bergamot	0.2%
Aster novae-angliae	New England Aster	0.2%
Solidago odora	Licorice Scented Goldenrod	0.2%
Desmodium canadense	Showy Tick Trefoil	0.2%
Eupatorium perfoliatum	Boneset	0.2%
Eupatorium maculatum	Spotted Joe Pye Weed	0.2%
Solidago juncea	Early Goldenrod	0.1%
Euthamia graminifolia	Grass-leaved Goldenrod	0.1%
Lobelia cardinalis	Cardinal Flower	0.1%
		8.0%
Seeding Rate: 15.0 lbs PLS/Acre		**100.0%**

***Used for Infiltration Basin**

Application Rate

Mid-Height Grassland Mix: 18 lbs./acre PLS. Option1: In addition, apply 30 pounds of cover crop (grain oats or grain rye) as appropriate to the season. Option 2: No cover crop shall be applied.

Roadside Riverbank Mix: 15 lbs./acre PLS. Option1: In addition, apply 30 pounds of cover crop (grain oats or grain rye) as appropriate to the season. Option 2: No cover crop shall be applied.

ITEMS 765.421 AND 765.442 (Continued)

Any species substitution shall be with a species having similar characteristics and function. Substitutions must be approved by MassDOT Landscape Design Section per the documentation submittal process.

50% Increase Adjustment for Field Conditions

Seeding under the following conditions requires a 50% increase in the permanent mix at the time of construction:

- Seeding out of season
  OR
- Seeding after Compost Blanket has been applied (unless already increased for out of season).

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Mid-Height Grassland Mix and Roadside Riverbank Mix will be measured for payment by the pound of Pure Live Seed delivered and complete in place.

Mid-Height Grassland Mix and Roadside Riverbank Mix will be paid at the contract unit price per pound of Pure Live Seed delivered upon approval of all Seed Submittal Documentation. Overseeding required to correct poor germination, or establishment shall be incidental to the item.

Cover crop not included as part of the permanent mix composition will be paid for under Item 765.21, Annual Cover Crop.

Application and care of native seed mix will be paid for separately under Item 735.635 Native Seeding and Establishment.

ITEMS 765.421 AND 765.442 (Continued)

NATIVE SEED WORKSHEET

Project Description: _____ Project No: _____

Contractor: _____Contract No: _____

Seed Mix Number & Description: _____

Contractor: Complete Prior To Ordering

Pounds of Seed Required Per Contract:

_____lbs./acre for _____Acre(s) OR _____ SY

Additional 50% increase if required (out of season or seeding over compost blanket):

_____**lbs. Total Seed Required**

Calculated Quantity for **P**ure **L**ive **S**eed (PLS[1]):

_____ **Total Pounds PLS**

Engineer: Verification at Time of Application

Number pounds delivered to site[2]: _____ Date(s): _____

Actual Seed Bag Tag/s Received or photo documented by Engineer: _____

[1] *PLS=% pure seed x % viable seed (total germination, hard seed, and dormant seed).*
[2]*Quantity delivered should match pounds* ***Total Pounds PLS*** *and* ***Verification of Seed Delivery****. Pounds should be shown on each Seed Tag.*

ITEMS 765.421 AND 765.442 (Continued)

SUPPLIER VERIFICATION OF SEED DELIVERY FOR MASSDOT PROJECTS

Date_____

We hereby certify that (*Seed Supplier*):_____

Furnished to (*Contractor*): _____

For use on: (*Project Description*) _____

Project #: _____ Contract #: _____

Pounds of Pure Live Seed: _____

Of Mix (*Description*): _____

Lot Number _____

The material was delivered on (*Date*)_____.

The labels and contents meet all State and Federal regulations. The mixture consists of the following species, including cultivars (as applicable) and ecotype region, and at the following percentages (may be attached separately):

Name (print): _____ Title: _____

Supplier: _____

Signature and Seal: _____

ITEM 765.635 NATIVE SEEDING AND ESTABLISHMENT SQUARE YARD

Work shall conform to the relevant provisions of Subsections 765 and 767 of the Standard Specifications and the following:

The work under this item shall consist of seeding, mowing, and other care to establish a stand of grass in the areas shown on the plans or as required by the Engineer. For the purposes of these specifications, the term "grass" shall apply to all the forbs, grasses, sedges, and rushes included in the materials.

QUALIFICATIONS

Seeding shall be done by a company having a minimum of five years of experience with a native seed establishment. Prior to beginning work, the seeding Contractor shall furnish proof of qualifications to the Engineer for approval. Proof of qualifications shall include providing documentation (photos and contacts) to demonstrate knowledge and expertise with native seeding and establishment and proof of having completed successful native seeding projects.

SEEDING SEASON

The seeding seasons for native mixes are April 1 - May 15 and October 1 - December 1 for dormant seeding. Written approval must be obtained for seeding outside the seeding season and, if approved, the permanent seed rate shall be increased by 50%.

The seeding season for cover crops shall be grain oats January 1 – July 31 and grain rye August 1 – December 1.

MATERIAL AND SUBMITTALS

Seed Mixes and Submittals shall be per the item(s) for permanent and annual (cover crop) seed mixes.

Compost Blanket, if used, shall meet the material and submittal requirements for that item.

Hydromulch shall be wood fiber or straw applied per the Standard Specifications and at the rates specified below and per the manufacturer.

A certified statement shall be furnished, prior to start of work, to the Engineer by the Contractor as to the number of pounds of hydromulch, tackifier, and seed, per 100 gallons of water and as applicable to products used. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above.

Fertilizer

No fertilizers shall be applied.

ITEM 765.635 (Continued)

Water

Water, including hose and all other watering equipment required for the work, shall be furnished by the Contractor to the site at no additional cost. Water shall be suitable for irrigation and free from ingredients harmful to plant life. All plants injured or work damaged due to the lack of water, or the use of too much water shall be the Contractor's responsibility to correct.

SEEDING

Hand broadcast method shall be used for all areas smaller than half an acre and when specified on the plans for areas over half an acre.

Seeding shall occur within 72 hours of placement of loam and final grading, or the Contractor shall propose a reasonable, alternative schedule that shall be approved by the Engineer.

Surface Preparation

No seeding or soil preparation shall be done if the soil is muddy or dry and compacted. Bare soils shall be raked to remove large stiff clods, lumps, brush, roots, stumps, litter, and other foreign matters. Ruts and depressions shall be filled with additional loam or compost, and the soil shall be re-graded to a relatively smooth finish corresponding to the required grades.

When seeding over existing or compacted soil or soil that has sat bare for more than 30 days, surface will be prepared by tilling or raking to a minimum depth of 2 inches prior to seeding and prior to Compost Blanket application (when applied).

Surface preparation shall be compensated for under for loam placement or topsoil rehandled and spread as appropriate to the project.

Jute or coir mesh, when specified in the contract, shall be placed after seeding and per the Standard Specifications and the manufacturer’s instruction.

Surface preparation shall be approved by the Engineer prior to seeding.

Seeding over Various Substrates

Loam: Seeding shall occur within 72 hours of loam placement to prevent loss of topsoil. Seed shall be manually broadcast for areas less than half an acre (each area, not cumulative area) and when specified on the plans. Broadcasting shall be immediately followed by hydro mulching as specified below. When not specified on the plans, larger areas may be hydroseeded as specified below.

Compost Blanket: Compost Blanket shall be applied as specified under that item. Seed should be hand broadcast at the same time as compost application to ensure a thin cover of compost over seed.

ITEM 765.635 (Continued)

When seeding is done after application of Compost Blanket the rate shall be increased by 50%. If the Compost Blanket is applied after December 1, seed shall be broadcast or hydroseeding over the compost in the Spring and the rate increased by 50% specified under Seed Application.

Compost Mulch over Modified Rock: Compost Mulch and seed shall be applied as specified under that item. No hydromulch is required.

Cover Crop

Cover crop shall be used when seeding out of season, when specified with the permanent native seed mix under that item, and as required to prevent erosion until the permanent seed establishes.

A cover crop should not be used with a steep slope mix or other permanent mix which already contains either cereal rye or oats in the composition of the mix. A cover crop is not necessary for wetland seeding and is not typically necessary for soil stabilization when seeding in conjunction with a compost blanket application.

Seed Application

All seeds shall be mulched as specified herein.

Seed application should be by broadcast seeding or by hydroseeding as described below.

Broadcast Seeding

Seed shall be broadcast spread using a cyclone or whirlwind seeder or hand broadcast. Small or light-seeded species such as bluestem may be mixed with approved filler to achieve an even distribution. Seed shall not be broadcast when wind velocities are greater than 15 mph.

Broadcast seeding shall be undertaken in two separate passes at ninety degrees to each other. One-half the seeding rate shall be applied in each direction (horizontally and vertically). To ensure seed to soil contact with broadcasting of seeds, seeding shall be followed by rolling or tracking with equipment approved by the Engineer.

Broadcast seed shall be mulched with weed-free straw mulch unless seeding is done as part of Compost Blanket in which case it shall be as specified above under seeding with Compost Blanket application. Hydro mulching shall be as specified under Hydro mulching.

Hydroseeding and Hydro mulching

Hydroseed and mulching shall be per the manufacturer's direction and as follows.

Hydroseeding shall only be used for sites over half an acre in size or with permission of the Engineer.

ITEM 765.635 (Continued)

Tank and hoses shall be cleaned from all previous hydro-seeding and hydro mulching projects. Seed shall be mixed into the slurry immediately before application and slurry applied within 30 minutes after seeds have been placed in the tank. Once seed has been placed in the tank, tank shall be agitated only enough to mix the seeds and keep slurry from separating.

A 2-step process shall be used for seeding in conjunction with hydromulch. Seed shall be applied with 500 lbs./acre of hydromulch in the first pass. A second pass with 1,000 lbs./ acre of hydromulch shall be applied in a second pass. Each pass shall be applied in a different direction.

Once the seed has been added to the tank mixture a one-hour time limit is set for spreading the mixture on the soil. Once the one hour has passed the excess mixture must be discarded.
For broadcast seeding, hydromulch shall be applied immediately following seeding at a rate of 1,000 lbs./acre. Tank should be cleaned from any previous hydroseeding.

CARE DURING GERMINATION AND ESTABLISHMENT

The contractor shall care for seeded areas as necessary for successful germination. Care will include watering and weed control as necessary to achieve the establishment of the specified seeded species after one growing season as specified below.

The contractor shall maintain the stand of grass to ensure healthy growth of the seeded species. Work shall include mowing or weed whacking for weed control, watering if necessary, and removal of invasive plants.

Watering shall be sufficient to achieve soil moisture to a depth of 2 inches or more and such moisture is uniform. The method of watering shall not erode or damage soil or grassed surfaces.

General Weed Control: Unless otherwise directed, mowing shall be as specified under Mowing for Weed Control for seed establishment. Weeds shall be mowed prior to weed setting seed (by the end of July unless otherwise approved).

Control of Invasive and Aggressive Weeds: Invasive and aggressive weeds, including but not limited to mugwort, ragweed, knapweed, foxtail, crabgrass, and chicory must be cut or treated prior to going to seed. Herbicide treatment must be coordinated with MassDOT. Undesired species (such as chicory) introduced due to the use of incorrect seed mix shall be removed at the Contractor's expense.

MOWING FOR WEED CONTROL

Mowing for weed control shall be completed after weeds have sprouted and show leaf and bud growth, but prior to setting seed, generally between July 7th and August 1st, unless directed otherwise by the MassDOT Landscape Architect and the Engineer.

Mowing height shall be as needed for weed control, generally to a height of 8 inches and not below 4 inches, unless directed otherwise. Mowing shall be with a brush hog mower or string trimmer other approved equipment. Conventional lawn mowers which cannot achieve the appropriate cut shall not be used.

ITEM 765.635 (Continued)

The contractor shall give 48-hour notice prior to mowing work. Mowing shall only occur in dry sunny weather. Litter pickup should occur prior to mowing in all areas. If required, cut grass shall be raked and removed. Litter pickup and raking and removal of grass shall be incidental to the work.

Mowing equipment shall be approved by the Engineer prior to work.

OVER-SEEDING

Areas of bare ground greater than 2-3 feet in diameter shall be over-seeded with the specified mix during the appropriate season for seeding. Where required for overseeding mowing shall be as close to the soil as much as possible. Soil that is compacted shall be raked or otherwise roughened prior to over-seeding.

Over-seeding rates and methods shall those specified above under Materials and Methods. Following over-seeding, soil shall be lightly tamped to ensure seed to soil contact and areas shall be mulched with straw mulch and watered with a fine mist to moisten soil to a depth of at least 2 inches.

Over-seeding, mulch, watering, and all work for over-seeding shall be incidental.

DETERMINING SATISFACTORY GRASS ESTABLISHMENT

A well-established stand of the specified seeded species as determined by the Engineer and the MassDOT Landscape Architect will be required for Final Acceptance. The expectation is that an acceptable number and variety of the desired permanent seeded species (not the cover crop) will be visible. Generally:

- A minimum of 75% coverage by the specified permanent seeded species after one growing season. Of that percentage, generally, depending on the mixed species:
  - At least 3 types of permanent seeded grass species shall be visible.
  - At least 3 species of wildflowers shall be visible.
- There will be no significant gaps or bare soil (generally 2-3 feet in diameter or greater).
- There will be no more than 25% coverage by weed species.
- All soil shall be stabilized and there shall be no channeling or erosion.
- There will be no invasive or aggressive species within the stand at the time of acceptance.
- There shall be no evidence of seed from non-native mixes (i.e., clover) due to failure to clean the hydroseeding tank or using incorrect mix.

Invasive and aggressive weeds (such as mugwort, ragweed, knapweed, and chicory) must be cut or treated prior to going to seed for Interim Acceptance. Herbicide treatment must be coordinated with MassDOT.

A warm-season grass mix with perennials will not have uniform growth. A uniform stand of grass may indicate the use of an incorrect mix.

ITEM 765.635 (Continued)

ACCEPTANCE OF SEEDING AND ESTABLISHMENT WORK

Conditional Acceptance shall be based on proper application of seed as specified herein.

Interim Acceptance of Care. Seeding will be inspected by mid-July to assess germination and Establishment conditions as described above. When necessary for Interim Acceptance, areas shall be mowed prior to weed species producing seed and as specified above under Weed Control. ***Areas requiring weed control that are not mowed prior to weed seed dispersal will not be approved for Interim Acceptance.*** Seeding that shows good germination and is determined by the Engineer and Landscape Architect to not require weed control at time of inspection shall be accepted for Interim Acceptance payment.

Final Acceptance of Establishment shall be given upon satisfactory Establishment as described above.

If the seeded area fails to meet the requirements of Establishment by the end of the growing season, contractor shall propose and implement remediations and site shall be inspected during the following growing season after July 1st. All remediation shall be at the contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Native Seeding and Establishment will be measured for payment by the square yard, complete in place.

Native Seeding and Establishment will be paid at the Contract unit price by the square yard upon Conditional, Interim, and Final Acceptances as described above. This price shall include all submittals, seeding, rolling to ensure seed-to-soil contact, weed control other than mowing, water, over-seeding, labor, materials, equipment, and all incidental costs required to complete the work of establishing a satisfactory stand of grass.

Native seed and cover crop mixes shall be compensated under the respective items.

Site preparation, including raking, tilling, removal of debris and stones, and other work to the prepare site for seeding shall be compensated under loam placement or topsoil rehandled and spread as relevant to the project. If used, Compost Blanket shall be compensated under the respective item.

Option 2: Mowing for weed control will be incidental to this item.
Schedule of payment shall be as follows:

30% upon Conditional Acceptance.
20% upon Interim Acceptance of Care, except this amount will be reduced to zero and final payment will be reduced accordingly when areas requiring weed control are not mowed as specified in the Interim Acceptance criteria.
50% upon Final Acceptance of Establishment.

ITEM 767.121 SEDIMENT CONTROL BARRIER FOOT

The work under this item shall conform to the relevant provisions of Subsections 670, 751 and 767 of the Standard Specifications and shall include the furnishing and placement of a sediment control barrier. Sediment control barrier shall be installed prior to disturbing upslope soil.

The purpose of the sediment control barrier is to slow runoff velocity and filter suspended sediments from storm water flow. Sediment barriers 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:

(a) 9-inch compost filter tubes
(b) 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, an 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.

The 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 plan details.

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 Section 670.40 and 670.60 of the Standard Specifications and the following:

A 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.

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:

(a) 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.
(b) Straw bales shall be removed and disposed of off-site by the Contractor. Areas of trenching shall be raked smoothly and disturbed soils stabilized with a seed mix matching adjacent seeding or existing grasses (i.e., lawn or native grass mix).
(c) Sedimentation fence, stakes, and other debris shall be removed and disposed of off-site. The 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 barriers, 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 damage by construction activities shall be repaired or replaced as directed by the Engineer at the Contractors expense.

ITEM 771.1	**EVERGREEN TREE – 3-4 FEET**	**EACH**
ITEM 775.1	**DECIDUOUS TREE – 1.5-2 INCH CALIPER**	**EACH**
ITEM 775.2	**DECIDUOUS TREE – 2-2.5 INCH CALIPER**	**EACH**
ITEM 778.1	**MULTISTEM TREE – 5-6 FEET**	**EACH**
ITEM 785.1	**LARGE SHRUB – 2-2.5 FEET**	**EACH**
ITEM 785.2	**SMALL SHRUB – 18-24 INCH**	**EACH**

GENERAL

Work under these items shall conform to the relevant provisions of Section 771, "Planting Trees, Shrubs and Groundcover" of the Standard Specifications, all supplemental specifications and details thereto, and the following:

Descriptions of Plant Items

The following describes the plant species included under each of the plant bid items according to the Master Plant List. Should substitutions be needed during construction, other plant species within each bid item may be considered with written request by the Contractor and approval of the Landscape Architect. This should not be interpreted as a means to reduce the number of proposed plant species. A diversity of plant species is desired on this project, and substitutions will be evaluated on a case-by-case basis once the Contractor has confirmed lack of availability from multiple local nurseries.

Item 771.1 Evergreen Tree – 3-4 Feet

Juniperus virginiana	(Eastern Red Cedar)

Item 775.1 Deciduous Tree – 1.5-2 Inch Caliper

Celtic occidentalis	(Hackberry)
Nyssa sylvatica	(Black Gum)
Quercus bicolor	(Swamp White Oak)

Item 775.2 Deciduous Tree – 2-2.5 Inch Caliper

Acer rubrum	(Red Maple)

Item 778.1 Multistem Tree – 5-6 Feet

Betula populifolia	(Gray Birch)

Item 785.1 Large Shrub – 2-2.5 Feet

Cephalanthus occidentalis	(Buttonbush)
Lindera benzoin	(Spicebush)
Myrica pensylvanica	(Northern Bayberry)

Item 785.2 Small Shrub – 18-24 Inch

Aronia melanocarpa	(Black Chokeberry)
Gaylussacia baccata	(Black Huckleberry)

ITEMS 771.1 through 785.2 (Continued)

Planting Oversight

The Consulting Landscape Architect (Shadley Associates, P.C.) shall oversee the layout of all plants and planting operations. The Contractor shall engage the Landscape Architect prior to the start of planting to review the schedule, source and tagging of plant material, and to inspect the site. The Contractor shall lay out the plants shown on the Contract Drawings for review and approval by the Landscape Architect prior to installation. The Landscape Architect reserves the right to adjust the layout of the plant material shown on the Contract Drawings, given the quantities do not change.

METHOD OF MEASUREMENT

Items 771.1 through 785.2 will be measured for payment per EACH plant installed.

BASIS OF PAYMENT

Items 771.1 through 785.2 will be paid respectively at the Contract unit bid prices per EACH, which prices will be full compensation for all labor and materials to furnish and install each plant complete in place including, but not limited to, delivery, excavation for root ball, planting media, soil amendments, fertilizers, watering, stakes and guys, as required by the Engineer.

Age pine bark mulch will be separately under item 767.6 as required.

ITEM 813.9 DESIGN AND INSTALLATION OF ELECTRICAL SERVICE LUMP SUM

The work under these Items shall conform to the relevant provisions of Section 800 and the following:

All construction of proposed service including trench, excavation, and backfill shall conform to Eversource details and specifications. All work shall be performed by an Eversource approved Contractor. A representative from Eversource shall be present for the installation of all services, switches, and conduits.

The system shall be designed by an electrical engineer licensed in the Commonwealth of Massachusetts and meet all MassDOT and Eversource requirements for electrical systems and components.

All trench excavation activities shall comply with all appropriate OSHA standards.

Conduits shall be blown clean using compressed air. Run mandrel through each conduit to confirm viable pathway.

PVC conduits shall be Schedule 40.

BASIS OF PAYMENT

Item 813.9 will be paid at the contract unit price of LUMP SUM; which price shall be considered full compensation for all labor equipment and materials necessary to complete the work specified above, including, but not limited to, design, excavation, backfill, service connections, meters, switches, conduit, and outlets, etc.

ITEM 852.11 TEMPORARY PEDESTRIAN BARRICADE FOOT
ITEM 852.12 TEMPORARY PEDESTRIAN CURB RAMP EACH

DESCRIPTION

Work under these items consists of furnishing, deploying, maintaining proper operating conditions, and removing temporary pedestrian barricades and temporary pedestrian ramps as part of a Temporary Pedestrian Access Route (TPAR) in order to guide pedestrians around a fully or partially closed sidewalk. These devices are intended to prevent pedestrians from entering the work area and to prevent pedestrians from inadvertently entering the vehicle travel lane by providing visual and physical separation between each space.

MATERIALS

The Temporary Pedestrian Barricade shall have a continuous bottom rail or edge no more than two (2) inches above the ground and eight (8) inches in height (minimum) to accommodate cane users, have a smooth and continuous hand railing along the top edge no less than 32 inches above the ground and not obstruct or project into the pedestrian path of travel. Barricade walls shall be nearly vertical and generally within the same plane.

If exposed to traffic, Temporary Pedestrian Barricades shall be crashworthy. The Temporary Pedestrian Curb Ramp shall provide a 48-inch minimum width, with a firm, stable, and non-slip surface. Protective edging with a two (2) inch minimum height shall be installed when the curb ramp or landing platform has a vertical drop of six (6) inches or greater.

The Temporary Pedestrian Curb Ramp walkway and landing area surface shall be of a solid, continuous, contrasting color abutting up to the existing sidewalk.

If a Temporary Pedestrian Curb Ramp leads to a crosswalk, a detectable warning pad must be used at the base of the ramp; if it leads to a protected path that does not conflict with vehicular traffic then a detectable pad shall not be used.

CONSTRUCTION METHODS

The Temporary Pedestrian Barricade shall be placed in an area that will provide pedestrians with a TPAR on a smooth, continuous hard surface for its entirety. The geometry and alignment of the facility shall meet the applicable requirements of the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities” and the Massachusetts Architectural Access Board.

The recommended width of the TPAR is 60 inches, but if constraints exist a minimum clear width of 48 inches shall be provided in its entirety. If a 60-inch width cannot be accommodated in full, a 60 inch by 60 inch passing space shall be provided every 200 feet or less along the TPAR.

Turning areas shall be 60 inches by 60 inches minimum.

ITEMS 852.11 and 852.12 (Continued)

Lateral joints between any surfaces shall not exceed 0.5 inches. Lateral edges may be vertical up to 0.25 inches high and shall be beveled at 1V:2H between 0.25 inches and 0.5 inches.

The TPAR shall be kept clear of debris, snow, and ice and the Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall not obstruct drainage.

Removal and/or resetting of Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall be considered incidental.

COMPENSATION

Payment for Temporary Pedestrian Barricades will be made at the contract price per foot installed in place, including all incidental items. This price shall include the cost of furnishing, installing, resetting, removal, and maintaining in good working condition.

Payment for Temporary Pedestrian Curb Ramps will be made at the contract price per each unit installed in place, including all incidental items. This price shall include the cost of furnishing, installing, resetting, removal, and maintaining in good working condition.

ITEM 874.2	**TRAFFIC SIGN REMOVED AND RESET**	**EACH**
ITEM 874.4	**TRAFFIC SIGN REMOVED AND STACKED**	**EACH**
ITEM 877.1	**SIGN POST REMOVED AND DISCARDED**	**EACH**

The work under these items shall conform to the relevant provisions of Subsections 828 and 840 of the Standard Specifications and the following:

For signs designated to be removed and reset, the Contractor shall carefully remove the sign and post as a single assembly and stockpile at a location approved by the Engineer until the sign and post can be installed in their final location.

The Contractor shall carefully remove, transport and stack signs as directed by the Engineer. Signposts shall be discarded.

METHOD OF MEASUREMENT

Items 874.2 Traffic Sign Removed and Reset, 874.4Traffic Sign Removed and Stacked and 877.1 Signpost Removed and Discarded will be measured for payment by EACH.

BASIS OF PAYMENT

Item 874.2 Traffic Sign Removed and Reset will be paid for at the Unit Price EACH, which price will include all labor, equipment, and materials including post bases, hardware, and all other incidental costs required to complete the Work.

Items 874.4 Traffic Sign Removed and 877.1Stacked and Signpost Removed and Discarded will be paid for respectively at the Contract Unit Price EACH, which will include all labor and equipment, including the legal disposal of all signposts and all incidental costs required to complete the Work.

ITEM 874.99 WARNING BUOYS AND SIGNS LUMP SUM

The Work under this Item shall conform to the relevant provisions of the Standard Specifications and these Special Provisions.

This Item shall include all materials, equipment, and labor needed to fabricate, deliver, and install the proposed warning buoys and signs at the locations shown on the plans, which includes the following: floating warning barrier, floating buoys, aluminum signs with warning and hazard messages, and required anchors.

MATERIALS

All materials required to fabricate and install the proposed floats and signage shall meet the requirements of the Standard Specifications.

Floating Warning Barrier

The floating barrier shall consist of 18-inch, safety yellow spheres spaced no more than 10-feet on center. The float material shall be UV protected polyethylene and the hardware and cables/chains shall be stainless steel.

Buoy

The buoy shall be designed to support the proposed warning and hazard signage, including wind and wave action that could destabilize the float, as detailed in the plans. The float shall be made with UV protected polyethylene and all hardware shall be stainless steel.

Signage

The signage shall be constructed of aluminum clad plywood. The thickness of the sign and required connections to the buoy shall be designed for anticipated wind and wave action. The lettering on the signage shall be "Helvetica Bold" and be the dimensions shown on the Plans. The signage shall have a reflective coating to allow it to be visible at dusk and night but shall not hinder visibility during daylight. All colors shall meet MUTCD requirements.

Anchor

The warning barrier and buoys shall be anchored to the pond bottom as required by the design and manufacturer requirements. All metal components shall be stainless steel.

SUBMITTALS

The Contractor shall submit shop drawings of the floating barriers, buoys, signage, hardware and anchors that they intend to install for review and approval by the Engineer.

BASIS OF PAYMENT

Payment for work described under this Item will be paid for at the Contract LUMP SUM price, which price shall include full compensation for all labor, tools, equipment, materials, testing, loading, delivery, transportation, storage, approvals, and permits necessary for the completion of the work.

ITEM 910.4 MECHANICAL REINFORCING BAR SPLICER EACH

This item is for use at construction joints within the spillway, low-level outlet chamber, fish ladder, eel ramp, retaining walls, training walls, and all other concrete components not included in the 993.01 and 995.01 lump sum items. Work under this heading shall confirm the relevant provisions of Subsection 901 of the Supplemental Specifications and the following:

Splicers shall conform to engineering directive E-09-007 and the manufacturer shall be listed in the MassDOT Qualified Construction Materials List.

METHOD OF MEASUREMENT

Item 910.4 will be measured for payment by the Each mechanical reinforcing bar splicers, complete in place.

BASIS OF PAYMENT

Item 910.4 will be paid for at the Contract unit price per Each, which price shall include all labor, materials, tools, equipment, and all incidental costs required to complete the work.

ITEM 945.99 SECANT WALLS LUMP SUM

The work under these items shall conform to the relevant provisions of Subsections 945 and 950 of the Standard Specifications and the following:

Work under this item shall include all required design, installation, testing, partial removal and demolition of the proposed secant wall systems or existing structures and components, and closure pours and encasements at wall penetrations at the locations shown and as detailed on the Plans.

At the Contractor's option, this item of work can be Value Engineered per the "Value Engineering Change Proposal" section of these Special Provisions. In addition to the requirements of that section, the revised design calculations, and plans and details shall be reviewed and approved by MassDOT and their engineer, and the Department of Recreation

(DCR) Office of Dam Safety (ODS) prior to commencement of this work item and any related work items necessary to complete this work. There is no guarantee that the Value Engineered option will be approved by either MassDOT or ODS. There shall be no additional compensation for costs incurred to prepare the Value Engineering Change Proposal.

Portions of the secant walls will be required to be removed and disposed to facilitate construction of the proposed structures and roadway profile, removal of existing structures, and removal of the proposed cofferdam structure, as shown on the plans. The demolition methods shall meet the requirements of Standard Specification Section 112 and Item 127.1 of these Special Provisions, as required.

BASIS OF PAYMENT

Item 945.99 will be paid for at the Contract Unit Bid Price per LUMP SUM, hich price will include excavation of secant walls shall be considered complete compensation for temporary casing, water control, removal from the site and disposal of excavated materials, using slurry as necessary, tools and drilling equipment to excavate the shaft of the wall, and furnishing all other labor, materials, and equipment necessary to complete the excavation. If a larger diameter excavation than that specified on the plans is performed at the Contractor's option, no additional compensation will be provided to perform this oversized excavation.

Payment for trial secant walls shall be considered full compensation for the excavation of the trial shaft hole through whatever materials are encountered to the authorized bottom of trial shaft, including obstructions, temporary casings, backfilling the hole with unreinforced concrete, restoring the site as required, and all other incidentals necessary to complete the trial drilled shaft. If a larger diameter trial drilled shaft than that specified on the plans is performed at the Contractor's option, no additional compensation will be provided to perform this oversized excavation.

ITEM 945.99 (Continued)

Payment for construction of the secant walls shall be considered full compensation for all cement concrete, timber, structural steel, labor, materials, equipment, and all other incidentals necessary to complete the secant wall. This payment shall include all cement concrete, timber, and structural steel that extends into the shaft, if any, and all structural steel that is embedded in the wall and extends above the top of the wall. Bracing, centering devices, and support devices for the structural steel shall be considered incidental to the work. If a secant wall is constructed larger than that specified on the plans at the Contractor's option, no additional compensation will be provided to perform this oversized construction.

Payment for all partial removal of the secant walls shall be considered full compensation for removal of wall materials, proper disposal of removed materials labor, materials, equipment, and all other incidentals necessary to remove portions of the secant wall to the limits shown on the plans.

ITEM 950.1 TEMPORARY SHORING LUMP SUM

The work under this Item shall conform to the relevant provisions of Subsections 140 and 950 of the Standard Specifications and the following:

Work under this Item shall consist of the design, procurement, installation and removal of temporary earth support systems to maintain the existing roadway grade and for retaining the embankments adjacent to excavation for the construction of new and demolition of the existing bridge elements, including but not limited to, abutments, footings, wingwalls at excavation limits as required, along areas used to support utilities or other existing structures scheduled to remain during construction, and any areas chosen to facilitate the Contractor's construction methods. Anticipated locations of Temporary Shoring are shown on the Plans, but the exact layout and

location of the systems shall be determined by the Contractor to accommodate the specific site conditions encountered and the Contractor's operations.

Additionally, the Contractor shall be responsible for providing the necessary temporary support for any existing drainage structures, buried utilities, or utility poles that will remain in service during the bridge excavation operations. This work is incidental to the item and will not be considered for additional compensation.

The system shall be designed to adequately resist all forces acting upon it, including, but not limited to, earth and/or water pressures, vehicular live loads, construction live loads, live loads from staged traffic, and adjacent bridge structure loads. Loading shall meet all requirements specified in the most recent edition of the AASHTO LRFD Bridge Design Specifications and the MassDOT Highway Division LRFD Bridge Manual. The design shall be based on soil strata and design parameters provided in the geotechnical report included in this Contract. Particular attention shall be paid to Subsection 3.2.4 of the aforementioned Bridge Manual regarding the design and installation of support of excavation, especially as it relates to support of excavation that protrudes into the soil that supports the bridge structure.

The Contractor may elect, at no additional cost to the State, an alternate means of temporary earth support, as approved in writing by the Engineer. The Contractor's installation method shall consider the close proximity of right-of-way lines, wetland delineation, and existing utilities, all of which may require the temporary shoring to be installed in phases coordinated with the utility companies and other work items. The method of shoring should consider the overhead restrictions imposed by the overhead wires and existing bridge structure that will remain in place.

The temporary shoring for the proposed Work may be any combination of steel sheeting, soldier piles and timber lagging, fabricated cofferdams or "trench boxes", or other support methods may be acceptable. The temporary shoring provided should be independent and not cause damage to the permanent structure when removed. All support for excavation that protrudes into the soil that supports the bridge structure shall be left in place. Supporting soil shall be defined in Section 3.2.5.8 of the MassDOT LRFD Bridge Manual.

ITEM 950.1 (Continued)

The temporary shoring design shall consider the requirements of other items of Work including construction phasing, maintenance and protection of traffic (including pedestrian and bicycle), presence of existing and proposed utilities both underground and overhead, and installations of utility piping and structures during each phase of the Work. The temporary shoring may need to be modified or altered to conform to the work as necessary.

The Contractor is responsible for selecting, designing, furnishing, installing, and maintaining the temporary shoring systems. Plans and calculations for the temporary shoring system shall be prepared and submitted to the Engineer for approval. The Contractor shall submit for review and approval, plans and calculations of the proposed system. All plans and calculations submitted shall bear the seal of a Professional Engineer registered in Massachusetts.

Excavation for construction of proposed substructure elements shall be paid for under Item 120.1, Unclassified Excavation and Item 140., Bridge Excavation. Payment shall be made at the

Lump Sum Price for Temporary Shoring and shall include full compensation for all design, plans, labor, materials, equipment, removal and all other incidental work to complete the work.

BASIS OF PAYMENT

Item 950.1 will be paid per LUMP SUM unit for all the shoring systems required on the project. Each system location will not be measured and paid for separately. This item is one payment for all systems required on the project.

This work will be paid for at the contract LUMP SUM Contract Bid Price, which price shall include full compensation for the design, installation, maintenance, and removal of the shoring systems, and all labor, tools, equipment, materials, and incidental expense necessary to complete this Work. No increase will be made to the Bid Price due to any unseen nature of the Work or materials involved.

The full payment will be due upon completion of the Work to the satisfaction of the Engineer. Partial payments shall be made at the following percentages:

Approval of Temporary Shoring Plan(s)	10%
Accepted installation of Temporary Shoring (total for all phases)	60%
Satisfactory removal of the Temporary Shoring system(s)	30%

ITEM 960.1 STRUCTURAL STEEL – COATED STEEL POUND

A. GENERAL

The rolled steel grating support beams located in the Low-Level Outlet Chamber shall be galvanized. All fabrication shall be completed prior to surface preparation and the application of any coating.

The faying surfaces of all field bolted connections shall be coated based on the design of the connection. Class B connections shall be masked prior to galvanizing to allow for application of an approved class B slip coefficient primer. After galvanizing the masked surface will be cleaned in accordance with SSPC-SP11 and coated with the approved zinc rich primer. A galvanized connection will result in a faying surface meeting a class C slip coefficient.

When grinding, drilling or any other operation produces steel turnings, filings, shavings, etc. the contractor shall completely clean all areas of all accumulation prior to the end of the work shift.

Locations of field applied studs shall require masking or removal of galvanizing and paint prior to welding.

The Engineer shall provisionally accept the shop coated items before shipment to the jobsite, but final acceptance of the coating system will occur after erection of the coated items, and after all required repairs and coating application has been completed.

The contractor shall be responsible for failure and damage of all applied coating. Failures include but are not limited to, visible corrosion, blistering, checking, cracking, or delamination (peeling) and loss of gloss and color of the coating system. Damage includes but is not limited to damage from installation or from external agents, such as scraping, vandalism, debris impacts, and collisions. The extent and method of repair must be approved by the Engineer.

B. GALVANIZING

The following shall be hot dipped galvanized in accordance with Section M7 of these Specifications: (Designer shall modify list as required)

1. Members identified on the contract documents.
2. Diaphragms, cross frames, utility supports and bottom lateral bracing elements that are composed of non-weathering steels or weathering steels designated to be coated.
3. All sole plates and masonry plates (except sole plates for sliding elastomeric bearings).

Galvanized members requiring shop fabrication and assembly shall be cut, welded, and/or drilled prior to galvanizing. Bearing members to be milled shall be galvanized prior to milling. A thin layer of a rust inhibitor shall be applied to the milled surface. Material to be painted shall not be quenched after galvanizing.

ITEM 960.1 (Continued)

Where material is required to be welded after galvanizing, the steel shall be masked 3 inches on each side of the weld center line. Prior to field welding the masked surface shall be cleaned in accordance with SSPC-SP11. After welding the area shall be repaired in accordance with ASTM A780 "Repair of Hot Dip Galvanizing" section 4.2.2, "Paints Containing Zinc Dust" and Annex 2. Repair paint shall meet M7.04.11 and application shall be in accordance with the manufacturer's recommendations.

Damaged galvanized surfaces shall be repaired in accordance with ASTM A780 "Repair of Hot Dip Galvanizing" section 4.2.2 Paints Containing Zinc Dust "High Zinc Dust Content". The paint shall be applied to achieve a minimum dry film thickness of 3 mils and not more than 5 mils. Repair paint shall meet M7.04.11 and application shall be in accordance with the manufacturer's recommendations.

The contractor shall provide protection of the adjacent coating in areas that will be field welded. After welding, the weld areas shall be prepared in accordance with SSPC-SP-11.

METHOD OF MEASUREMENT

Items 960.1 will be measured for payment by the Pound of structural steel- coated steel installed complete in place as indicated by the approved shop drawings.

BASIS OF PAYMENT

Items 960.1 will be paid for at the Contract unit price per Pound, which price shall include all materials, equipment, labor, and all incidental costs required to complete the work as described herein and shown on the plans.

ITEM 982.9 ALUMINUM WIERS EACH

The work under this Item includes the procurement and complete installation of the aluminum fish ladder weirs, including the mounting hardware and concrete anchors.

The weirs shall be fabricated to the dimensions shown on the plans. The Contractor shall verify all dimensions and coordinate with the Manufacturer prior to fabrication and installation of the weirs and connection components. If, due to field changes during construction, the dimensions of the weirs need to be modified, MassDOT and the Engineer shall be notified. All edges of the weirs shall be beveled and free of burrs.

QUALITY ASSURANCE

All the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 10 years of experience in successfully designing and manufacturing components of similar designs.

The Contractor shall warrantee all components for a period of 2 years after project completion.

SUBMITTALS

The Contractor shall submit Shop Drawings that include the following:

1. Complete description in sufficient detail to permit item by item comparison with the Contract Documents.
2. Dimensions.
3. Weights.
4. Capacity.
5. Maximum support reactions.
6. Performance characteristics.
7. Layout drawing for all equipment showing installation details.
8. Deviations from Drawings and Specifications.
9. Manufacturer's installation instructions.
10. Affidavits of compliance with referenced standard and codes.
11. Manufacturer's standard guarantee.

MATERIALS

The weirs shall meet all applicable requirements of section M7 of the 2026 Edition of the Massachusetts Department of Transportation Standard Specifications.

STORAGE, HANDLING, AND DELIVERY

Damage present on the weir upon delivery from the Manufacturer shall immediately be documented with each the Engineer and Manufacturer upon the State's receipt of the weirs. Damage to the weirs prior to release to the State shall immediately be repaired by the Manufacturer at the Manufacturer's sole expense in accordance with Manufacturer standard repair recommendations and procedures.

ITEM 982.9 (Continued)

Upon receiving the weirs, the Contractor will be responsible for protecting the weirs and their components from damage. Damage to the weirs after the Contractor has taken delivery of the weirs shall be repaired at the Contractor's sole expense in accordance with Manufacturer repair recommendations and procedures.
The weirs and components shall be stored in such a way to prevent any damage and weathering to the structure and components of the weirs. The weirs shall be stored at a secure location to prevent theft and/or vandalism.

The weirs shall be picked in accordance with the manufacturer's recommendations. Equipment used to move the weirs shall be adequately sized and capable of lifting the stated loads without damaging the weirs.

The weirs shall only be delivered to the site when the Contractor is ready to install the weirs as shown on the attached plans. The weirs will not be allowed to stay on-site overnight without being installed unless it is stored in a secure enclosure.

INSTALLATION

Installation of the weir and appurtenances shall be done in a workmanlike manner. It shall be the responsibility of the Contractor to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's recommendations.

The Contractor shall review the installation drawings and installation instruction prior to installing the weirs.

METHOD OF MEASUREMENT

Item 982.9 will be measured for payment by EACH.

BASIS OF PAYMENT

Item 982.9 will be paid for at the Contract unit bid price per EACH, which price shall include full compensation for all labor, tools, equipment, materials, testing, loading, delivery, delivery, transportation, storage, approvals, submittals and permits necessary for the completion of the work.

ITEM 982.91 ALUMINUM STOP LOGS FOOT

The work under this Item includes the procurement and complete installation of the aluminum stop logs and guide frames, including the mounting hardware and concrete anchors.

The stop logs shall be fabricated to the dimensions shown on the plans. The Contractor shall verify all dimensions and coordinate with the Manufacturer prior to fabrication and installation of the stop logs. If, due to field changes during construction, the dimensions of the stops logs need to be modified, MassDOT and the Engineer shall be notified.

Each stop log shall be outfitted with an identification tag indicating the Stop Log Manufacturer, width of the opening and maximum head rating at a minimum. Additional tags shall be included on each stop log that indicate “dry side” and “wet side”. Tags shall be welded to each log.

Each stop log shall be outfitted with a continuous resilient lip seal along the bottom and both sides to restrict leakage in accordance with the requirements listed in this specification.

1. The continuous lip seal shall be constructed of urethane or rubber and shall be mechanically retained to the stop log.

2. The lip seal shall be activated by a combination of the weight of the stop log and the differential water pressure, which pushes the seal against the inside of the groove assembly.

3. Stop logs that utilize rubber “J” seals or “P” seals are not acceptable.

The frame guides or grooves and invert members shall be constructed of type 316 stainless steel and shall be designed to be wall mounted as recommended by the Stop Log manufacturer.

1. Frame design shall allow for embedded mounting or mounting directly to a wall with stainless steel anchor bolts and grout. Mounting style shall be as shown on the Contract Drawings, or as recommended by the Stop Log manufacturer.

2. An invert member shall be provided across the bottom of the guides. The invert member shall be designed for minimal flow interference along the bottom of the channel, as recommended by the Stop Log manufacturer.

3. Frame mounted seals are not acceptable.

Anchor bolts shall be provided by the Stop Log manufacturer for mounting the guide frames and storage racks (if applicable).

1. Quantity and location shall be determined by the Stop Log manufacturer.

2. If epoxy type anchor bolts are provided, the Stop Log manufacturer shall provide the studs and nuts.

3. Anchor bolts shall have a minimum diameter of 1/2-inch.

ITEM 982.91 (Continued)

Non extruded logs will not be accepted.

Fiberglass logs will not be accepted.

QUALITY ASSURANCE

All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 10 years of experience in successful design and manufacturing of stop logs of similar design.

The Contractor shall warrantee all components for a period of 2 years after project completion.

SUBMITTALS

The Contractor shall submit Shop Drawings that include the following:

1. Complete description in sufficient detail to permit item by item comparison with the Contract Documents.
2. Dimensions.
3. Weights.
4. Capacity.
5. Maximum support reactions.
6. Performance characteristics.
7. Layout drawing for all equipment showing installation details.
8. Deviations from Drawings and Specifications.
9. Manufacturer's installation instructions.
10. Affidavits of compliance with referenced standard and codes.
11. Manufacturer's standard guarantee.

MATERIALS

The stop logs shall meet all applicable requirements of section M7 of the 2026 Edition of the Massachusetts Department of Transportation Standard Specifications.

All extrusions shall have a minimum thickness of 5/16 inches. Leakage shall not exceed 0.05 gpm/ft of wetted seal perimeter. Adequate drainage shall be provided for each stop log.

Maximum bending stress shall not exceed 7,600psi at the maximum head. All structural components of the stop logs, and guide frames shall be fabricated of aluminum and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.

The stop logs shall have resilient lip-type seals that are attached along the sides and across the bottom of each log with type 316 stainless steel fasteners. Seals will not be permitted to be attached to the guides due to the potential damage from floating debris.

ITEM 982.91 (Continued)

Mill finish on aluminum and stainless steel. All aluminum in contact with concrete shall be field coated with a heavy coat of bitumastic paint. Welds on aluminum shall be cleaned to provide a uniform finish. Welds on stainless steel shall be sandblasted to remove weld burn and scale. All welds shall be performed by welders with AWS certification.

Components	Materials
Frame Guides and Invert	316 Stainless Steel
Stop Logs	6061-T6 Aluminum
Lip Seal	Urethane, EPDM or Neoprene ASTM D-2000
Anchor Studs, Fasteners and Nuts	Stainless Steel, Type 316, ASTM A276

STORAGE, HANDLING, AND DELIVERY

Damage present on the stop logs upon delivery from the Manufacturer shall immediately be documented with each Engineer and Manufacturer upon the State's receipt of the weirs. Damage to the weirs prior to release to the State shall immediately be repaired by the Manufacturer at the Manufacturer's sole expense in accordance with Manufacturer standard repair recommendations and procedures.

Upon receiving the weirs, the Contractor will be responsible for protecting the weirs and their components from damage. Damage to the weirs after the Contractor has taken delivery of the weirs shall be repaired at the Contractor's sole expense in accordance with Manufacturer repair recommendations and procedures.

The weirs and components shall be stored in such a way to prevent any damage and weathering to the structure and components of the weirs. The weirs shall be stored at a secure location to prevent theft and/or vandalism.

The weirs shall be picked in accordance with the manufacturer's recommendations. Equipment used to move the weirs shall be adequately sized and capable of lifting the stated loads without damaging the weirs.

The weirs shall only be delivered to the site when the Contractor is ready to install the weirs as shown on the attached plans. The weirs will not be allowed to stay on-site overnight without being installed unless it is stored in a secure enclosure.

ITEM 982.91 (Continued)

INSTALLATION

Installation of the stop logs, guide frames and appurtenances shall be done in a workmanlike manner.

It shall be the responsibility of the Contractor to handle, store and install the equipment specified in this Section in strict accordance with the Stop Log Manufacturer's recommendations.

The Contractor shall review the installation drawings and installation instruction prior to installing the guide frames.

The guide frames shall be installed in a true vertical plane, square and plumb.

METHOD OF MEASUREMENT

Item 982.91 will be measured for payment per FOOT complete in place.

BASIS OF PAYMENT

Item 982.91 will be paid for at the Contract unit bid Price per FOOT, which price shall include full compensation for all labor, tools, equipment, materials, testing, loading, delivery, delivery, transportation, storage, submittals, approvals, and permits required for the completion of the work.

ITEM 983.9 STREAMBED RESTORATION CUBIC YARD

DESCRIPTION

This work shall consist of removing, stockpiling, and replacing riverbed material in the area downstream of the proposed bridge replacement and downstream of the proposed spillway in the limits of work. The streambed restoration shall replicate the existing natural channel bed outside the work area in terms of material, roughness, shape, profile, and appearance. The ultimate product will, to the extent possible, replicate the function and appearance of the natural stream channel, as illustrated by photo-documentation herein (Figure A).

The Contractor shall coordinate with his/her subcontractors to ensure all required equipment is available on-site to complete the work in this manner. The streambed restoration is required to comply with environmental permits issued for the project. MassDOT Environmental Services will provide a Fluvial Geomorphologist (Geomorphologist) to provide a pre-construction meeting, on-site oversight during construction, and assistance during streambed restoration construction to ensure the restoration is constructed as shown on the Plans, as required by these Special Provisions and in accordance with permit requirements.

At least 30 days prior to the commencement of construction, the Contractor shall coordinate with David Paulson (MassDOT Wildlife Unit Supervisor, (508) 389-6366 / david.j.paulson@state.ma.us) to set up an initial (virtual or in person) meeting with MassDOT's Geomorphologist, Contractor, and Resident Engineer. At this meeting, the Geomorphologist will provide an overview of the restoration work. The Contractor should be prepared to discuss the anticipated means, methods, and schedule.

Process Approval:

In lieu of a mockup, the Contractor shall schedule an onsite meeting to discuss the streambed restoration with the Geomorphologist and respective parties from MassDOT. The Geomorphologist shall be onsite during initial streambed restoration. The Contractor shall provide the Geomorphologist adequate access to observe, direct, and inspect the channel restoration work throughout the duration of the removal, stockpile, and reinstallation of the existing streambed material. If material is being brought to the site for streambed restoration, the Contractor shall provide the Geomorphologist with photographs to see the material.

MATERIAL

The streambed material excavated from the existing streambed shall be removed and stockpiled to facilitate reinstallation and replication of the natural streambed. The excavated streambed material shall also be reused to provide a minimum 12" layer of native streambed material on top of the proposed riprap placed downstream of the proposed concrete spillway slab.

In the event that excavated material is not suitable or there is not enough suitable material available, additional streambed restoration material shall be locally sourced that matches the composition of the existing native riverbed. Photos have been provided of the downstream channel for informational purposes. The Contractor, with MassDOT, shall evaluate material excavated from the site to determine the appropriate restoration material to be brought from off-site.

ITEM 983.9 (Continued)

The streambed material shall be approved by the Resident Engineer and Geomorphologist prior to use.

The streambed material shall be comprised of two primary components:

(a) The top 12 inches of streambed material shall consist of natural streambed material from material stockpiled onsite.

(b) The bottom layer of riprap shall consist of stone with a D_{50} of 0.5 feet and shall be a minimum of 24" thick, infilled with bank run gravel to lock the stones prior to placement of the streambed material topping.

CONSTRUCTION

Channel

The streambed material shall be reinstalled over modified rockfill as depicted on the plans, to an minimum thickness of 12 inches, with variations in thickness as necessary to replicate existing channel conditions. The initial placement of streambed material shall fill the voids in the underlying riprap. Fill voids by shaking stone with the teeth of an excavator bucket, hand tamping with metal tamping rods, and by spraying water to settle fines between large stones. Plate compactors shall not be used. The purpose of filling the voids is to prevent subsurface flow where surface water disappears into large voids between the stone fill below the channel bed surface during low flow conditions. The final streambed shape and appearance shall be finalized in the field as directed by the Geomorphologist.

Completion

Once all material has been placed in the stream channel and approved by the Geomorphologist and Resident Engineer, the Contractor shall remove the cofferdams in such a way as 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 shall maintain the general configuration of the existing streambed bedform and there shall be minimal subsurface flow upon final inspection by the Resident Engineer and Geomorphologist. The project must be passable by fish and other aquatic organisms following construction.

ITEM 983.9 (Continued)

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 983.9 streambed restoration will be measured for payment per CUBIC YARD will be the complete and accepted work for restoration of the streambed within the limits shown on the Plans as approved by the Resident Engineer and Geomorphologist.

The accepted streambed restoration will be paid for on a lump sum basis. Payment will be full compensation for excavating, stockpiling, transporting, and placing the material specified and for furnishing all labor, tools, equipment, testing, and incidentals necessary to complete the work.

The Geomorphologist will be provided by MassDOT at no cost to the Contractor.

Any required soil, gravel borrow, or modified rockfill to be installed below the streambed material shall be paid for under separate items included within Contract.

FIGURES

Figure A: Downstream of Bridge

ITEM 991.1 CONTROL OF WATER - STRUCTURE NO. W-06-020 (CCV) LUMP SUM

This Item includes all dewatering necessary to accomplish the demolition of the existing structures, construction of the proposed structures, and placement of the proposed stone armaments in the dry. The Work under this Item shall conform to the relevant provisions of Section 140 of the Standard Specifications and these Special Provisions. The selected dewatering and maintenance of flow systems shall not significantly alter the normal water surface elevations or stream velocities.

Dewatering shall be conducted to ensure that all cement concrete masonry is placed and cured in the dry.

Anticipated locations of Control of Water are shown on the Plans, but the exact layout and location of the systems shall be determined by the Contractor to accommodate the specific site conditions encountered and the Contractor's operations. It is the responsibility of the Contractor to determine the need and extent of stream diversions, sedimentation basins and dewatering techniques and sedimentation controls needed to control water and sediment at the site. It is also the Contractor's responsibility to ensure the proposed dewatering system is in conformance with permits provided through this Contract. During the actual process of executing the excavation operations, the Contractor shall submit the methods and materials he proposes to use for the Engineer's approval.

The Contractor's methods shall consider the close proximity of right-of-way lines, wetland delineation, overhead utilities, and existing and proposed structures, all of which may require the dewatering controls to be coordinated with other work items.

The design of the water control system shall be in accordance with the Standard Specifications, Chapter 3.2.5 of the MassDOT *LRFD Bridge Manual*, and relevant provisions of the AASHTO *LRFD Bridge Design Specifications* and Guide Specifications. The system will be designed to a height of 1 foot above the design flood elevation given in the Construction Plans.

Particular attention shall be paid to Subsection 3.2.4 of the aforementioned MassDOT Bridge Manual regarding the design and installation of control of water, especially as it relates to buried portions that protrude into the soil that supports the bridge structure.

Plans and Calculations for dewatering measures shall be developed by the Contractor for this Item, prepared by a Professional Engineer Registered in the Commonwealth of Massachusetts and submitted for the review of the Engineer prior to the start of construction.

CONSTRUCTION METHODS

The Contractor is advised that the effectiveness of the water control method used will vary based on the field conditions at the time at which the work is being performed. The Engineer has the right to order the Contractor to stop all construction operations when in his judgment the Contractor's water control operations are failing to produce adequate results or are posing a threat to the environment.

ITEM 991.1 (Continued)

The Contractor shall design the system so that normal pool elevations are maintained during construction to allow abutters that relay on the pond to maintain their operations. The Contractor shall coordinate with stakeholders during installation and maintenance of the Control of Water measures to ensure stakeholder operations are not significantly impacted.

The Control of Water system shall be designed for a minimum of 2000 GPM of seepage for the cofferdam system detailed in the plans. The Contractor shall provide temporary Control of Water measures for additional leakage, as required, through the cofferdam to maintain a dry work environment. The Contractor shall provide a contingency plan in the event of excessive leakage or overtopping of the cofferdam.

The Contractor shall use such equipment and shall perform his operations in such a manner that boiling or other disturbances of the soil in the foundation area will be prevented. 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 work shall be conducted in such a manner as to prevent siltation or contamination of the waterway or adjoining wetlands. The Contractor shall take note of any Time of Year Restrictions outline in the environmental permits. The Contractor will be required to provide unrestricted passage during upstream and downstream migration seasons through the existing and/or proposed spillways during construction.

The pumping discharge shall not be allowed to enter directly into Mill Pond or the Agawam River. The water from the work areas shall be pumped to a settling tank/basin. 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. The tank can be constructed of concrete, fiberglass or any other material that will meet the following:

A. 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.
B. The outlet from the settling tank/basin 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/basin.

The settling tanks/basins shall be maintained as follows:

A. Inspect at least twice daily during dewatering operations.
B. Repair any damage immediately.
C. Clean tank/basin outlet daily. Remove any debris immediately.
D. Remove sediments when deposits reach eight (8) inches below the outlet invert.
E. Dispose sediments outside of wetland areas at a location approved by the Engineer.

The Contractor shall inspect hay bales that surround the outlet daily and shall immediately replace any that are damaged. The Contractor shall utilize dewatering stockpile basins and filter basins as shown on the plans for the purposes of dewatering excavated material.

ITEM 991.1 (Continued)

The location of the tanks/basins will be as directed by the Engineer due to specific site conditions and staging operations of the Contractor.

Pumping shall be conducted in a manner that will not adversely affect the freshly placed cement 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 Contractor shall select the size and configuration of pumps and pipes.

When there is visible turbidity within the river caused by construction, the polluting activity will cease until adequate controls can be installed to protect the river.

Sufficient operating and stand-by pumps and equipment shall be available to dewater and keep the work areas dry during the construction period. Utility costs, and connections shall be arranged and paid for by the Contractor.

The Contractor is advised that the work to be performed under this item shall be in conformance with the applicable provisions of the MassDOT Standard Specifications as well as the following environmental permitting sections as referenced in these Special Provisions:

- DEP - WATER QUALITY CERTIFICATE
- ARMY CORPS OF ENGINEERS PERMIT

All work (including all labor, tools, equipment, materials, maintenance and fees) required in order to conform to the MassDOT Standard Specifications and the above environmental permitting sections, if not included separately under other items, shall be considered incidental to Item 991.1, and no additional compensation shall be made to the Contractor. Also included shall be all necessary additional permits that may be required in performing the work under this item.

The Contractor shall provide any necessary temporary filtering fabrics, silt fencing, sedimentation/retention basins and/or other effective procedures or structures together with all labor, materials, and equipment necessary for controlling water within the limits of the temporary shoring and cofferdam limits. Such work shall be subject to the approval of the Engineer, but such approval will not relieve the Contractor of the responsibility for the adequacy of construction, maintenance, operation and safety of the water control system.

BASIS OF PAYMENT

Item 991.1 will be paid for at the contract unit bid price per LUMP SUM, which price shall include full compensation for all necessary design, labor, equipment, materials, installation, piping, pumping, maintenance, removal of the water control systems and all other incidentals necessary to satisfactorily complete the work.

If partial payment is desired by the Contractor, the Contractor shall submit a schedule of payment to the Engineer for approval.

ITEM 992.32 TEMPORARY SUPPORTS FOR PIPING LUMP SUM

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

The work includes the design, erection, and maintenance of any required temporary support structures for existing utilities. The existing utilities on site that will require temporary support include a gas main. The Contractor shall be responsible for designing and constructing a safe and adequate temporary support system for the utility. The supports should be designed in accordance with the utility requirements, and provide the necessary rigidity, and support to resist loads imposed throughout construction. The support system shall be removed only upon the direction of the Engineer.

The location of the temporary support system shall not interfere with the demolition of the existing structure and the construction of the proposed structure. Included in this Item are all supporting elements needed for the temporary support of the utilities to remain in place and any excavation in the vicinity of the work required for the erection of the support system. The support for the temporary installation shall be located in an upland area and within the temporary work areas shown on the plans. The excavation and backfilling shall conform to the relevant provisions of Section 140.

The Contractor shall coordinate with all utility owners on the schedule of work and shall verify at the time of actual construction their requirements for supporting these utilities during construction.

MATERIALS

Materials shall conform to the requirements of the Standard Specifications. Construction materials may include lumber, plywood, steel, and concrete. Dimensional lumber shall be straight and free from defects. Structural steel may be either new or salvaged material, provided that the steel is in excellent condition (free from any significant loss of section). New steel for the support system shall conform to the requirements of AASHTO M270 Grade 36, 50 or 50W (ASTM A709 Grade 36, 50, or 50W), the grade chosen by the Contractor to suit his design. All steel welding shall conform to the relevant provisions of Section 960 of the Standard Specifications as amended herein. The concrete shall be 4000 psi-1 ½" -565 LB/CY Cement Concrete and shall conform to the requirements of Section 901 of the Standard Specifications.

DESIGN

The design of the temporary supports shall be adequate for all anticipated loads until the utility can be relocated to its permanent position, as more specifically shown on the construction plans. Loads acting on the support system include self-weight, weight of any bracing, and all construction live loads.

The Contractor shall submit calculations and detailed drawings of the proposed support system to the Engineer for approval. These calculations and drawings shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

ITEM 992.32 (Continued)

The design and detailing of the temporary utility support structure shall satisfy all requirements of the Massachusetts Department of Public Utilities, as well as all codes, regulations, and rules pertaining to the safety of pipeline facilities and the transportation of gas. The allowable design stresses shall be in accordance with the AASHTO Standard Specifications for Highway Bridges. Unless sufficiently documented to the contrary, all salvaged steel used in the support system shall assume a maximum yield stress of 30 ksi, with the various allowable stresses determined in accordance with the applicable AASHTO criteria.

CONSTRUCTION

All welding and the preparation and assembly of materials for welding shall conform to the relevant provisions of the Standard Specifications for Highways and Bridges, the current edition as of the bid opening date of the AASHTO Standard Specifications for Highway Bridges and the AASHTO/AVVS Bridge Welding Code (ANSI/MSHTO/AWS D1.5).

The Contractor's methods shall not damage any retained structural elements of the existing structure. Any damage done to the retained portions of the existing structure as a result of the Contractor's operations shall be repaired to the satisfaction of the Engineer at the Contractor's expense.

All temporary materials used in the support system shall remain the property of the Contractor and shall be removed from the site at the completion of the project. Supports shall be installed or removed only upon the approval of the Engineer.

Upon completion of all work under this Item, the Contractor shall remove the entire temporary support system including any temporary foundations for the supports.

BASIS OF PAYMENT

Item 992.32 Temporary supports for Piping will be paid for at the Contract unit price per lump sum, which price shall include all labor, materials, equipment and all incidental costs required to complete the work.

Partial Payment

For the purpose of estimating partial payments, the item will be considered 50 percent complete when all utilities are temporarily relocated and functioning. The item will be considered completed when all materials associated with the temporary bridge support system have been removed and properly disposed of.

ITEM 993.01 TEMPORARY BRIDGE STRUCTURE LUMP SUM
ITEM 995.01 BRIDGE STRUCTURE, BRIDGE NO. W-06-020 (CCV) LUMP SUM

The work under this Item shall conform to the applicable provisions of Section 995 of the Standard Specifications and the specific requirements stipulated below for the component parts of this Item. For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

Work under this Item shall include all materials, equipment, and labor needed to construct the complete bridge structures, which includes the following: reinforced concrete cantilever abutments and wingwalls, end diaphragms, safety curbs, highway guardrail transitions, and approach slabs. Installation of steel bridge railings, fabrication and erection of precast, prefabricated bridge units consisting of steel stringers with reinforced concrete deck. Work also includes steel reinforced elastomeric bearings, bituminous damp-proofing, membrane waterproofing, and bituminous wearing surface.

The following Special Provisions shall apply to items included in Item 995.01 and 993.1.

5000 psi, ¾ in., 685 HP CEMENT CONCRETE

The work under these headings shall conform to the relevant provisions of Sections 901 and the relevant provisions of Materials Section M4 of the Standard Specifications and the following:

The following items shall be considered as included in the unit price per Cubic Yard of concrete, as stated by the Contractor and as approved by the Engineer in the respective "Basis for Partial Payments": Development of Assembly Plan, forms, form liners, paraffin joints, water stops, adhesives, concrete joint sealers, construction joints, expansion joints, preformed joint fillers, neoprene seals, backer rods, premolded fillers, joint sealers, lifting hardware, bedding grouts and controlled low strength material, caulking, closed cell foam, weep holes with bagged stone, all piping and drains, waterproofing protective course, and all other work considered as incidental to the work involved in furnishing and placing the concrete.

The voids and keyways cast into the elements shall be considered incidental to the concrete construction. The calculation of the volume of concrete used for the "Basis for Partial Payments" shall include all voids and keys and be based on the overall plan and elevation dimensions of the elements.

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of this bridge structure or which may be incidental to its construction and are not specifically included for payment under another Item shall be considered incidental to the work performed under this Item and shall be included in the unit price of the component of which they are a part.

The following work shall be paid for under separate pay items: Demolition of Bridge No. W-06-020(9LH), Demolition of Bridge No. W-06-020(8MI), Demolition of Bridge No. W-06-020(8KD), Control of Water – Structure No. W-06-020(CCV), Bridge Excavation, Concrete Excavation, Gravel Borrow, Gravel Borrow for Backfilling Structures and Pipes, Crushed Stone,

ITEMS 993.01 AND 995.01 (Continued)

Crushed Stone for Bridge Foundations, Riprap, Temporary Shoring and other work specified elsewhere in the Proposal and for which payment is provided elsewhere in the contract.

PREFABRICATED BRIDGE UNITS (PBUs)

A. General.

The work under this Heading consists of fabricating, transporting, and erecting Prefabricated Bridge Units (PBUs) and includes all labor, materials, equipment and incidentals necessary to complete the work as shown on the Plans. PBUs consist of shop assembled pairs of structural steel beams and associated diaphragms with shop cast reinforced concrete deck slabs that are fabricated off site and shipped as units. The concrete to be used in the fabrication of the Prefabricated Bridge Units (PBUs) shall meet the requirements of Section M4: Cement Concrete and Related Materials.

QUALITY ASSURANCE FOR STRUCTURAL STEEL

A. **General.**

Quality Assurance requirements for the fabrication of structural steel shall be as specified in Section 960 and shall be performed at the structural steel plant during fabrication, at the precast concrete plant during PBU assembly, and in the field for final erection and assembly. Quality Assurance requirements for the assembly of the structural steel elements and fabrication of precast concrete deck slabs shall be as specified below.

B. **Quality Control for Structural Steel.**

The work under this subheading shall conform to the relevant provisions of Section 960 and shall include the supply, fabrication, and assembly of beams and diaphragms into PBUs. Structural steel Fabricators shall be approved by MassDOT in accordance with Standard Specifications, Division I, Section 6.01. The steel Fabricator shall provide qualified work crew(s) and QC inspectors to the precast concrete plant as needed to perform all steel fabrication and assembly work that is required to be performed for the fabrication of the PBUs.

C. **Acceptance for Structural Steel.**

Structural steel elements shall conform to the requirements of the specifications and shall be accepted by MassDOT prior to being released from the steel Fabricator for shipment to the precast plant. The structural steel for the PBUs shall be assembled at the precast concrete plant and the assembly shall be accepted by MassDOT at the precast concrete plant prior to casting the deck.

MATERIALS

A. Materials.

Materials shall conform to M4.09.1 and the following:

Mechanical Reinforcing Bar Splicer	M8.01.9
Lifting Devices	PCI MNL-116
Stud Shear Connectors	M8.04.1
High Strength Bolts	M8.04.3
Structural Steel	M8.05.0

ITEMS 993.01 AND 995.01 (Continued)

1. **Cement Concrete Mix Design.**

Cement concrete for PBUs shall be 5000 psi, 3/4 inch HP Concrete and meet the requirements of M4.06.2 High Performance Concrete.

2. **Stud Shear Connectors.**

Stud shear connectors applied to flanges of the beams may be installed at either the steel fabrication shop or the precast plant. If the installation is performed at the precast plans, the work shall be done by steel fabrication shop personnel.

3. **Threaded Inserts**

Threaded inserts are permissible on the underside of the PBU decks to facilitate the forming of the closure pours. Threaded inserts shall be hot dip galvanized or made of stainless steel. The number of threaded inserts shall be minimized, and the inserts shall not contact the reinforcing steel.

CONSTRUCTION METHODS – PLANT FABRICATION OF STRUCTURAL STEEL

A. **Shop Drawings.**

Shop drawings shall conform to the following requirements:

(a) General Requirements of Section 5.02
(b) Subsection 960.60 and M4.09.2B
(c) The drawings shall account for the geometry of the complete bridge structure and individual PBU components.

B. **Fabrication.**

All structural steel components shall be fabricated in accordance with Subsection 960.61.

C. **Coatings.**

The corrosion protection for the fabricated steel members shall be as specified on the Plans.

D. **Tolerances.**

Tolerances for the fabrication of the steel beams shall be in accordance with 960.61.

CONSTRUCTION METHODS – PLANT FABRICATION OF PRECAST CONCRETE

A. **PBU Assembly Plan Drawings.**

PBU Assembly Plan Drawings shall identify the Fabricator's proposed plan for supporting the steel beams of a PBU unit in a manner that will provide for the proper fit and relative elevations of PBUs consistent with the final relative bridge geometry (elevations, horizontal locations and skew) and that will ensure the beams deflect as assumed in the calculation of the beam camber and Top-of-Form elevations. Alternative methods of support during casting of the deck require approval by the engineer and revised Top-of-Form elevations. The PBU Assembly Plan shall also show the design and plan of the foundation that shall support the PBU units during assembly, the method for forming the deck, and the procedure for the placement and finishing of the deck concrete. The PBU Assembly Plan Drawings shall be submitted by the Contractor to the Engineer of Record for approval.

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To ensure proper fit in the field and conformance with the roadway profile and deck cross slope, the Fabricator shall cast the deck with the beams set to the relative proposed bridge seat geometry (elevations, horizontal locations, and skew) and the deck forms to the relative blocking distances as defined by the Top-of-Form elevations. The temporary support shall be installed in accordance with the approved PBU Assembly Plan Drawings. The Contractor shall independently verify the Fabricator's temporary support geometry and the foundation and temporary supports during all operations for settlement. The Contractor shall submit the following documentation to the Engineer of Record for review and approval:

(a) The method the Contractor shall employ to independently verify the Fabricator's temporary support geometry as installed to ensure that it is consistent with the final relative bridge geometry
(b) The method the Contractor shall employ to independently monitor the foundation and temporary support during all assembly and casting operations for settlement
(c) Method of forming deck slabs

B. Pre-Production Meeting.

The Contractor shall notify the MassDOT Research and Materials Section to determine if a pre-production meeting will be required to review the specifications, shop drawings, curing plan, schedule, and discuss any specific requirements. The meeting shall be held prior to scheduling a MassDOT Inspector (refer to M4.09.4 *Department Acceptance*), and at least seven (7) days prior to the scheduled casting of any PBU or control section. The Contractor shall schedule the meeting, which shall include representatives of the Fabricator and MassDOT.

C. Reinforcement.

The reinforcing bars shall be installed in accordance with Subsection 901.35, including tolerances for cover and horizontal spacing of bars. Components of mechanical reinforcing bar splicers shall be set with the tolerances shown on the plans. The reinforcing bars and mechanical reinforcing bar splicers shall be assembled into a rigid cage that will maintain its shape in the form and which will not allow individual reinforcing bars to move during the placement of concrete. This cage shall be secured in the form so that the clearances to all faces of the concrete, as shown on the plans, shall be maintained.

D. Tolerances.

Fabrication shall comply with tolerances specified on the plans. Tolerances for steel reinforcement placement shall be in accordance with Subsection 901.35. Tolerances for the deck finish shall be in accordance with Subsection 901.37E.4.

E. Forms.

Concrete shall be cast in rigidly constructed forms, which will maintain the PBUs within specified tolerances to the shapes, lines and dimensions shown on the approved fabrication drawings. Forms shall be constructed from flat, smooth, non-absorbent material and shall be sufficiently tight to prevent the leakage of the plastic concrete. When wood forms are used, all faces in contact with the concrete shall be laminated or coated with a non-absorbent material. All worn or

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damaged forms, which cause irregularities on the concrete surface or damage to the concrete during form removal, shall be repaired or replaced before being reused. If threaded inserts are cast into the elements for support of formwork, the inserts shall be recessed a minimum of 1 inch and shall be plugged after use with a grout of the same color as that of the precast cement concrete.

CONSTRUCTION METHODS – FIELD CONSTRUCTION

A. **General.**

All of the Contractor's field personnel involved in the erection and assembly of the Prefabricated Bridge Units shall have knowledge of and follow the approved Erection Procedure and Quality Control Plan for Prefabricated Bridge Unit Assembly.

Prior to installation, the following documentation shall be reviewed and confirmed by the MassDOT Resident Engineer or designee:

(a) QC Compressive Strength Test Report Forms attaining Design Strength, f'c for the Prefabricated Bridge Unit's representative sublot.
(b) Certificate of Compliance generated by the Fabricator as described in M4.09.3.
(c) QC Inspection Reports signed by the Quality Control Manager.

Field construction staff shall verify that the Resident Engineer has accepted all Prefabricated Bridge Units prior to installation.

B. **Erection Procedure and Quality Control Plan for Prefabricated Bridge Unit Assembly.**

Prior to the erection, the Contractor shall submit an Erection Procedure and a Quality Control Plan for PBU Assembly for approval by the Engineer. This submittal shall include computations and drawings for the transport, hoisting, erection and handling of the PBUs. The Erection Procedure and Quality Control Plan for PBU Assembly shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts with working knowledge of the Contractor's equipment, approved shop drawings, and materials to build the bridge. The Erection Procedure and Quality Control Plan for PBU Assembly shall, at a minimum, include the following:

1. **Erection Procedure**

The Erection Procedure shall be prepared to conform to the requirements of Subsection 960.61, Design, Fabrication and Erection and the applicable sections in Chapter 8 of the PCI Design Handbook (eighth edition) for handling, erection, and bracing requirements. At a minimum, the Erection Procedure shall provide:

(a) Steel reinforcing details, concrete deck details, location, and details of lifting devices
(b) Minimum concrete compressive strength for handling the PBUs.
(c) Concrete stresses and steel member stresses during handling, transport, and erection.
(d) Crane capacities, pick radii, sling geometry, and lifting hardware.
(e) Verification that the equipment can handle all pick loads and weights with the required factor of safety.

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(f) Evaluation of construction sequence and evaluation of any geometric conflicts in the lifting of the PBUs and setting them on the abutments and piers.
(g) Design of crane supports including verification of subgrade for support.
(h) Location and design of all temporary bracing that will be required during erection.

2. **Quality Control Plan for PBU Assembly**

The Quality Control Plan for PBU Assembly is a document prepared and submitted by the Contractor prior to the start of work which requires the Contractor to identify and detail the sequence of construction in accordance with the project schedule and which clearly identifies all stages of field construction. The assembly procedures for the PBUs shall be submitted in PDF

format on 24"x36" sheets. This document will be treated as a Construction Procedure and will be reviewed by both the Designer and the District Construction Office.
At a minimum, the Quality Control Plan for PBU Assembly shall include the following:

(a) Listing of the equipment, materials, and personnel including their assigned responsibilities that will be used to erect and assemble the PBUs on site.
(b) Documentation of all preparatory work necessary for moving personnel, equipment, supplies, and incidentals to the project site before beginning work.
(c) Detailed schedule showing the sequence of operations that the Contractor will follow to complete the field construction from setting working points and working lines to the casting of closure pours and the curing of the closure pour concrete, as described below and as called for on the plans.
(d) Contractor's means for ensuring that the PBU shall align to the roadway profile and cross slope and means for adjusting the final deck slab elevation.
(e) Timeline and descriptions of Quality Control activities to be followed throughout the field construction operations including methods and procedures for controlling tolerance limits both horizontally and vertically.

C. **Survey and Layout.**

Working points, working lines, and benchmark elevations shall be established prior to placement of all elements. The Contractor is responsible for field survey as necessary to complete the work. MassDOT reserves the right to perform additional independent survey. If discrepancies are found, the Contractor may be required to verify previous survey data.

D. **Preparation of Closure Pours.**

Immediately prior to erecting the PBUs, the surfaces of the closure pours shall be cleaned at the job site of all dust, dirt, carbonation, laitance, and other potentially detrimental materials which may interfere with the bonding of the closure pour concrete and precast concrete bridge deck using a high-pressure water blast. The exposed reinforcing steel in the precast concrete bridge deck shall be protected from damage during the cleaning of the closure pours. Damaged epoxy coating of steel reinforcement shall be repaired, and the reinforcing steel shall be cleaned as directed by the Engineer. The surfaces of the closure pours shall be wetted so that the surfaces shall have a Saturated Surface Dry (SSD) condition no more than 24 hours prior to the placement of the closure pour concrete. If UHPC is used as the closure pour concrete, the surfaces of the closure pours shall be prepared as called for in the UHPC Special Provision.

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E. **Erection.**

The PBUs shall be placed in the sequence and according to the methods outlined in the Erection Procedure and Quality Control Plan for Prefabricated Bridge Unit Assembly to the line and grade shown on the plans. The height of each PBU shall be adjusted to within acceptable tolerances by approved means as specified in the Assembly Plan. The Contractor shall ensure that the PBU is in the proper horizontal and vertical location prior to releasing it from the crane and setting the next unit.

As the PBUs are being erected, the Contractor shall monitor the width of the closure pours and the out-to-out width of the precast concrete bridge deck elements so that, after all PBUs are erected, the actual overall width of the bridge deck shall not deviate from the dimension shown on the plans beyond a tolerance of +0 inches and -1 inches. In order to achieve this, the Contractor may vary the width of the closure pours within the tolerances specified on the plans. If required, random oriented fiber shims of different thicknesses may be used to adjust the final elevation of the prefabricated bridge unit to meet the proper roadway grade.

After the layout of PBUs has been accepted by the Engineer, the Contractor shall cut all lifting devices off below the surface of the precast concrete bridge deck.

F. **Filling of Blockouts for Lifting Devices and Closure Pours.**

Concrete for closure pours shall be as called for in the plans and shall be placed and cured in accordance with the Assembly Plan. If called for on the plans, the concrete end diaphragms, pier diaphragms, and link slabs shall be filled with the closure pour concrete in accordance with the Assembly Plan.

Blockouts in the precast concrete bridge deck that were provided for the lifting devices shall be filled with same concrete as that used for filling the closure pours or other approved material.
After the formwork has been removed, all threaded inserts that have been cast into the precast concrete bridge deck for support of the formwork shall be plugged with a grout of the same color as that of the precast concrete.

HOT DIP GALVANIZED COATING FOR NEW STRUCTURAL STEEL

A**. GENERAL**

Fabricated steel shall be either galvanized or galvanized and coated as indicated on the plans. All fabrication shall be completed prior to surface preparation and the application of any coating.

Duplex coating systems shall be submitted by the contractor for approval by the Engineer. The submittal shall contain a minimum 2-year field history of the proposed system with a minimum of 5 uses in the Northeast on galvanized surfaces utilizing a minimum of 25 total gallons. The end user contact information should also be included.

Prior to the start of any coating application, each batch of paint shall be sampled, tested and approved in accordance with Section M7. On projects that require less than 40 total gallons of paint to complete all painting, the paint shall not require sampling and testing. In lieu of sampling, a letter stating that less than 40 gallons is required to complete all painting shall be

ITEMS 993.01 AND 995.01 (Continued)

submitted to the Engineer along with a manufacturer's certificate of compliance. When steel is painted, the finish coat color shall conform to the Federal Standard 595D, "Colors Used in Government Procurement". Finish coat colors shall be as called for on the plans.

Coating applicators shall submit a written Quality System Manual (QSM) in accordance with AASHTO R38 to the Engineer for acceptance. All coating facilities shall be audited by the Department before final approval is granted. For contracts requiring greater than 1,500 square feet of coated steel surfaces, the applicator performing surface preparation and coating of structural steel shall have a current American Institute of Steel Construction (AISC) Sophisticated Paint Endorsement or Society of Protective Coatings (SSPC) QP3 certification for painting or a QP 6 certification for metalizing. Applicators shall be approved by the Department prior to the bid opening date. Applicator approval shall be valid for 5 years.

All painting in the field required to complete the coating system or touch up of the coating shall be in accordance with the MassDOT specification 961. Specification for Field Maintenance Painting of Bridges.

All coating shall be applied according to the latest requirements of the manufacturer's data sheet unless modified per these specifications. The dry film thickness of all coated surfaces shall be measured in accordance with SSPC PA2. The maximum recoat times of the intermediate and finish coats shall not be exceeded.

The faying surfaces of all field bolted connections shall be coated based on the design of the connection. Class B connections shall be masked prior to galvanizing to allow for application of an approved class B slip coefficient primer. After galvanizing the masked surface will be cleaned in accordance with SSPC-SP11 and coated with the approved zinc rich primer. A galvanized connection will result in a faying surface meeting a class C slip coefficient.

When grinding, drilling or any other operation produces steel turnings, filings, shavings, etc. the contractor shall completely clean all areas of all accumulation prior to the end of the work shift.

Locations of field applied studs shall require masking or removal of galvanizing and paint prior to welding.

The Engineer shall provisionally accept the shop coated items before shipment to the jobsite, but final acceptance of the coating system will occur after erection of the coated items, and after all required repairs and coating application has been completed.

The contractor shall be responsible for failure and damage of all applied coating. Failures include but are not limited to, visible corrosion, blistering, checking, cracking, or delamination (peeling) and loss of gloss and color of the coating system. Damage includes but is not limited to damage from installation or from external agents, such as scraping, vandalism, debris impacts, and collisions. The extent and method of repair must be approved by the Engineer.

ITEMS 993.01 AND 995.01 (Continued)

B**. GALVANIZING**

The following shall be hot dipped galvanized in accordance with Section M7 of these Specifications:

1. All main load carrying rolled steel beams shown on the plans.
2. Diaphragms, utility supports, and connections plates.

Galvanized members requiring shop fabrication and assembly shall be cut, welded, and/or drilled prior to galvanizing. Bearing members to be milled shall be galvanized prior to milling. A thin layer of a rust inhibitor shall be applied to the milled surface. Material to be painted shall not be quenched after galvanizing.

Where material is required to be welded after galvanizing, the steel shall be masked 3 inches on each side of the welding center line. Prior to field welding the masked surface shall be cleaned in accordance with SSPC-SP11. After welding the area shall be repaired in accordance with ASTM A780 "Repair of Hot Dip Galvanizing" section 4.2.2, "Paints Containing Zinc Dust" and Annex 2. Repair paint shall meet M7.04.11 and application shall be in accordance with the manufacturer's recommendations.

Damaged galvanized surfaces shall be repaired in accordance with ASTM A780 "Repair of Hot Dip Galvanizing" section 4.2.2 Paints Containing Zinc Dust "High Zinc Dust Content". The paint shall be applied to achieve a minimum dry film thickness of 3 mils and not more than 5 mils. Repair paint shall meet M7.04.11 and application shall be in accordance with the manufacturer's recommendations.

The contractor shall provide protection of the adjacent coating in areas that will be field welded. After welding, the weld areas shall be prepared in accordance with SSPC-SP-11.

C**. COATING OVER GALVANIZING**

GENERAL

The work under this heading shall include the surface preparation and the application of a duplex coating system to galvanized components including but not limited to beams (girders), bearings, diaphragms, cross frames, bridge rail, and other components as shown on the drawings.

Proposed coating systems shall be submitted by the Contractor for approval by the Engineer.

Surface preparation and application of the coating system shall be completed within 14 calendar days of galvanizing. The Contractor shall take all necessary measures to prevent wet storage stain and accumulation of dirt, dust, grease, or oil while being handled or staged prior to application of the coating.

All galvanized pieces shall be visually inspected to determine the cleanliness of the surface. All contaminated surfaces shall be cleaned in accordance with SSPC-SP-1.

ITEMS 993.01 AND 995.01 (Continued)

All material shall be checked for wet storage stain. Wet storage stain shall be removed prior to abrasive blasting in accordance with SSPC-SP-16 Appendix A.

Prior to surface preparation, all components shall have a finish that is smooth and uniform. The surface shall be free of protrusions greater than 1/8 inch above the surrounding surface and meet the requirements of ASTM A123 section 6.2.

The thickness of the galvanizing shall be checked before and after the completion of abrasive blasting using SSPC PA-2 to confirm that prepared surfaces still have the minimum thickness requirements of AASHTO M111 or AASHTO M232 as applicable.

Provide abrasives that are clean, dry, and sized properly to provide the specified surface profile. The profile shall be dense, uniform and of sufficient angularity to be acceptable for the application of the coating. Abrasives shall conform to the following as applicable:

- SSPC-AB 1 for mineral slag abrasives
- SSPC-AB 2 for recycled ferrous metal abrasives
- SSPC-AB 3 for new steel abrasives

The abrasive shall be tested weekly for grease, oil or non-abrasive residue using ASTM D 7393 - Standard Practice for Indicating Oil in Abrasive. Contaminated abrasives shall be changed out and not be used for surface preparation. The use of steel shot abrasive is not allowed for final blasting prior to coating application.

All compressed air sources shall have properly sized and operational oil and moisture separators to allow for oil and moisture free air.

Surfaces to be painted shall be blast cleaned in accordance with requirements of SSPC SP16 “Brush-off Blast Cleaning Non-Ferrous Metals” producing a minimum surface profile of 1 mil. Profile shall meet the requirements of the manufacturer for the coating being applied. Abrasives, nozzle size, nozzle pressure and dwell time shall be sufficient and controlled to thoroughly clean and produce a uniform surface profile. Surface preparation shall not loosen, cause flaking or debonding of the galvanized surface. Unacceptable thickness and damage shall be cause for rejection of the entire piece.

Surfaces unacceptable after abrasive blasting and approved for repair shall be repaired in accordance with ASTM A780. Surface preparation of approved repair areas shall be done in accordance with SSPC SP-10 or SP-11. Repairs to the galvanized surface in excess of one percent of the total surface area of the piece being repaired are not allowed. The repair coating shall be a zinc rich primer as specified by the coating manufacturer compatible with the coating system approved.

Prior to coating bolted connections, galvanized fasteners shall be cleaned of all lubricating wax. Cleaning shall be in accordance with SSPC-SP-1, Solvent Cleaning, method 4.1.1. The contractor is responsible for identifying the solvent and method needed to remove all lubricants. Cleanliness will be determined by the use of a white cloth wipe test. The wipe test will be performed by the Engineer using a clean white cloth and the same solvent used for cleaning. The

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cloth shall be wet and rung to a damp condition, placed on the selected fasteners and rubbed with a twisting motion around the entire surface of the previously waxed surfaces. Acceptance is with no color transfer to the cloth.

Coating application shall be completed within six hours after surface preparation has been accepted by the applicator and the Engineer.

PAINT OVER GALVANIZING

The coating system shall consist of a polyamide epoxy and an aliphatic polyurethane over galvanizing. All paint shall be applied in accordance with these specifications and the coating manufacturer's product data sheet.

Application of full coats of paint shall be accomplished by spray equipment. Spray equipment shall meet the requirements of the coating manufacturer and be in proper working order. Application by brush and roller will be limited to stripe coating, limited access areas and small touch up areas.

Brushes and roller cover recommended by the coating manufacturer shall be used. Areas brushed and rolled will have a uniform thickness and be free of defects and excessive coating thickness. Spray or brush applied coatings shall not exhibit, runs, sags, holidays, wrinkling, pinholes, nap hair, topcoat color or gloss variations, or other discontinuities.

Application of coating shall be sequenced, and components staged to minimize overspray and dry spray falling onto nearby surfaces. In the process components shall be covered to provide protection from overspray and dry spray as needed.

Paint application shall not be performed when the relative humidity is above 85% or when the surface temperature of the steel is less than 5°F above the Dew Point. Paint shall not be applied when the surface temperature is below 40°F or when the surface temperature is above 120°F. All changes to ambient and surface parameters shall be approved by the Engineer. Ambient conditions should be closely monitored so that the proper cure is achieved prior to recoat.

If force curing of applied coating is utilized, it shall be performed in accordance with the manufacturer's recommendations. The coating facility shall provide a letter of recommendation from the manufacturer to the Engineer stating the minimum and maximum temperature range and time required for cure. Exceeding the temperature range or time recommended by the manufacturer shall cause for rejection by the Engineer. Curing ovens shall have instrumentation for monitoring both temperature and time and be suitable for the size of the oven. Instrument readings for temperature shall be able to provide an average temperature throughout the entire oven.

All surfaces coated prior to the Engineer's approval, shall require the complete removal of the applied coating. All labor, materials, and costs associated with the removal of any unapproved coating shall be done at the Contractor's expense to the satisfaction of the Engineer in accordance with these specifications.

ITEMS 993.01 AND 995.01 (Continued)

Repair of unacceptable areas shall require surface preparation and coating equal to that specified. Repair procedures used for any unacceptable coating shall be those supplied by the manufacturer and approved by the Engineer. The finish coat for these areas shall be from the same batch as the originally applied coating.

Repair procedures used for any unacceptable coating shall be those recommended by the paint manufacturer and approved by the Engineer.

Powder Coating over Galvanizing
The coating shall be a two-coat, electrostatically shop-applied, oven-baked, powder coat system. The first coat shall be an epoxy primer suitable for application over galvanized steel. The finish coat shall be polyester TGIC super durable powder. All coats of the applied system shall be from the same manufacturer. All powder shall be stored via the manufacturer's data sheet.

Application and curing shall be performed in conformance with the powder coating manufacturer's recommendations and shall consist of the following:

- All parts to be coated shall be pre-baked after galvanizing to reduce the potential for outgassing. Pre-baking shall be done at a minimum of 55°F above the manufacturer's recommended curing oven temperature for 30 minutes unless otherwise recommended by the manufacturer.

- The powder shall be applied maintaining even coverage on all surfaces to be coated. The Applicator shall ensure that a stable transfer between the powder application and the curing oven is accomplished to prevent the loss of powder from the parts.

Each coat shall be visually inspected and shall not exhibit film discontinuities including but not limited to discontinuities, pinholes, runs, excess build at edges, topcoat gloss or color variations.

Any part that does not meet the specified coating thickness may be recoated immediately without undergoing additional preparation and pretreatment.

The contractor shall obtain all field repair and touch-up material from the applicator. Coating material used for repairs and touch up shall be from the same manufacturer as the powder used on that project or from a manufacturer recommended by the powder manufacturer. Touch up shall be applied in accordance with the powder manufacturer's written recommendations and the applicators approved touch-up procedure.

The DFT of the touch up areas shall be the same as the DFT of the powder system and can be applied in multiple coats. The color, gloss and appearance shall match that of the topcoat being repaired

ITEMS 993.01 AND 995.01 (Continued)

PRECAST CONCRETE GUARDRAIL TRANSITIONS

General.
The work under this Heading consists of fabricating, transporting and installing Precast Concrete Guardrail Transitions and includes all necessary labor, materials, and equipment to complete the work as shown on the Plans. The Precast Concrete Bridge Elements shall meet the requirements of Section M4: Cement Concrete and Related Materials.

MATERIALS

B. **Materials.**
Materials shall conform to M4.09.1 and the following:

Non-Shrink Grout Products	M4.04.5
Controlled Low-Strength Material – Structural Non-Excavatable	M4.08.0
Welded Steel Wire Fabric	M8.01.2
Mechanical Reinforcing Bar Splicer	M8.01.9
Lifting Devices	PCI MNL-116
Corrugated Metal Pipe	AASHTO M 36

3. **Vertical Adjustment Assembly.**
Vertical Adjustment Assembly details and material requirements shall be as shown on the plans. Alternate devices may be used provided that they are adjustable and can support the anticipated loads. The design of the leveling devices, with necessary calculations, shall be submitted to the Engineer of Record for approval.

4. **Threaded Inserts.**
Threaded inserts are permissible to facilitate forming the keyway pours. Threaded inserts shall be hot dip galvanized or made of stainless steel. The number of threaded inserts shall be minimized, and the inserts shall not come in contact with the reinforcing steel.

5. **Corrugated Metal Pipe.**
Corrugated Metal Pipe to be used for forming voids as specified on the plans shall be fabricated from steel and shall have a protective metallic coating of zinc (galvanizing).

CONSTRUCTION METHODS – PLANT FABRICATION

A. Pre-Production Meeting

The Contractor shall notify the MassDOT Research and Materials Section to determine if a pre-production meeting will be required to review the specifications, shop drawings, curing plan, schedule, and discuss any specific requirements. The meeting shall be held prior to scheduling a MassDOT Inspector (refer to M4.09.4 *Department Acceptance*), and at least seven (7) days prior to the scheduled casting of any Precast Concrete Bridge Element or control section. The Contractor shall schedule the meeting, which shall include representatives of the Fabricator and MassDOT.

ITEMS 993.01 AND 995.01 (Continued)

B. Reinforcement

The reinforcing bars shall be installed in accordance with Subsection 901.35, including tolerances for cover and horizontal spacing of bars. Components of mechanical reinforcing bar splicers shall be set with the tolerances shown on the plans. The reinforcing bars and mechanical reinforcing bar splicers shall be assembled into a rigid cage that will maintain its shape in the form and which will not allow individual reinforcing bars to move during the placement of concrete. This cage shall be secured in the form so that the clearances to all faces of the concrete, as shown on the plans, shall be maintained.

Where reinforcing bars are to protrude from one Precast Concrete Bridge Element in order to mate with reinforcing bar splicers in a second precast concrete element, the fabricator shall set the reinforcing bars and the reinforcing bar splicers with a template in order to ensure proper fit up within the tolerances specified on the plans.

C. Tolerances

Fabrication shall comply with tolerances specified on the plans. Tolerances for steel reinforcement placement shall be in accordance with Subsection 901.35. In the absence of specifications on the plans, tolerances shall comply with the latest version of the PCI MNL 135, Precast Tolerance Manual.

D. Forms

Concrete shall be cast in rigidly constructed forms, which will maintain the Precast Concrete Bridge Elements within specified tolerances to the shapes, lines and dimensions shown on the approved fabrication drawings. Forms shall be constructed from flat, smooth, non-absorbent material and shall be sufficiently tight to prevent the leakage of the plastic concrete. When wood forms are used, all faces in contact with the concrete shall be laminated or coated with a non-absorbent material. All worn or damaged forms, which cause irregularities on the concrete surface or damage to the concrete during form removal, shall be repaired or replaced before being reused. If threaded inserts are cast into the elements for support of formwork, the inserts shall be recessed a minimum of 1 inch and shall be plugged after use with a grout of the same color as that of the precast cement concrete.

CONSTRUCTION METHODS – FIELD CONSTRUCTION

A. **General**

All of the Contractor's field personnel involved in the erection and assembly of the Precast Concrete Bridge Elements shall have knowledge of and follow the approved Erection Procedure.

Prior to installation, the following documentation shall be reviewed and confirmed by the MassDOT Resident Engineer or designee:

(a) QC Compressive Strength Test Report Forms attaining Design Strength, f'c for the Precast Concrete Bridge Element's representative sublot.
(b) Certificate of Compliance generated by the Fabricator as described under the Fabricator Quality Control section.
(c) QC Inspection Reports signed by the Quality Control Manager.

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Field construction staff shall verify that the Resident Engineer has accepted all Precast Concrete Bridge Elements prior to installation.

B. **Erection Procedure**

Prior to the erection, the Contractor shall submit an Erection Procedure for approval by the Engineer. This submittal shall include computations and drawings for the transport, hoisting, erection and handling of the Precast Concrete Bridge Elements. The Erection Procedure shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts with working knowledge of the Contractor's equipment, approved shop drawings, and materials to build the bridge. The Erection Procedure shall, at a minimum, include the following:

1. **Erection Procedure**

The Erection Procedure shall be prepared to conform to the requirements of 960.61, Design, Fabrication and Erection and the applicable sections in Chapter 8 of the PCI Design Handbook (eighth edition) for handling, erection, and bracing requirements. At a minimum, the Erection Procedure shall provide:

(a) Minimum concrete compressive strength for handling the Precast Concrete Bridge Elements.
(b) Concrete stresses during handling, transport, and erection.
(c) Crane capacities, pick radii, sling geometry, and lifting hardware.
(d) Verification that the equipment can handle all pick loads and weights with the required factor of safety.
(e) Evaluation of construction sequence and evaluation of any geometric conflicts in the lifting of the Precast Concrete Bridge Elements and setting them as shown on the plans.
(f) Design of crane supports including verification of subgrade for support.
(g) Location and design of all temporary bracing that will be required during erection.

Non-shrink grout and concrete materials, approved by the Engineer, shall be placed as shown on the plans. Fill joints, keyways, and voids, in strict accordance with the specifications and manufacturer's recommendations and instructions.

For footings, approach slabs and highway guardrail transitions, once these Precast Concrete Bridge Elements have been set to the correct horizontal and vertical alignment, the void between them and the supporting soil shall be filled with Controlled Low-Strength Material – Structural Non-Excavatable to the limits as shown on the plans. Add additional grout ports in the footings to facilitate the bedding process if required.

Except in approach slabs, joints shall be filled flush to the top with non-shrink grout, and any vertical misalignment between adjacent elements shall be feathered out on a slope of 1 to 12.

ITEMS 993.01 AND 995.01 (Continued)

Curing of grout or concrete shall be performed in strict accordance with the specifications and manufacturer's recommendations. Filling shall not be completed in cold weather when either the ambient temperature or the precast member's temperature is below the manufacturer's recommendation. No localized heating of either the precast members or of the air surrounding the element will be permitted in an attempt to reach application temperatures.

If the joints or voids are not filled within five days after the Precast Bridge Elements are erected, the Contractor shall cover and protect the openings from weather and debris until they are filled.

C. **Survey and Layout.**

Working points, working lines, and benchmark elevations shall be established prior to placement of all elements. The Contractor is responsible for field survey as necessary to complete the work. MassDOT reserves the right to perform additional independent survey. If discrepancies are found, the Contractor may be required to verify previous survey data.

D. **Preparation of Closure Pours and Grouted Keyways.**

Immediately prior to erecting the Precast Concrete Bridge Elements, the closure pours and grouted keyways shall be cleaned at the job site of all dust, dirt, carbonation, laitance, and other potentially detrimental materials which may interfere with the bonding of the closure pour concrete or grout and precast concrete using a high-pressure water blast. Any exposed reinforcing steel in the precast concrete shall be protected from damage during the cleaning of the keyways. Damaged epoxy coating of steel reinforcement shall be repaired, and the reinforcing steel shall be cleaned as directed by the Engineer. The surfaces of the closure pours and grouted keyways shall be wetted so that the surfaces shall have a Saturated Surface Dry (SSD) condition for at least 24 hours prior to the placement of the closure pour concrete.

E. **Erection.**

The elements shall be placed in the sequence and according to the methods outlined in the Erection Procedure. As the erection proceeds, the Contractor shall constantly monitor the assembly to ensure that the precast concrete bridge element is within proper horizontal and vertical location and tolerances prior to releasing it from the crane and setting the next unit. The Contractor may use shims to maintain proper setting tolerances.

The concrete elements shall be lifted only by the lifting devices, and the utmost care shall be taken to prevent distortion of the elements during handling, transportation or storage.

This approval will be contingent on the Contractor demonstrating by calculations, prepared by a Professional Engineer registered in Massachusetts, that the elements will not be damaged by the non-vertical lifting force and by documentation that the capacity of the lifting devices is adequate for the non-vertical lifting force.

After all Precast Concrete Bridge Elements have been placed, the actual overall dimensions of the structure both horizontal and vertical, as laid out shall not deviate from the nominal dimensions shown on the plans beyond a tolerance of +0 inches and -1 inches. Once the layout of Precast Concrete Bridge Elements has been accepted by the Engineer, the Contractor shall cut all lifting devices off below the surfaces of the elements.

ITEMS 993.01 AND 995.01 (Continued)

F. **Filling of Blockouts for Lifting Devices and Threaded inserts.**

If the blockouts in the Precast Concrete Bridge Elements where the lifting devices were located will be exposed and visible after assembly is complete, the Contractor shall fill these blockouts with Mortar (M4.04.5).

After the formwork has been removed, all threaded inserts that have been cast into the precast concrete bridge deck for support of the formwork shall be filled with a grout of the same color as that of the precast concrete.

SAWING & SEALING JOINTS IN ASPHALT PAVEMENT AT BRIDGES

(Issued: 03/31/2025)

The work to be done under this Item consists of making a sealed kerf across the full width of the finished asphalt pavement at bridge abutments where called for on the Plans. The shape, width, and depth of the kerf shall be as shown on the Plans.

Prior to the start of the asphalt pavement operation, the Contractor shall place a mark on each curb or barrier on either side of the paved roadway. These marks shall be aligned with the actual end of the bridge deck and shall be placed so that they will not be covered or otherwise obscured by the asphalt pavement.

After the completion of the paving operation, the Contractor shall snap a straight chalk line on the pavement between these two marks. The Contractor shall then saw cut the pavement along this line to the depth, width and shape as shown on the Plans. The equipment shall be approved by the Engineer prior to commencing work.

After completing the saw cutting, the Contractor shall clean the saw groove of any dust and debris with an oil free air blast. If the groove was wet sawn, the groove shall be cleaned with a water blast to remove any remaining slurry and debris, vacuumed with a Wet-or-Dry vacuum to remove any standing water, and then dried with an air blast from a Hot-Air-Lance.

Once the groove is clean and dry, the Contractor shall fill it completely with a Hot Applied Crack Sealer meeting the requirements of M3.05.2 in accordance with the manufacturer's application instructions and restrictions regarding ambient and material temperatures. The crack sealer shall be thoroughly cured prior to opening the road to traffic. To reduce tackiness, only boiler slag aggregate (black beauty) shall be scattered over the sealer when required by the Engineer. Conventional sand shall not be used for this purpose.

ITEMS 993.01 AND 995.01 (Continued)

METAL BRIDGE RAILING (3 RAIL), STEEL (TYPE S3-TL4)

Work under this heading shall conform to the relevant provisions of Subsection 975 of the Standard Specifications, and as shown on the plans.

\MECHANICAL REINFORCING BAR SPLICER

Work under this heading shall confirm the relevant provisions of Subsection 901 of the Supplemental Specifications and the following:

Splicers shall conform to engineering directive E-09-007 and the manufacturer shall be listed in the MassDOT Qualified Construction Materials List.

CHAIN LINK FENCE

Work under this heading shall conform to the relevant provisions of Subsection 975 of the Standard Specifications, and as shown on the plans. The fence and all connections on the permanent structure and temporary bridge shall be designed per the requirements of the AASHTO LRFD Bridge Design Specifications for a pedestrian railing. The Contractor shall provide calculations from an Engineer registered in the Commonwealth of Massachusetts for design of the fencing and connections for review and approval by MassDOT and the Engineer.

SCHEDULE BASIS FOR PARTIAL PAYMENT

Items No. 993.01 – Temporary Bridge Structure and No. 995.01 – Bridge Structure, Bridge No. W-06-020(CCV) will be paid per the LUMP SUM unit at the Contract Bid Price, based on Contractor's independent investigation of the work prior to bidding. The Contract Bid Price shall include all labor, materials, tools, equipment, and all other incidentals that may be necessary to perform the work as specified. No increase will be made to the Bid Price due to any unseen nature of the work or materials involved.

Within ten (10) days after the award of the Contract, the Contractor shall submit, in duplicate, for the approval of the Engineer, a schedule of unit prices for the major components of the bridge structure as listed below. The bridge structure Lump Sum breakdown quantities provided below are estimated and not guaranteed. The total of all partial payments to the Contractor shall equal the Lump Sum contract price regardless of the accuracy of the quantities furnished by the Engineer for the individual bridge components. The cost of labor and materials for any Item not listed but required to complete the work shall be considered incidental to Items 993.01 and 995.01 and no further compensation will be allowed.

The schedules on the following proposal forms apply only to Temporary Bridge Structure and Bridge Structure No. W-06-020(CCV) as indicated in each table. Payment for similar materials and construction at locations other than at this bridge structure shall not be included under this Item. Sub-Item numbering is presented for information only in coordination with MassDOT Standard Nomenclature.

ITEMS 993.01 AND 995.01 (Continued)

TEMPORARY BRIDGE STRUCTURE:

SCHEDULE FOR PARTIAL PAYMENT

Sub-Item	Component	Quantity	Unit	Unit Price	Amount
645.072	72 Inch Chain Link Fence (Pipe Top Rail) (Line Post Option)	24	FT		
904.3	5000 psi, 3/4-inch, 685 HP Cement Concrete	51	CY		
910.1	Steel Reinforcement for Structures – Epoxy Coated	11,000	LB		
922.1	Laminated Elastomeric Bearing w/o Anchor Bolts	8	EA		
950.9	Temporary Stop Logs	1	LS		
960.	Structural Steel	16,360	LB		
				Total Lump Sum Price for Item 993.1 =	

Any component not covered in these special provisions, but shown in the plans, shall be included in the contract lump sum price for Item 993.1 unless specifically covered under another payment item.

ITEMS 993.01 AND 995.01 (Continued)

BRIDGE STRUCTURE No. W-06-020 (CCV):
SCHEDULE FOR PARTIAL PAYMENT

Sub-Item	Component	Quantity	Unit	Unit Price	Amount
904.3	5000 psi, 3/4-inch, 685 HP Cement Concrete	2230	CY		
910.1	Steel Reinforcement for Structures – Epoxy Coated	145,000	LB		
910.4	Mechanical Reinforcing Bar Splicer	2,300	EA		
922.	Laminated Elastomeric Bearing w/o Anchor Bolts	20	EA		
930.13	Precast Highway Guardrail Transition	4	EA		
960.91	Prefabricated Bridge Units	5	EA		
965.	Membrane Waterproofing for Bridge Decks	3,720	SF		
970.	Damp-Proofing	2,600	SF		
975.1	Metal Bridge Railing (3 Rail), Steel (Type S3-TL4)	130	FT		
975.3	Protective Screen Type 1	270	FT		
				Total Lump Sum Price for Item 995.01 =	

Any component not covered in these special provisions, but shown on the plans, shall be included in the contract lump sum price for Item 995.01 unless specifically covered under another payment item.

END OF SPECIAL PROVISIONS

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DOCUMENT A00802

DETAIL SHEETS

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THE COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
TEN PARK PLAZA, BOSTON, MA

- ESTIMATE OF QUANTITIES - DETAIL SHEETS -

TOWN/CITY: Wareham
STA. 10+91 to 22+76

TYPE OF PROJECT: Bridge Replacement

YEAR: Federal Fiscal Year 2025
ROAD: Cranberry Highway (Route 6/28)
CLASS: Minor Arterial
DATE: July 2026

Unclassified Excavation	3,130 CY	Gravel Borrow for Backfilling Structures and Pipes	2,790 CY
Bridge Excavation	7,650 CY		
Gravel Borrow	1,560 CY	Crushed Stone	1,163 TON
Class A Trench Excavation	5 CY	Modified Rockfill	225 TON
Class B Trench Excavation	520 CY	Reinformed Concrete Excavation	330 CY
Dense Graded Crushed Stone for Subbase	410 CY	Muck Excavation	500 CY
		Class B Rock Excavation	110 CY

PAVEMENT NOTES

PROPOSED FULL-DEPTH CONSTRUCTION **AREA = 2,165 SY**

SURFACE COURSE:	1.5” SUPERPAVE BRIDGE SURFACE COURSE – 9.5 POLYMER (SSC-B-9.5-P)
INTERMEDIATE COURSE:	2.5” SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC-19.0)
BASE COURSE:	4.5” SUPERPAVE BASE COURSE - 37.5 (SBC-37.5)
SUB-BASE:	4” DENSE GRADED CRUSHED STONE FOR SUB-BASE OVER
	8” GRAVEL BORROW (TYPE B)

PROPOSED MICROMILL AND OVERLAY **AREA = 2,430 SY**

MICROMILL:	1.5” EXISTING PAVEMENT
OVERLAY:	1.5” SUPERPAVE BRIDGE SURFACE COURSE – 9.5 POLYMER (SSC-B-9.5-P) AND 2.0” SUPERPAVE LVELING COURSE- 9.5 (SLC-9.5) AS REQUIRED

PROPOSED HOT MIX ASPHALT DRIVEWAY **AREA = 590 SY**

SURFACE COURSE:	1.5" SUPERPAVE SURFACE COURSE – 9.5 (SSC-9.5) OVER
INTERMEDIATE COURSE:	2.5" SUPERPAVE SURFACE COURSE – 12.5 (SSC-12.5) OVER
SUB-BASE:	8" SUITABLE EXISTING GRAVEL ADD GRAVEL BORROW, TYPE B AS REQUIRED

PROPOSED HOT MIX ASPHALT SIDEWALK **AREA = 540 SY**

SURFACE COURSE:	1.25" SUPERPAVE SURFACE COURSE – 9.5 (SSC-9.5) OVER
INTERMEDIATE COURSE:	1.75" SUPERPAVE SURFACE COURSE – 12.5 (SSC-12.5) OVER
SUB-BASE:	8" GRAVEL BORROW (TYPE B)

PROPOSED CEMENT CONCRETE PEDESTRIAN CURB RAMP **AREA = 50 SY**

SURFACE COURSE:	4" CEMENT CONCRETE (AIR RETAINED, 4000 PSI, ¾, 610)
SUB-BASE:	8" GRAVEL BORROW (TYPE B)

PROPOSED CEMENT CONCRETE SIDEWALK **AREA = 205 SY**

SURFACE COURSE:	4" CEMENT CONCRETE (AIR RETAINED, 4000 PSI, ¾, 610)
SUB-BASE:	8" GRAVEL BORROW (TYPE B)

PROPOSED TEMPORARY PAVEMENT TRENCH PATCH **AREA = 1,000 SY**

SURFACE COURSE:	2.5" HMA FOR PATCHING
SUB-BASE:	EXISTING MATERIAL SUITABLE FOR RE-USE

PROPOSED PERMENANT PAVEMENT TRENCH PATCH **AREA = 1,000 SY**

SURFACE COURSE:	1.5" SUPERPAVE BRIDGE SURFACE COURSE – 9.5 POLYMER (SSC-B-9.5-P)
INTERMEDIATE COURSE:	2.5" SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC-19.0)
BASE COURSE:	4.5" SUPERPAVE BASE COURSE - 37.5 (SBC-37.5)
SUB-BASE:	4" DENSE GRADED CRUSHED STONE FOR SUB-BASE
	8" GRAVEL BORROW (TYPE B)

PROPOSED TEMPORARY PAVEMENT WIDENING **AREA = 656 SY**

SURFACE COURSE:	2.5" SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC-19.0) OVER
INTERMEDIATE COURSE:	2.5" SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC-19.0) OVER
SUB-BASE:	8" GRAVEL BORROW (TYPE B)

NOTES:

1. ALL HOT MIX ASPHALT PAVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SECTION 450 HOT MIX ASPHALT AND SECTION M3. ASPHALTIC MATERIALS.

2. THE HOT MIX ASPHALT (HMA) WALKS AND DRIVES MAY BE SUPERPAVE HMA MIXTURES PAVED IN ACCORDANCE WITH SECTION 702. OF THE STANDARD SPECIFICATIONS.

3. TACK COAT APPLICATION SHALL BE IN ACCORDANCE WITH SUBSECTION 450.43G(2).

4. WHERE EXISTING SUBBASE/SUBGRADE IS FOUND TO MEET SPECIAL BORROW (M1.02.0) SPECIFICATION REQUIREMENTS, THE EXISTING MATERIAL MAY BE LEFT IN PLACE, AFTER APPROVAL OF THE ENGINEER.

5. UNLESS NOTED OTHERWISE ON THE DRAWINGS, PAVEMENT MILLING SHALL BE USED TO ACHIEVE A 2.00% CROSS SLOPE OR TO MAINTAIN EXISTING CROSS SLOPE.

6. * = TOLERANCE FOR CONSTRUCTION ± 0.5% ON SIDEWALK SLOPES, DRIVEWAY SLOPES, AND CURB RAMPS.

ALL ITEMS NOT COMPLETELY DESCRIBED AND LOCATED ON THE PLANS ARE TO BE DETAILED AS SHOWN BELOW:

ITEM 104. TREE REMOVED- DIAMETER 24 INCHES AND OVER

To be used to remove isolated trees 24 inches and over in diameter as shown on the Plans, and as directed by the Town of Wareham.

STATION	OFFSET
16+75	RT
16+80	RT

ITEM 201. CATCH BASIN

For construction of drainage structures and as directed by the Engineer.

STATION	SIDE
18+29	LT
20+57	LT
18+35	RT
20+74	LT
20+83	RT
21+37	RT
21+47	LT
19+26	RT

ITEM 202. MANHOLE

For construction of drainage structures and as directed by the Engineer.

STATION	SIDE
13+37	RT
18+29	LT
21+49	RT
19+26	LT

ITEM 202.2 MANHOLE (9 TO 14 FOOT DEPTH)

For use in the existing upstream channel to divert flow into the Low Level Outlet and as shown on the Drainage and Utility Plan.

STATION	SIDE
16+87	LT

ITEM 203. SPECIAL MANHOLE

For construction of drainage structures and as directed by the Engineer.

STATION	SIDE
20+69	LT
20+69	LT
20+85	LT
21+37	RT

ITEM 220. DRAINAGE STRUCTURE ADJUSTED

STATION	SIDE
12+67	RT
12+69	RT
12+72.5	RT
20+55	LT

ITEM 221. FRAME AND COVER

STA 18+29 6' LT (DMH-1)
STA 20+69 23' LT (DMH-3)
STA 20+69 5' RT (DMH-4)
STA 21+49 13' RT (DMH-5)
STA 20+85 39' LT (DMH-6)
STA 20+69 9' LT (DMH-7)
STA 19+26 8' LT (DMH-8)
STA 16+87 6' LT (DMH-9)
STA 13+37 37' RT (DMH-10)

ITEM 222.1 FRAME AND GRATE- MASSDOT CASCADE TYPE

STA 18+29 LT (CB-1) 1.0
STA 20+57 LT (CB-2) 1.0
STA 18+35 RT (CB-3) 1.0
STA 20+74 LT (CB-4) 1.0
STA 20+83 RT (CB-5) 1.0
STA 21+37 RT (CB-6) 1.0
STA 21+47 LT (CB-7) 1.0
STA 19+26 RT (CB-8) 1.0
Contingency (As directed by the engineer 2.0

ITEM 223.2 FRAME AND GRATE (OR COVER) REMOVED AND DISCARDED

CB @ STA 18+35 LT 1.00
DMH @ STA 18+35 LT 1.00
CB @ STA 18+35 RT 1.00
CB @ STA 20+70 RT 1.00
CB @ STA 20+70 LT 1.00
CB @ STA 20+77 LT 2.00
CB @ STA 21+34 RT 1.00
CB @ STA 21+47 LT 1.00
Contingency (As directed by the engineer) 2.0

ITEM 227.3 REMOVAL OF DRAINAGE STRUCTURE SEDIMENT

STA 12+67.75 RT
STA 12+72.5 LT
STA 20+70 LT

ITEM 227.4 MASONRY PLUG

STA 16+79 38' LT
STA 18+35 38' LT
STA 18+35 12' RT
STA 19+26 12' RT
STA 20+69 12' RT
STA 20+71 36' LT
STA 20+87 12' RT
STA 21+32 12' RT

ITEM 358. GATE BOX ADJUSTED

STA 19+73 LT
STA 19+92 LT
STA 21+30 LT
STA 21+35 LT

ITEM 376.1 HYDRANT – EXCLUDING THE COST OF HYDRANT

STA 13+72 RT
STA 18+55 LT

ITEM 376.3 HYDRANT – REMOVED AND STACKED

STA 19+92 LT

ITEM 381.3 SERVICE BOX ADJUSTED

STA 19+92 LT

ITEM 470. HOT MIX ASPHALT BERM

STA 19+27 LT TO STA 19+49 LT
STA 17+61 RT TO STA 17+62 RT

ITEM 504. GRANITE CURB TYPE V4A - STRAIGHT

STA 12+32 LT TO STA 13+29 LT
STA 14+16 LT TO STA 17+23 LT
STA 17+71 LT TO STA 18+63 LT
STA 19+31 LT TO STA 19+49 LT
STA 21+24 LT TO STA 21+27 LT
DWY 2-3 TO DWY 2-6 ISLANDS
STA 12+66 RT TO STA 17+51 RT
STA 17+94 RT TO STA 19+03 RT
STA 21+34 RT TO STA 21+54 RT
ISLAND @ STA 21+00 LT 72.71

ITEM 504.1 GRANITE CURB TYPE VB – CURVED

STA 13+29 LT TO STSA 13+37 LT 8.00
STA 14+09 LT TO STA 14+16 LT 7.00
STA 18+58 LT TO STA 18+63 LT 6.00
STA 19+43 LT TO STA 19+29 LT 9.00
DWY 2-3 TO DWY 2-6 ISLANDS 55.03
STA 20+48 LT TO STA 20+57 LT
STA 21+27 LT TO STA 21+31 LT
STA 21+44 LT TO STA 21+53 LT
ISLAND @ STA 21+00 LT

ITEM 514. GRANITE CURB INLET - STRAIGHT

CB-1 STA 18+29 LT 1.00
CB-3 STA 18+35 RT 1.00
CB-6 STA 21+37 RT 1.00

ITEM 515. GRANITE CURB INLET - CURVED

CB-4 STA 20+74 LT 1.00
CB-7 STA 21+47 LT

ITEM 580. CURB REMOVED AND RESET

STA 11+76 LT to STA 13+55 LT
STA 12+81 RT to STA 19+03 RT
STA 13+92 LT to STA 18+72 LT
STA 19+00 LT to STA 21+46 LT
STA 20+73 LT to STA 20+75 LT

ITEM 581. CURB INLET REMOVED AND RESET

STA 12+75 LT
STA 12+75 RT

ITEM 594. CURB REMOVED AND DISCARDED

STA 11+76 LT to STA 13+55 LT
STA 12+81 RT to STA 19+02 RT
STA 13+92 LT to STA 18+72 LT
STA 19+00 LT to STA 21+46 LT
STA 20+73 LT to STA 20+75 LT

ITEM 620.12 GUARDRAIL, TL-2 (SINGLE FACED)

For use in the following locations and as directed by the Engineer:

From Station	Side	To Station	Side
13+85.82	RT	14+58.48	RT
14+41.12	LT	14+58.59	LT
15+88.38	RT	16+28.37	RT
15+88.38	LT	16.28.33	LT
16+60.54	LT	17+16.94	LT

ITEM 622.1 GUARDRAIL – WOOD, DOUBLE RAIL

For use in the following locations and as directed by the Engineer:

From Station	Side	To Station	Side
15+78	RT	15+96	RT
16+04	RT	16+40	RT

ITEM 627.1 TRAILING ANCHORAGE

For use in the following locations and as directed by the Engineer:

STATION	SIDE
14+41	LT
16+61	LT
13+76	RT

ITEM 627.82 GUARDRAIL TANGENT END TREATMENT, TL-2

For use in the following locations and as directed by the Engineer:

STATION	SIDE
16+28	RT
17+00	LT

ITEM 627.92 GUARDRAIL FLARED END TREATMENT, TL-2

For use in the following locations and as directed by the Engineer:

STATION	SIDE
16+28	LT

ITEM 628.24 TRANSITION TO BRIDGE RAIL

For use in the following locations and as directed by the Engineer:

From Station	Side
14+58.59	LT
15+54.68	LT
14+58.48	RT
15+54.57	RT

ITEM 690.3 SALVAGED GRANITE BLOCK WALL

For use in the following locations and as directed by the Engineer:

From Station	Side	To Station	Side
16+04	RT	16+49	RT

ITEM 690.5 SALVAGED GRANITE PIER

For use in the following locations and as directed by the Engineer:

From Station	Side
16+00	RT

ITEM 706.7 SALVAGED GRANITE PLANK PAVING

For use in the following locations and as directed by the Engineer:

From Station	Side	To Station	Side
15+55	RT	15+70	RT
16+00	RT	16+30	RT

ITEM 707.13 BENCH – 6 FEET

For use in the following locations and as directed by the Engineer:

From Station	Side
15+80	RT
15+90	RT
16+00	RT

ITEM 708.1 INTERPRETIVE PANEL METAL FRAME

For use in the following locations and as directed by the Engineer:

From Station	Side
15+70	RT
16+05	RT

ITEM 708.13 INTERPRETIVE PANEL

For use in the following locations and as directed by the Engineer:

From Station	Side
15+70	RT
16+05	RT

ITEM 708.15 AGAWAM HERRING RUN SIGN

For use in the following locations and as directed by the Engineer:

From Station	Side
16+85	RT

ITEM 710.4 BOUND- PLAIN GRANITE

As directed by the Engineer for new and replacement of broken or damaged state highway bounds

ITEM 711. BOUND REMOVED AND RESET

For use the following location:

STATION
16+87 LT

ITEM 771.1 EVERGREEN TREE – 3-4' HT.

For use in the following locations and as directed by the Engineer:

From Station	Side
14+25	RT
14+50	RT

ITEM 775.1 DECIDUOUS TREE – 1.5-2" CAL

For use in the following locations and as directed by the Engineer:

From Station	Side	To Station	Side
13+25	RT	15+00	RT
15+25	RT	17+25	RT

ITEM 775.2 DECIDUOUS TREE – 2-2.5" CAL

For use in the following locations and as directed by the Engineer:

From Station	Side	To Station	Side
16+45	RT	17+25	RT

ITEM 778.1 MULTI-STEM TREE – 5-6' HT.

For use in the following locations and as directed by the Engineer:

From Station	Side
15+60	RT

ITEM 785.1 LARGE SHRUB – 2-2.5' HT.

For use in the following locations and as directed by the Engineer:

From Station	Side	To Station	Side
13+25	RT	15+00	RT

ITEM 785.2 SMALL SHRUB – 18-24" HT

For use in the following locations and as directed by the Engineer:

From Station	Side	To Station	Side
13+25	RT	15+00	RT

ITEM 841.2 SUPPORTS FOR GUIDE SIGN (D6-5 INCH TUBULAR POST) STEEL

STATION	SIDE
16+86	RT
17+15	LT

ITEM 847.1 SIGN SUP (N/GUIDE)+RTE MKR W/1 BRKWAY POST ASSEMBLY - STEEL

As shown on the Signing and Striping Plans, and as directed by the Engineer

STATION	SIDE
11+55	LT
11+55	RT
11+76	LT
11+76	RT
13+16	LT
14+41	LT
15+65	LT
16+50	RT
16+58	LT
17+75	LT
18+25	LT
18+58	LT
19+55	RT
20+33	RT
20+73	LT
20+77	RT
21+71	RT
21+71	LT
22+76	RT
22+76	LT

ITEM 848.1. SIGN SUP (N/GUIDE)+RTE MKR W/2 BRKWAY POST ASSEMBLY - STEEL

As shown on the Signing and Striping Plans, and as directed by the Engineer

STATION	SIDE
21+73	LT

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DOCUMENT A00808

PROJECT UTILITY COORDINATION FORM

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Project Utilities Coordination (PUC) Form

CONTACTS AND GENERAL UTILITY INFORMATION

6/30/2026

Revision Date:

City/Town:	Project File #:	PUC Completed by:	Utility Pole Set:	
Wareham	606352		Eversource-Electric	
Route/Street:	**Resident Engineer:**	**Mass DOT PM:**	**Scheduled Ad Date:**	**Total Poles Relocated:**
Mill Pond Culvert & Dam (Route 6/28)		Harry Adolphe	7/18/2026	7

4/8/2025 PRINTED

Consultant:	Contact:	Office #	Cell #	Email
Pare Corporation				

Utility Company	Contact	Office #	Cell #	Email	Scope, Budget, Duration Submitted		Reimbursement			Potential for District Initiated Early Relocation *		Utilities On Bridge/Structure		Utilities Underground (UG) /Aerial (OH)	
					Yes	No	Agreement	Non-Reimb'le	Notes	YES	NO	YES	NO	UG	OH
Eversource	Ned Sadowski	(413) 537-6594		Ned.Sadowski@eversource.com	x		50%				x		x		x
Eversource Fiber	Bechir Khoury	(781) 441-3864		Bechir.Khoury@eversource.com		x	50%		No Facilities on-site per email dated 02/09/2022.		x		x		x
Verizon	Karen Mealey	(774) 409-3160		karen.m.mealey@verizon.com	x		50%				x		x		x
Comcast	Wendy Brown	(978) 848-5163		Wendy_Brown@comcast.com	x		50%				x		x		x
OpenCape	Gary Farrenkopf	(508) 524-5903		Gary@opencape.org	x		50%				x		x		x
Ngrid Gas	Melissa Owens	(781) 907-2845		Melissa.Owens@nationalgrid.com	x		50%				x	x		x	
Wareham Fire Arlam	Chief Mathew Rowley	(508) 295-2973		fireprevention@warehamfiredistrict.org	x		100%		Existing OHW inactive.		x		x		x

Utility Relocation Notes for MassDOT Contractor

Unless otherwise noted by Contract, the MassDOT Contractor is to provide the District Construction Office with 7 Calendar Days advance notification in order to validate the current progress and provide the required 30 Days advance notice-to-proceed for the first Utility - and each subsequent Utility. These advance notifications are to be identified in the Contractor's Schedules (Pre-Con preparation, Baseline, Subnets, and Updated/Monthly Schedules) as specified in Subsection 8.02 (for DBB Contracts) and/or Section 9 (of DB Contracts). Note: The durations included below do not include these lead-times. See Additional 'Important Basis notes for Contractor' - on last PUC Form page.

Additional notes:

Suggested Sequence of Relocation (Based on Consultant proposed construction staging)

The sequence as detailed on the following pages is based on the consultants proposed staging plan. This information was compiled through meetings that included all of the utilities listed below along with the designer and the Town of Wareham . The information provided is the best available information prior to project advertisement.

Proposal No. 606352-136278

A00808 - 3

PUC FORM - CONTINUED

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

4/8/2025
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 ?	
					Exclusive Utility on site	Concurrent Utilities	Contractor Off-Site	Contractor Concurrent		
	C = Contractor	U = Utility Co.			Utility working with no other Utilities in vicinity	Utility working with other Utilities on site	No Contractor physical construction operations on-site (while Utility is	Contractor and Utility are working on-site - but NOT in the same vicinity	Potential Access Restraint (Yes/No)	Reason/Note (optional)
Stage : 1			>Contractor to provide 60 day notice to utilities prior to start of work.							
			Temporary Overhead Utiliies							
Task: 1			***Verizon***							
		U	Verizon - Place new strand on existing Eversource poles along north side of roadway.	5	x			x		
		U	Verizon - Place all new anhors and guying.	2	x			x		
		U	Verizon - Place temprorary fiber and copper cables and new fiber terminals.	16	x			x		
		U	Verizon - Splice new cables and terminals and trim out old plant.	41	x			x		
		U	Verizon - Remove old plant.	7	x			x		
		U	Verizon - Remove old poles along south side of roadway.	6	x			x		
			Sub-Total	**77**						
Stage : 1			>Contractor to provide 60 day notice to utilities prior to start of work. >Contractor to perform Clearing and Grubbing. >Contractor to build temprorary utiltiy bridge.							
			Temporary Underground Utiliies							
Task: 2			***NGRID-Gas***							
		U	NGRID-Gas- Excavate and shore.	20	x			x		
		U	NGRID-Gas- Trench and Install approx 310 FT of 6 inch 60 PSIG Plastic and Coated Steel Gas Main.		x			x		
		U	NGRID-Gas- Main Connections/Tie-ins.		x			x		
		U	NGRID-Gas- Stop/Tap/Purge/Cut/Cap.		x			x		
		U	NGRID-Gas- Backfill.		x			x		
			Sub-Total	**20**						

Proposal No. 606352-136278

A00808 - 4

	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 : 2			>Contractor to provide 60 day notice to utilities prior to start of work. >Contractor to build southern portion of superstructure and embankments prior to overhead Utility relocations.							
			Permanent Overhead Utilities							
Task: 1			***Eversource-Electric***							
		U	Eversource-Electric - Install poles: 19/85PB, 19/84.5, 102/142, 102/141, 102/140, 102/139, 102/138, 102/137, 102/136.5, and 534/757 with back and side guys as required.	12	x			x		
		U	Eversource-Electric - Install sections of 3-477 AL OH wire from pole 19/84.5 to pole 102/136 via re-routed pole line and from pole 102/140 to pole 102/136 with a 4/0 neutral.	12	x			x		
		U	Eversource-Electric - Remove sections of 3-477 AL, OH Wire and secondary / neutral from pole 19/85 to pole 102/136 and from pole 102/140 to pole 102/136.	12	x			x		
		U	Eversource-Electric - Remove 600 kVAR VVO Cap Bank on pole 102/137 and install a new 25 kV 600 kVAR cap bank on pole 102/141.	3	x			x		
			Sub-Total	**39**						
Task: 2			***Wareham Fire Alarm***							
		U	Wareham Fire Alarm - Mobilitzation and Preplan.	1	x			x		
		U	Wareham Fire Alarm - Decommissioning of Fire Alarm Wire.	2	x			x		
			Wareham Fire Alarm - Removing J Boxes and Misc Equipment.	1	x			x		
			Wareham Fire Alarm - Securing Remaining Fire Alarm Wire and Connections.	1	x			x		
				5						
Task: 3			***OpenCape***							
		U	OpenCape - Frame poles with new hardware.	1	x			x		
		U	OpenCape - Move Aerial Fiber Cable. 690' from old poleline across roadway to new poleline.	1	x			x		
		U	OpenCape - Remove old hardware from old pole line.	1	x			x		
			Sub-Total	**3**						
Task: 4			***Comcast***							
		U	Comcast - BUILD & PLACE "NEW" 1000' of Fiber thru the Work Zone (2 separate fibers being pulled).	7	x			x		
		U	Comcast - Splice new fiber ready to tie into existing plant.	5	x			x		
		U	Comcast - ACTIVATE, CUT OVER "NEW" FIBER DISTRIBUTION NETWORK.	2	x			x		
		U	Comcast - REMOVE AND DISPOSE OF "OLD" FIBER NETWORK.	2	x			x		
			Sub-Total	**16**						
Task: 5			***Verizon***							
		U	Verizon - Place strand and guying on new pole line set by Eversource-Electric along south side of roadway.	5	x			x		
		U	Verizon - Place cabling.	16	x			x		
		U	Verizon - Splice new cables and terminals and trim out temporary plant.	41	x			x		
		U	Verizon - Remove temporary plant.	7	x			x		
		U	Verizon - Remove old guying.	1	x			x		
			Sub-Total	**70**						
Task: 6			***Eversource-Electric***							
		U	Eversource-Electric - Remove old poles.	2	x			x		
			Sub-Total	**2**						
Stage 2			>Contractor to provide 60 day notice to utilities prior to start of work. >Contractor to build southern portion of superstrucutre prior to gas relocation.							
			Permanent Underground Utilities							
Task: 7			***NGRID-Gas***							
		U	NGRID-Gas - Excavate & Shore.	20	**x**			**x**		
		U	NGRID-Gas - Trench and Install approx 175 FT of 6 inch 60 PSIG Plastic and Coated Steel Gas Main.		**x**			**x**		
		U	NGRID-Gas - Main Connections/Tie-ins.		**x**			**x**		
		U	NGRID-Gas - Stop/Tap/Purge/Cut/Cap.		**x**			**x**		
		U	NGRID-Gas - Backfill.		**x**			**x**		
			Sub-Total	**20**						

DESCRIPTION - Utility Relocation Phases, Tasks and Activities

RESPONSIBLE PARTY	Estimated Duration (Work Days) by Utilities (Lead time not included)		Concurrent / Exclusive Utility Work		Access Restraint & Limitations of Operations Notes
C = Contractor U = Utility Co.	Utility working with no other Utilities in vicinity	Utility working with other Utilities on site	No Contractor physical construction operations on-site (while Utility is	Contractor and Utility are working on-site - but NOT in the same vicinity	Potential **Access Restraint** (Yes/No) Reason/Note (optional)
	Exclusive Utility on site	**Concurrent Utilities**	**Contractor Off-Site**	**Contractor Concurrent**	Should an AR be considered for the Contractor ?
			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.		

IMPORTANT BASIS NOTES - FOR CONTRACTOR

1. Unless otherwise specified in the MassDOT Construction Contract, or unless specifically noted within this PUC Form, these durations (herein) are based upon the Contractor providing *unimpeded access* to the Utility company to
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
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
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
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
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
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
9. ** Assumed duration

DOCUMENT A00810

MassDOT Herbicide Use Report

Proposal No. 606352-136278

MassDOT Herbicide Use Report

Date Submitted:

Use multiple sheets for multiple application techniques or sites as needed.

Contractor Performing Work:

Project or Contract No:

Town/s:

Associated Route:

Project Description:

MDAR ALERT*:

Treatment Description:

Area Treated (as applicable)

Acres: **Sq Yds:** **Miles:**

Weeds Targeted:

Gallons Formula Used:

Application Method:

Date/Time Began:

Date/Time End:

Product Used:

Name: _____	Name: _____	Name: _____
EPA Reg. No: _____	EPA Reg. No: _____	EPA Reg. No: _____
% Active Ingredient	% Active Ingredient	% Active Ingredient
Dry: _____	Dry: _____	Dry: _____
Liquid: _____	Liquid: _____	Liquid: _____
Formulation (dilution rate): _____	Formulation (dilution rate): _____	Formulation (dilution rate): _____

Additional products used (surfactants, etc.) or other information:

Applicators: **License Numbers:**

* Please note:
EDRR Species (MAM, Hogweed, Pepperweed, Kudzu, etc.)
Tree of Heaven 1) stands of >20 trees; 2) >5 trees near nursery, landscape company, or highway rest area where trucks stop

Upon completion, please submit form to MassDOT District Engineer and Landscape Design Section in Boston office.

07/18/2018

DOCUMENT A00811

WATERING LOG
for
MassDOT Plantings

Watering Log for MassDOT Plantings

Project Description:

Contract No:

Project No:

Plant Locations/s: (Attach planting plan/s as necessary)

Notes:

	Separate logs shall be kept to track areas or plants with different watering schedules. Trees shall receive a minimum of 10 gallons with each watering and shrubs a minimum of 5 gallons. Provide note that if watering is not performed as scheduled due to rain. Record date of rainfall and amount.												
Date Watered													
Landscape Contractor Initial													
Prime Contractor Initial													
Date Watered													
Landscape Contractor Initial													
Prime Contractor Initial													

Each week, following watering, Log shall be submitted to the MassDOT Engineer.
6/15/2018

DOCUMENT 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: WAREHAM Project File Number: 606352

Contract Number: 136278

Project Description: Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River

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 A00831

ARMY CORPS OF ENGINEERS

GENERAL PERMIT

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DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, NEW ENGLAND DISTRICT
NEW ENGLAND DISTRICT OFFICE
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

August 11, 2025

Regulatory Division
Transportation & Utility Section
File No. NAE-2007-03255

Courtney Walker
MassDOT - Highway Division
10 Park Plaza
Room 7360
Boston, Massachusetts 02116
Via Email: courtney.l.walker@dot.state.ma.us

Dear Ms. Walker:

This letter is in response to the application you submitted to the U.S. Army Corps of Engineers (USACE), New England District, on March 3, 2025, for a Department of the Army general permit verification. We have assigned this project file number NAE-2007-03255, which you should reference in all correspondence with this office. This letter follows a provisional notification letter from this office, dated May 29, 2025.

The work includes the permanent discharge of fill within 13,017 square feet below the Ordinary High Water (OHW) mark of Mill Pond, and within 4,297 square feet below the High Tide Line (HTL) of the Agawam River, associated with the replacement of the Mill Pond Dam, spillway, and fish ladder, and the bridge conveying Cranberry Highway over the spillway, at Latitude 41.762690º and Longitude -70.676300º, in Wareham, Plymouth County, Massachusetts. The existing primary and secondary spillways will be removed and replaced with a single new spillway. The upstream slope of the dam will be regraded to a 2:1 slope covered with rip-rap slope protection. The existing Alaskan Steeppass fish ladder will be replaced with a new pool and weir fish ladder and eel passage. The existing fishway north of the bridge will be retained for historic reasons and to maintain hydrology for adjacent wetlands. The existing two-bay concrete box culvert (primary) and 5’ diameter metal pipe culvert (secondary) crossings over the spillways will be replaced by a single-span bridge crossing. The project also includes temporary impacts within 4,328 square feet below OHW and 446 square feet below HTL associated with the installation and dewatering of cofferdams to allow work to proceed in the dry. Work will be staged to maintain fish passage throughout construction. The work is shown on the enclosed plans titled “MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION PLAN AND PROFILE OF US 6 WB & ST 28 NB (BRIDGE NO. W-06-020) IN THE TOWN OF WAREHAM PLYMOUTH COUNTY,” on 38 sheets dated 2/21/2025.

Based on the information you have provided, we verify that the activity is authorized under General Permits 2 and 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. You can find a copy of these permits at: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/.

Any deviation from the terms and conditions of the permit, or your submitted plans, may subject the permittee to the enforcement provisions of our regulations. Therefore, in the event changes to this project are contemplated, it is recommended you coordinate with this office prior to proceeding with the work. This office must approve any changes before you undertake them. You must perform this work in compliance with the terms and conditions of the GPs listed above, and also in compliance with the following special conditions:

Project Specific Special Conditions:

1. The permittee shall complete and return the enclosed Work-Start Notification Form to this office at least two weeks prior to the anticipated construction start date.

2. The permittee shall complete and return the enclosed Completion Certification Form to this office at least one month following the completion of the authorized work.

3. All construction shall be completed in accordance with the limits of construction and construction sequences detailed on the enclosed plan drawings, titled "MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION PLAN AND PROFILE OF US 6 WB & ST 28 NB (BRIDGE NO. W-06-020) IN THE TOWN OF WAREHAM PLYMOUTH COUNTY," on 38 sheets dated 2/21/2025. If you change the plans or construction methods for work within or adjacent to Mill Pond or the Agawam River, please contact us immediately to discuss modification of this authorization. USACE must approve any changes before you undertake them.

4. To protect diadromous fish species, no in-water, silt-producing work shall occur during the time-of-year (TOY) restrictions from March 15 to July 15 and September 1 to November 15 of any year(s). Work may occur in the dry behind cofferdams provided the cofferdams are installed outside of the above TOY restrictions. Upstream and downstream fish passage shall be maintained throughout construction. Activities must not encroach >25% of the stream width measured during the anadromous TOY restriction unless such encroachment is otherwise approved by State Fisheries.

5. Controls shall be removed upon completion of the project, but not until all exposed soil, fill, and other in-water work are permanently stabilized. 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.

6. Replaced or upgraded crossings must be a similar or improved structure type and must be designed to provide diadromous and resident fish organism passage by providing sufficient water depth, maintaining suitable water velocities during migration periods, and maintaining or replicating natural stream channel and flow conditions. Upgraded crossings must be designed in accordance with the order of preference set out in NMFS' Anadromous Salmonid Passage Facility Design, unless such design is otherwise approved by the State Fisheries Agency.

7. 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 GP 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.

Your project is located within, or may affect resources within, the coastal zone. The Massachusetts Office of Coastal Zone Management (CZM) has already determined that no further Federal Consistency Review is required.

If you have any questions related to this verification or have issues accessing documents referenced in this letter, please contact Dan Vasconcelos, Project Manager, at 978-318-8653, or by email at daniel.b.vasconcelos@usace.army.mil. This agency continually strives to improve our customer service.

To better serve you, please complete the Customer Service Survey located at: https://regulatory.ops.usace.army.mil/customer-service-survey/.

Sincerely,

Ryan Malterud
Deputy Chief, Regulatory Division

Enclosures

cc (w/enclosures):

Sean Duffey, Coastal Zone Management (via sean.duffey@mass.gov)
Patrice Bordonaro, Coastal Zone Management (via patrice.bordonaro@mass.gov)
Amanda Davis, MA DMF (via amanda.davis@mass.gov)
Heidi Davis, MassDEP (via heidi.davis@mass.gov)
Tyler Lewis, MassDEP (via tyler.lewis@state.ma.us)
Wareham Conservation Commission (via csantos@wareham.ma.us)
Erika Klinkhammer, Pare Corporation (via eklinkhammer@parecorp.com)

Work-Start Notification Form

File Number: NAE-2007-03255 State: Massachusetts County: Plymouth

Permittee: MassDOT - Highway Division, Courtney Walker
Date Verification Issued: 8/11/2025
Project Manager: Dan Vasconcelos

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: Dan Vasconcelos
696 Virginia Road
Concord, MA 01742
or
daniel.b.vasconcelos@usace.army.mil and cenae-r-tu@usace.army.mil
978-318-8653

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.

If the work is in the Massachusetts Coastal Zone (https://www.mass.gov/service-details/czm-regions-coastal-communities-and-coastal-zone-boundary), email this form to robert.boeri@mass.gov or mail to: The Massachusetts Office of Coastal Zone Management, Project Review Coordinator, Suite 800, 251 Causeway Street, Boston, MA 02114.

The people (e.g. contractor) listed below will do the work, and they understand the permit's conditions and limitations.

Contractor Name/Contractor Firm: _____
Business Address: _____
_____
Contractor Phone and Email: _____

Proposed Construction Dates: Start: _____ Finish: _____

_____ _____
Signature of Permittee Date

U.S. Army Corps of Engineers (USACE)

CERTIFICATION OF COMPLIANCE WITH DEPARTMENT OF THE ARMY PERMIT

For use of this form, see Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act of 1899, and Section 103 of the Marine Protection, Research, and Sanctuaries Act; the proponent agency is CECW-COR.

Form Approved - OMB No. 0710-0003 Expires 2027-10-31

The Agency Disclosure Notice (ADN)

The Public reporting burden for this collection of information, 0710-0003, is estimated to average 10 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or burden reduction suggestions to the Department of Defense, Washington Headquarters Services, at whs.mc-alex.esd.mbx.dd-dod-information-collections@mail.mil. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

PURPOSE: This form is used by recipients of U.S. Army Corps of Engineer Regulatory permits to certify compliance with the permit terms and conditions.

Your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with this permit, you are subject to permit suspension, modification, or revocation.

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the U.S. Army Corps of Engineers, New England District, Regulatory Office.

The certification can be submitted by email at daniel.b.vasconcelos @usace.army.mil or by mail at the below address:

U.S. Army Corps of Engineers
New England District Office
Street Address: 696 Virginia Road
City: Concord State: Massachusetts Zip Code: New England District Office

COMPLETED BY THE CORPS

Corps Action Number: NAE-2007-03255

Permit Type: General Permit

General Permit Number and Name (*if applicable*): 2 (Maintenance), 23 (Linear Transportation)

Name of Permittee: Courtney Walker

Project Name: Cranberry Highway over Mill Pond/Agawam River

Project Location (*physical address*): Cranberry Highway over Mill Pond/Agawam River
Wareham, Massachusetts

PERMITTEE'S CERTIFICATION

Date Work Started: _____

Date Work Completed: _____

Enclose photographs showing the completed project (*if available*).

I _____ hereby certify that the work authorized by the above referenced permit has been completed in accordance with all of the permit terms and conditions, and that any required compensatory mitigation has been completed in accordance with the permit conditions.

Name	Date	Signature

ENG FORM 6285, DEC 2024 PREVIOUS EDITIONS ARE OBSOLETE.

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	38
PROJECT FILE NO.	606352		

TITLE SHEET & INDEX

PLAN AND PROFILE OF

US 6 WB & ST 28 NB

(BRIDGE NO. W-06-020)

IN THE TOWN OF

WAREHAM

PLYMOUTH COUNTY

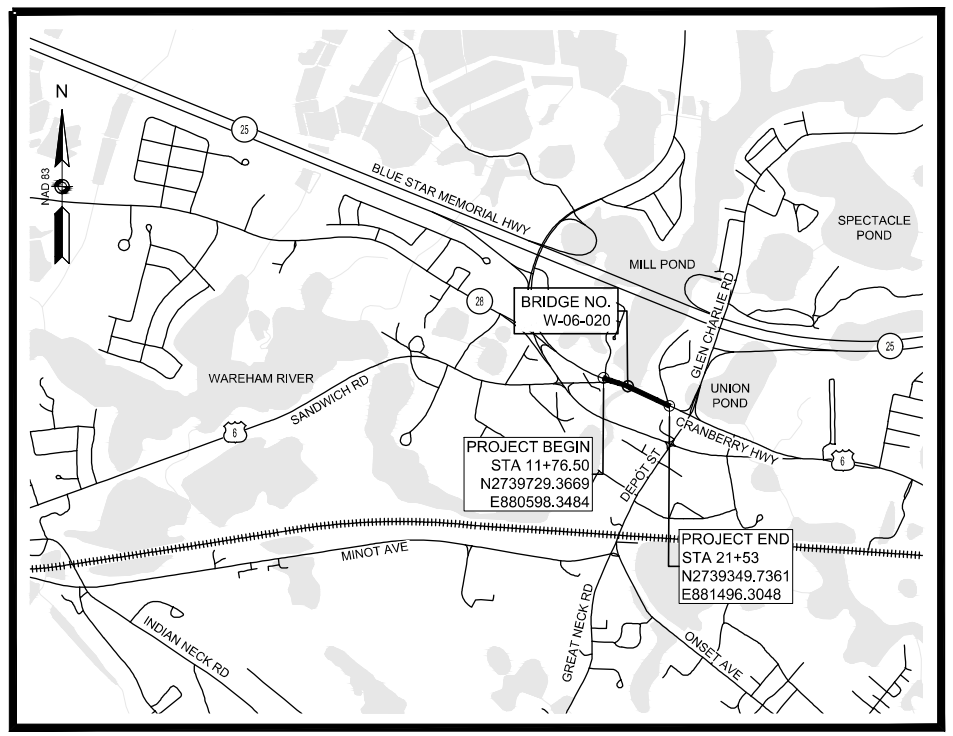
FEDERAL AID PROJECT NO. ######

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 LATEST MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS WITH MASSACHUSETTS AMENDMENTS, 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, WILL GOVERN.

WATER QUALITY CERTIFICATION PERMIT SUBMISSION

INDEX

SHEET NO.	DESCRIPTION
1	TITLE SHEET & INDEX
2	LEGEND
3	NOTES
5 , 6	CONSTRUCTION PLAN NO. 1 & NO. 2
7 , 8	PROFILE NO. 1
7 , 10	DRAINAGE & UTILITY PLAN NO. 1
8	WETLAND IMPACT PLAN
9	SPILLWAY SECTION
10 , 11	CONSTRUCTION DETAILS NO. 1 & NO. 2
12	KEY PLAN & INDEX
13	BRIDGE NOTES
14	BRIDGE & SPILLWAY GENERAL PLAN
15	BRIDGE & SPILLWAY ELEVATION
16	BRIDGE & SPILLWAY DEMOLITION PLAN
17 - 20	PHASED CONSTRUCTION SECTIONS NO. 1 TO NO. 4
21 - 29	PHASED CONSTRUCTION PLANS NO. 1 TO NO. 9
30	WILDLIFE PASSAGE PLAN
31 - 38	WILDLIFE PASSAGE SECTIONS & PERMIT DETAILS NO. 1 TO NO. 8



0 1200 2400 3600

SCALE: 1" = 1200'
(1" = 3000')

LENGTH OF PROJECT = 976.5 FEET = 0.185 MILES

SCALE CONVERSION

ORIGINAL 24"X36" PLAN SCALE: 1' = 20'
11"X17" PLAN SCALE: (1' = 50')

DESIGN DESIGNATION (US 6 WB & ST 28 NB)

DESIGN SPEED	40 MPH
ADT (2023)	14,255
ADT (2043)	16,260
K	9%
D	N/A
T (PEAK HOUR)	9%
T (AVERAGE DAY)	9%
DHV	1,464
DDHV	N/A
FUNCTIONAL CLASSIFICATION	URBAN MINOR ARTERIAL

DATE	DESCRIPTION	REV #
02-21-2025	REVISED - 100% DESIGN	
01-15-2025	100% DESIGN	
12-17-2024	100% DESIGN	
01-31-2024	75% DESIGN	
12-17-2021	25% DESIGN	

PARE CORPORATION
ENGINEERS • SCIENTISTS • PLANNERS

Shadley Associates

massDOT Massachusetts Department of Transportation Highway Division

APPROVED

CHIEF ENGINEER **DATE**

Proposal No. 606352-136278

606352_HD(TITLE SHEET).DWG Plotted on 19-Mar-2025 10:34 AM

A00831 - 9

Proposal No. 606352-136278

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606352_HDLEGEND.DWG Plotted on 19-Mar-2025 10:34 AM

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
		CATCH BASIN CURB INLET
FP	FP	FLAG POLE
GP	GP	GAS PUMP
MB	MB	MAIL BOX
		POST SQUARE
		POST CIRCULAR
WELL	WELL	WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GATE POST
GG	GG	GAS GATE
BHL #	BHL #	BORING HOLE
MW #	MW #	MONITORING WELL
TP #	TP #	TEST PIT
		HYDRANT
		LIGHT POLE
CO.BD.		COUNTY BOUND
		GPS POINT
		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
		GUARD RAIL - DOUBLE FACE - STEEL POSTS
		GUARD RAIL - DOUBLE FACE - WOOD POSTS
x	x	CHAIN LINK OR METAL FENCE
		WOOD FENCE
		EROSION AND SEDIMENT CONTROL BARRIER
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDERING VEGETATED WETLANDS
		100 FT ZONE BUFFER
		200 FT RIVERFRONT AREA
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT
		COMPOST FILTER SOCK

TRAFFIC SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
1	1	CONTROLLER PHASE ACTUATED
		TRAFFIC SIGNAL HEAD (SIZE AS NOTED)
		WIRE LOOP DETECTOR (6' x 6' TYP UNLESS OTHERWISE SPECIFIED)
		VIDEO DETECTION CAMERA
		MICROWAVE DETECTOR
		PEDESTRIAN PUSH BUTTON, SIGN (DIRECTIONAL ARROW AS SHOWN) AND SADDLE
	*	EMERGENCY PREEMPTION CONFIRMATION STROBE LIGHT
		VEHICULAR SIGNAL HEAD
		VEHICULAR SIGNAL HEAD, OPTICALLY PROGRAMMED
		FLASHING BEACON
		PEDESTRIAN SIGNAL HEAD, (TYPE AS NOTED OR AS SPECIFIED)
RRSG	RRSG	RAILROAD SIGNAL
OR		SIGNAL POST AND BASE (ALPHA-NUMERIC DESIGNATION NOTED)
	20'	MAST ARM, SHAFT AND BASE (ARM LENGTH AS NOTED)
		HIGH MAST POLE OR TOWER
		SIGN AND POST
		SIGN AND POST (2 POSTS)
	20'	MAST ARM WITH LUMINAIRE
		OPTICAL PRE-EMPTION DETECTOR
		CONTROL CABINET, GROUND MOUNTED
		CONTROL CABINET, POLE MOUNTED
		FLASHING BEACON CONTROL AND METER PEDESTAL
		LOAD CENTER ASSEMBLY
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
ONLY	ONLY	LEGEND "ONLY" - WHITE
	SL	STOP LINE
	CW	CROSSWALK - SEE DETAIL (SHEET ##)
	SWL	SOLID WHITE LINE - 6" REFLECTORIZED
	SYL	SOLID YELLOW LINE
	BWL	BROKEN WHITE LINE (10' STRIPE - 30' SPACE - 10' STRIPE)
	BYL	BROKEN YELLOW LINE (3' STRIPE - 9' SPACE - 3' STRIPE)
	DGL	DOTTED GREEN LINE (3' STRIPE - 9' SPACE - 3' STRIPE)
	DWL	DOTTED WHITE LINE (3' STRIPE - 9' SPACE - 3' STRIPE)
	DYL	DOTTED YELLOW LINE
	DWLEx	DOTTED WHITE LINE EXTENSION (2' STRIPE - 6' SPACE - 2' STRIPE)
	DYLEx	DOTTED YELLOW LINE EXTENSION
	DBWL	DOUBLE WHITE LINE
	DBYL	DOUBLE YELLOW LINE - 6" REFLECTORIZED
	WGL	WHITE GORE LINE - 12" @ 20' O.C. ANGLE @ 45°
	YGL	YELLOW GORE LINE - 12" @ 20' O.C. ANGLE @ 45°
	WCG	WHITE CHEVRON GORE LINE - 24" @ 20' O.C.

ABBREVIATIONS

GENERAL

AADT	ANNUAL AVERAGE DAILY TRAFFIC
ABAN	ABANDON
ADJ	ADJUST
APPROX.	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CB	CATCH BASIN
CBCI	CATCH BASIN WITH CURB INLET
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CIP	CAST IRON PIPE
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DHV	DESIGN HOURLY VOLUME
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DW	STEADY DON'T WALK - PORTLAND ORANGE
DWY	DRIVEWAY
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
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

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	38
PROJECT FILE NO.	606352		

LEGEND & ABBREVIATIONS

ABBREVIATIONS (cont.)

GENERAL

PWW	PAVED WATER WAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDWY	ROADWAY
REM	REMOVE
RET	RETAIN
RET WALL	RETAINING WALL
ROW	RIGHT OF WAY
RR	RAILROAD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SMH	SEWER MANHOLE
ST	STREET
STA	STATION
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SW	SIDEWALK
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
PCR	PEDESTRIAN CURB RAMP

TRAFFIC SIGNAL ABBREVIATIONS

CAB	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY UPRAISED HAND
FDW	FLASHING UPRAISED HAND
FR	FLASHING CIRCULAR RED
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR YELLOW
FYL	FLASHING YELLOW LEFT ARROW
FYR	FLASHING YELLOW RIGHT ARROW
G	STEADY CIRCULAR GREEN
GL	STEADY GREEN LEFT ARROW
GR	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
GV	STEADY GREEN VERTICAL ARROW
OL	OVERLAP
PED	PEDESTRIAN
PTZ	PAN, TILT, ZOOM
R	STEADY CIRCULAR RED
RL	STEADY RED LEFT ARROW
RR	STEADY RED RIGHT ARROW
TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALKING PERSON
Y	STEADY CIRCULAR YELLOW
YL	STEADY YELLOW LEFT ARROW

Proposal No. 606352-136278

Plotted on 19-Mar-2025 10:35 AM
606352_HD(GENERAL NOTES).DWG

SURVEY NOTES

1. THE EXISTING CONDITION SHOWN ON THE SURVEY BASE PLAN ARE A RESULT OF AN ON THE GROUND INSTRUMENT SURVEY PERFORMED BY DAWOOD ENGINEERING, INC., BOSTON, MASSACHUSETTS, IN SEPTEMBER, 2022 AND SUPPLEMENTED IN DECEMBER 2023.
2. THE MOST RECENT SITE VISIT WAS COMPLETED IN OCTOBER 2024 TO VERIFY THAT THE EXISTING CONDITIONS SHOWN ON THE PLAN ARE THE CURRENT CONDITIONS IN THE FIELD.
3. THE OWNERS HAVE BEEN CHECKED AND UPDATED AS OF DECEMBER, 2023.
4. COORDINATES, IN U.S. SURVEY FEET, ARE IN THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM (MCS), MAINLAND ZONE, REFERENCED TO THE NORTH AMERICAN DATUM OF 1983, (NAD 83/2011, EPOCH 2010.00), BASED ON THE KeyNetGPS VIRTUAL REFERENCE SYSTEM (VRS).
5. ELEVATIONS, IN U.S. SURVEY FEET, ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) BASED ON THE KeyNetGPS VIRTUAL REFERENCE SYSTEM (VRS)
6. SUBSURFACE UTILITY LINES AND FEATURES, AS SHOWN HEREON, WERE COMPILED FROM FIELD EVIDENCE AND/OR AVAILABLE RECORD INFORMATION (SEE REFERENCES), AND THEIR LOCATIONS ARE ONLY APPROXIMATE. ACTUAL LOCATIONS MUST BE DETERMINED IN THE FIELD.
7. DAWOOD ASSUMES NO RESPONSIBILITY FOR DAMAGES INCURRED AS A RESULT OF UTILITIES OMITTED OR INACCURATELY SHOWN.
8. BEFORE DESIGNING FUTURE CONNECTIONS, THE APPROPRIATE UTILITIES MUST BE CONSULTED.
9. BEFORE CONSTRUCTION, ALL UTILITIES, PUBLIC AND PRIVATE, MUST BE NOTIFIED (SEE MASSACHUSETTS GENERAL LAWS, CHAPTER 82 SECTION 40). CALL "DIG SAFE" 1-888-DIG-SAFE. (888-344-7233).
10. BATHYMETRIC SURVEY DATA BASED ON A BATHYMETRIC SURVEY PERFORMED BY HEIDECKER LAND SURVEYING, LLC ON OCTOBER 5, 2022

UTILITY NOTE

1. EXISTING UTILITIES, WHERE SHOWN HEREON, ARE APPROXIMATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPERLY LOCATING AND COORDINATING ANY ON-SITE ACTIVITY WITH DIG-SAFE AND THE APPROPRIATE UTILITY COMPANY AND MAINTAINING EXISTING UTILITY SYSTEM SERVICE. DIG-SAFE SHALL BE NOTIFIED PER THE COMMONWEALTH OF MASSACHUSETTS STATUTE CHAPTER 82, SECTION 40, AT 1-888-344-7233. NO GUARANTEE IS IMPLIED OR INTENDED AS TO THE ACCURACY, LOCATION OR THAT ALL UTILITIES AND/OR SUBSURFACE STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL VERIFY SIZE, LOCATION AND INVERTS OR UTILITIES AND STRUCTURES AS REQUIRED PRIOR TO THE START OF CONSTRUCTION.

NATIONAL GRID GAS NOTES

1. IF THE PROPOSED CONSTRUCTION IS WITHIN CLOSE PROXIMITY OF HIGH PRESSURE TRANSMISSION GAS MAIN, CONTACT NATIONAL GRID'S DAMAGE PREVENTION DEPARTMENT FOR SPECIFIC REQUIREMENTS. IT IS RECOMMENDED THAT:

   - A NATIONAL GRID REPRESENTATIVE IS ON SITE CONTINUOUSLY DURING ANY EXCAVATION/SUBSURFACE WORK WITHIN 15 FEET OF A TRANSMISSION FACILITY.

   - WHEN WORKING WITHIN 15' OF THE OUTSIDE PERIMETER OF ANY TRANSMISSION PIPELINE, HAND TOOLS AND VACUUM EXCAVATION MUST BE USED UNTIL THE EXACT ALIGNMENT HAS BEEN VERIFIED

   - WHEN WORKING WITHIN 15' OF THE OUTSIDE PERIMETER OF ANY TRANSMISSION PIPELINE, VERIFICATION HOLES SHOULD BE DUG USING HAND TOOLS/VACUUM EXCAVATION AT 50 FT INTERVALS OVER TRANSMISSION MAIN THAT RUNS ADJACENT TO A PROPOSED INDIVIDUAL CONSTRUCTION EXCAVATION.

   - WHERE CROSSING TRANSMISSION GAS PIPE WITH UTILITIES AND UNDERGROUND STRUCTURES, TEST HOLES MUST BE DUG AT THE CROSSING TO CONFIRM THE DEPTH, INVERT ELEVATION, AND SEPARATION.

   - ONCE THE EXACT ALIGNMENT OF TRANSMISSION PIPING HAS BEEN VERIFIED USING HAND TOOLS AND VACUUM EXCAVATION, POWERED EXCAVATION MAY BE USED WITHIN 15' OF THE PIPELINE, **BUT NO CLOSER THAN THE TRANSMISSION PIPELINE SAFETY ZONE (18" + 1/2 THE DIAMETER OF THE PIPELINE).**

GENERAL NOTES

1. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR SHALL SUBMIT FOR REVIEW A SCHEDULE OF OPERATIONS IN ADDITION TO OTHER CONTRACT REQUIREMENTS TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, HIGHWAY DIVISION.
2. WHERE THE NEW CONSTRUCTION COINCIDES WITH PRESENT TRAVELED WAYS, THE CONTRACTOR SHALL PERFORM THEIR WORK IN A MANNER ACCEPTABLE TO THE ENGINEER SO THAT INTERFERENCE TO BUSINESSES AND ABUTTERS, ON ACCOUNT OF THE CONSTRUCTION WORK, IS KEPT TO A MINIMUM. THE CONTRACTOR WILL NOT BE ALLOWED TO PARK EQUIPMENT OR STOCKPILE MATERIAL ON THE TRAVELED WAYS OVERNIGHT OR WHEN NOT IN USE. THE CONTRACTOR SHALL MAINTAIN SAFE AND REASONABLE ACCESS TO AND FROM ABUTTING PROPERTIES AT ALL TIMES AT NO ADDITIONAL COST.
3. THE CONTRACTOR SHALL EXCAVATE TEST PITS TO VERIFY LOCATIONS OF EXISTING UTILITIES AS DIRECTED BY THE ENGINEER.
4. THE CONTRACTOR SHALL COORDINATE THIS WORK WITH THE UTILITY COMPANIES DOING WORK IN THE SAME AREA. THE CONTRACTOR SHALL ALLOW THE UTILITY COMPANIES AND THEIR REPRESENTATIVES TO INSTALL THEIR SYSTEMS WITHIN MASSDOT AND/OR TOWN OWNED STREETS AND EASEMENTS.
5. THE CONTRACTOR'S ATTENTION IS DIRECTED TO EXISTING LABELED SEWER MANHOLE OR DRAINAGE MANHOLE COVERS SHOWN ON THE PLANS AS THEY MAY NOT ACCURATELY REPRESENT THE UNDERGROUND SERVICE. PRIOR TO ANY WORK THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF AN EXISTING COVER NOT ACCURATELY REPRESENTING THE SERVICE BELOW.
6. NO EXISTING PUBLIC UTILITY STRUCTURES SHALL BE ABANDONED AND/OR DISMANTLED WITHOUT AUTHORIZATION FROM THE ENGINEER.
7. THE CONTRACTOR SHALL PROVIDE METHODS DURING DEWATERING OPERATIONS AND FOR STORM WATER RUNOFF NOT TO ALLOW SILT OR DEBRIS TO ENTER EXISTING DRAINAGE FACILITIES OR CREATE NUISANCES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING EXISTING OR NEW FACILITIES IF SILTATION OCCURS DUE TO THE CONTRACTOR'S OPERATIONS.
8. FINAL LOCATION OF TRAFFIC SIGNS AND SUPPORTS SHALL BE SHOWN ON THE TRAFFIC PLAN AND MAY, IF NECESSARY, AT DISCRETION OF THE ENGINEER, BE MODIFIED IN THE FIELD AS APPROPRIATE.
9. DETAILS FOR SIGN SUPPORTS SHALL BE IN ACCORDANCE WITH MASSDOT STANDARD DRAWINGS.
10. DAMAGE OF PROPERTY BEYOND THE WORK LIMITS CAUSED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE, SUBJECT TO THE APPROVAL OF THE ENGINEER AND ACCEPTANCE OF THE PROPERTY OWNER.
11. THE CONTRACTOR SHALL CLEAR AND GRUB/REMOVE DEBRIS WITHIN THE LIMITS OF THE SHLO AND EASEMENT AREAS.
12. THE CONTRACTOR SHALL DISPOSE OF ALL WASTE MATERIAL IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS AT THEIR OWN EXPENSE IF NOT OTHERWISE SPECIFIED, OUTSIDE OF THE PROJECT LIMITS.
13. ALL EXISTING TOWN AND PRIVATE UTILITY CASTINGS SUCH AS WATER BOXES, CURB STOPS, MANHOLE FRAMES AND COVERS, CATCH BASIN FRAME AND GRATES AND OTHER CASTINGS SHALL BE ADJUSTED BY THE CONTRACTOR TO LINE AND GRADE AS DIRECTED BY THE ENGINEER UNLESS OTHERWISE SPECIFIED IN THE SPECIAL PROVISIONS OR ON THE CONTRACT PLANS.
14. THE CONTRACTOR SHALL PROVIDE ACCESS TO ALL UTILITIES THROUGHOUT THE PROJECT SO THAT THE VARIOUS UTILITY OWNERS HAVE ACCESS TO VAULTS AND MANHOLES TO OPERATE VALVES AND OTHER CONTROLS ON THEIR SYSTEM.
15. THE LOCATIONS OF PROPOSED PIPELINES, STRUCTURES AND UTILITY RELOCATIONS MAY BE MODIFIED TO SUIT FIELD CONDITIONS AT THE DISCRETION OF THE ENGINEER.
16. OFFSETS TO CATCH BASINS ARE TO THE CENTER OF THE GRATE.
17. IF THE CONTRACTOR DAMAGES UTILITY SERVICES, THEY SHALL IMMEDIATELY NOTIFY THE RESPECTIVE UTILITY COMPANY AND SHALL IMMEDIATELY REPLACE OR REPAIR, UNLESS INDICATED OTHERWISE BY THE RESPECTIVE UTILITY OWNER.
18. ALL PROPOSED DRAINAGE CONNECTIONS TO EXISTING STRUCTURES WILL BE INCLUDED IN THE COST OF INSTALLATION OF THE NEW PIPE OR STRUCTURE.
19. RIM ELEVATIONS MAY BE SUBJECT TO FIELD ADJUSTMENTS AS DIRECTED BY THE ENGINEER. ELEVATIONS ON CATCH BASINS ARE REFERENCED TO THE CENTER OF GRATE AT FACE OF CURB.
20. WHERE WATERLINES, DRAINAGE PIPES OR STRUCTURES ARE ABANDONED IN PLACE, CONTRACTOR SHALL MAKE SURE THAT ALL CONNECTING PIPES, INLETS AND OUTLETS ARE PLUGGED. ALL LIVE CONNECTIONS SHALL BE CONNECTED TO THE NEW SYSTEM.
21. WHEN A PROPOSED CATCH BASIN INTERFERES WITH ANY UNDERGROUND UTILITY, A GUTTER INLET SHALL BE USED.
22. ALL EXISTING DRAINAGE STRUCTURES AND PIPE TO REMAIN WITHIN THE PROJECT LIMITS SHALL BE CLEANED AND SEDIMENT DISPOSED OF.
23. DRAINAGE ELEVATIONS ARE PROVIDED FOR DESIGN PURPOSES ONLY. THE CONTRACTOR SHALL VERIFY, BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED DRAINAGE DESIGN. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER. ONLY AFTER THE CONTRACTOR VERIFIES ELEVATIONS FOR THE CONSTRUCTABILITY OF THE DRAINAGE SYSTEM SHALL ANY OF THE STRUCTURES BE ORDERED.
24. ALL PEDESTRIAN CURB RAMPS SHALL CONFORM TO THE MASSACHUSETTS ARCHITECTURAL ACCESS BOARD (AAB) RULES AND REGULATIONS AND THE AMERICANS WITH DISABILITIES ACT (ADA) GUIDELINES. SEE LATEST MASSDOT CONSTRUCTION STANDARDS.
25. IN ALL LOCATIONS WHERE PROPOSED SIDEWALK TRANSITIONS TO MEET EXISTING GRADE, SIDEWALK OR PAVED AREA, SLOPE SHALL NOT EXCEED 1:12.
26. AN UNOBSTRUCTED PATH OF TRAVEL WITH A MINIMUM WIDTH OF 3'-0" SHALL BE MAINTAINED PAST ALL OBSTRUCTIONS (UTILITY POLES, SIGNS, SIGNAL FOUNDATIONS AND MASTS, MAILBOXES, ALONG DRIVE OPENINGS, ETC.)
27. EXISTING CURB (GRANITE AND CONCRETE) IN GOOD CONDITION SHALL BE RESET. NEW CURB SHALL BE USED ONLY AFTER ALL EXISTING CURB HAS BEEN RESET.
28. ADA COMPLIANT ACCESS MUST BE MAINTAINED AT ALL TIMES.
29. THE CONTRACTOR SHALL COORDINATE THIS WORK WITH THAT OF ADJACENT PROJECTS UNDERWAY AT THE SAME TIME.

RESTORATION NOTES:

1. DECOMPACT (SCARIFY) AREAS OF COMPACTED SOIL, RESTORE WITH COMPOST BLANKET, CORRESPONDING SEED MIX AND JUTE MESH IF REQUIRED FOR STEEP SLOPES.
2. COMPOST BLANKET AND SEEDING SHALL OCCUR AFTER FINAL GRADING. TEMPORARY SEEDING MAY BE UTILIZED TO STABILIZE EXPOSED SURFACES IF STABILIZATION WILL NOT OCCUR WITHIN 14 DAYS OF THE DISTURBANCE.
3. SEEDING WITH COMPOST BLANKET SHALL BE PER THE SPECIAL PROVISIONS.
4. SEED RATES SHALL BE INCREASED AS SPECIFIED FOR SLOPE CONDITIONS.

EROSION AND SEDIMENT CONTROL NOTES:

1. COMPOST FILTER TUBES (OR SIMILAR BARRIER APPROVED BY THE ENGINEER) SHOWN ON LANDSCAPE PLAN SHALL BE LEFT TO DEGRADE OVER TIME AND THEREFORE MUST BE COMPRISED OF 100% BIODEGRADABLE MATERIALS- BURLAP, COTTON, HEMP, ETC.
2. USE SHALL BE IF AND WHERE NEEDED AND AS APPROVED BY THE ENGINEER. PLACEMENT SHALL BE WHERE MOST EFFECTIVE TO REDUCE POTENTIAL EROSION OF SLOPES UNTIL AT LEAST 75% VEGETATIVE COVER ESTABLISHES.
3. THE EROSION AND SEDIMENTATION CONTROLS SHOWN ON THE PLANS ARE INTENDED TO REPRESENT THE MINIMUM CONTROLS NECESSARY TO MEET ANTICIPATED SITE CONDITIONS. ADDITIONAL MEASURES SHALL BE IMPLEMENTED AS CONDITIONS WARRANT OR AS DIRECTED BY THE ENGINEER.
4. THE CONTRACTOR SHALL MAINTAIN EROSION CONTROLS THROUGHOUT CONSTRUCTION. THE CONTRACTOR SHALL REPLACE DAMAGED EROSION CONTROLS AT THE OWNER AND ENGINEER'S REQUEST AT NO ADDITIONAL EXPENSE TO THE OWNER.
5. THE CONTRACTOR SHALL NOT LEAVE DISTURBED AREAS UNSTABILIZED FOR PERIODS MORE THAN 14 DAYS. PROVIDE TEMPORARY SEED OR MULCH ON DISTURBED AREAS THAT WILL REMAIN EXPOSED FOR GREATER THAN 14 DAYS.

Proposal No. 606352-136278

A00831 - 12

606352_HDICONSTRUCTION 1).DWG Plotted on 19-Mar-2025 10:35 AM

WAREHAM
US 6 WB & ST 28 NB

CONSTRUCTION PLAN NO. 1

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	38
PROJECT FILE NO. 606352			

DRAINAGE DETAILS — SEE SHEETS 11 AND 12

WATER SUPPLY ALTERATIONS — SEE SHEETS 11 AND 12

TRAFFIC SIGNAL CONDUIT — NONE

HIGHWAY GUARD DETAILS

TRAILING ANCHORAGE
STA 14+24.98 LT TO STA 14+33.98 LT
STA 16+43.85 LT TO STA 16+53.17 LT
STA 16+44.03 RT TO STA 16+53.40
STA 16+51.17 LT TO STA 16+60.54 LT

GUARDRAIL, TL-2 (SINGLE FACED)
STA 14+33.98 LT TO STA 14+63.96 LT
STA 15+88.38 LT TO STA 16+43.85 LT
STA 15+88.38 RT TO STA 16+44.03 RT

TRANSITION TO BRIDGE RAIL
STA 14+43.96 LT TO STA 14+96.71 LT
STA 15+54.57 LT TO STA 15+88.38 LT
STA 15+54.57 RT TO STA 15+88.38 RT

GUARDRAIL TANGENT END TREATMENT, TL-2
STA 17+46.78 LT TO STA 17+59.27 LT

AGAWAM MILL POND

MAP 129 LOT 1161
AGAWAM MILL POND
OWNER UNKNOWN

PROP PERMANENT EASEMENT

LIMIT OF DISTURBANCE (TYP)

COFFERDAM

PROP PERMANENT EASEMENT

PROP STEEL W-BEAM
TRAILING ANCHORAGE (TYP)

#284B CRANBERRY HWY
WAREHAM LAND TRUST, IN
BOOK 37870 PAGE 247

DEMOLISH EX CULVERT
CONSTRUCT PROP BRIDGE W-06-020 (CCV) & SPILLWAY (SEE BRIDGE PLANS FOR DETAILS)

LIMIT OF DISTURBANCE (TYP)

BEGIN PVMT MILLINGS

PROP GRAN CURB TRANSITION 8" TO 6" REVEAL
6'-3" LONG (TYP)

RECONSTRUCT FISHWAY WALLS AND CHANNEL BOTTOM

PROP GUARDRAIL FLARED END TREATMENT

PROP STEEL W-BEAM GUARDRAIL TL-2 (TYP)

RECONSTRUCT FISHWAY CHANNEL AND REPAIR FISHWAY ROOF

RBR BOUND

PROP HMA SW
5.5' WIDTH

PROP GRAN CURB TYPE VA5

8" REVEAL / 16'-10" LONG (TYP)

COFFERDAM

END RBD SW

PROP HMA SW
5.5' WIDTH

PROP HMA DWY 1-2

PROP SAWCUT

PROP TEMP EASEMENT

PROP PCR 1-3 WITH DETECTABLE WARNING PANEL

PROP LOAM & SEED

BEGIN PVMT MILLINGS

PROP HMA SW
5.5' WIDTH

PROP COMPOST FILTER TUBE (TYP)

LIMIT OF STREAMBED RESTORATION PLAN

PROP PERMANENT EASEMENT

PROP BRIDGE TO HWY GUARD TRANS (TYP)

BEGIN PVMT MILLINGS

RBD EX GUARDRAIL AND POSTS

PROP GUARDRAIL TANGENT END TREATMENT, TL-2 (TYP)

RBD MHB
PROP GRAN MHB

PROP SHED

END PVMT MILLINGS

PROP HMA SW
5.5' WIDTH

ALT NO. 8953
END PROP S.H.L.O.

CONST ℄

PRC +93.02
OFFSET: 0.00

+81.39
OFFSET: 0.00

B-2
B-OFFSET: 0.00

B-4

B-3

B-1

B-5

B-6

B-7

B-8

B-9

B-10

B-11

B-12

B-13

B-14

B-15

B-16

B-17

B-18

B-19

B-20

B-21

B-22

B-23

B-24

B-25

B-26

B-27

B-28

B-29

B-30

B-31

B-32

B-33

B-34

B-35

B-36

B-37

B-38

B-39

B-40

B-41

B-42

B-43

B-44

HIGHWAY GUARD DETAILS — SEE SHEET 5

TRAFFIC SIGNAL CONDUIT — NONE

WATER SUPPLY ALTERATIONS — SEE SHEETS 11 AND 12

DRAINAGE DETAILS — SEE SHEETS 11 AND 12

RECONSTRUCTION AND OVERLAY

STA 17+25

NAD 83

CONTINUED ON SHEET NO. 5

ELM ST
PRIVATE WAY
(ASSUMED 33' WIDE)
(F.K.A. ELM STREET)
UNKNOWN OWNER

OLD GLEN CHARLIE RD
(PUBLIC – 1953 TOWN LAYOUT)

(RTE 6 & 28)
CRANBERRY HWY WESTBOUND
(1925 STATE HWY ALTERATION LAYOUT NO. 2313)

EX HUMP SHOULD BE LEVELED BY MILLING TO ALLOW FOR POSITIVE DRAINAGE

LIMIT OF DISTURBANCE (TYP)

PROJECT END
STA 21+53
N2739349.7361
E881496.3048

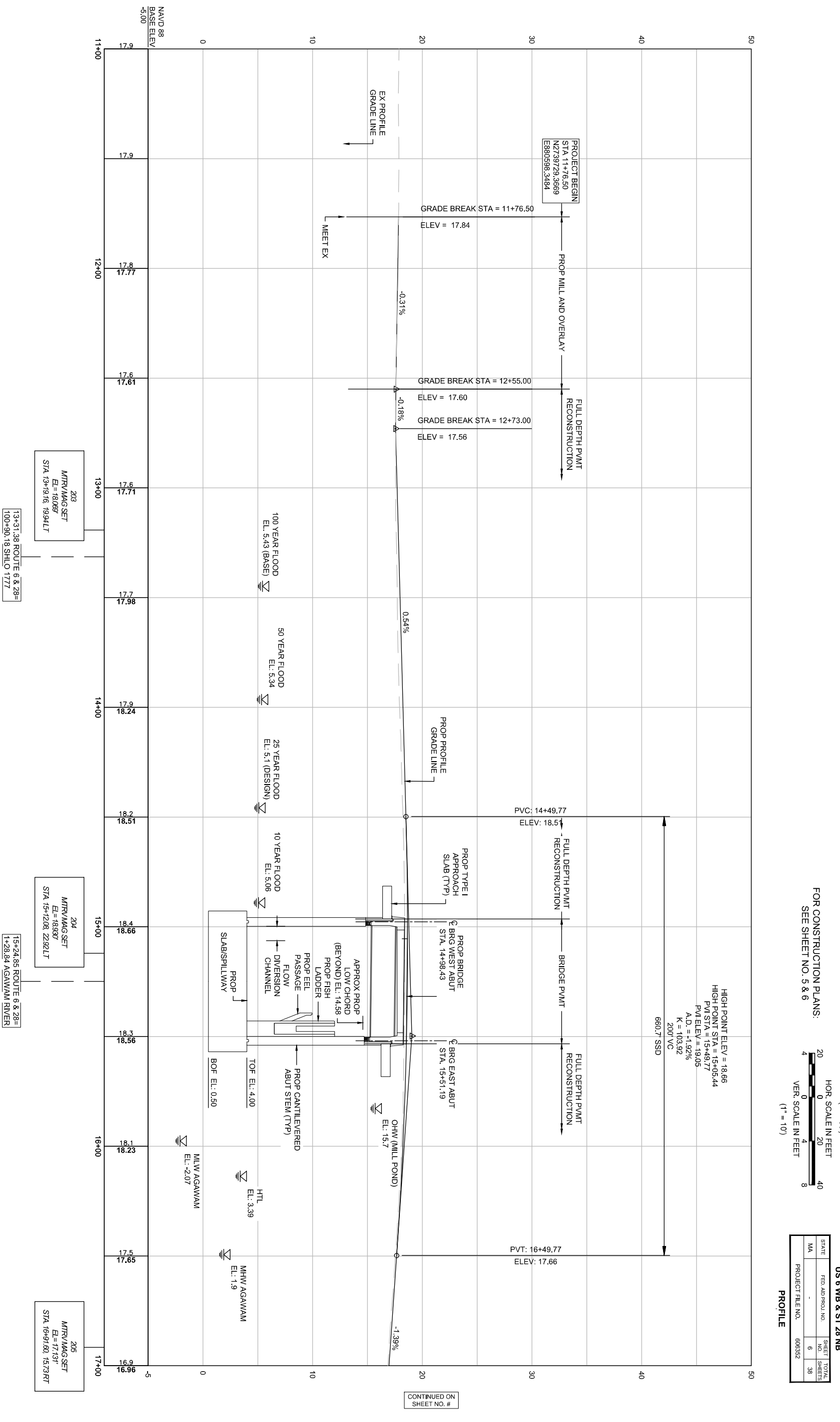
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	38
PROJECT FILE NO.	606352		

WAREHAM
US 6 WB & ST 28 NB
CONSTRUCTION PLAN NO. 2

FOR PROFILE: SEE SHEET NO. 8

SCALE: 1" = 20' (1" = 50')

606352_HD(CONSTRUCTION 2).DWG Plotted on 19-Mar-2025 10:35 AM



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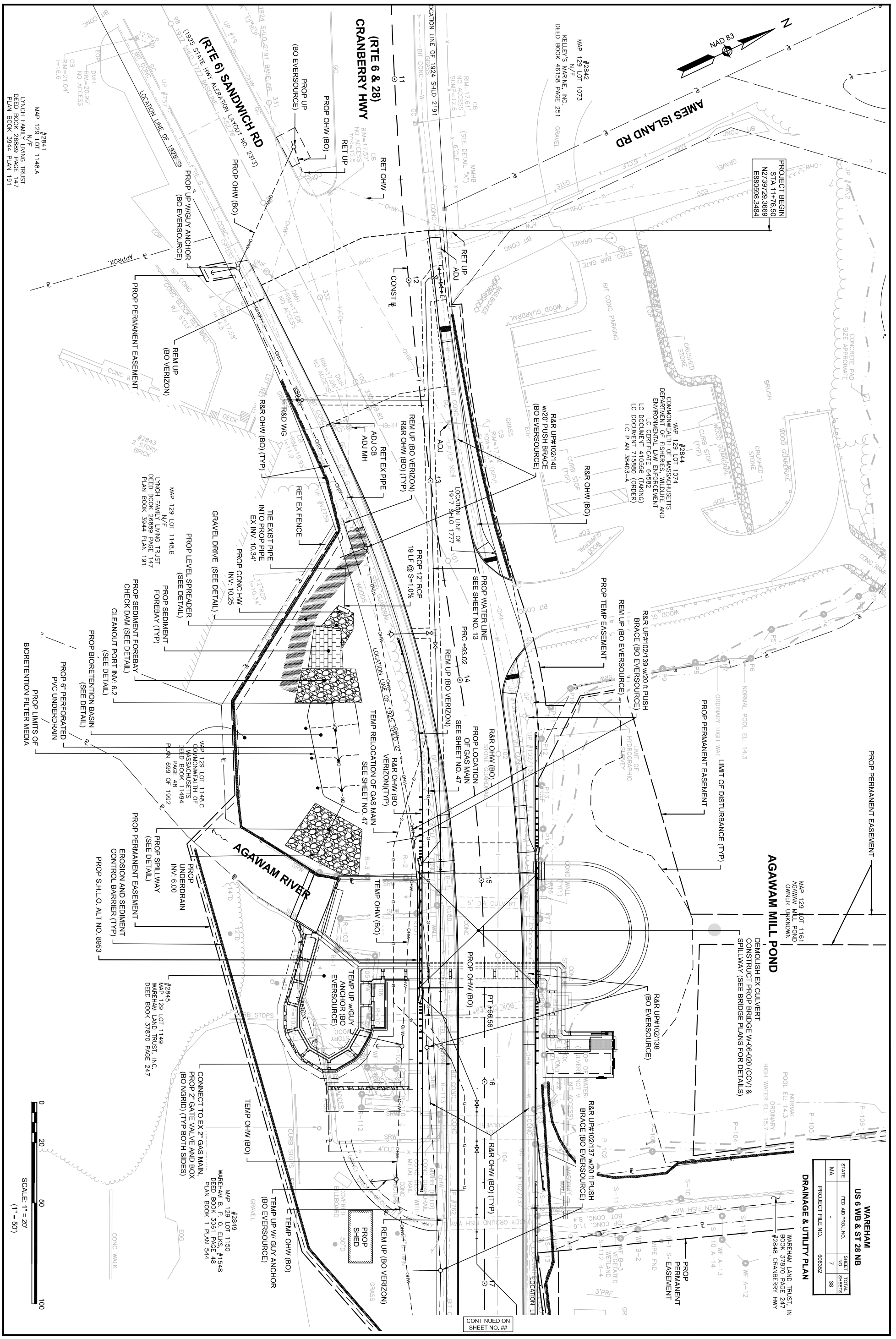

WAREHAM
US 6 WB & ST 28 NB
DRAINAGE & UTILITY PLAN
STATE: MA
FED. AID PROJ. NO.: -
SHEET NO.: 7
TOTAL SHEETS: 38
PROJECT FILE NO.: 606352
AGAWAM MILL POND
DEMOLISH EX CULVERT
CONSTRUCT PROP BRIDGE W-06-020 (CCV) & SPILLWAY (SEE BRIDGE PLANS FOR DETAILS)
(RTE 6) SANDWICH RD
(1925 STATE HWY ALFERATION LAYOUT NO. 2313)
(RTE 6 & 28) CRANBERRY HWY
AMES ISLAND RD
PROJECT BEGIN
STA 11+76.50
N2739729.3669
E880598.3484
NAD 83
AGAWAM RIVER
LOCATION LINE OF 1924 SHLO 2191
LOCATION LINE OF 1925 SHLO 2313
LOCATION LINE OF 1917 SHLO 1777
PROP PERMANENT EASEMENT
LIMIT OF DISTURBANCE (TYP)
PROP TEMP EASEMENT
REM UP (BO EVERSOURCE)
R&R UP#102/139 w/20 ft PUSH BRACE (BO EVERSOURCE)
R&R UP#102/138 (BO EVERSOURCE)
R&R UP#102/137 w/20 ft PUSH BRACE (BO EVERSOURCE)
R&R UP#102/140 w/20' PUSH BRACE (BO EVERSOURCE)
PROP WATER LINE SEE SHEET NO. 13
PROP LOCATION OF GAS MAIN SEE SHEET NO. 47
TEMP RELOCATION OF GAS MAIN SEE SHEET NO. 47
PROP 12" RCP 19 LF @ S=1.0%
PROP OHW (BO)
PROP UP (BO EVERSOURCE)
RET UP
RET OHW
RET UP ADJ
CONST ℄
ADJ
REM UP (BO VERIZON)
R&R OHW (BO)
R&R OHW (BO) (TYP)
R&R OHW (BO VERIZON)(TYP)
REM UP (BO VERIZON) R&R OHW (BO) (TYP)
PROP UP W/GUY ANCHOR (BO EVERSOURCE)
TEMP UP w/GUY ANCHOR (BO EVERSOURCE)
TEMP UP W/ GUY ANCHOR (BO EVERSOURCE)
TEMP OHW (BO)
PROP OHW (BO)
R&D WG
ADJ CB
ADJ MH
RET EX PIPE
RET EX FENCE
TIE EXIST PIPE INTO PROP PIPE EX INV: 10.34'
PROP CONC HW INV: 10.25
GRAVEL DRIVE (SEE DETAIL)
PROP LEVEL SPREADER (SEE DETAIL)
PROP SEDIMENT FOREBAY (TYP)
PROP SEDIMENT FOREBAY CHECK DAM (SEE DETAIL)
CLEANOUT PORT INV: 6.2 (SEE DETAIL)
PROP BIORETENTION BASIN (SEE DETAIL)
PROP 6" PERFORATED PVC UNDERDRAIN
PROP LIMITS OF BIORETENTION FILTER MEDIA
PROP UNDERDRAIN INV: 6.00
PROP SPILLWAY (SEE DETAIL)
PROP PERMANENT EASEMENT
EROSION AND SEDIMENT CONTROL BARRIER (TYP)
PROP S.H.L.O. ALT NO. 8953 - 1
PROP SHED
PROP PERMANENT EASEMENT
CONNECT TO EX 2" GAS MAIN. PROP 2" GATE VALVE AND BOX (BO NGRID) (TYP BOTH SIDES)
PROP OHW (BO)
PROP WATER LINE SEE SHEET NO. 13
PROP LOCATION OF GAS MAIN SEE SHEET NO. 47
R&R OHW (BO) (TYP)
R&R OHW (BO VERIZON)(TYP)
TEMP OHW (BO)
REM UP (BO VERIZON)
TEMP UP W/ GUY ANCHOR (BO EVERSOURCE)
TEMP RELOCATION OF GAS MAIN SEE SHEET NO. 47
PROP PERMANENT EASEMENT
PROP PERMANENT EASEMENT
PROP PERMANENT EASEMENT

Proposal No. 606352-136278

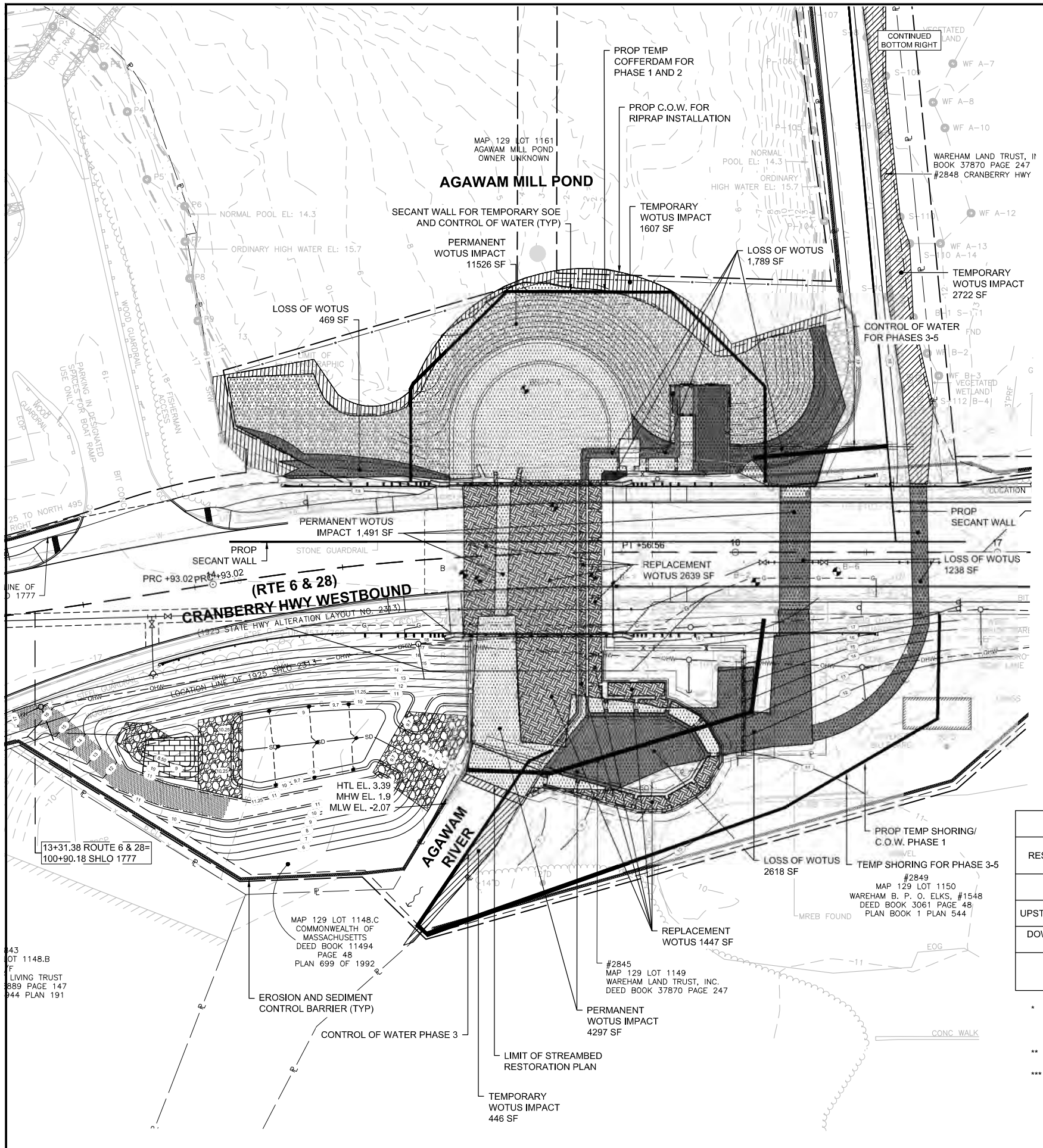
A00831 - 16

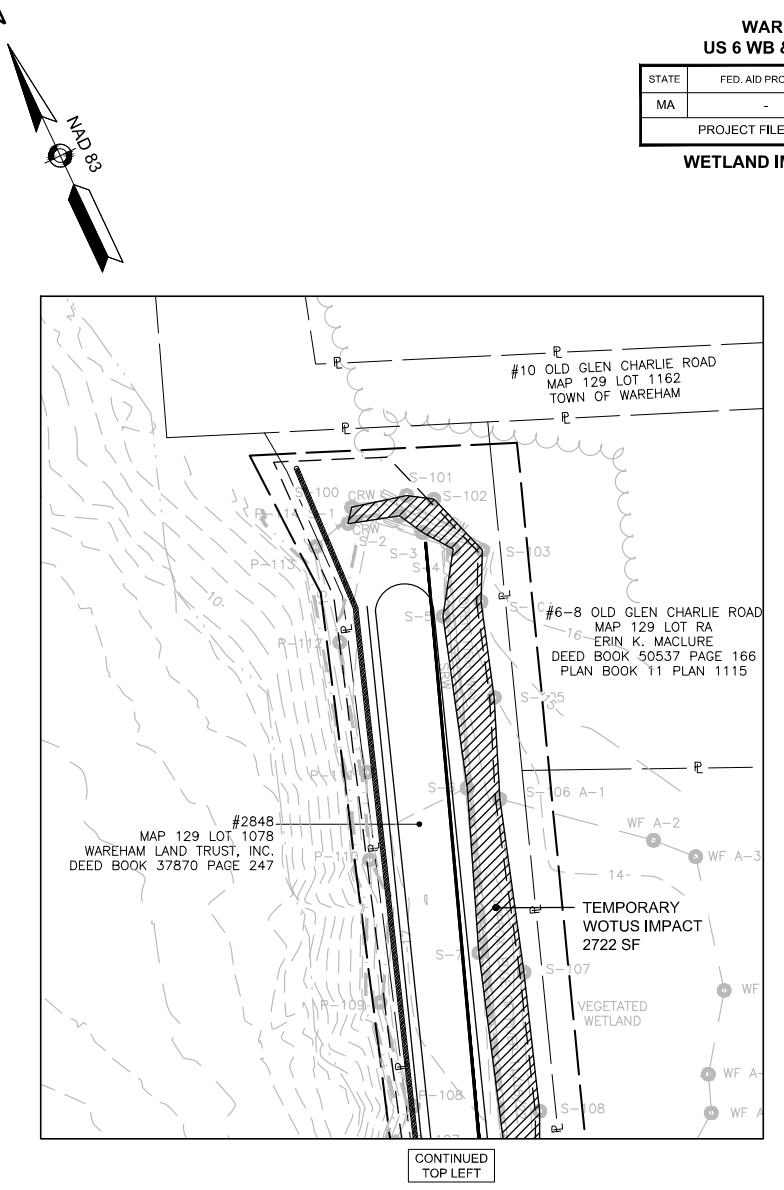
606352_HD(WETLAND IMPACT).DWG Plotted on 19-Mar-2025 10:36 AM

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	8	38
PROJECT FILE NO.	606352		

WETLAND IMPACT PLAN





WATERS OF THE UNITED STATES (WOTUS) IMPACT SUMMARY TABLE

RESOURCE AREA	TEMPORARY IMPACTS (S.F.)	PERMANENT IMPACTS* (S.F.)	IMPACT TOTALS (S.F.)	LOSS OF WOTUS*** (S.F.)	REPLACEMENT WOTUS* (S.F.)	TOTAL (S.F.)
UPSTREAM OF DAM**	4,328	13,017	17,345	3,496	2,639	857
DOWNSTREAM OF DAM	446	4,297	4,743	2,618	1,447	1,172
		TOTAL IMPACTS TO WOTUS (S.F.)	22,088		TOTAL LOSS OF WOTUS (S.F.)	2,029

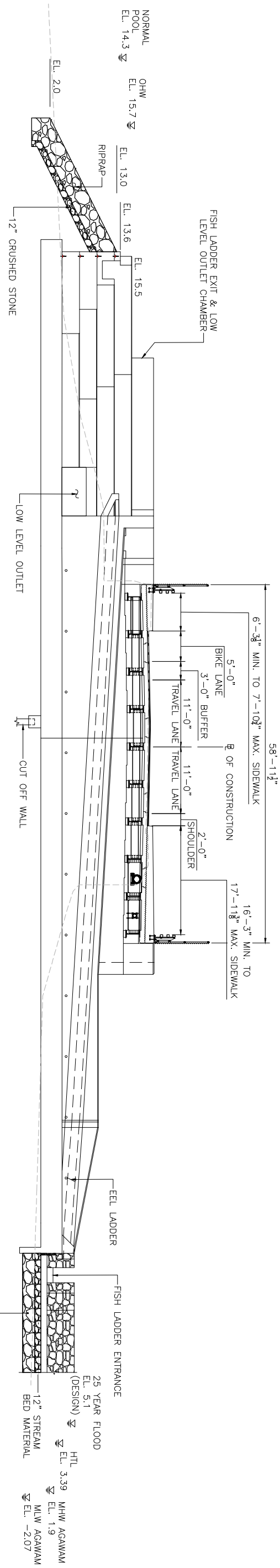
* THE PROPOSED FOOTPRINT OF DREDGED AND FILL IS THE SAME AREA AS PERMANENT IMPACTS TO WOTUS IN MILL POND. IN THE AGAWAM RIVER THE PROPOSED FOOTPRINT OF FILL IS THE SAME AREA AS PERMANENT IMPACTS, HOWEVER NOT ALL AREAS REQUIRE DREDGE (DREDGE AREA WITHIN THE AGAWAM RIVER = 2,413 S.F.).

** QUANTITIES INCLUDE CULVERTS.

*** LOSS OF WOTUS IS THE AREA IN WHICH EXISTING WOTUS IS PROPOSED TO BE CHANGED TO UPLAND OR A STRUCTURE IN ASSOCIATION WITH THE DAM AND BRIDGE STRUCTURES. AREAS WHERE WOTUS WILL BE PERMANENTLY IMPACTED BUT WILL REMAIN WOTUS ARE NOT INCLUDED IN THIS SUM. THE AREAS OF LOSS OF WOTUS ARE ALSO INCLUDED IN THE PERMANENT WOTUS IMPACT SUM.

0 20 50 100

SCALE: 1" = 20'
(1" = 50')



PROPOSED SPILLWAY SECTION

SCALE: 1/8" = 1'-0"
(1/8" = 2'-6")

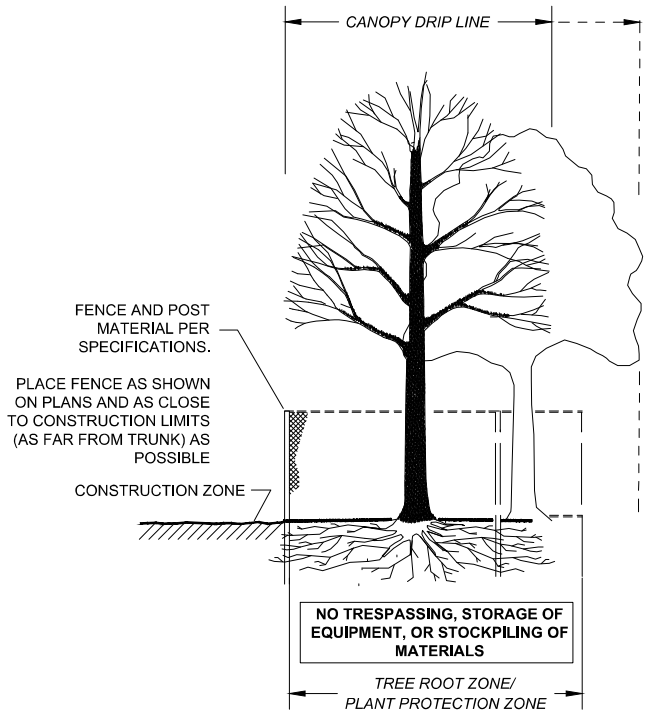
WAREHAM
US 6 WB & ST 28 NB
SPILLWAY SECTION

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	9	38
PROJECT FILE NO.	606352		

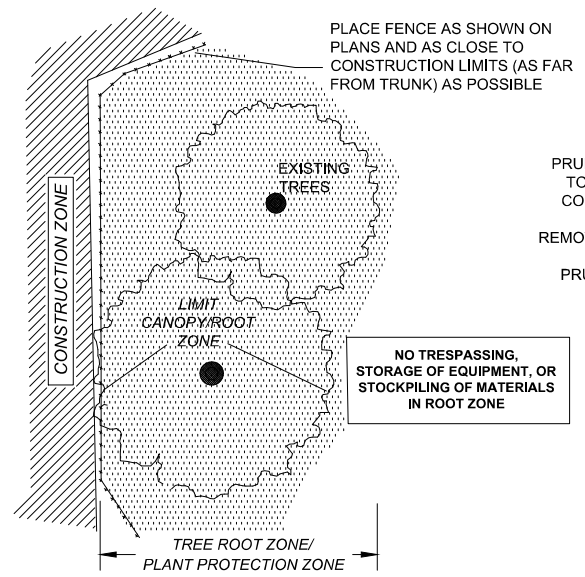
606352_BR-SPILLWAY SECTION(W06020).DWG Plotted on 19-Mar-2025 10:36 AM

Plotted on 19-Mar-2025 10:36 AM
606352_HD\DETAILS\DWG

Proposal No. 606352-136278



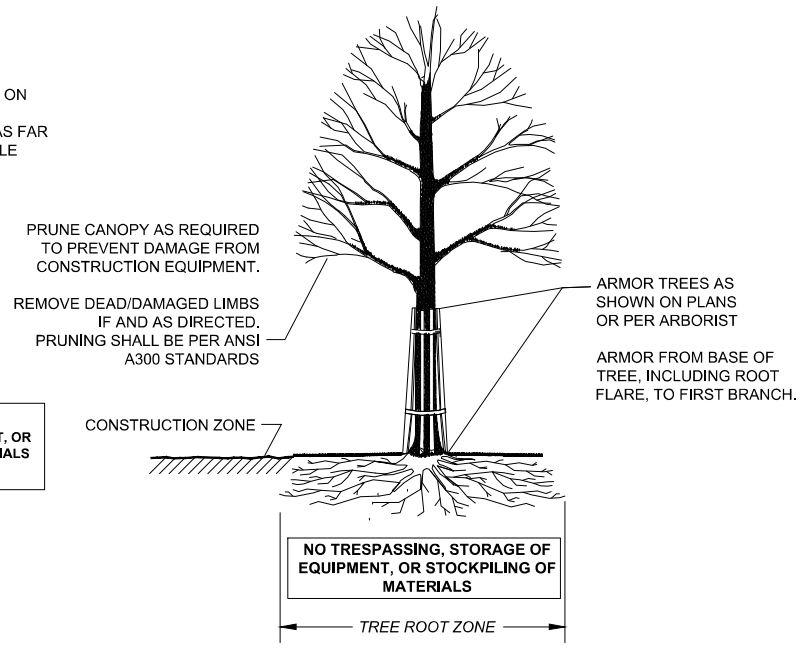
SECTION - FENCE PROTECTION OF ROOT ZONE



PLAN VIEW - FENCE PROTECTION OF ROOT ZONE

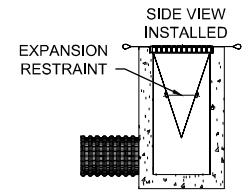
TREE PROTECTION - ROOT ZONE

NOT TO SCALE

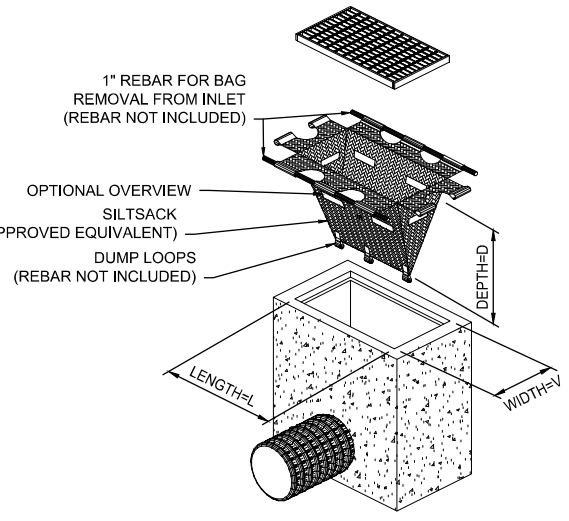


SECTION - TRUNK ARMORING & PRUNING

TREE PROTECTION - TRUNK

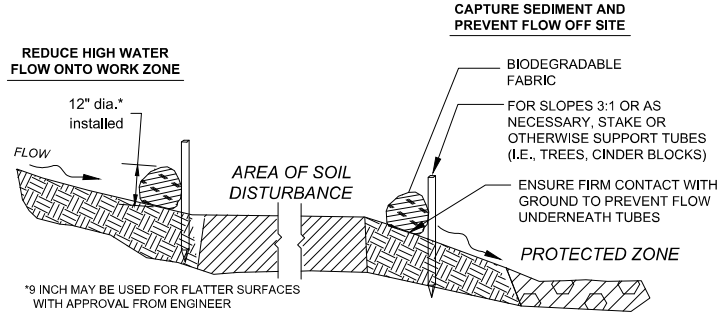


INSTALLATION DETAIL



TEMPORARY INLET PROTECTION

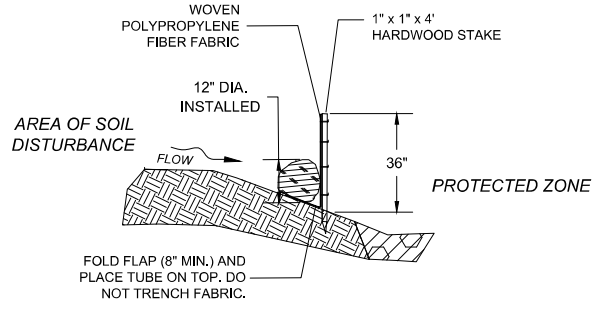
NOT TO SCALE



SECTION

SEDIMENT BARRIER - COMPOST FILTER TUBES

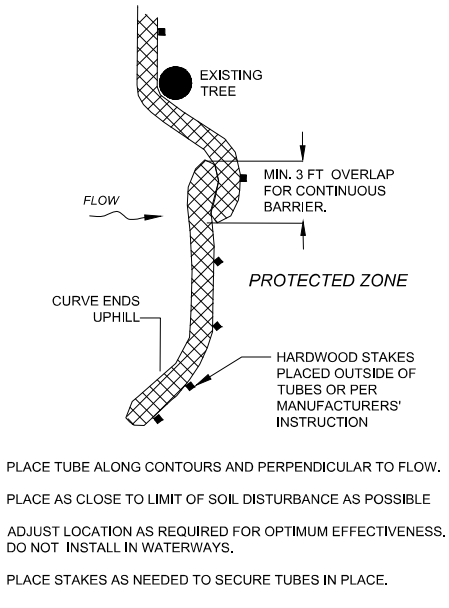
NOT TO SCALE



SECTION

COMPOST FILTER TUBE & SILT FENCE

NOT TO SCALE



PLACE TUBE ALONG CONTOURS AND PERPENDICULAR TO FLOW.

PLACE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE

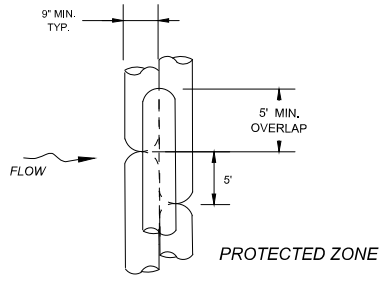
ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLACE STAKES AS NEEDED TO SECURE TUBES IN PLACE.

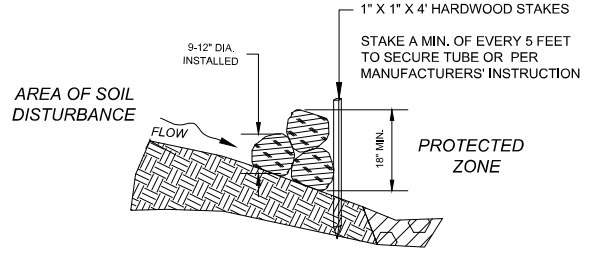
PLAN VIEW

COMPOST FILTER TUBE

NOT TO SCALE



PLAN VIEW

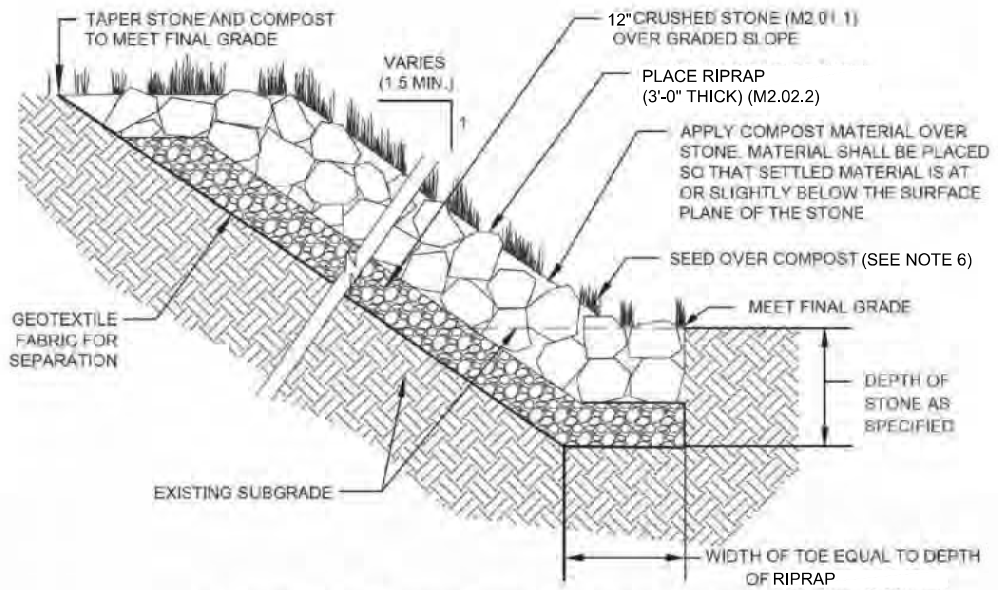


SECTION

COMPOST FILTER TUBE BERM (SLOPES 2:1 OR STEEPER)

NOT TO SCALE

Proposal No. 606352-136278

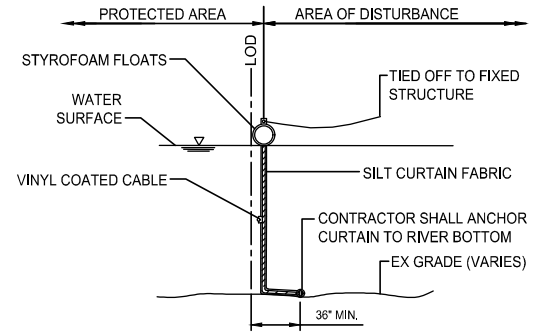


COMPOST AND SEED OVER RIPRAP

SCALE: N.T.S.

NOTES:

1. THE EROSION AND SEDIMENTATION CONTROLS SHOWN ON THE PLANS ARE INTENDED TO REPRESENT THE MINIMUM CONTROLS NECESSARY TO MEET ANTICIPATED SITE CONDITIONS. ADDITIONAL MEASURES SHALL BE IMPLEMENTED AS CONDITIONS WARRANT OR AS DIRECTED BY THE OWNER OR OWNER'S REPRESENTATIVE.
2. THE CONTRACTOR SHALL MAINTAIN EROSION CONTROLS THROUGHOUT CONSTRUCTION. THE CONTRACTOR SHALL REPLACE DAMAGED EROSION CONTROLS AT THE OWNER AND ENGINEER'S REQUEST AT NO ADDITIONAL EXPENSE TO THE OWNER.
3. THE CONTRACTOR SHALL NOT LEAVE DISTURBED AREAS UNSTABILIZED FOR PERIODS MORE THAN 14 DAYS. PROVIDE TEMPORARY SEED OR MULCH ON DISTURBED AREAS THAT WILL REMAIN EXPOSED FOR GREATER THAN 14 DAYS.
4. REMOVE AND STOCKPILE LOAM WITHIN LIMITS OF CONSTRUCTION. EXISTING LOAM REQUIRES AMENDMENT PRIOR TO PLACEMENT. CONTRACTOR MAY ONLY EXPORT EXCESS LOAM NOT REQUIRED TO COMPLETE THE PROJECT.
5. TURBIDITY BARRIER TO REMAIN IN PLACE DURING ACTIVITIES CAUSING TURBID CONDITIONS. TURBIDITY BARRIER MAY BE REMOVED FROM OUTSIDE THE COFFERDAM ONLY AFTER ALL ACTIVITIES CAUSING DISTURBANCE TO SEDIMENT HAVE CEASED AND SUSPENDED PARTICLES HAVE SETTLED
6. SEED OVER COMPOST VARIES. REFER TO LANDSCAPE DRAWINGS FOR APPROPRIATE SEED MIX TYPE PER LOCATION.



NOTES:

1. TURBIDITY BARRIER TO REMAIN IN PLACE DURING ACTIVITIES CAUSING TURBID CONDITIONS. TURBIDITY BARRIER MAY BE REMOVED FROM OUTSIDE THE COFFERDAM ONLY AFTER ACTIVITIES CAUSING DISTURBANCE TO SEDIMENT HAVE CEASED AND SUSPENDED PARTICLES HAVE SETTLED.
2. REQUIRED DEPTH OF CURTAIN MAY VARY

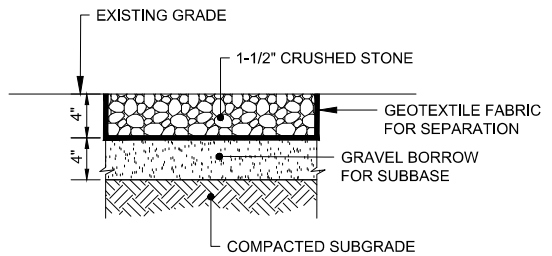
TYPICAL TURBIDITY BARRIER

NOT TO SCALE

WAREHAM
US 6 WB & ST 28 NB

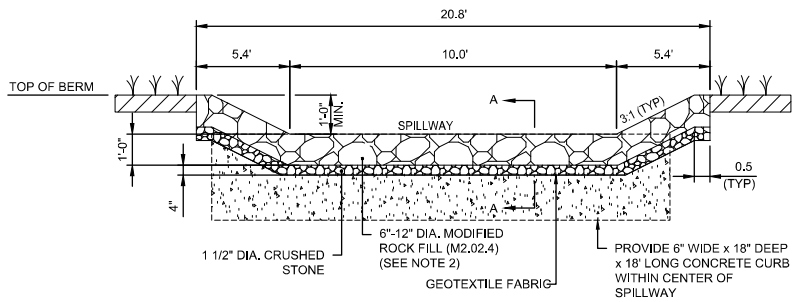
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	38
PROJECT FILE NO.	606352		

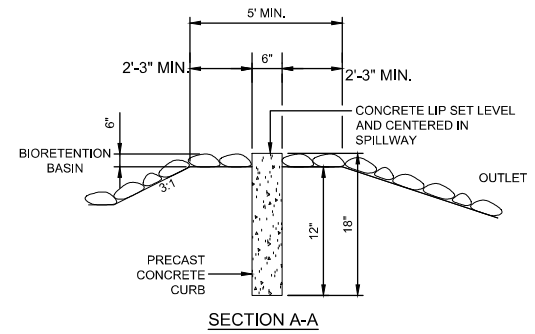
CONSTRUCTION DETAILS NO. 2



GRAVEL DRIVE DETAIL

NOT TO SCALE





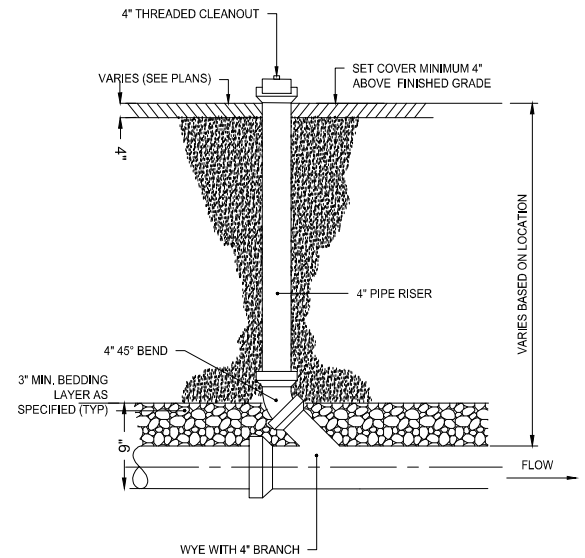
SECTION A-A

NOTES:

1. CONTRACTOR SHALL FILL VOIDS BETWEEN CURB SECTIONS WITH MORTAR.
2. SEED OVER COMPOST SHALL BE PER THE LANDSCAPE DRAWINGS.

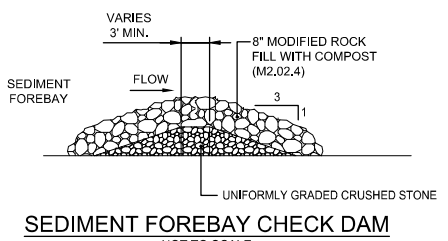
SPILLWAY DETAIL

NOT TO SCALE



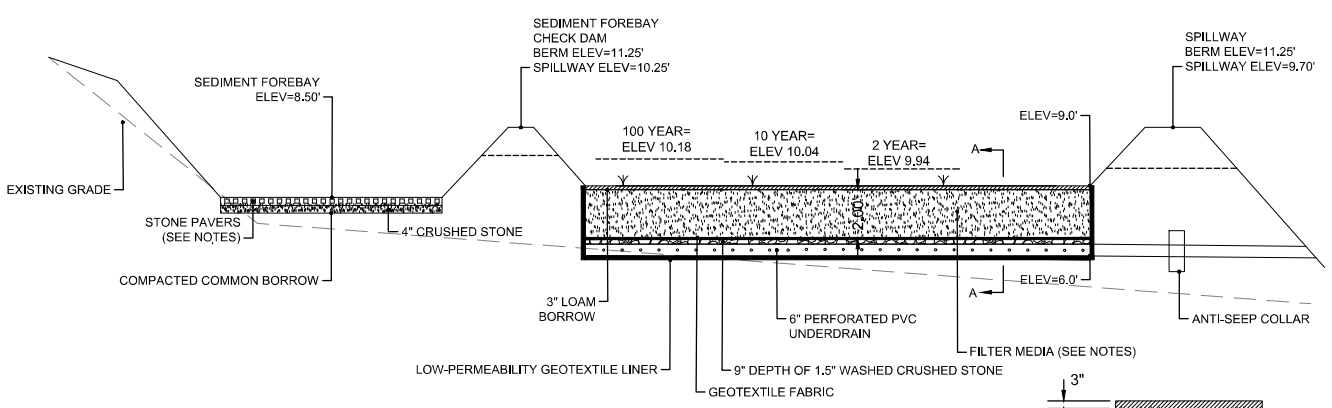
CLEANOUT DETAIL

NOT TO SCALE



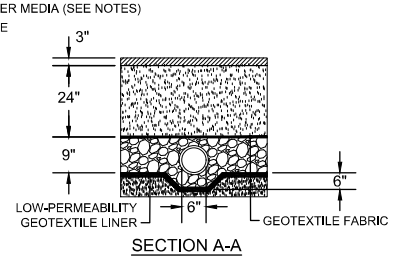
SEDIMENT FOREBAY CHECK DAM

NOT TO SCALE



BIORETENTION BASIN DETAIL

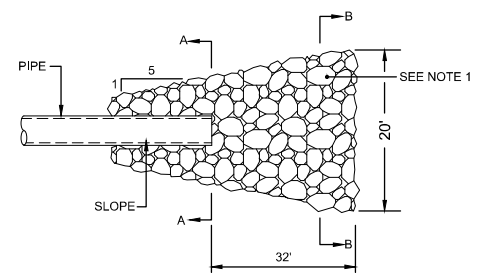
NOT TO SCALE



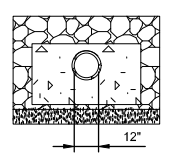
SECTION A-A

NOTES:

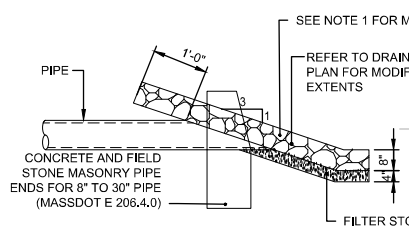
1. INDIVIDUAL PAVERS SHOULD HAVE A MINIMUM DEPTH OF 4 INCHES AND SHOULD BE PLACED WITH A 2-INCH SPACING ON ALL SIDES.
2. IF STONE PAVERS ARE NOT AVAILABLE, OTHER RIGID MATERIALS SUCH AS CONCRETE PAVERS MAY BE USED AS DIRECTED BY THE ENGINEER.
3. BIORETENTION SOIL MEDIA SHALL BE UNIFORM, FREE OF STONES, STUMPS, ROOTS, OR SIMILAR MATERIALS LARGER THAN 0.187 INCHES. NO COMPOST SHALL BE USED IN THE PLANTING MIX UNLESS SPECIFIED BY THE ENGINEER.
4. BIORETENTION SOIL MEDIA SHALL CONSIST 3 TO 10% ORGANIC CONTENT BY VOLUME, HAVE A SOIL pH BETWEEN 6 AND 7, HAVE A CATION EXCHANGE CAPACITY OF MINIMUM 10 mEq/100 mL AT pH OF 7.0, AND PARTICLE DISTRIBUTION OF:
   - 4.A. 5% MAXIMUM VERY COARSE SAND/GRAVEL
   - 4.B. 80-90% SAND
   - 4.C. 15% MAXIMUM SILT
   - 4.D. 5% MAXIMUM CLAY
5. SEED WITH STANDARD MASSDOT SEED MIXES FOR BASIN BOTTOM AND SIDE SLOPES IN ACCORDANCE WITH THE LANDSCAPE DRAWINGS AND SPECIAL PROVISIONS. REFER TO LANDSCAPE DRAWINGS FOR SEED TYPE AND LOCATION. REFER TO THE SPECIAL PROVISIONS FOR APPROPRIATE RATES.
6. LOW-PERMEABILITY LINER SHALL HAVE A MAXIMUM IN-SITU HYDRAULIC CONDUCTIVITY OF LESS THAN 0.03 FT/DAY.
7. TURF REINFORCEMENT JUTE MESH SHALL BE APPLIED ON ALL SLOPES 2H:1V OR STEEPER.
8. ANTI-SEEP COLLAR AND CLEANOUTS ARE CONSIDERED INCIDENTAL TO THE COST OF THE SUBDRAIN ITEM.



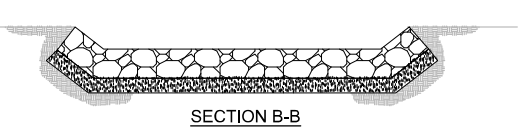
PLAN



SECTION A-A



SIDE ELEVATION



SECTION B-B

NOTE:
1. PROVIDE THE FOLLOWING MATERIALS WHERE INDICATED ON THE PLANS:
   1.1. MODIFIED ROCK FILL (M2.02.4)

LEVEL SPREADER

NOT TO SCALE

606352_HDI(DETAILS).DWG Plotted on 19-Mar-2025 10:37 AM

Proposal No. 606352-136278

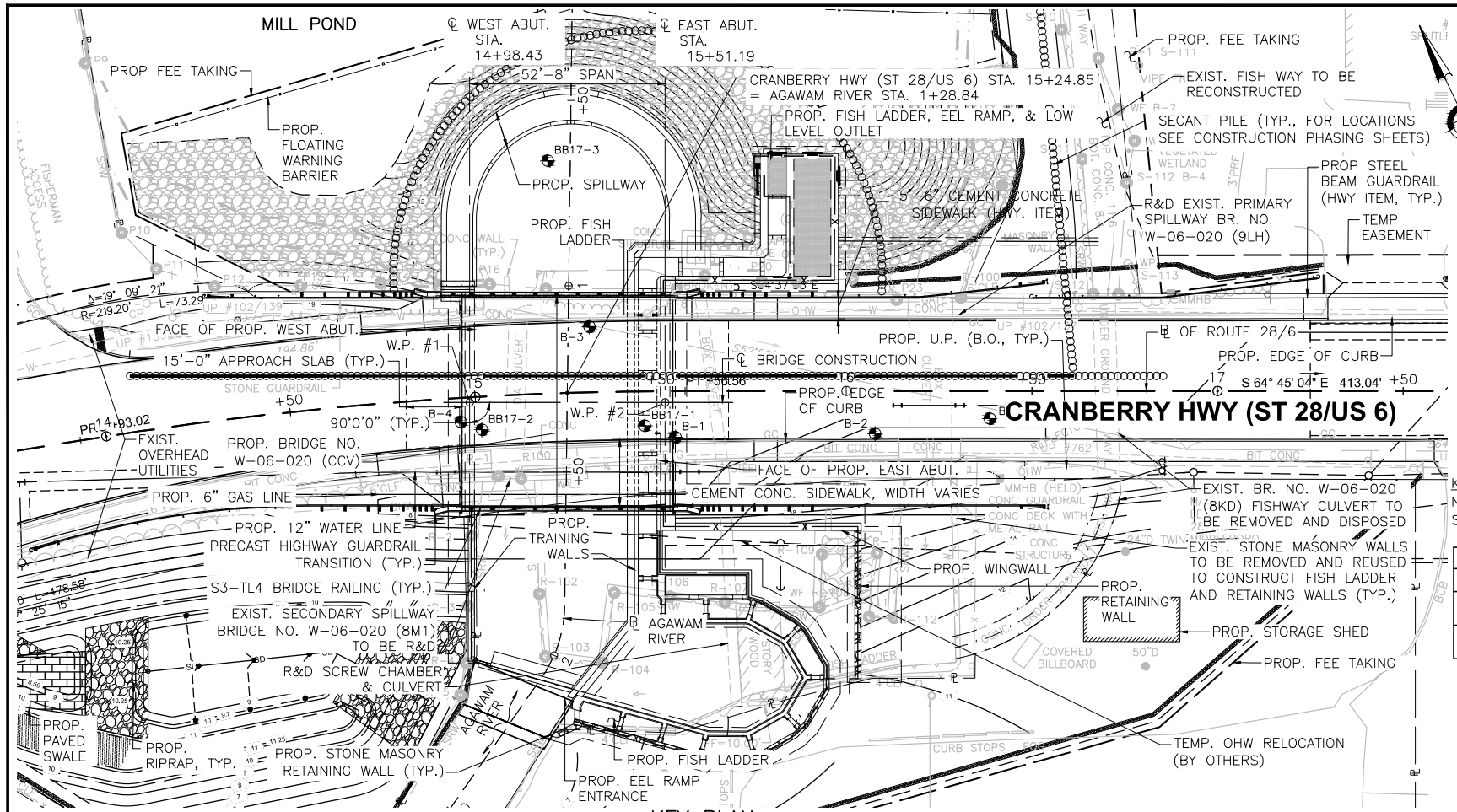
A00831 - 20

Plotted on 19-Mar-2025 10:37 AM

606352_BR1(W06020).DWG

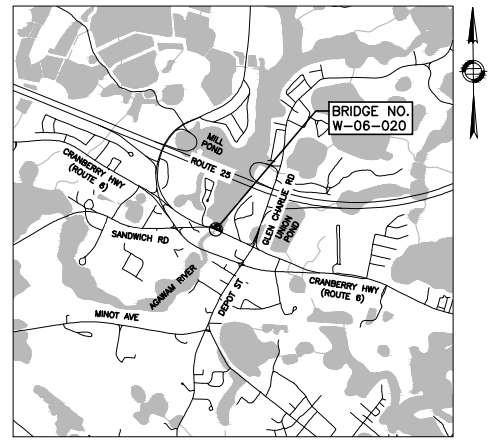
Second Structural Submittal (S2)

17-December-2024



KEY PLAN

SCALE: 1" = 20'
(1" = 50')



LOCUS

SCALE: 1"=2,000'
(1"=5,000')

KEY PLAN NOTE:
NORTH BRIDGE SIDEWALK WIDTH: 6'-3 ⅛" MIN. TO 7"-10 ¾" MAX.
SOUTH BRIDGE SIDEWALK WIDTH: 16'-3" MIN. TO 17'-11 ⅝" MAX.

CONSTRUCTION WORKING POINTS				
W.P. #	STATION	OFFSET	NORTHING	EASTING
1	14+98.43	1.38' RT	N2739626.125	E880903.067
2	15+51.19	3.05' RT	N2739603.660	E880950.702

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	12	38
PROJECT FILE NO.	606352		

KEY PLAN & INDEX

INDEX OF DRAWINGS

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02	BRIDGE NOTES
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09	BRIDGE & SPILLWAY GENERAL PLAN
10	BRIDGE & SPILLWAY ELEVATION
11	BRIDGE & SPILLWAY DEMOLITION PLAN
12–15	PHASED CONSTRUCTION SECTIONS NO. 1–4
16–24	PHASED CONSTRUCTION PLANS NO. 1–9
25–26	TEMPORARY BRIDGE DETAILS NO. 1–2
27	FOOTING GENERAL PLAN
28	WEST ABUTMENT PLAN & ELEVATION
29	EAST ABUTMENT PLAN & ELEVATION
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33	WINGWALL PLAN & ELEVATION
34	WINGWALL SECTIONS & DETAILS
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38	WILDLIFE PASSAGE PLAN
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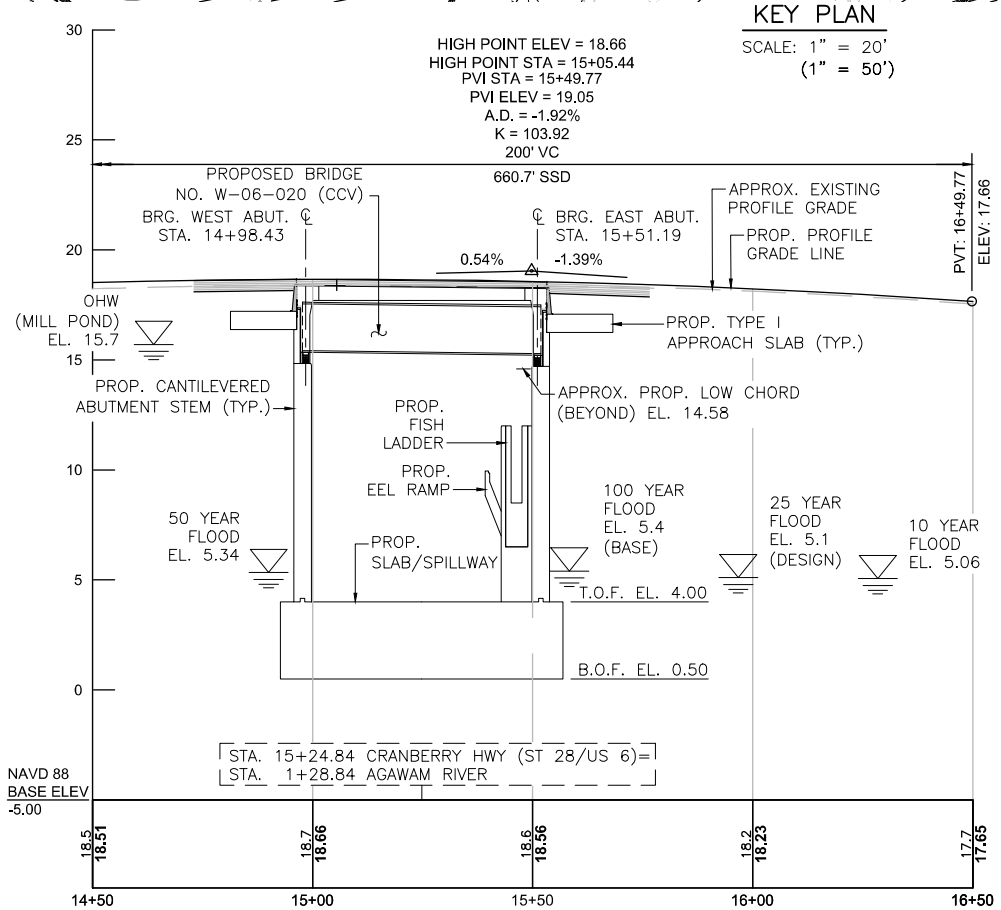
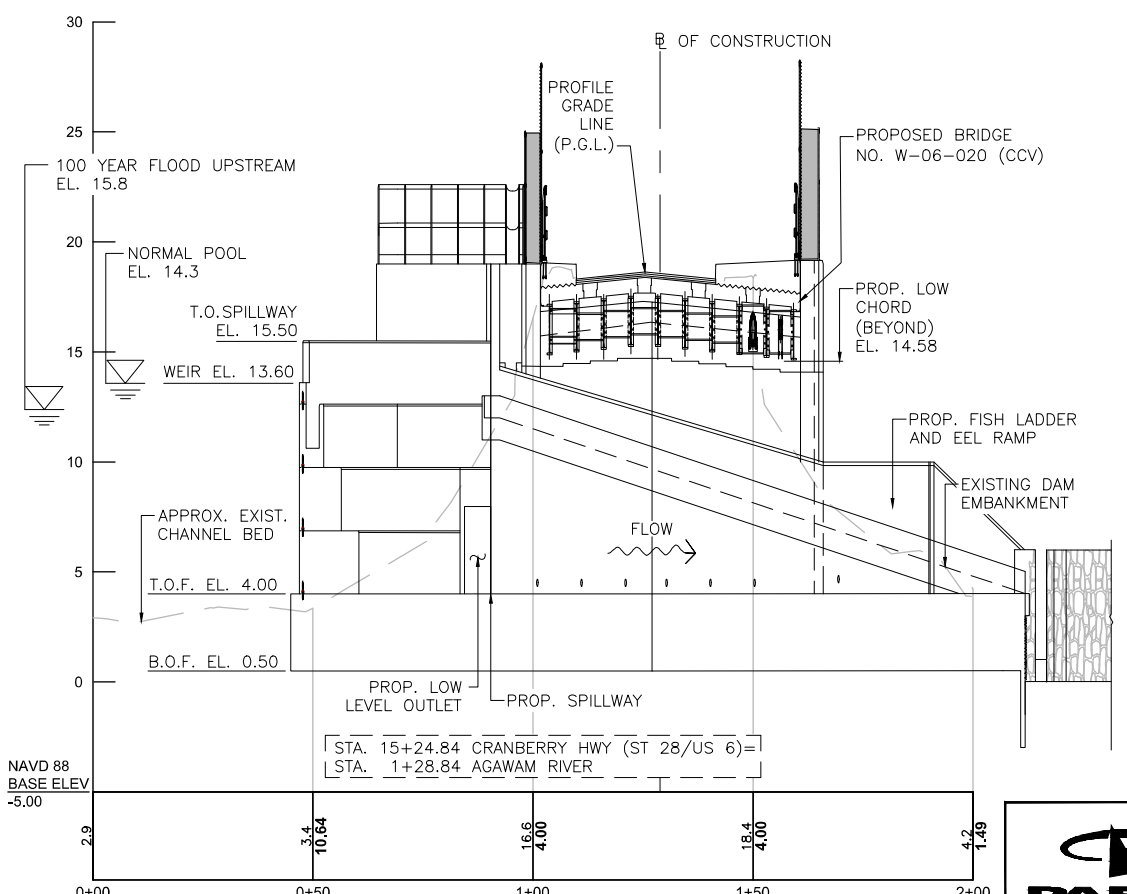
42–44	SPILLWAY SECTIONS & DETAILS NO. 1–3
45–46	LOW LEVEL OUTLET SECTIONS & DETAILS NO. 1–2
47	STORAGE SHED DETAILS
48	FRAMING PLAN & STRINGER ELEVATION
49–51	STEEL DETAILS NO. 1–3
52	BEARING DETAILS
53	TRANSVERSE SECTION
54–55	DECK SECTIONS & DETAILS NO. 1–2
56–57	GUARDRAIL TRANSITIONS NO. 1–2
58	S3-TL4 BRIDGE RAIL DETAILS
59	PROTECTIVE SCREEN TYPE I
60	TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION



PROFILE – US 6 WB & ST 28 NB

HORIZONTAL 1"=20' (1" = 50')
VERTICAL 1"=5' (1" = 12.5')



HOR. SCALE IN FEET
20 0 20 40
VER. SCALE IN FEET
4 0 4 8

PROFILE – SLAB/SPILLWAY

HORIZONTAL 1"=20' (1" = 50')
VERTICAL 1"=5' (1" = 12.5')

PARE CORPORATION
ENGINEERS · SCIENTISTS · PLANNERS
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
401-334-4100

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION

MassDOT Highway Division

BRIDGE REPLACEMENT

WAREHAM

US 6 WB & ST 28 NB
OVER AGAWAM RIVER

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

STATE BRIDGE ENGINEER

CHIEF ENGINEER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	13	38
PROJECT FILE NO.	606352		

BRIDGE NOTES

GENERAL NOTES:

DESIGN
IN ACCORDANCE WITH THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, XTH EDITION, 20XX, FOR HL–93 LOADING.

EXISTING CONDITIONS
ALL DIMENSIONS AND DETAILS SHOWN FOR THE EXISTING STRUCTURE ARE BASED ON LIMITED FIELD MEASUREMENTS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENTS AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ADEQUACY AND ACCURACY THEREOF, AND SHALL 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. EXISTING STRUCTURE IS SHOWN THUS — · — · — · — · — EXCEPT AS NOTED.

SURVEY NOTEBOOKS
ELECTRONIC SURVEY WAS USED. A COPY OF THE DATA FILE MAY BE OBTAINED FROM THE TOWN OF WAREHAM.

BENCHMARK
STATION #203: MAG. NAIL SET IN SIDEWALK, N2739701.77 E880739.15, EL. 18.07
STA. 12+90.94, OFF 105.63 LT
STATION #205: MAG. NAIL SET IN SIDEWALK, N2739532.32 E881072.28, EL. 17.13
STA. 16+91.60, OFF 15.73 RT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

DATE
DATE TO BE PLACED ON THE INSIDE FACE OF THE NORTHEAST AND SOUTHWEST HIGHWAY GUARDRAIL TRANSITIONS. A SHEET SHOWING THE SIZE AND CHARACTER OF NUMERALS WILL BE FURNISHED. THE DATE USED SHALL BE THE LATEST YEAR OF CONTRACT COMPLETION AS OF THE DATE THE FIRST HIGHWAY GUARDRAIL TRANSITION IS CONSTRUCTED. BOTH HIGHWAY GUARDRAIL TRANSITIONS SHALL FEATURE THE SAME DATE.

FOUNDATIONS
FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER. THE GEOTECHNICAL REPORT, REVISED DECEMBER 2022, IS AVAILABLE UPON REQUEST.

UNSUITABLE MATERIAL
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 M 31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS	#7 BARS	#8 BARS
1. NONE	19"	24"	29"	33"	38"
2. 12" OF CONCRETE BELOW BAR	25"	31"	37"	43"	49"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	43"	50"	57"
4. COATED BARS, ALL OTHER CASES	30"	37"	48"	56"	64"
5. CONDITION 2. AND 3.	30"	37"	48"	56"	64"
6. CONDITION 2. AND 4.	30"	37"	48"	56"	64"

ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

ALL REINFORCING STEEL SHALL BE EPOXY COATED.

LAP LENGTHS ABOVE ARE BASED ON 4000 PSI CONCRETE STRENGTH.

UTILITIES
THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

MEMBRANE WATERPROOFING
ALL MEMBRANE WATERPROOFING USED ON BRIDGE DECKS SHALL BE MEMBRANE WATERPROOFING FOR BRIDGE DECKS – SPRAY APPLIED.

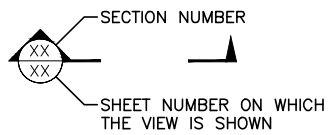
CONCRETE MIXES
ALL CONCRETE SHALL BE 5000 PSI CONCRETE, EXCEPT AS NOTED BELOW:

SIDEWALKS AND GUARDRAIL TRANSITIONS SHALL BE 5000 HP PSI HP CONCRETE

STRUCTURAL STEEL
ALL STRUCTURAL STEEL SHALL BE AASHTO M270 GRADE 50 UNLESS OTHERWISE NOTED HEREIN. UNLESS OTHERWISE NOTED, ALL STRUCTURAL STEEL SHALL BE GALVANIZED. THE STRUCTURAL STEEL FOR THE TEMPORARY BRIDGE SHALL BE UNCOATED.

SCALES
SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS.
DIVIDE SCALES BY 2 FOR HALF SIZE PRINTS.

SECTION MARK



ESTIMATED QUANTITIES (NOT GUARANTEED)		
STORAGE FACILITY OR BUILDING	1	LS
STEEL GRATING FOR WALK	400	SF
ALUMINUM SLIDE GATE	1	LS
SHED DISPOSAL	1	LS
DEMOLITION OF BRIDGE NO. W–06–020 (9LH)	1	LS
DEMOLITION OF BRIDGE NO. W–06–020 (8M1)	1	LS
DEMOLITION OF BRIDGE NO. W–06–020 (8KD)	1	LS
DEMOLITION OF TEMPORARY BRIDGE	1	LS
MUCK EXCAVATION	500	CY
REINFORCED CONCRETE EXCAVATION	240	CY
BRIDGE EXCAVATION	7240	CY
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	2610	CY
CRUSHED STONE	400	TON
CRUSHED STONE FOR BRIDGE FOUNDATIONS	1210	TON
FINE GRADING AND COMPACTING – SUBGRADE AREA	5930	SY
MANHOLE (9 TO 14 FOOT DEPTH)	1	EA
24 INCH POLYMERIC PRECOATED CORRUGATED METAL PIPE	70	LF
12 INCH DUCTILE IRON INSULATED PIPE (BRIDGE)	104	FT
TEMPORARY GAS BYPASS	1	LS
10 INCH STEEL CASING FOR GAS PIPE	60	LF
SUPERPAVE BRIDGE SURFACE COURSE – 9.5 (SSC–B–9.5)	32	TON
SUPERPAVE BRIDGE PROTECTIVE COURSE – 9.5 (SPC–B–9.5)	32	TON
72 INCH CHAIN LINK FENCE (PIPE TOP RAIL (LINE POST OPTION)	230	FT
48 INCH CHAIN LINK FENCE (PIPE TOP RAIL) VINYL COATED (LINE POST OPTION)	130	FT
48 INCH CHAIN LINK GATE WITH GATE POSTS	10	FT
CHAIN LINK FENCE REMOVED AND STACKED	160	FT
STONE MASONRY WALL IN CEMENT MORTAR	40	CY
STONE MASONRY VENEER	445	SY
STONE MASONRY REMOVED AND STACKED	327	CY
GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL	1040	SY
LOAM FOR LAWNS	30	CY
SEEDING	30	SY
5000 PSI, 0.75IN., 685 HP CEMENT CONCRETE	2765	CY
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	203000	LB
MECHANICAL REINFORCING BAR SPLICERS	2100	EA
SECANT WALLS	1	LS
TEMPORARY SHORING	1	LS
ALUMINUM HANDRAIL	70	FT
RIPRAP	3620	TON
STREAMBED FILL	30	CY
CONTROL OF WATER – STRUCTURE NO. W–06–020 (CCV)	1	LS
WARNING SIGNS AND BUOYS	1	LS
TEMPORARY BRIDGE STRUCTURE	1	LS
BRIDGE STRUCTURE – BRIDGE NO. W–06–020 (CCV)	1	LS

TRAFFIC DATA	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2043	
AVERAGE DAILY TRAFFIC – PRESENT	14,255	
AVERAGE DAILY TRAFFIC – DESIGN YEAR	16,260	
DESIGN HOURLY VOLUME	1,464	
DIRECTIONAL DISTRIBUTION	N/A	
TRUCK PERCENTAGE – AVERAGE DAY	9%	
TRUCK PERCENTAGE – PEAK HOUR	9%	
DESIGN SPEED	40 MPH	
DIRECTIONAL DESIGN HOURLY VOLUME	N/A	

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	2500 YEARS
DESIGN SPECTRA	
As	0.126
SDs	0.210
SD1	0.113
SITE CLASS	D
SEISMIC DESIGN CATEGORY (SDC)	A

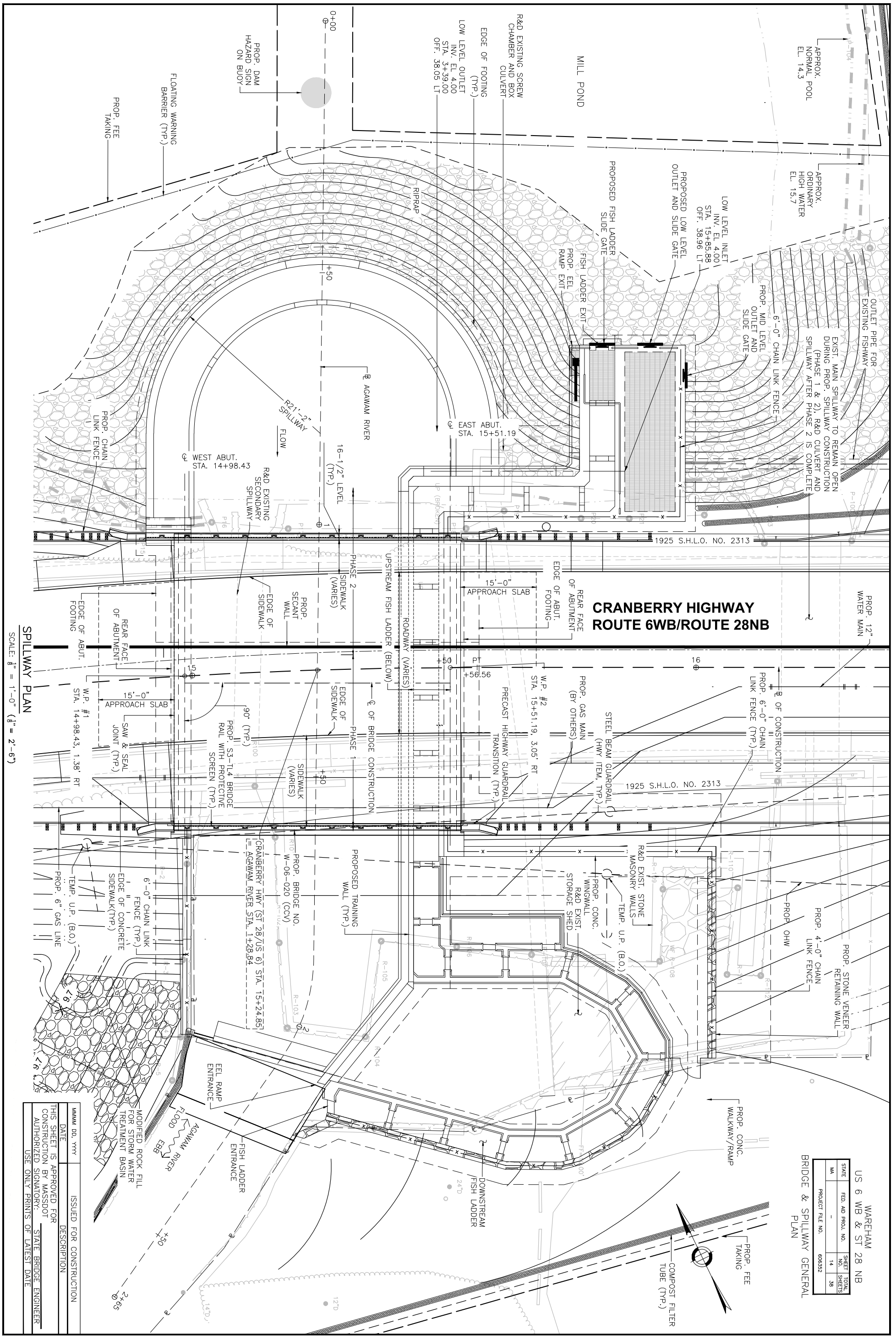
HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	7.7
DESIGN FLOOD DISCHARGE (C.F.S.)	113
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	3.1
DESIGN FLOOD ELEVATION (FEET, NAVD)	5.13
BASE (100–YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	167
BASE FLOOD ELEVATION (FEET, NAVD)	5.43
DESIGN 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)	100
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	N
EVIDENCE OF SCOUR AND EROSION	N

TEMPORARY WATER CONTROL DESIGN DATA	
UPSTREAM	
DESIGN FLOOD DISCHARGE (C.F.S.)	212
DESIGN FLOOD FREQUENCY (YEARS)	100
DESIGN FLOOD VELOCITY (F.P.S.)	6.8
DESIGN FLOOD ELEVATION (FEET, NAVD)	12.4
DOWNSTREAM	
DESIGN FLOOD DISCHARGE (C.F.S.)	212
DESIGN FLOOD FREQUENCY (YEARS)	100
DESIGN FLOOD VELOCITY (F.P.S.)	3.1
DESIGN FLOOD ELEVATION (FEET, NAVD)	3.7

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

Proposal No. 606352-136278
A00831 - 21
Plotted on 19-Mar-2025 10:37 AM
606352_BR2(W06020).DWG
17-December-2024
Second Structural Submittal (S2)


SPILLWAY PLAN
SCALE: 1" = 1'-0" (1/8" = 2'-6")
CRANBERRY HIGHWAY
ROUTE 6WB/ROUTE 28NB
WAREHAM
US 6 WB & ST 28 NB
BRIDGE & SPILLWAY GENERAL PLAN
APPROX. NORMAL POOL EL. 14.3
APPROX. ORDINARY HIGH WATER EL. 15.7
MILL POND
R&D EXISTING SCREW CHAMBER AND BOX CULVERT
EDGE OF FOOTING (TYP.)
LOW LEVEL OUTLET INV. EL 4.00 STA. 3+39.00 OFF. 38.05 LT
PROP. DAM HAZARD SIGN ON BUOY
FLOATING WARNING BARRIER (TYP.)
PROP. FEE TAKING
RIPRAP
PROPOSED FISH LADDER SLIDE GATE
PROPOSED LOW LEVEL OUTLET AND SLIDE GATE
LOW LEVEL INLET INV. EL 4.00 STA. 15+85.88 OFF. 38.96 LT
PROP. EEL RAMP EXIT
FISH LADDER EXIT
PROP. MID LEVEL OUTLET AND SLIDE GATE
6'-0" CHAIN LINK FENCE
EXIST. MAIN SPILLWAY TO REMAIN OPEN DURING PROP. SPILLWAY CONSTRUCTION (PHASE 1 & 2), R&D CULVERT AND SPILLWAY AFTER PHASE 2 IS COMPLETE
OUTLET PIPE FOR EXISTING FISHWAY
PROP. 12" WATER MAIN
℄ AGAWAM RIVER
℄ WEST ABUT. STA. 14+98.43
℄ EAST ABUT. STA. 15+51.19
R21'-2" SPILLWAY
FLOW
16-1/2" LEVEL (TYP.)
R&D EXISTING SECONDARY SPILLWAY
PROP. CHAIN LINK FENCE
1925 S.H.L.O. NO. 2313
PHASE 2 SIDEWALK (VARIES)
UPSTREAM FISH LADDER (BELOW)
ROADWAY (VARIES)
EDGE OF SIDEWALK
PROP. SECANT WALL
EDGE OF ABUT. FOOTING
REAR FACE OF ABUTMENT
15'-0" APPROACH SLAB
W.P. #1 STA. 14+98.43, 1.38' RT
SAW & SEAL JOINT (TYP.)
90° (TYP.)
PROP. S3-TL4 BRIDGE RAIL WITH PROTECTIVE SCREEN (TYP.)
PHASE 1 SIDEWALK (VARIES)
℄ OF BRIDGE CONSTRUCTION
PT +56.56
W.P. #2 STA. 15+51.19, 3.05' RT
PRECAST HIGHWAY GUARDRAIL TRANSITION (TYP.)
PROP. GAS MAIN (BY OTHERS)
STEEL BEAM GUARDRAIL (HWY ITEM, TYP.)
PROP. 6'-0" CHAIN LINK FENCE (TYP.)
℄ OF CONSTRUCTION
PROP. 12" WATER MAIN
PROP. CONC. WALKWAY/RAMP
PROP. FEE TAKING
COMPOST FILTER TUBE (TYP.)
DOWNSTREAM FISH LADDER
FISH LADDER ENTRANCE
EEL RAMP ENTRANCE
FLOW
AGAWAM RIVER EBB
MODIFIED ROCK FILL FOR STORM WATER TREATMENT BASIN
PROPOSED TRAINING WALL (TYP.)
PROP. BRIDGE NO. W-06-020 (CCV)
CRANBERRY HWY (ST 28/US 6) STA. 15+24.85 = AGAWAM RIVER STA. 1+28.84
TEMP. U.P. (B.O.)
PROP. CONC. WINGWALL
R&D EXIST. STORAGE SHED
R&D EXIST. STONE MASONRY WALLS
PROP. OHW
PROP. 4'-0" CHAIN LINK FENCE
PROP. STONE VENEER RETAINING WALL
PROP. 6" GAS LINE
EDGE OF CONCRETE SIDEWALK(TYP.)
6'-0" CHAIN LINK FENCE (TYP.)
MMMM DD, YYYY
ISSUED FOR CONSTRUCTION
DATE
DESCRIPTION
THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT AUTHORIZED SIGNATORY:
STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE
STATE MA
FED. AID PROJ. NO. -
PROJECT FILE NO. 606352
SHEET NO. 14
TOTAL SHEETS 38

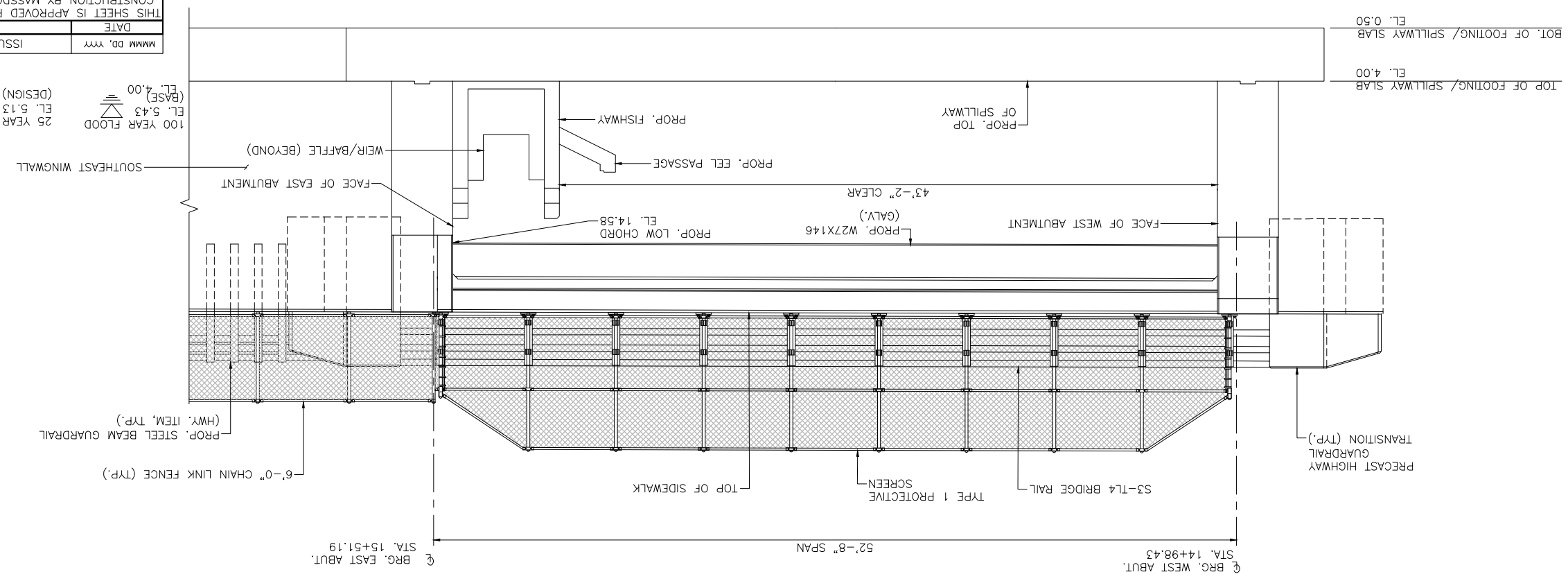
DATE	DESCRIPTION
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

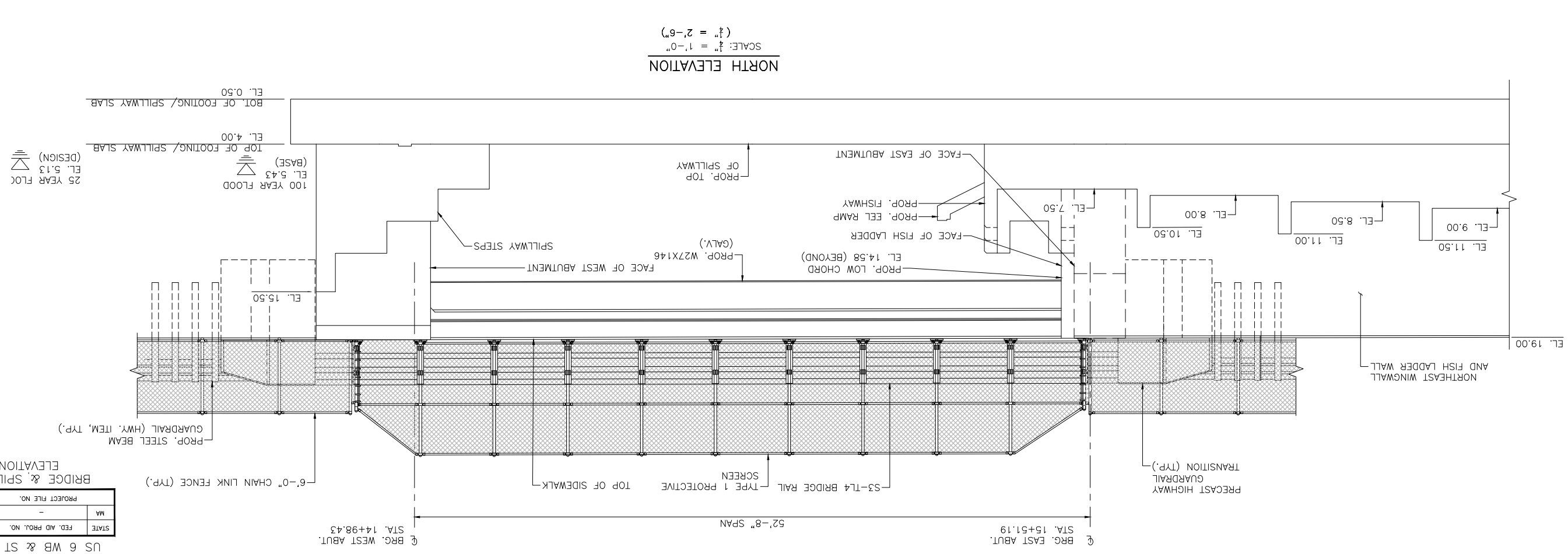
SOUTH ELEVATION

SCALE: $\frac{3}{4}$" = 1'–0" ($\frac{3}{4}$" = 2'–6")



NORTH ELEVATION

SCALE: $\frac{3}{4}$" = 1'–0" ($\frac{3}{4}$" = 2'–6")

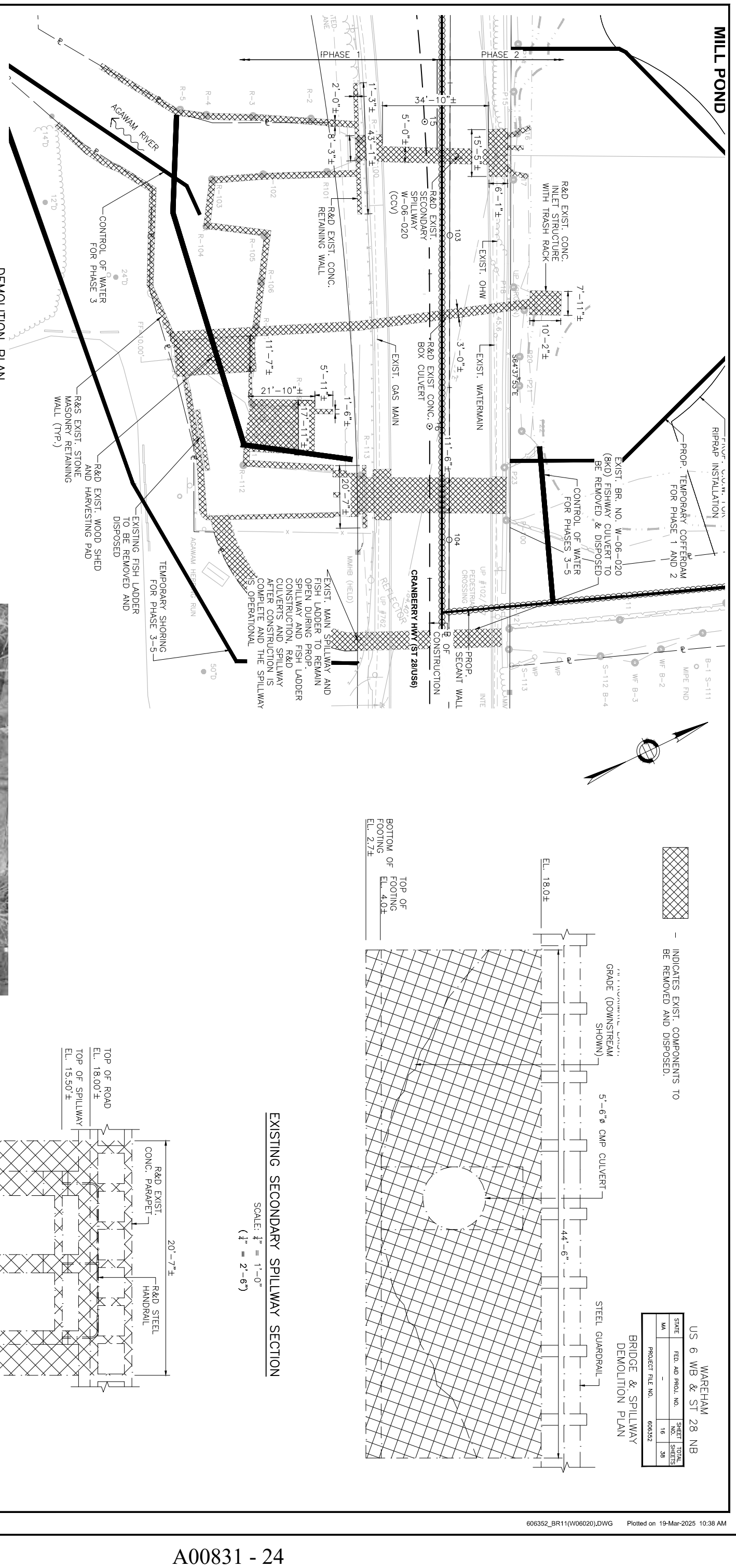


BRIDGE & SPILLWAY ELEVATION

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	–	MA
	SHEET NO.	15	TOTAL SHEETS
	PROJECT FILE NO.	606352	

606352_BR10WW08020.DWG Plotted on 19-Mar-2025 10:38 AM



DEMOLITION PLAN

SCALE: 1" = 15'
(1" = 37.5')

AERIAL VIEW OF EXISTING TIMBER SHED

NOT TO SCALE

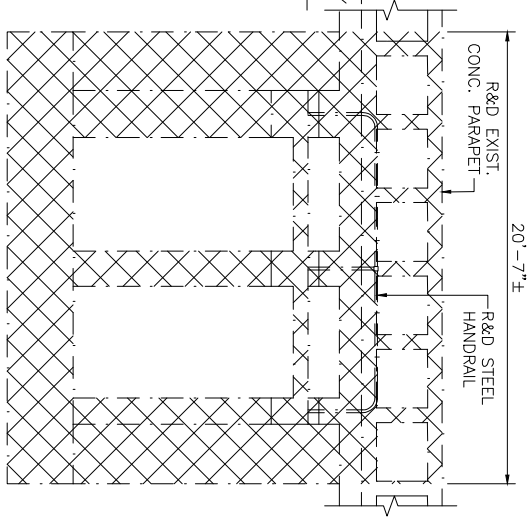
BRIDGE & SPILLWAY DEMOLITION PLAN

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	16	38
PROJECT FILE NO.	606352		

WAREHAM
US 6 WB & ST 28 NB

EXISTING SECONDARY SPILLWAY SECTION

SCALE: 1/4" = 1'-0"
(1/4" = 2'-6")



EXISTING PRIMARY SPILLWAY SECTION

SCALE: 1/4" = 1'-0"
(1/4" = 2'-6")

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT AUTHORIZED SIGNATORY:

STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

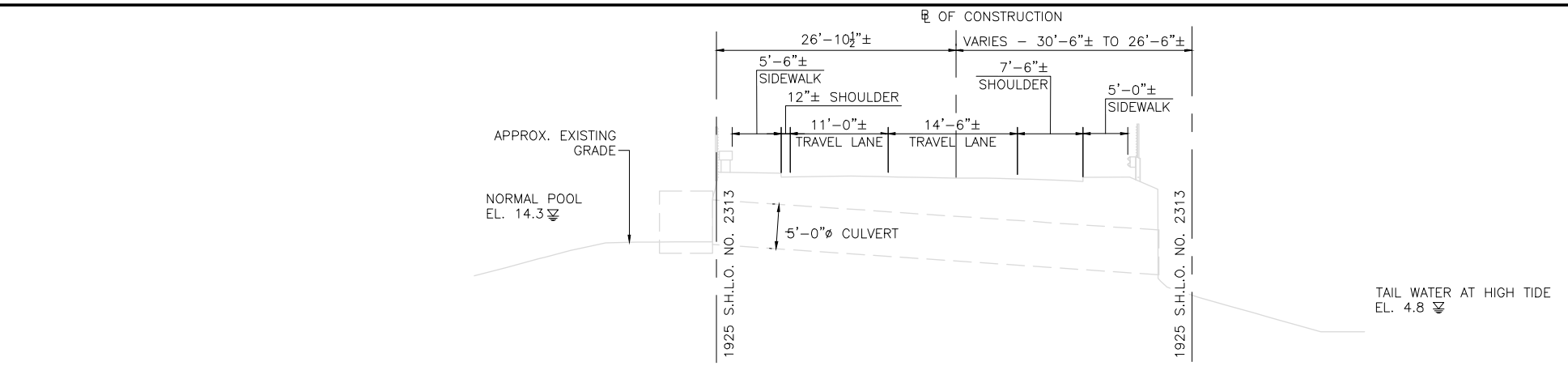
Second Structural Submittal (S2) 17-December-2024 606352_BR11(W06020).DWG Plotted on 19-Mar-2025 10:38 AM

606352_BR12-15(W06020).DWG Plotted on 19-Mar-2025 10:38 AM

WAREHAM
US 6 WB & ST 28 NB

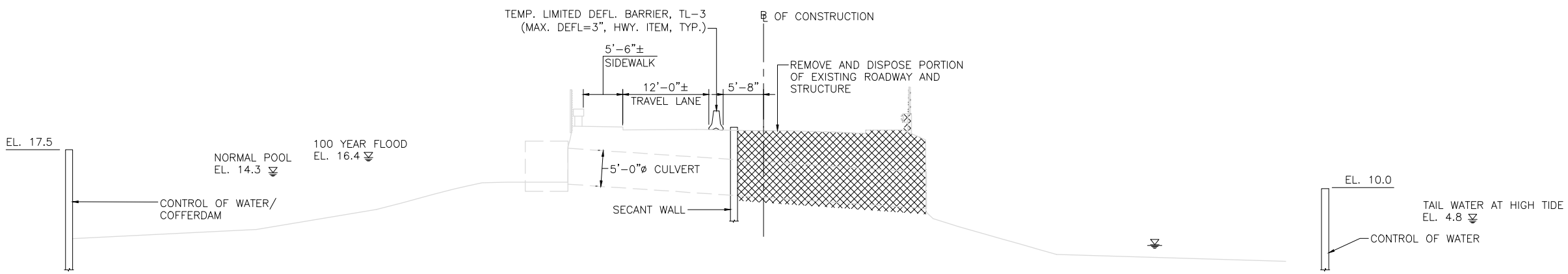
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	17	38
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
SECTIONS NO. 1

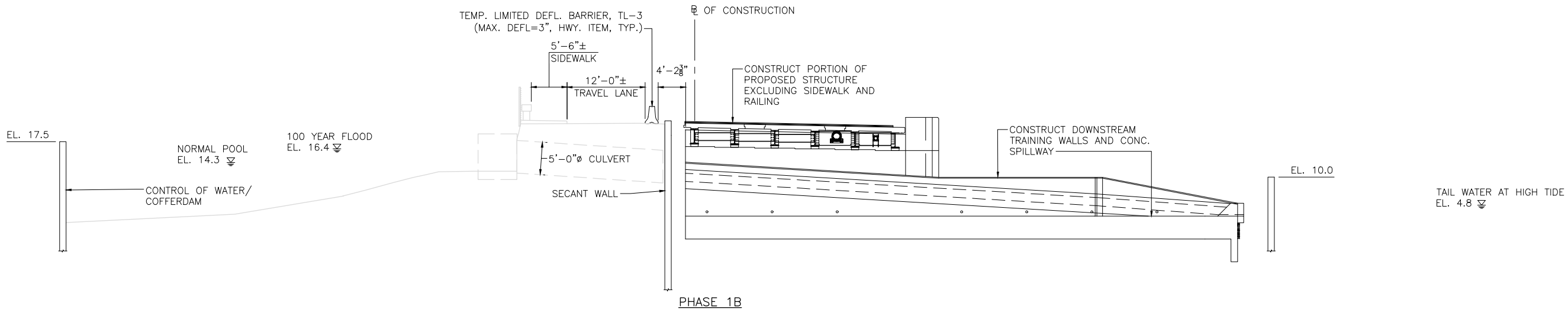


EXISTING CONDITION

SCALE: ⅛" = 1'–0" (⅛" = 2'–6")



PHASE 1A



PHASE 1B

PHASED BRIDGE CONSTRUCTION – PHASE 1

SCALE: ⅛" = 1'–0"
(⅛" = 2'–6")

SUGGESTED SEQUENCE OF CONSTRUCTION – PHASE 1

PHASE 1A

- TEMPORARILY RELOCATE SOUTH OVERHEAD UTILITIES TO THE UTILITY POLES ON THE NORTH SIDE OF THE DAM
- PLACE TRAFFIC CONTROL MEASURES AND SHIFT WESTBOUND TRAVEL LANES TO NORTHERN PORTION OF EXISTING STRUCTURE.
- PLACE STEEL SHEETING ALONG PHASE LINE.
- REMOVE AND DISPOSE SOUTHERN PORTION OF EXISTING STRUCTURE.

PHASE 1B

- CONSTRUCT SOUTHERN PORTION OF PROPOSED SUPERSTRUCTURE WITH THE EXCEPTION OF THE SIDEWALK AND BRIDGE RAIL.
- INSTALL PRECAST HIGHWAY GUARDRAIL TRANSITIONS.
- CONSTRUCT THE DOWNSTREAM TRAINING WALLS AND GROUTED RIPRAP SCOUR APRON.
- RELOCATE THE WATER MAIN AND GAS MAIN TO PROPOSED SUPERSTRUCTURE.
- PARTIALLY DEMOLISH THE DOWNSTREAM PORTION OF THE EXISTING PRIMARY SPILLWAY. CONSTRUCT THE TEMPORATY VEHICULAR AND PEDESTRIAN BRIDGE.

NOTES:

1. THE 100 YEAR FLOOD ELEVATIONS FOR CONSTRUCTION WILL BE USED FOR THE DESIGN OF CONTROL OF WATER, COFFERDAMS, AND TEMPORARY SHORING DURING CONSTRUCTION FOR PHASES 1 AND 2.
2. THE TOP OF THE COFFERDAMS AND CONTROL OF WATER SHALL BE A MINIMUM OF 1 FOOT HIGHER THAN THE REQUIRED FLOOD ELEVATIONS FOR CONSTRUCTION.

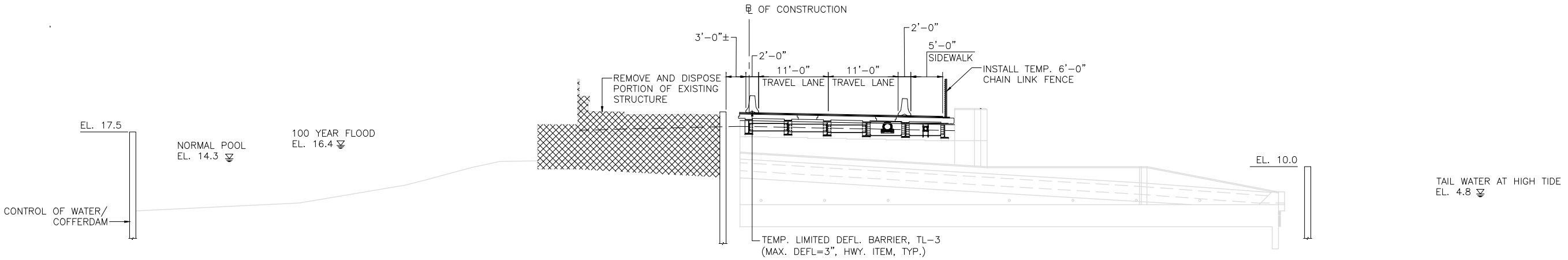
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

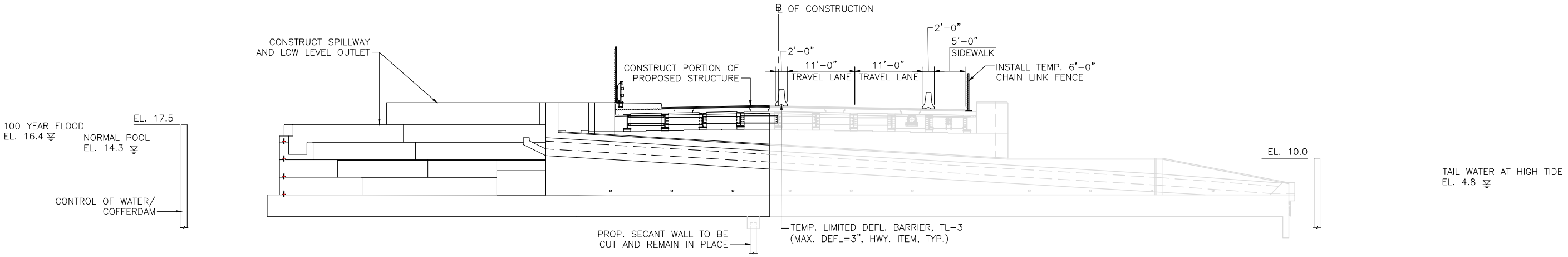
17-December-2024 Second Structural Submittal (S2)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	18	38
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
SECTIONS NO. 2



PHASE 2A



PHASE 2B

PHASED BRIDGE CONSTRUCTION – PHASE 2

SCALE: $\frac{1}{8}$" = 1'–0"
($\frac{1}{8}$" = 2'–6")

SUGGESTED SEQUENCE OF CONSTRUCTION – PHASE 2

NOTES

1. THE 100 YEAR FLOOD ELEVATIONS FOR CONSTRUCTION WILL BE USED FOR THE DESIGN OF CONTROL OF WATER, COFFERDAMS, AND TEMPORARY SHORING DURING CONSTRUCTION.

2. THE TOP OF THE COFFERDAMS AND CONTROL OF WATER SHALL BE A MINIMUM OF 1 FOOT HIGHER THAN THE 100 YEAR FLOOR ELEVATIONS FOR CONSTRUCTION.

PHASE 2A

- PERMANENTLY RELOCATE OVERHEAD UTILITIES TO THE SOUTH SIDE OF THE DAM.
- PLACE TRAFFIC CONTROL MEASURES AND SHIFT WESTBOUND TRAVEL LANES TO SOUTHERN PORTION OF PROPOSED SUPERSTRUCTURE.
- REMOVE AND DISPOSE NORTHERN PORTION OF EXISTING STRUCTURE.

PHASE 2B

- CONSTRUCT NORTHERN PORTION OF PROPOSED BRIDGE STRUCTURE, SPILLWAY, LOW LEVEL OUTLET CHAMBER, AND UPSTREAM PORTION OF FISH LADDER.
- REMOVE EARTH SUPPORT AROUND STRUCTURE WHILE ABANDONING REMAINING PORTIONS IN PLACE.
- REMOVE UPSTREAM AND DOWNSTREAM CONTROL OF WATER MEASURES AND DIVERT FLOW TO PROPOSED SPILLWAY IN PREPARATION FOR REMOVAL OF THE EXISTING PRIMARY SPILLWAY.

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

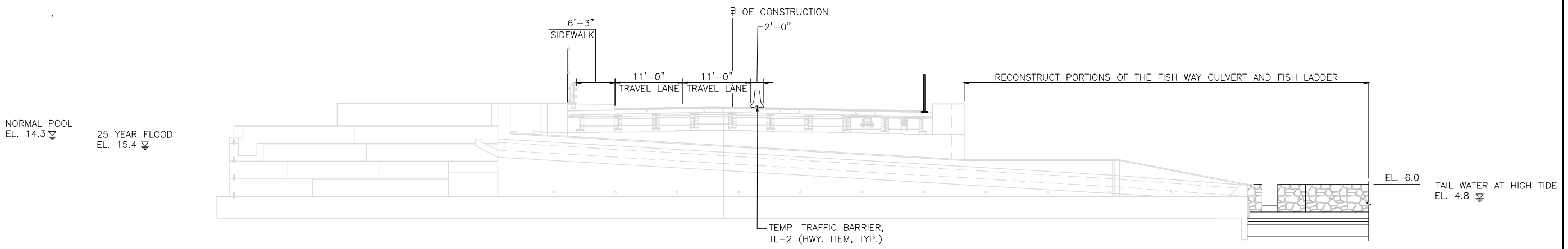
Proposal No. 606352-136278
A00831 - 26
Plotted on 19-Mar-2025 10:38 AM
606352_BR12-15(W06020).DWG
17-December-2024
Second Structural Submittal (S2)

Proposal No. 606352-136278

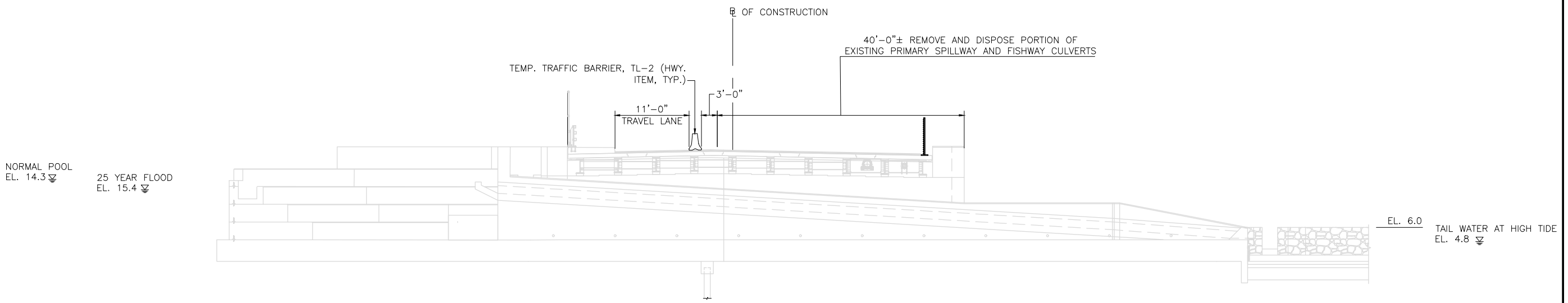
WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	19	38
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION SECTIONS NO. 3



PHASE 3



PHASE 4

PHASED BRIDGE CONSTRUCTION – PHASES 3–4

SCALE: $\frac{1}{8}$" = 1'–0"
($\frac{1}{8}$" = 2'–6")

SUGGESTED SEQUENCE OF CONSTRUCTION – PHASES 3–4

NOTES:

1. THE 100 YEAR FLOOD ELEVATIONS FOR CONSTRUCTION WILL BE USED FOR THE DESIGN OF CONTROL OF WATER, COFFERDAMS, AND TEMPORARY SHORING DURING CONSTRUCTION.
2. THE TOP OF THE COFFERDAMS AND CONTROL OF WATER SHALL BE A MINIMUM OF 1 FOOT HIGHER THAN THE 100 YEAR FLOOD ELEVATIONS FOR CONSTRUCTION.

PHASE 3

- PLACE TRAFFIC CONTROL MEASURES AND SHIFT WESTBOUND TRAVEL LANES TO NORTHERN PORTION OF STRUCTURE. INSTALL UPSTREAM AND DOWNSTREAM TEMPORARY CONTROL OF WATER MEASURES FOR FISH LADDER CONSTRUCTION AND DEMOLITION OF EXISTING CULVERT AND SPILLWAY.
- CONSTRUCT DOWNSTREAM PORTION OF FISH LADDER AND DIVERT FLOW TO PROPOSED FISH LADDER IN PREPARATION OF REMOVAL/ABANDONING OF EXISTING FISHWAY/SPILLWAY.
- REMOVE AND DISPOSE PORTIONS OF PRIMARY SPILLWAY AND FISHWAY, FISH LADDER AND TEMPORARY BRIDGE. RECONSTRUCT PORTIONS OF EXISTING FISH LADDER AND CONSTRUCT THE EEL PASSAGE IN THE DOWNSTREAM AREA.

PHASE 4

- PLACE TRAFFIC CONTROL MEASURES AND SHIFT SOUTHERN WESTBOUND LANE TO SOUTH SIDE OF DEMOLITION.
- REMOVE AND DISPOSE PORTION OF EXISTING PRIMARY SPILLWAY AND RECONSTRUCT PORTION OF THE FISH LADDER.

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

17-December-2024
Second Structural Submittal (S2)

606352_BR12-15(W090220).DWG Plotted on 19-Mar-2025 10:38 AM

A00831 - 27

SUGGESTED SEQUENCE OF CONSTRUCTION – PHASES 5–6

PHASE 5

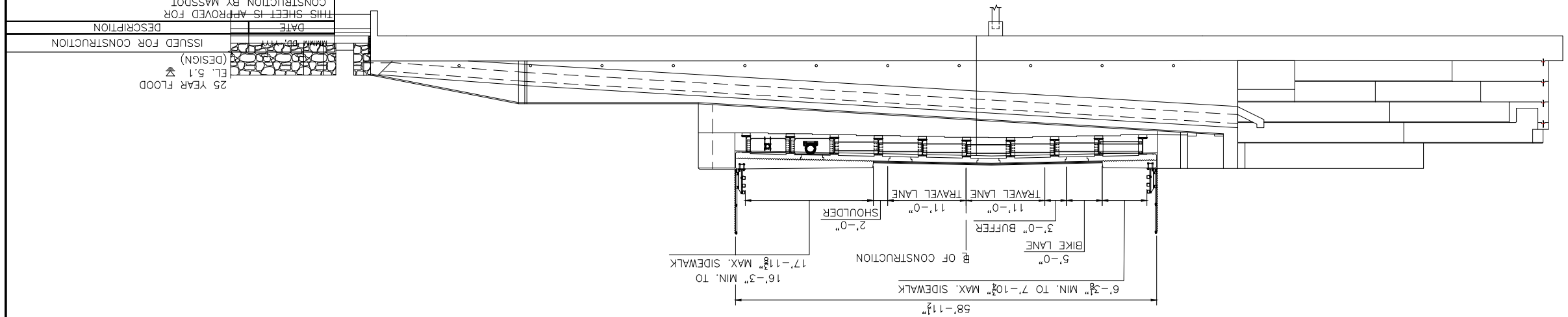
- PLACE TRAFFIC CONTROL MEASURES AND SHIFT WESTBOUND LANES TO SOUTHERN PORTION OF PROPOSED SUPERSTRUCTURE.
- REMOVE AND DISPOSE PORTIONS OF EXISTING PRIMARY SPILLWAY.
- RECONSTRUCT THE REMAINING PORTION OF THE EXISTING FISH LADDER UNDER THE ROADWAY.
- RECONSTRUCT THE UPSTREAM PORTION OF THE EXISTING FISH LADDER CHANNEL AND RETAINING WALLS.

PHASE 6

- GRADE DOWNSTREAM CHANNEL AND REMOVE WATER CONTROL MEASURES FROM UPSTREAM AND DOWNSTREAM OF THE DAM.
- PLACE TRAFFIC CONTROLS AND SHIFT WESTBOUND TRAVEL LANES TO NORTH SIDE OF PROPOSED SUPERSTRUCTURE.
- REMOVE AND DISPOSE OF TEMPORARY WEARING SURFACE.
- CONSTRUCT SOUTHERN SIDEWALK AND INSTALL S3–TL4 RAIL AND PROTECTIVE SCREEN.
- PLACE FINAL PAVING, STRIPING, AND SIGNAGE. REMOVE TRAFFIC CONTROL MEASURES AND OPEN ROADWAY TO FINAL TRAFFIC PATTERN. CONSTRUCT STORAGE SHED IN DOWNSTREAM AREA.

PROPOSED CONDITION

SCALE: 1/8" = 1'–0" (1/8" = 2'–6")



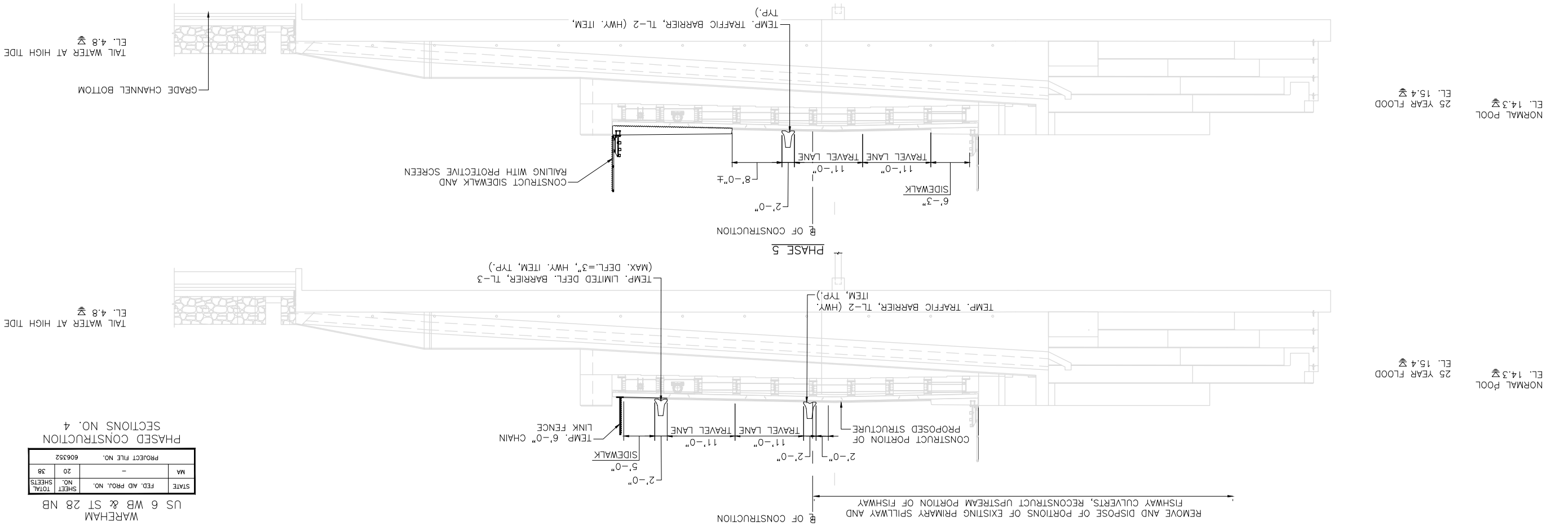
DATE	DESCRIPTION
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

PHASED BRIDGE CONSTRUCTION – PHASE 5–6

SCALE: 1/8" = 1'–0" (1/8" = 2'–6")



PHASED CONSTRUCTION SECTIONS NO. 4

WARE HAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	PROJECT FILE NO. 606352	
MA	–	SHEET NO. 20	TOTAL SHEETS 38

606352_BR12-15(W08020).DWG Plotted on 19-Mar-2025 10:38 AM
Second Structural Submittal (S2) 17-December-2024

Proposal No. 606352-136278

A00831 - 29

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	21	38
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
PLANS NO. 1

Plotted on 19-Mar-2025 10:39 AM

606352_BR16(W090620).DWG

AGAWAM MILL POND

MILL POND

FEE TAKING

LIMIT OF HYDROGRAPHIC SURVEY

PROP. TEMPORARY COFFERDAM

EXIST. CONC. INLET STRUCTURE WITH TRASH RACK

ONE WAY TRAFFIC (SEE TTCP'S)

PLACE STEEL SHEETING ALONG PHASE LINE

CONC WALL (TYP.)

CONC STRUCTURE

APPROX. EDGE OF POND

TOP OF WATER=13.6± (CULVERT NOT VISIBLE– NO ACCESS)

MASONRY WALL

TOP CONC. 11.6
BOT. CONC. 8.4

CRANBERRY HIG
WES
(1925 STATE HIGHWA

TEMP. EASEMENT

1917 SHLO NO. 1777

LOCATION LINE OF 1917 SHLO 1777

5'–6"± SIDEWALK

CRANBERRY HIGHWAY
(ROUTE 28NB/6WB)

TEMP. LIMITED DEFLECTION BARRIER TL–3 (MAX. DEFL. 3")

12'–0"± TRAVEL LANE

TEMP. PAVEMENT MARKINGS

R&D SOUTH PORTION OF EXISTING SECONDARY SPILLWAY

℄ OF CONSTRUCTION

PT +58.56

R&D SOUTHERN PORTION OF BOX CULVERT

SECANT WALL AT PHASE LINE

TRAFFIC BARREL (TYP.)

TEMPORARILY RELOCATE OVERHEAD UTILITIES TO NORTH SIDE OF ROADWAY

1923 SHLO NO. 2313

EXIST. MAIN SPILLWAY TO REMAIN OPERATIONAL DURING PHASES 1 & 2

EXIST. FISH WAY TO REMAIN OPERATIONAL DURING PHASE 1 & 2

6 WEST
MARION WAREHAM
LEFT LANE
28 NORTH
MIDDLEBORO
RIGHT LANE

TEMPORARY RELOCATION OF GAS MAIN, 6" STEEL PIPE, SUPPORTED ON UTILITY BRIDGE (BY OTHERS)

PROP. TEMPORARY SHORING/C.O.W. PHASE 1

SUGGESTED DEWATERING BASIN LOCATION

AGAWAM RIVER

R&D EXIST. WOOD SHED AND CONC. HARVESTING PAD

FEE TAKING

PHASE 1A

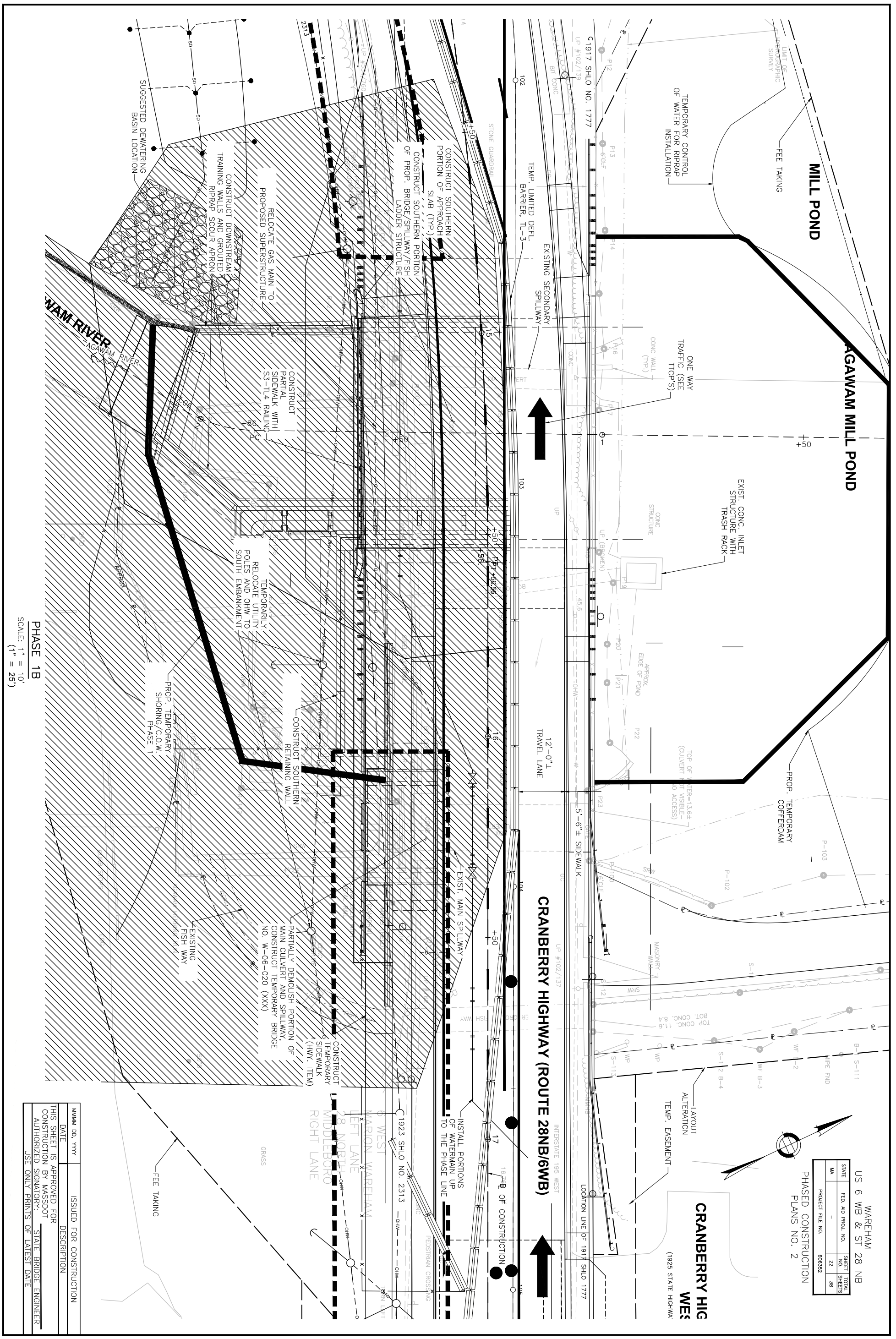
SCALE: 1" = 10'
(1" = 25')

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

17-December-2024

Second Structural Submittal (S2)


MILL POND
AGAWAM MILL POND
CRANBERRY HIGHWAY (ROUTE 28NB/6WB)
CRANBERRY HIG
WES
(1925 STATE HIGHWA
AGAWAM RIVER
AGAWAM RIVER
TEMPORARY CONTROL OF WATER FOR RIPRAP INSTALLATION
FEE TAKING
LIMIT OF HYDROGRAPHIC SURVEY
1917 SHLO NO. 1777
EXISTING SECONDARY SPILLWAY
TEMP. LIMITED DEFL. BARRIER, TL-3
ONE WAY TRAFFIC (SEE TTCP'S)
CONG WALL (TYP.)
EXIST. CONC. INLET STRUCTURE WITH TRASH RACK
PROP. TEMPORARY COFFERDAM
TOP OF WATER=13.6± (CULVERT NOT VISIBLE- NO ACCESS)
APPROX. EDGE OF POND
CONC STRUCTURE
STONE GUARDRAIL
SUGGESTED DEWATERING BASIN LOCATION
CONSTRUCT SOUTHERN PORTION OF APPROACH SLAB (TYP.)
CONSTRUCT SOUTHERN PORTION OF PROP. BRIDGE/SPILLWAY/FISH LADDER STRUCTURE
RELOCATE GAS MAIN TO PROPOSED SUPERSTRUCTURE
CONSTRUCT DOWNSTREAM TRAINING WALLS AND GROUTED RIPRAP SCOUR APRON
CONSTRUCT PARTIAL SIDEWALK WITH S3-TL4 RAILING
TEMPORARILY RELOCATE UTILITY POLES AND OHW TO SOUTH EMBANKMENT
PROP. TEMPORARY SHORING/C.O.W. PHASE 1
CONSTRUCT SOUTHERN RETAINING WALL
PARTIALLY DEMOLISH PORTION OF MAIN CULVERT AND SPILLWAY, CONSTRUCT TEMPORARY BRIDGE NO. W-06-020 (XXX)
CONSTRUCT TEMPORARY SIDEWALK (HWY. ITEM)
EXISTING FISH WAY
INSTALL PORTIONS OF WATERMAIN UP TO THE PHASE LINE
12'-0"± TRAVEL LANE
5'-6"± SIDEWALK
EXIST. MAIN SPILLWAY
LAYOUT ALTERATION
TEMP. EASEMENT
LOCATION LINE OF 1917 SHLO 1777
1923 SHLO NO. 2313
16.76 FB OF CONSTRUCTION
PEDESTRIAN CROSSING
INTERSTATE 195 WEST
6 WEST MARION WAREHAM
LEFT LANE
28 NORTH MIDDLEBORO
RIGHT LANE
GRASS
APPROX
PHASE 1B
SCALE: 1" = 10'
(1" = 25')
WAREHAM
US 6 WB & ST 28 NB
PHASED CONSTRUCTION
PLANS NO. 2
STATE: MA
FED. AID PROJ. NO.: -
PROJECT FILE NO.: 606352
SHEET NO.: 22
TOTAL SHEETS: 38
MMMM DD, YYYY
DATE
ISSUED FOR CONSTRUCTION
DESCRIPTION
THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT AUTHORIZED SIGNATORY:
STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	23	38
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
PLANS NO. 3

AGAWAM MILL POND

MILL POND

FEE TAKING

LIMIT OF HYDROGRAPHIC SURVEY

C.O.W FOR INSTALLATION OF RIPRAP

R&D EXIST. CONC. INLET STRUCTURE AND REMAINING PORTION OF CONC. CULVERT

R&D REMAINING PORTION OF EXISTING AUXILLARY SPILLWAY

SUGGESTED DEWATERING BASIN LOCATION

EXIST. PRIMARY SPILLWAY TO REMAIN OPERATIONAL DURING PHASES 1&2

TEMP. CHAINLINK FENCE (TYP.)

TEMPORARY EASEMENT

FEE TAKING

LOCATION LINE OF 1917 SHLO 1777

1917 SHLO NO. 1777

CRANBERRY HIGHWAY (ROUTE 28NB/6WB)

R&D EXIST. WATERMAIN AFTER PROP. WATERMAIN IS IN SERVICE

INSTALL REMAINING PORTION OF THE WATERMAIN

℄ OF CONSTRUCTION

TEMP. PAVEMENT MARKINGS

11'–0" TRAVEL LANE

11'–0" TRAVEL LANE

5'–0" SIDEWALK

TEMP. LIMITED DEFL. BARRIER, TL–3 (TYP.)

EXISTING ... SH WAY

FEE TAKING

AGAWAM RIVER

APPROX. ℄

205
N: 2739532.324'
E: 881072.276'
EL: 17.131'
MTRAV MAG SET

1933 SHLO NO. 2313

6 WEST
MARION WAREHAM
LEFT LANE
28 NORTH
MIDDLEBORO
RIGHT LANE

PHASE 2A

SCALE: 1" = 10' (1" = 25')

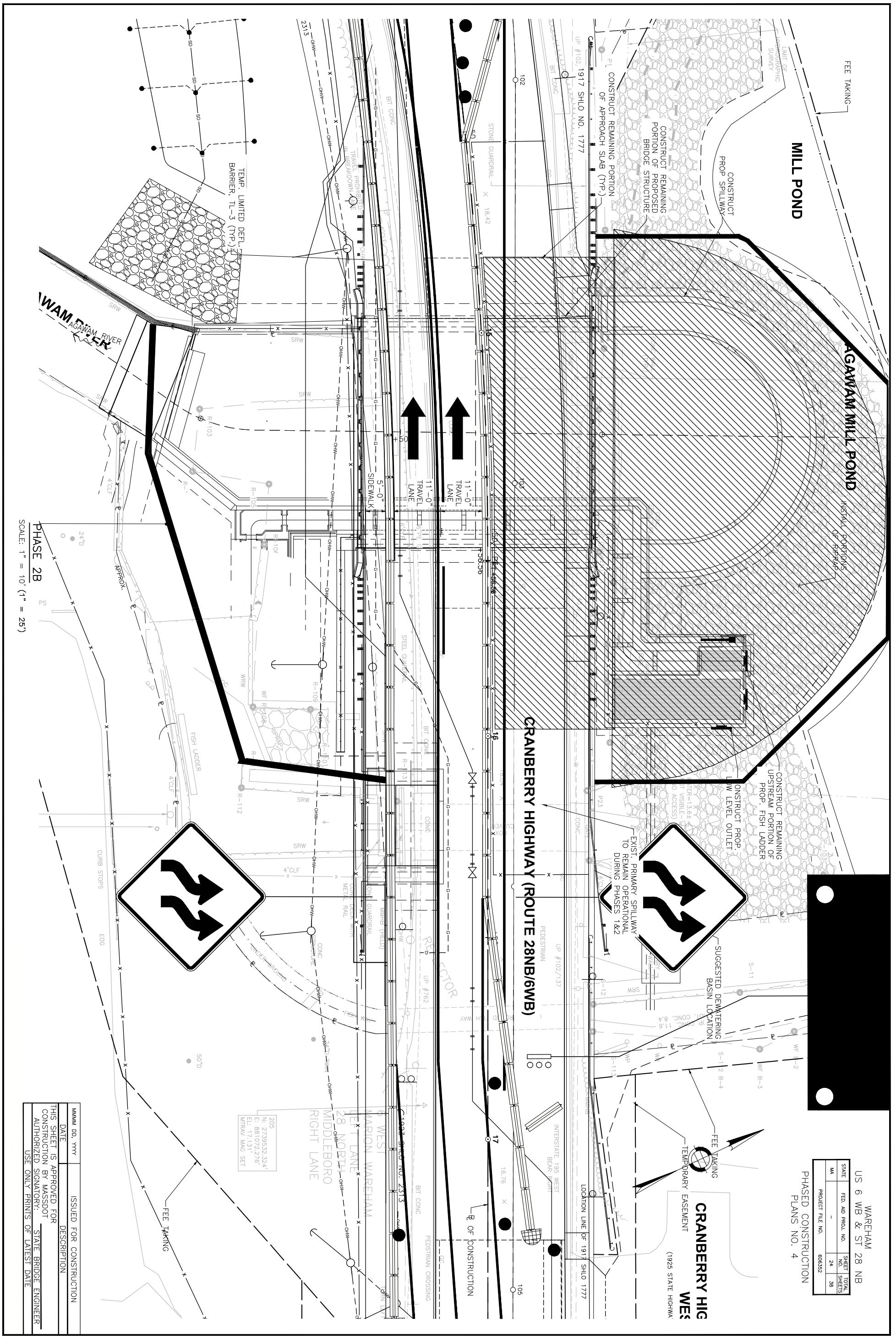
CONSTRUCTION ZONE

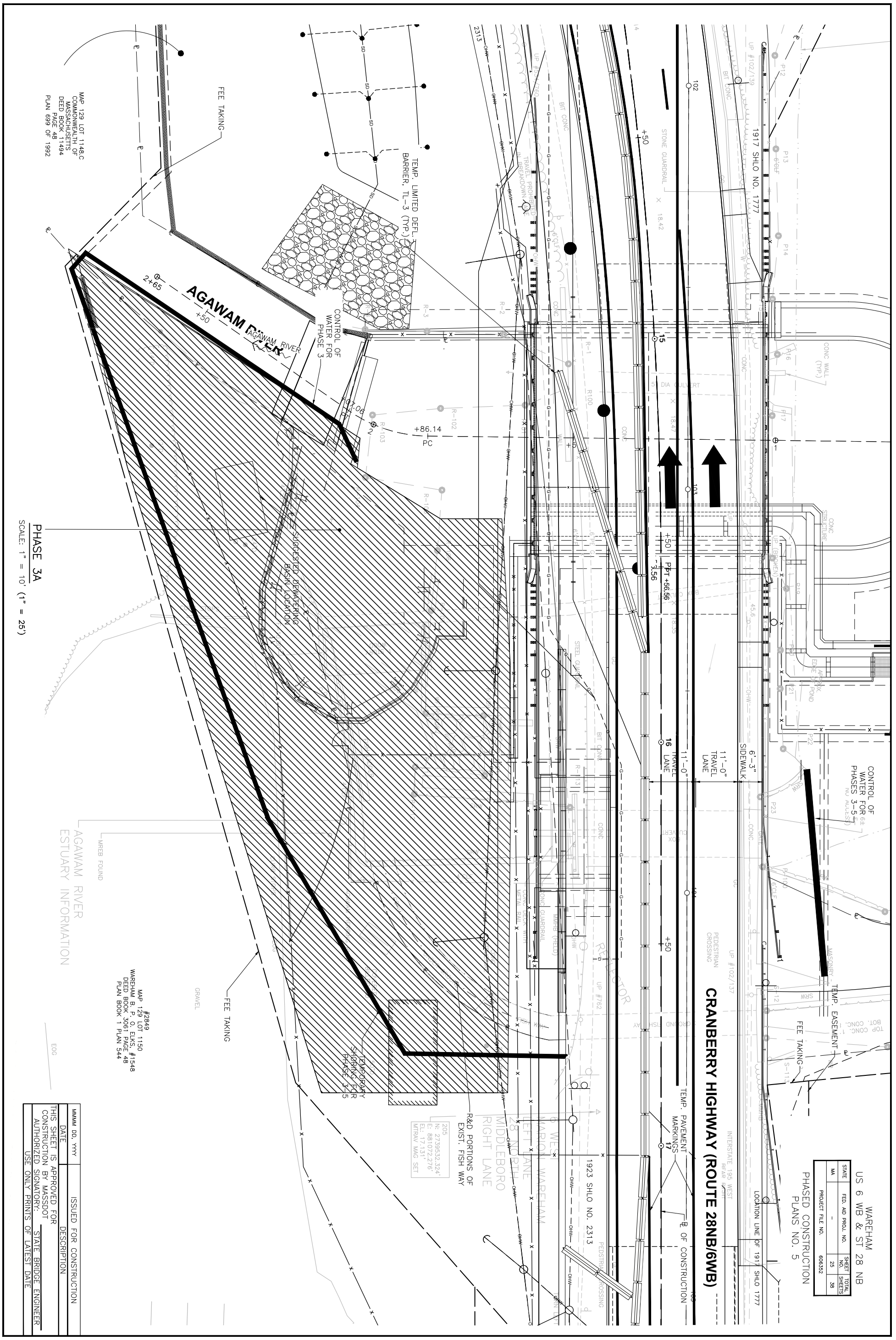
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

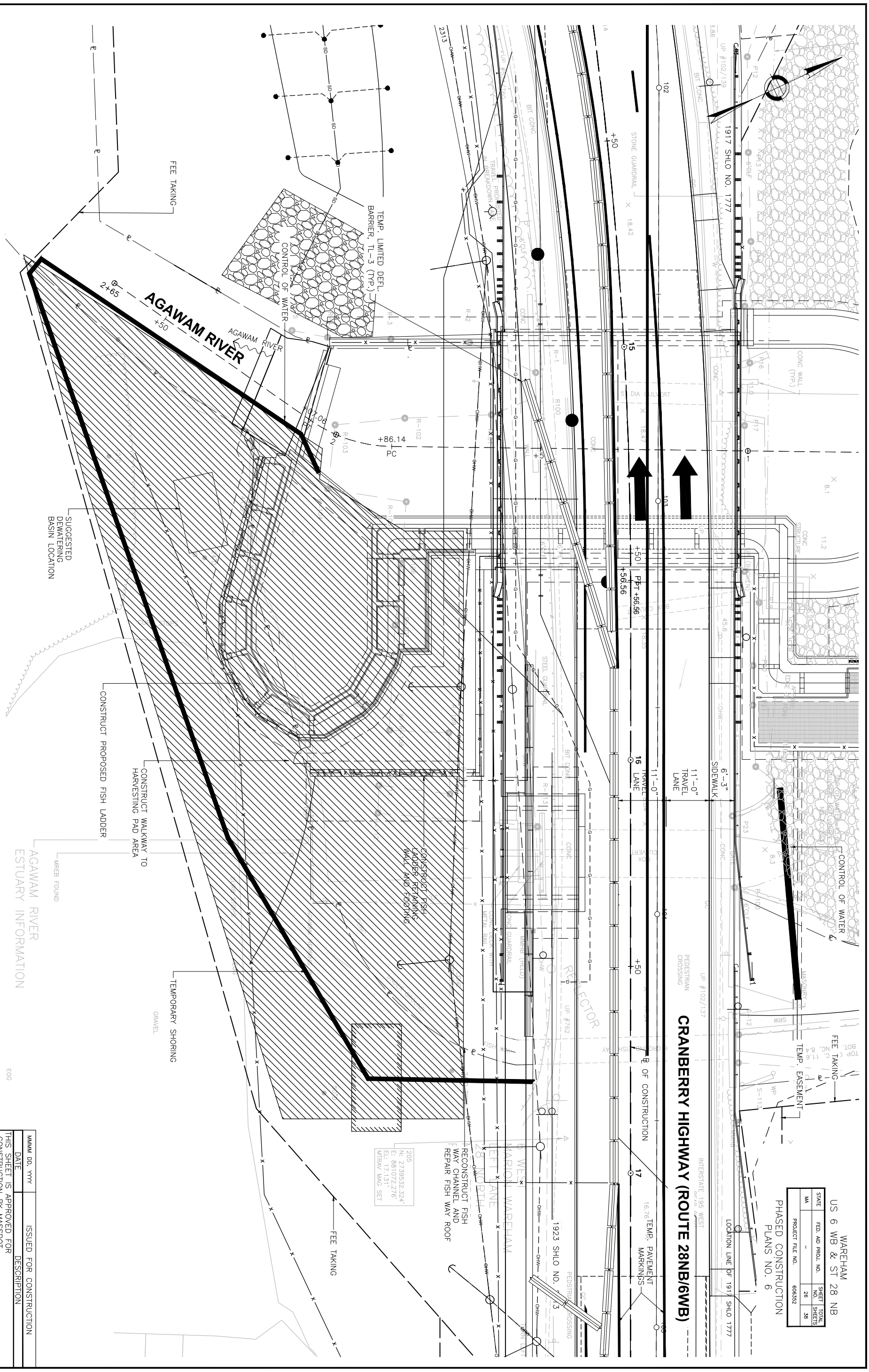
THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

Second Structural Submittal (S2) 17-December-2024

606352_BR18(W09020).DWG Plotted on 19-Mar-2025 10:40 AM


MILL POND
AGAWAM MILL POND
CRANBERRY HIGHWAY (ROUTE 28NB/6WB)
FEE TAKING
CONSTRUCT REMAINING PORTION OF PROPOSED BRIDGE STRUCTURE
CONSTRUCT REMAINING PORTION OF APPROACH SLAB (TYP.)
CONSTRUCT PROP SPILLWAY
INSTALL PORTIONS OF RIPRAP
CONSTRUCT REMAINING UPSTREAM PORTION OF PROP. FISH LADDER
CONSTRUCT PROP. LOW LEVEL OUTLET
EXIST. PRIMARY SPILLWAY TO REMAIN OPERATIONAL DURING PHASES 1&2
SUGGESTED DEWATERING BASIN LOCATION
TEMP. LIMITED DEFL. BARRIER, TL-3 (TYP.)
11'-0" TRAVEL LANE
5'-0" SIDEWALK
LOCATION LINE OF 1917 SHLO 1777
1917 SHLO NO. 1777
1925 SHLO NO. 2313
TEMPORARY EASEMENT
(1925 STATE HIGHWA
PHASE 2B
SCALE: 1" = 10' (1" = 25')
WAREHAM
US 6 WB & ST 28 NB
PHASED CONSTRUCTION
PLANS NO. 4
STATE MA
FED. AID PROJ. NO. -
PROJECT FILE NO. 606352
SHEET NO. 24
TOTAL SHEETS 38
MMMM DD, YYYY
ISSUED FOR CONSTRUCTION
DATE
DESCRIPTION
THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT AUTHORIZED SIGNATORY:
STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE


WAREHAM
US 6 WB & ST 28 NB
PHASED CONSTRUCTION
PLANS NO. 5
STATE
MA
FED. AID PROJ. NO.
-
SHEET NO.
25
TOTAL SHEETS
38
PROJECT FILE NO.
606352
CRANBERRY HIGHWAY (ROUTE 28NB/6WB)
PHASE 3A
SCALE: 1" = 10' (1" = 25')
1917 SHLO NO. 1777
1923 SHLO NO. 2313
LOCATION LINE OF 1917 SHLO 1777
AGAWAM RIVER
AGAWAM RIVER ESTUARY INFORMATION
CONTROL OF WATER FOR PHASES 3-5
TEMP. LIMITED DEFL. BARRIER, TL-3 (TYP.)
TEMP. EASEMENT
FEE TAKING
TEMP. PAVEMENT MARKINGS
SUGGESTED DEWATERING BASIN LOCATION
TEMPORARY SHORING FOR PHASE 3-5
R&D PORTIONS OF EXIST. FISH WAY
MAP 129 LOT 1148.C
COMMONWEALTH OF MASSACHUSETTS
DEED BOOK 11494
PAGE 48
PLAN 699 OF 1992
#2849
MAP 129 LOT 1150
WAREHAM B. P. O. ELKS, #1548
DEED BOOK 3061 PAGE 48
PLAN BOOK 1 PLAN 544
MMMM DD, YYYY
ISSUED FOR CONSTRUCTION
DATE
DESCRIPTION
THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT AUTHORIZED SIGNATORY:
STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE



PHASE 3B

SCALE: 1" = 10' (1" = 25')

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	26	38
PROJECT FILE NO.	606352		

US 6 WB & ST 28 NB
WAREHAM

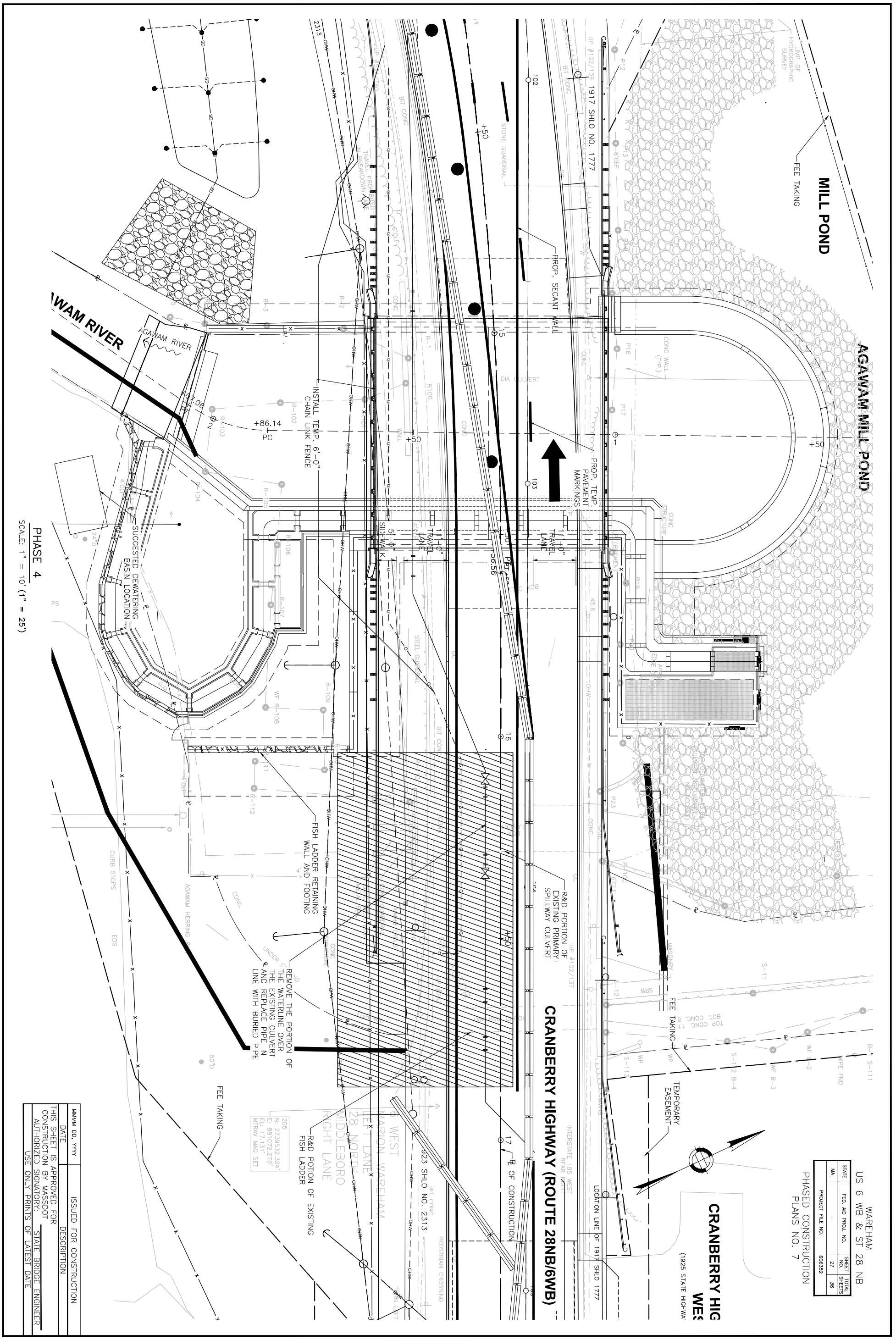
PHASED CONSTRUCTION
PLANS NO. 6

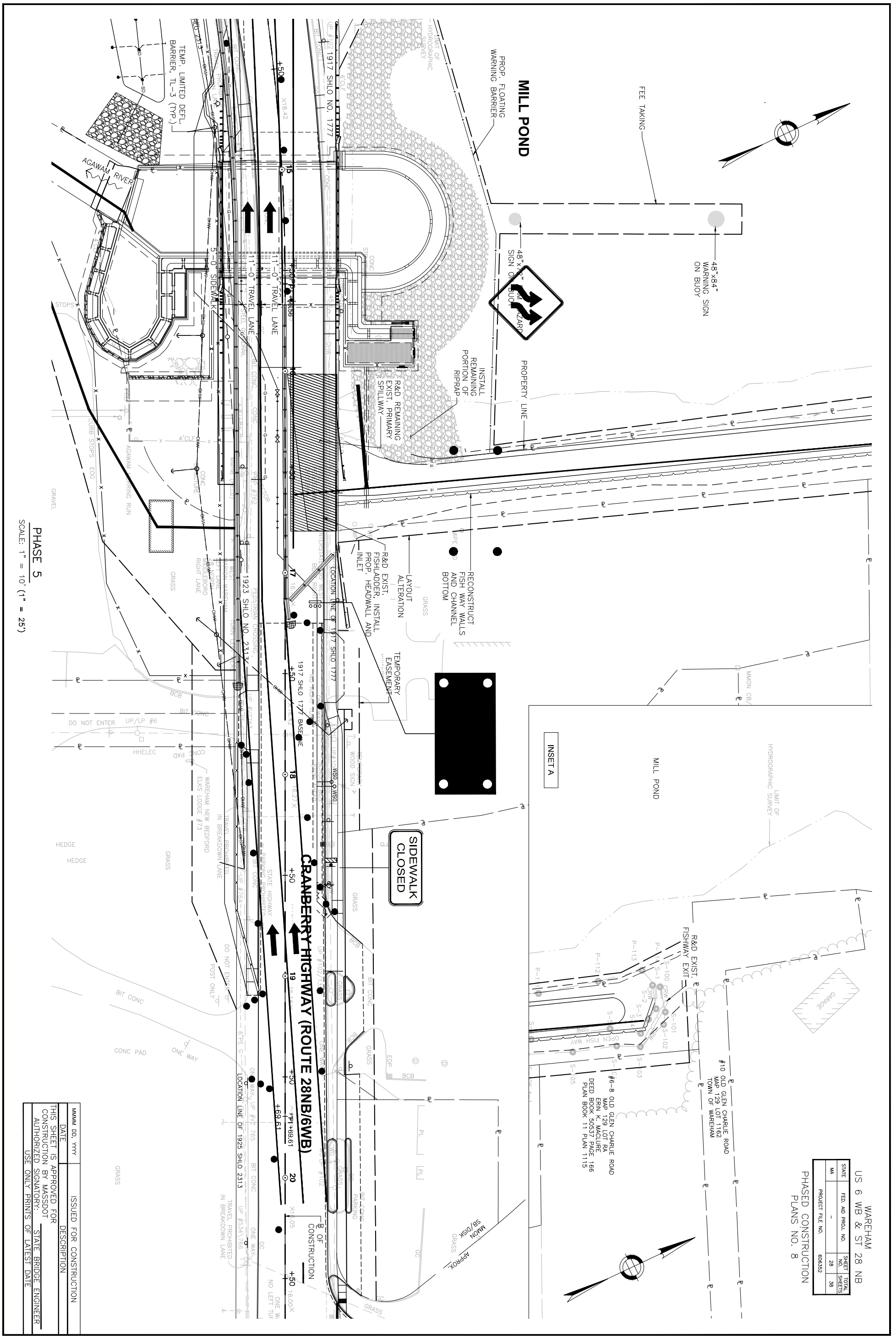
CRANBERRY HIGHWAY (ROUTE 28NB/6WB)

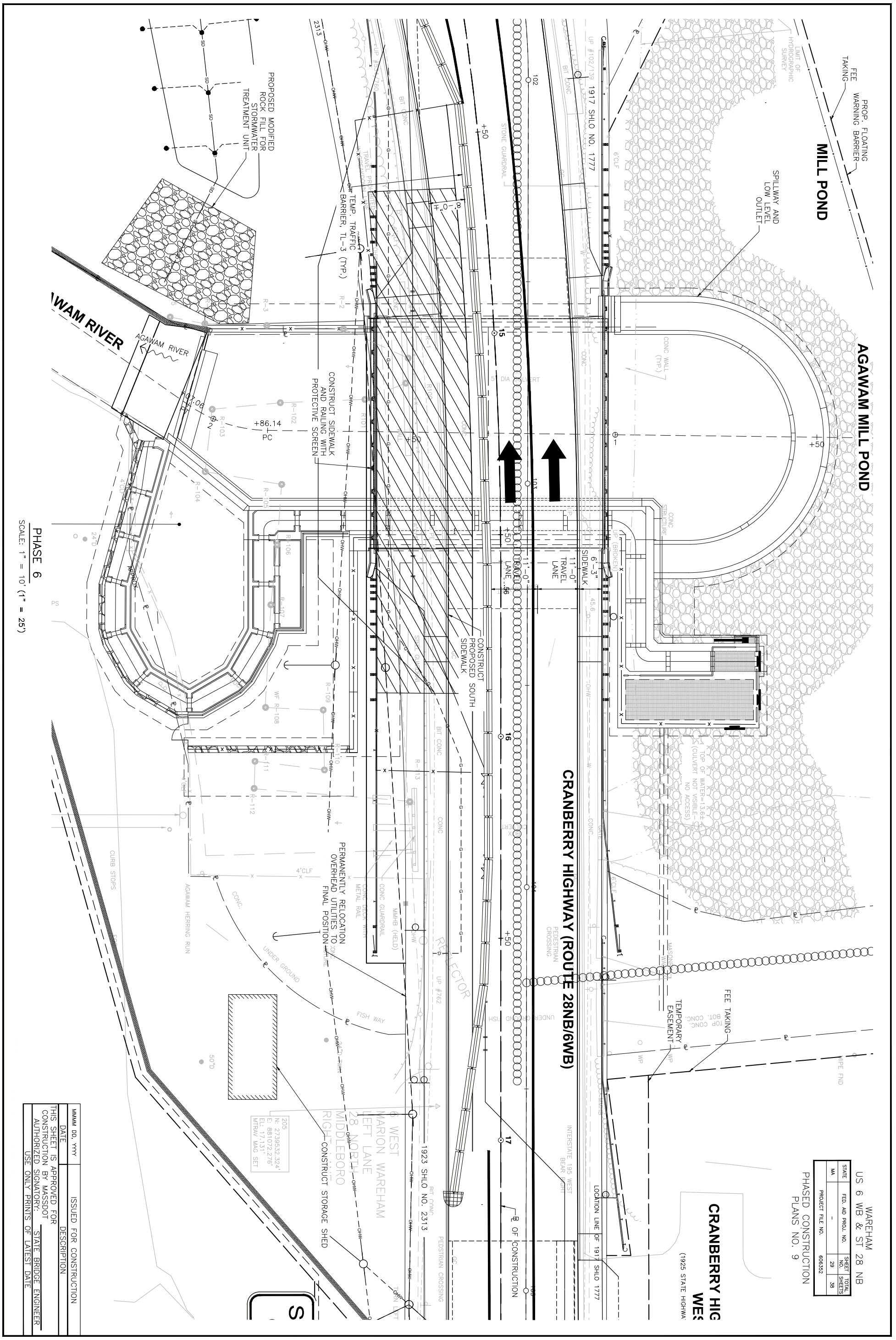
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

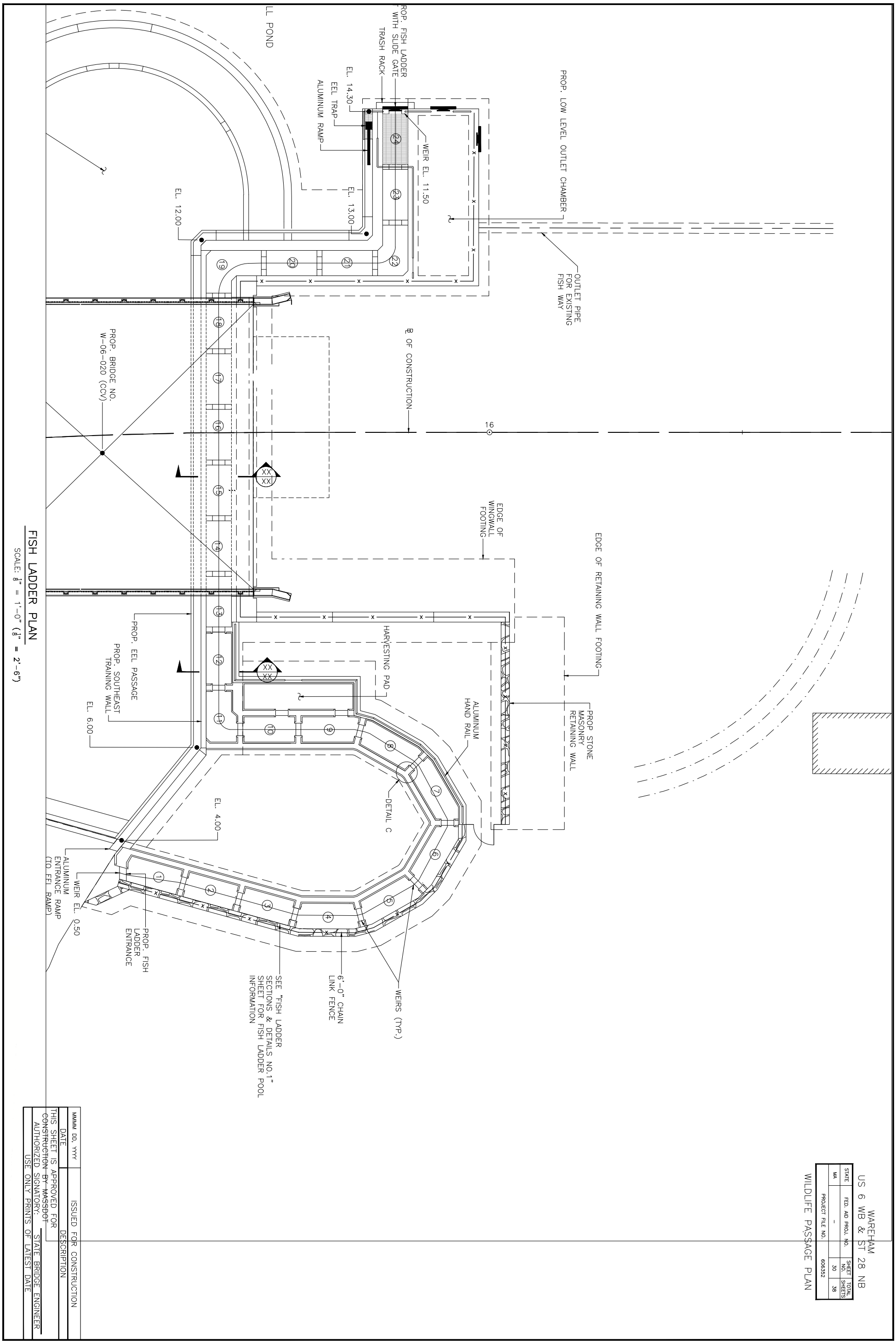
THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE


MILL POND
FEE TAKING
LIMIT OF HYDROGRAPHIC SURVEY
AGAWAM MILL POND
1917 SHLO NO. 1777
STONE GUARDRAIL
PROP. SECANT WALL
PROP. TEMP. PAVEMENT MARKINGS
11'-0" TRAVEL LANE
5'-0" SIDEWALK
INSTALL TEMP. 6'-0" CHAIN LINK FENCE
SUGGESTED DEWATERING BASIN LOCATION
FISH LADDER RETAINING WALL AND FOOTING
REMOVE THE PORTION OF THE WATERLINE OVER THE EXISTING CULVERT AND REPLACE PIPE IN LINE WITH BURIED PIPE
R&D PORTION OF EXISTING PRIMARY SPILLWAY CULVERT
R&D POTION OF EXISTING FISH LADDER
TEMPORARY EASEMENT
AGAWAM RIVER
923 SHLO NO. 2313
CRANBERRY HIGHWAY (ROUTE 28NB/6WB)
CRANBERRY HIG
WES
(1925 STATE HIGHWA
LOCATION LINE OF 1917 SHLO 1777
PEDESTRIAN CROSSING
FEE TAKING
WAREHAM
US 6 WB & ST 28 NB
PHASED CONSTRUCTION PLANS NO. 7
STATE MA
FED. AID PROJ. NO. -
PROJECT FILE NO. 606352
SHEET NO. 27
TOTAL SHEETS 38
PHASE 4
SCALE: 1" = 10' (1" = 25')
MMMM DD, YYYY
ISSUED FOR CONSTRUCTION
DATE
DESCRIPTION
THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT AUTHORIZED SIGNATORY:
STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE


MILL POND
PROP. FLOATING WARNING BARRIER
FEE TAKING
48"x84" WARNING SIGN ON BUOY
PROPERTY LINE
INSTALL REMAINING PORTION OF RIPRAP
R&D REMAINING EXIST. PRIMARY SPILLWAY
RECONSTRUCT FISH WAY WALLS AND CHANNEL BOTTOM
LAYOUT ALTERATION
R&D EXIST. FISHLADDER. INSTALL PROP. HEADWALL AND INLET
TEMPORARY EASEMENT
TEMP. LIMITED DEFL. BARRIER, TL-3 (TYP.)
AGAWAM RIVER
1917 SHLO NO. 1777
1923 SHLO NO. 2313
1917 SHLO 1777 BASELINE
LOCATION LINE OF 1917 SHLO 1777
LOCATION LINE OF 1925 SHLO 2313
11'-0" TRAVEL LANE
5'-0" SIDEWALK
SIDEWALK CLOSED
INSET A
MILL POND
R&D EXIST. FISHWAY EXIT
#10 OLD GLEN CHARLIE ROAD MAP 129 LOT 1162 TOWN OF WAREHAM
#6-8 OLD GLEN CHARLIE ROAD MAP 129 LOT RA ERIN K. MACLURE DEED BOOK 50537 PAGE 166 PLAN BOOK 11 PLAN 1115
CRANBERRY HIGHWAY (ROUTE 28NB/6WB)
LIMIT OF CONSTRUCTION
WAREHAM US 6 WB & ST 28 NB
PHASED CONSTRUCTION PLANS NO. 8
PHASE 5
SCALE: 1" = 10' (1" = 25')
MMMM DD, YYYY
ISSUED FOR CONSTRUCTION
DATE
DESCRIPTION
THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT AUTHORIZED SIGNATORY:
STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE
STATE MA
FED. AID PROJ. NO. -
PROJECT FILE NO. 606352
SHEET NO. 28
TOTAL SHEETS 38


MILL POND
AGAWAM MILL POND
CRANBERRY HIGHWAY (ROUTE 28NB/6WB)
AGAWAM RIVER
PROP. FLOATING WARNING BARRIER
FEE TAKING
LIMIT OF HYDROGRAPHIC SURVEY
SPILLWAY AND LOW LEVEL OUTLET
1917 SHLO NO. 1777
1923 SHLO NO. 2313
PROPOSED MODIFIED ROCK FILL FOR STORMWATER TREATMENT UNIT
TEMP. TRAFFIC BARRIER, TL-3 (TYP.)
CONSTRUCT SIDEWALK AND RAILING WITH PROTECTIVE SCREEN
CONSTRUCT PROPOSED SOUTH SIDEWALK
PERMANENTLY RELOCATION OVERHEAD UTILITIES TO FINAL POSITION
CONSTRUCT STORAGE SHED
11'-0" TRAVEL LANE
6'-3" SIDEWALK
+86.14 PC
PHASE 6
SCALE: 1" = 10' (1" = 25')
WAREHAM
US 6 WB & ST 28 NB
PHASED CONSTRUCTION
PLANS NO. 9
STATE MA
FED. AID PROJ. NO. -
PROJECT FILE NO. 606352
SHEET NO. 29
TOTAL SHEETS 38
MMMM DD, YYYY
ISSUED FOR CONSTRUCTION
DATE
DESCRIPTION
THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT AUTHORIZED SIGNATORY:
STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE


LL POND
ROP. FISH LADDER WITH SLIDE GATE
TRASH RACK
EL. 14.30
EEL TRAP
ALUMINUM RAMP
WEIR EL. 11.50
PROP. LOW LEVEL OUTLET CHAMBER
EL. 13.00
EL. 12.00
OUTLET PIPE FOR EXISTING FISH WAY
PROP. BRIDGE NO. W-06-020 (CCV)
℄ OF CONSTRUCTION
16
EDGE OF WINGWALL FOOTING
EDGE OF RETAINING WALL FOOTING
PROP STONE MASONRY RETAINING WALL
PROP. EEL PASSAGE
PROP. SOUTHEAST TRAINING WALL
EL. 6.00
HARVESTING PAD
ALUMINUM HAND RAIL
DETAIL C
EL. 4.00
ALUMINUM ENTRANCE RAMP (TO EEL RAMP)
WEIR EL. 0.50
PROP. FISH LADDER ENTRANCE
SEE "FISH LADDER SECTIONS & DETAILS NO.1" SHEET FOR FISH LADDER POOL INFORMATION
6'-0" CHAIN LINK FENCE
WEIRS (TYP.)
FISH LADDER PLAN
SCALE: 1/8" = 1'-0" (1/8" = 2'-6")
WARE HAM
US 6 WB & ST 28 NB
WILDLIFE PASSAGE PLAN
STATE MA
FED. AID PROJ. NO. -
PROJECT FILE NO. 606352
SHEET NO. 30
TOTAL SHEETS 38
MMMM DD, YYYY
ISSUED FOR CONSTRUCTION
DATE
DESCRIPTION
THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT AUTHORIZED SIGNATORY:
STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

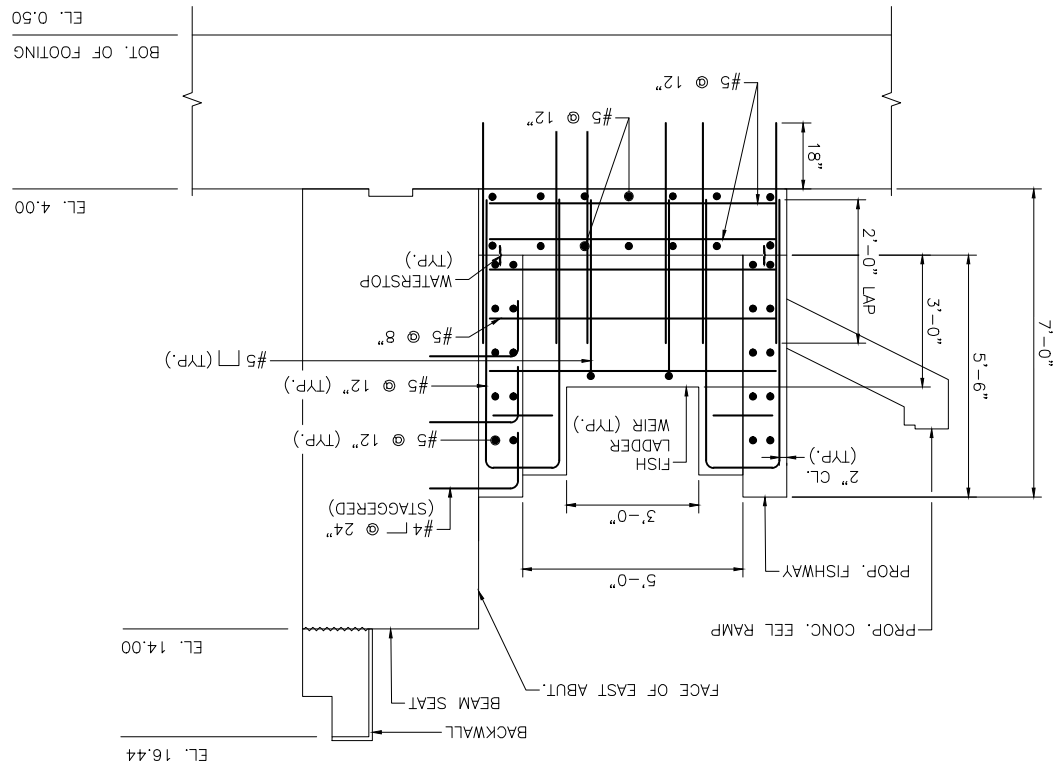
DATE	DESCRIPTION
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION

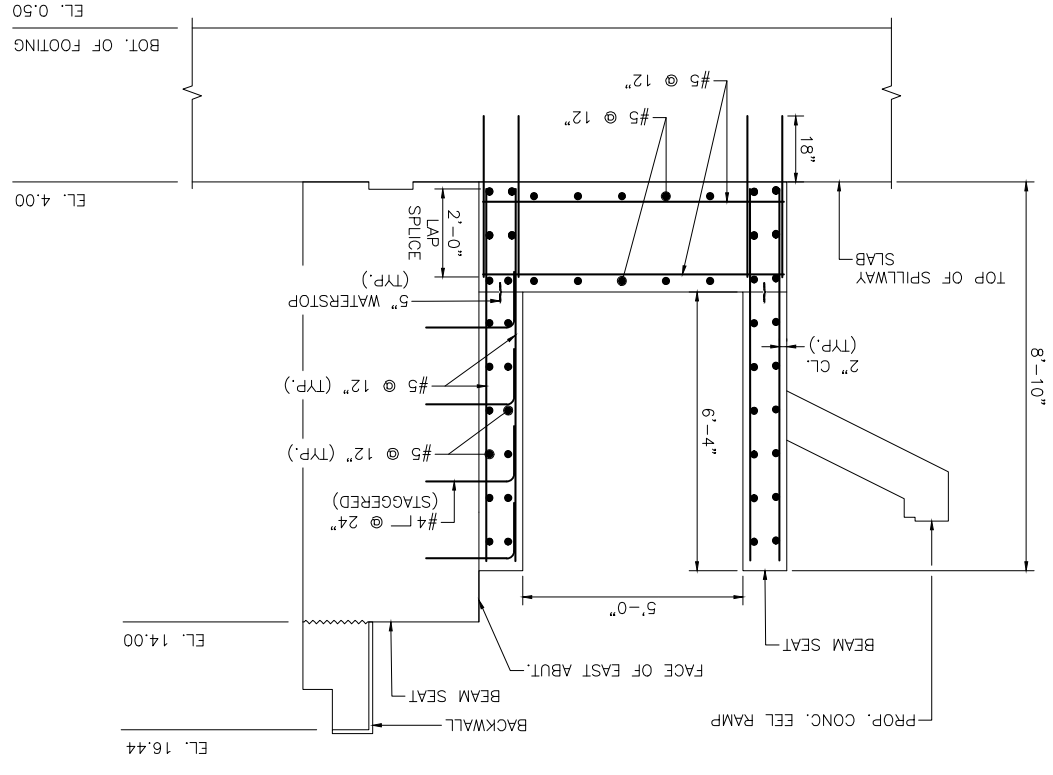
THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

DOWNSTREAM FISH LADDER LAYOUT INFORMATION

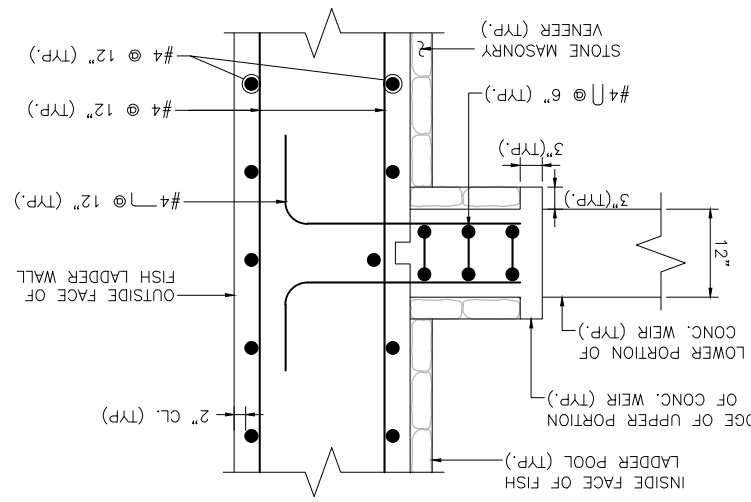
POOL NUMBER	B.O. POOL ELEVATION	DOWNSTREAM STATION	OFFSET (FT)	UPSTREAM STATION**	OFFSET (FT)
1	0.00	15+25.51	87.00 RT	15+37.14	88.86 RT
2	0.00	15+38.19	89.14 RT	15+49.29	92.06 RT
3	0.00	15+50.35	92.33 RT	15+61.04	95.13 RT
4	0.00	15+62.01	95.40 RT	15+73.89	95.47 RT
5	0.50	15+74.86	95.21 RT	15+85.17	89.34 RT
6	1.00	15+85.88	88.64 RT	15+91.70	77.69 RT
7	1.50	15+91.70	76.69 RT	15+85.88	65.73 RT
8	2.00	15+85.17	65.03 RT	15+74.86	59.16 RT
9	2.50	15+73.89	58.90 RT	15+62.71	58.72 RT
HARVESTING PAD	4.50	15+70.73	54.99 RT	15+58.96	54.97 RT
10	3.00	15+61.71	58.72 RT	15+50.88	58.71 RT
11	3.50	15+49.82	58.70 RT	15+45.92	50.92 RT
12	4.00	15+45.93	49.92 RT	15+46.04	39.42 RT
13	4.50	15+46.06	38.42 RT	15+46.16	28.42 RT
14	5.00	15+46.18	27.42 RT	15+46.28	17.42 RT
15	5.50	15+46.29	16.42 RT	15+46.40	6.42 RT
16	6.00	15+46.41	5.42 RT	15+46.51	4.58 LT
17	6.50	15+46.52	5.58 LT	15+46.62	15.58 LT
18	7.00	15+46.63	16.58 LT	15+46.72	26.58 LT
19	7.50	15+46.73	27.58 LT	15+54.93	33.46 LT
20	8.00	15+55.90	33.46 LT	15+65.88	33.46 LT
21	8.50	15+66.88	33.46 LT	15+76.88	33.46 LT
22	9.00	15+77.88	33.46 LT	15+81.38	40.96 LT
23	9.50	15+81.38	41.96 LT	15+81.38	51.96 LT
24	10.00	15+81.38	52.96 LT	15+81.38	63.96 LT

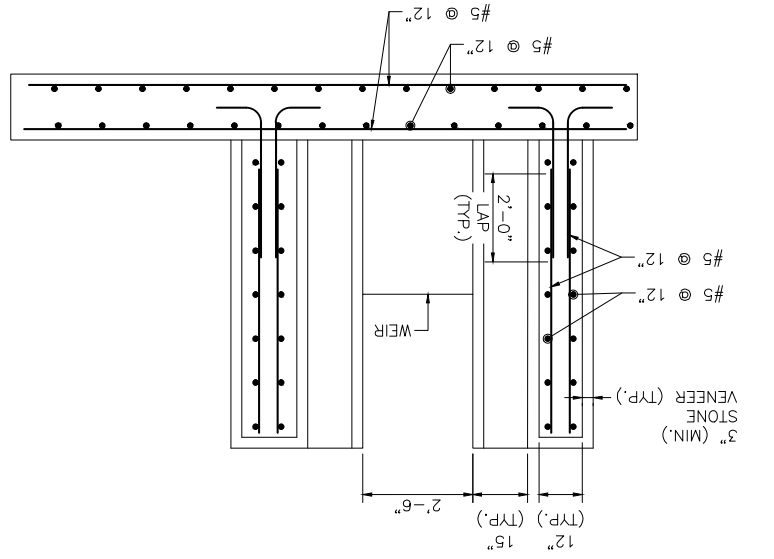




DETAIL C: TYPICAL WEIR REINFORCEMENT

SCALE: 1" = 1'-0"
(1" = 2'-6")

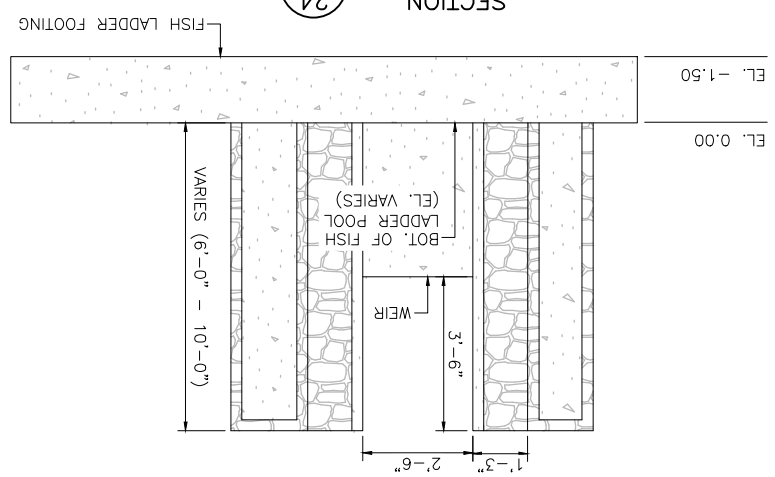


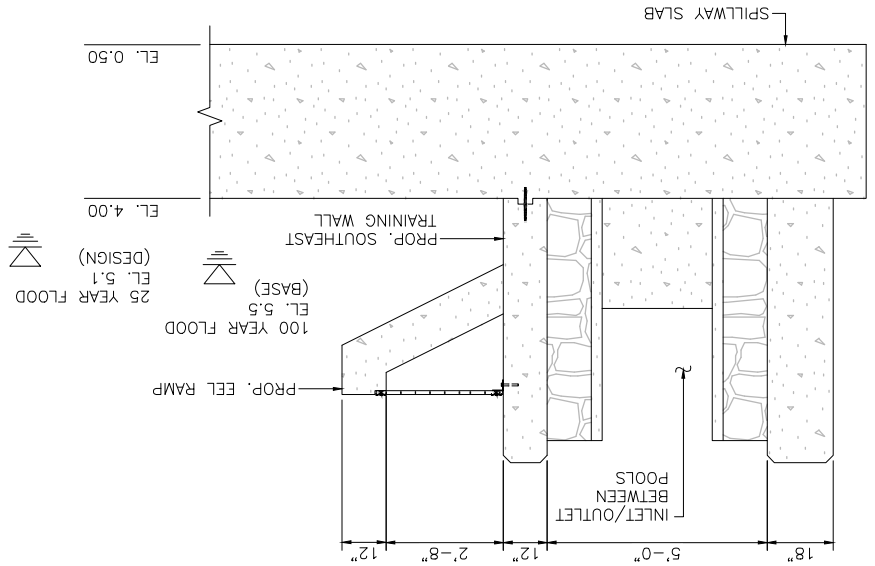


SECTION

24 / 41

SCALE: 2" = 1'-0"
(2" = 2'-6")





WARREHAM
US 6 WB & ST 28 NB
WILDLIFE PASSAGE SECTIONS & PERMIT DETAILS NO. 1

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	31	114
PROJECT FILE NO. 606352			

Second Structural Submittal (S2) 17-December-2024
606352_BR29-31VW08020.DWG Plotted on 19-Mar-2025 10:43 AM
Proposal No. 606352-136278

SHEET ---- OF 77 SHEETS BRIDGE NO. W-06-020 (CCV)

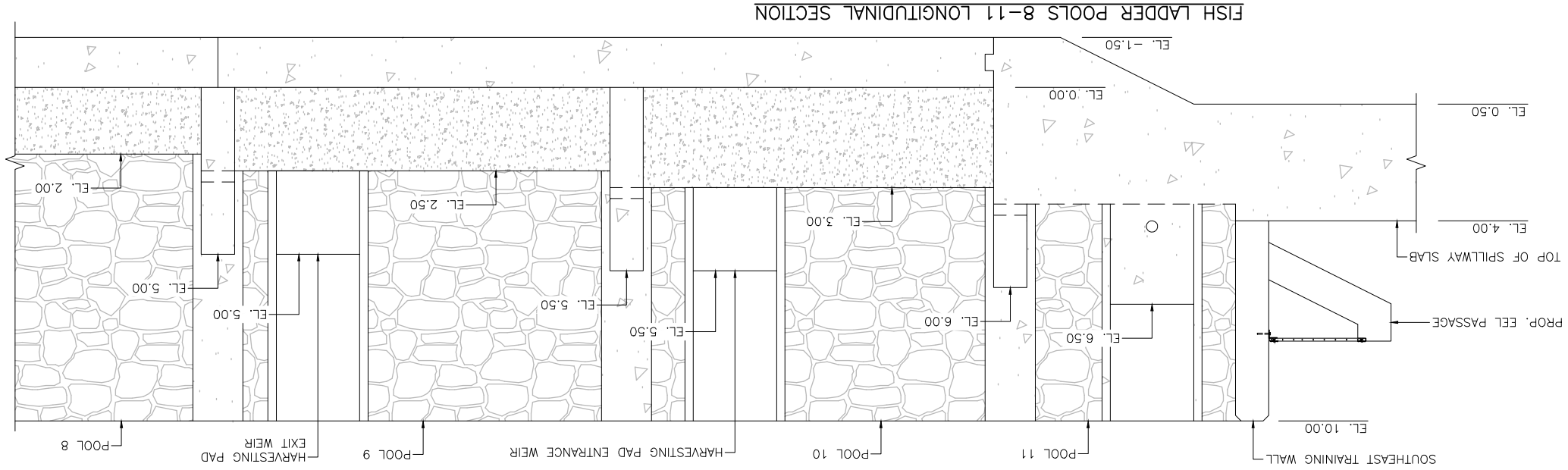
DATE	DESCRIPTION
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

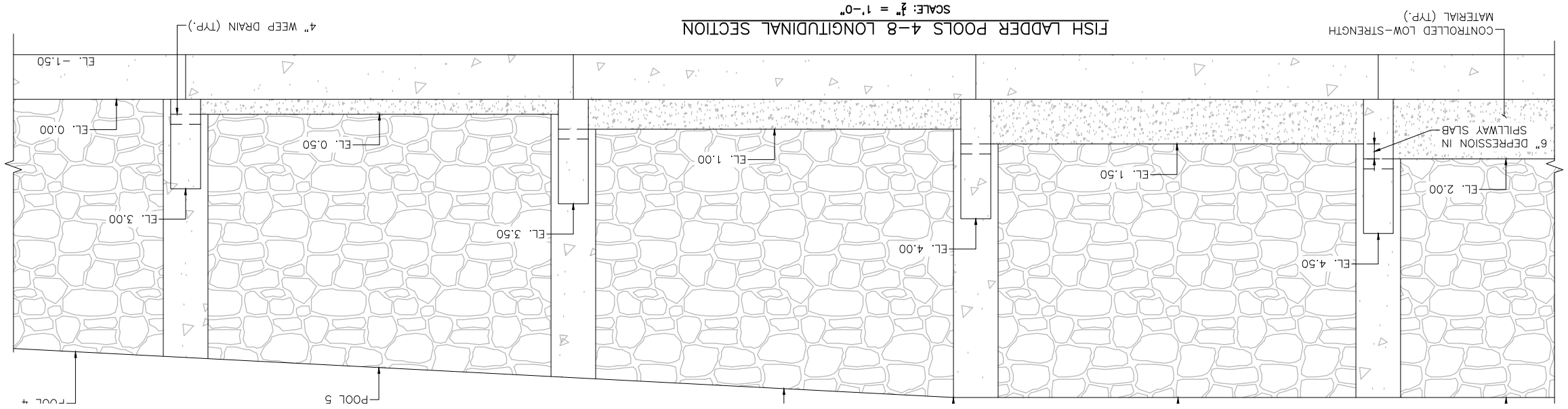
FISH LADDER POOLS 8–11 LONGITUDINAL SECTION

SCALE: 1" = 1'-0"
(½" = 2'-6")



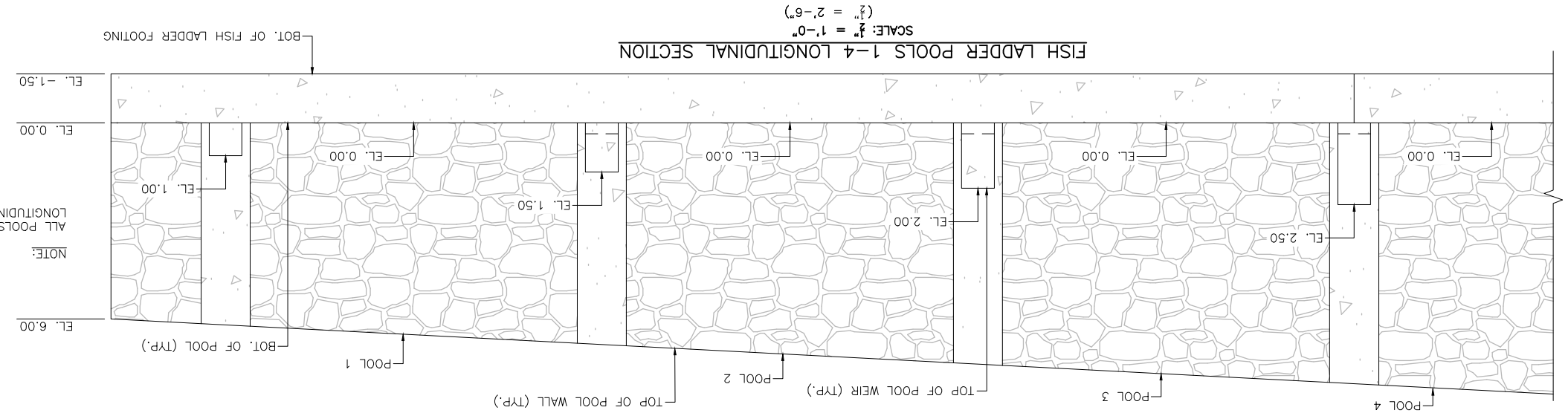
FISH LADDER POOLS 4–8 LONGITUDINAL SECTION

SCALE: 1" = 1'-0"
(½" = 2'-6")



FISH LADDER POOLS 1–4 LONGITUDINAL SECTION

SCALE: 1" = 1'-0"
(½" = 2'-6")



NOTE:
ALL POOLS ARE SHOWN LONGITUDINALLY FOR CLARITY.

WILDLIFE PASSAGE SECTIONS & DETAILS NO. 2

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	32	114
PROJECT FILE NO.	606352		

606352_BR29-31(W06020).DWG Plotted on 19-Mar-2025 10:43 AM

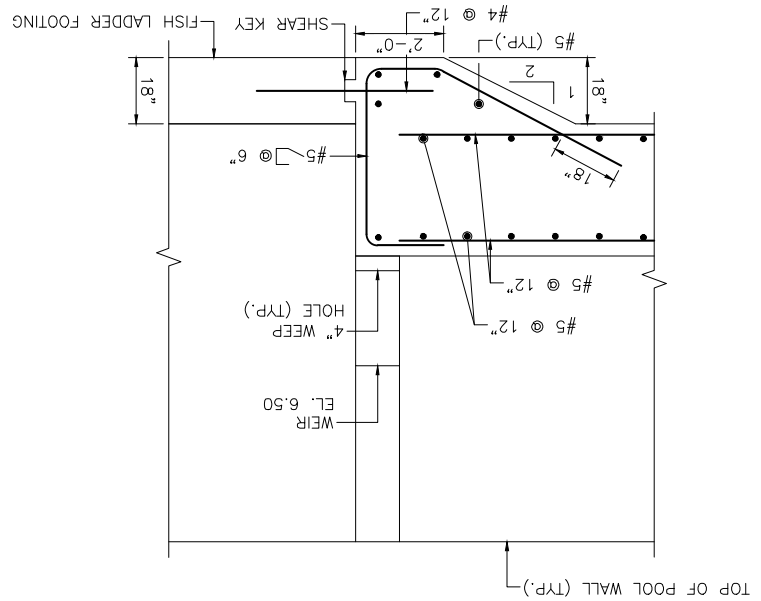
Proposal No. 606352-136278

DATE	DESCRIPTION
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY WASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

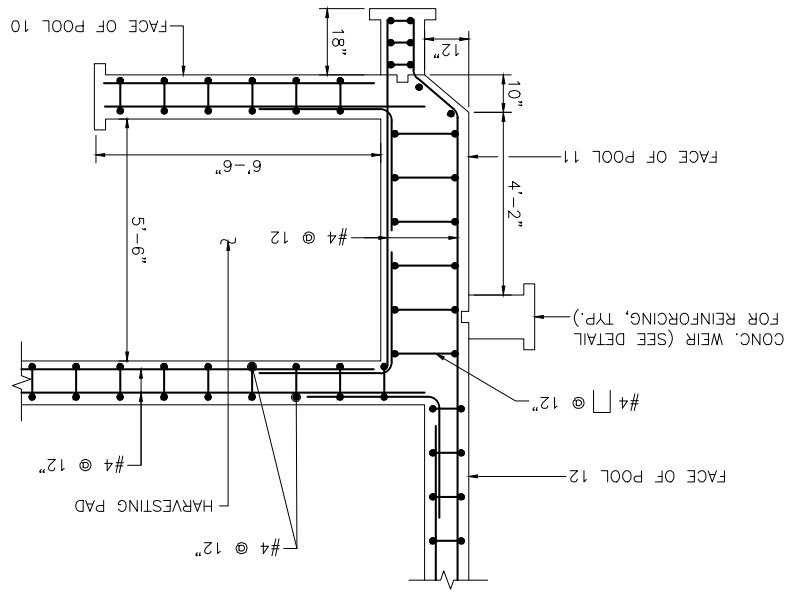
FOOTING HAUNCH REINFORCEMENT

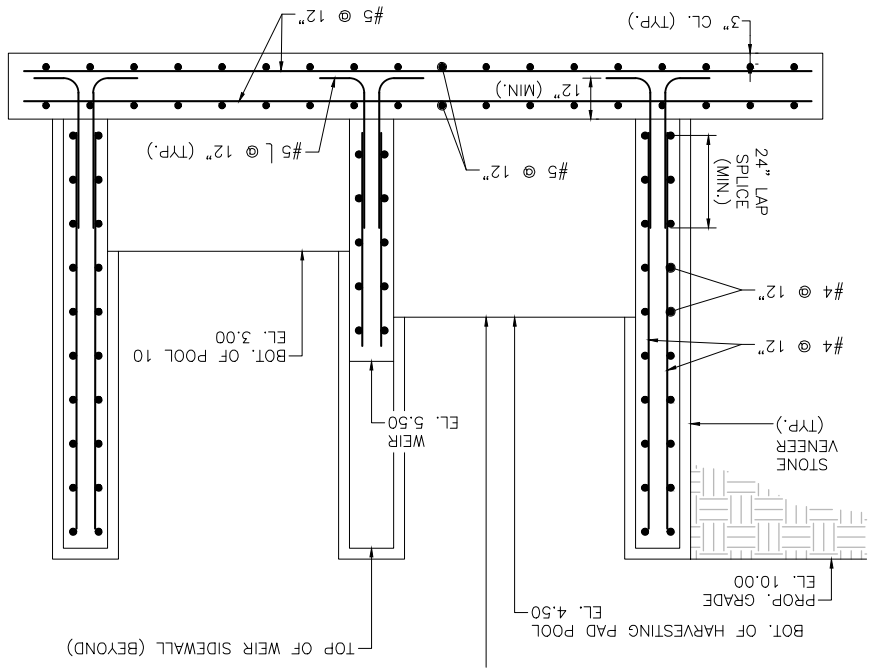
SCALE: 1" = 1'-0"
(2" = 2'-6")

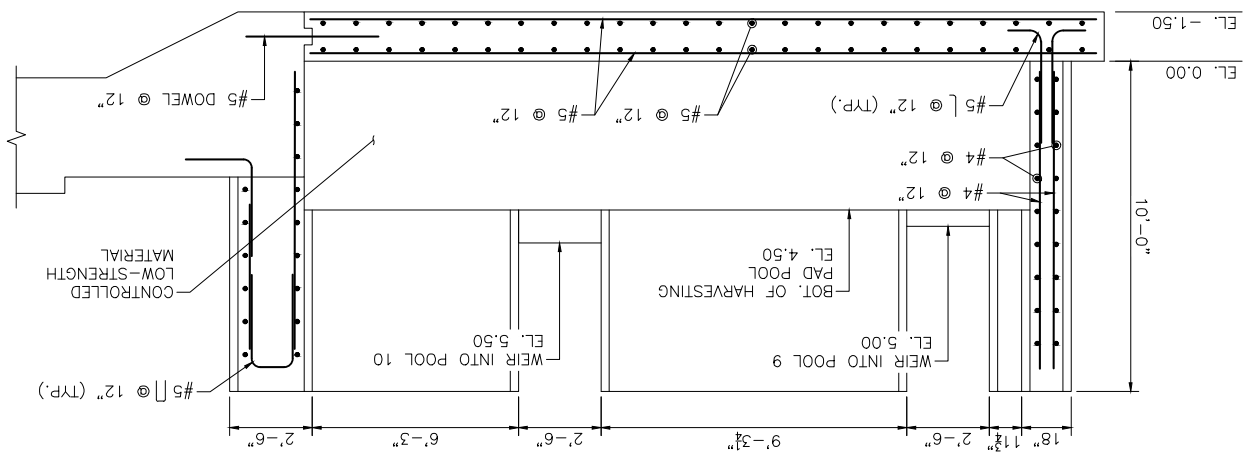


DETAIL D: HARVESTING PAD WALL REINFORCEMENT

SCALE: 1" = 1'-0"
(2" = 2'-6")

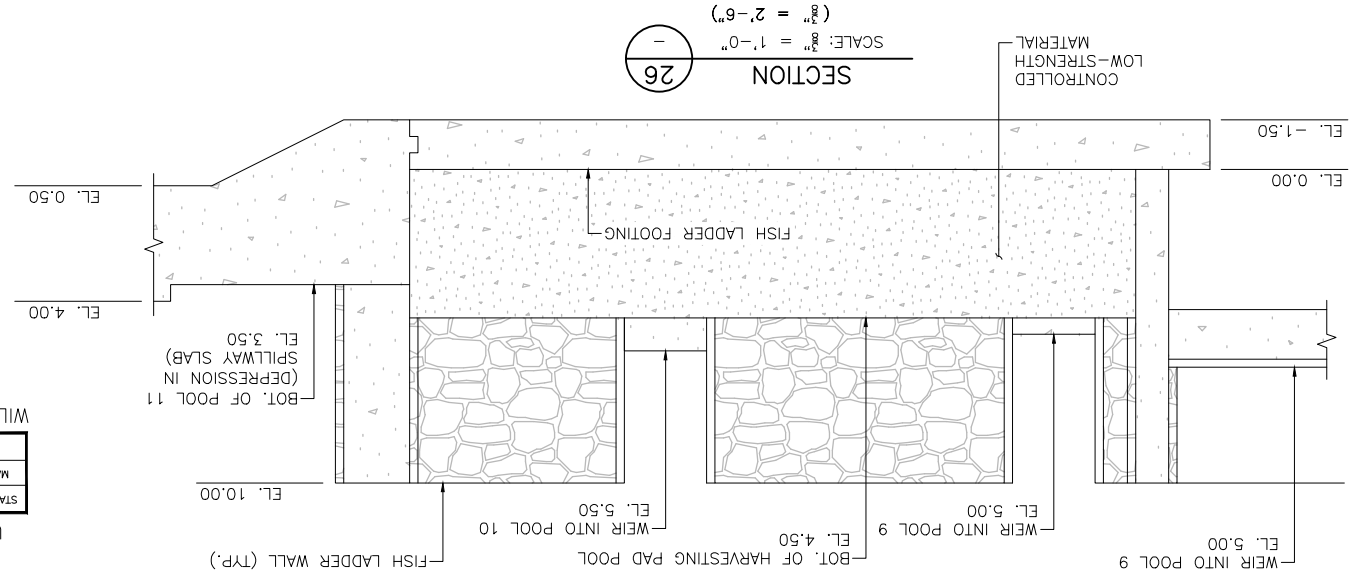


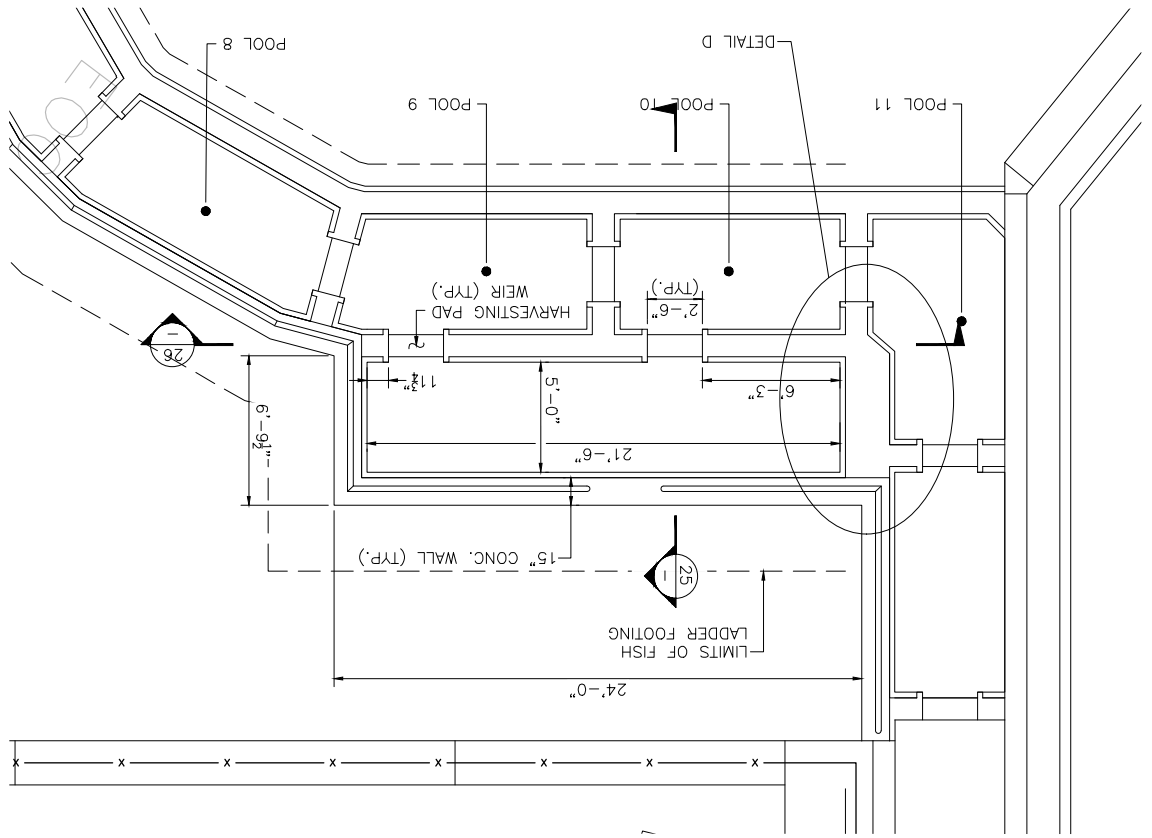




SECTION 26

SCALE: 3/8" = 1'-0"
(3/8" = 2'-6")





WILDLIFE PASSAGE SECTIONS & DETAILS NO. 3

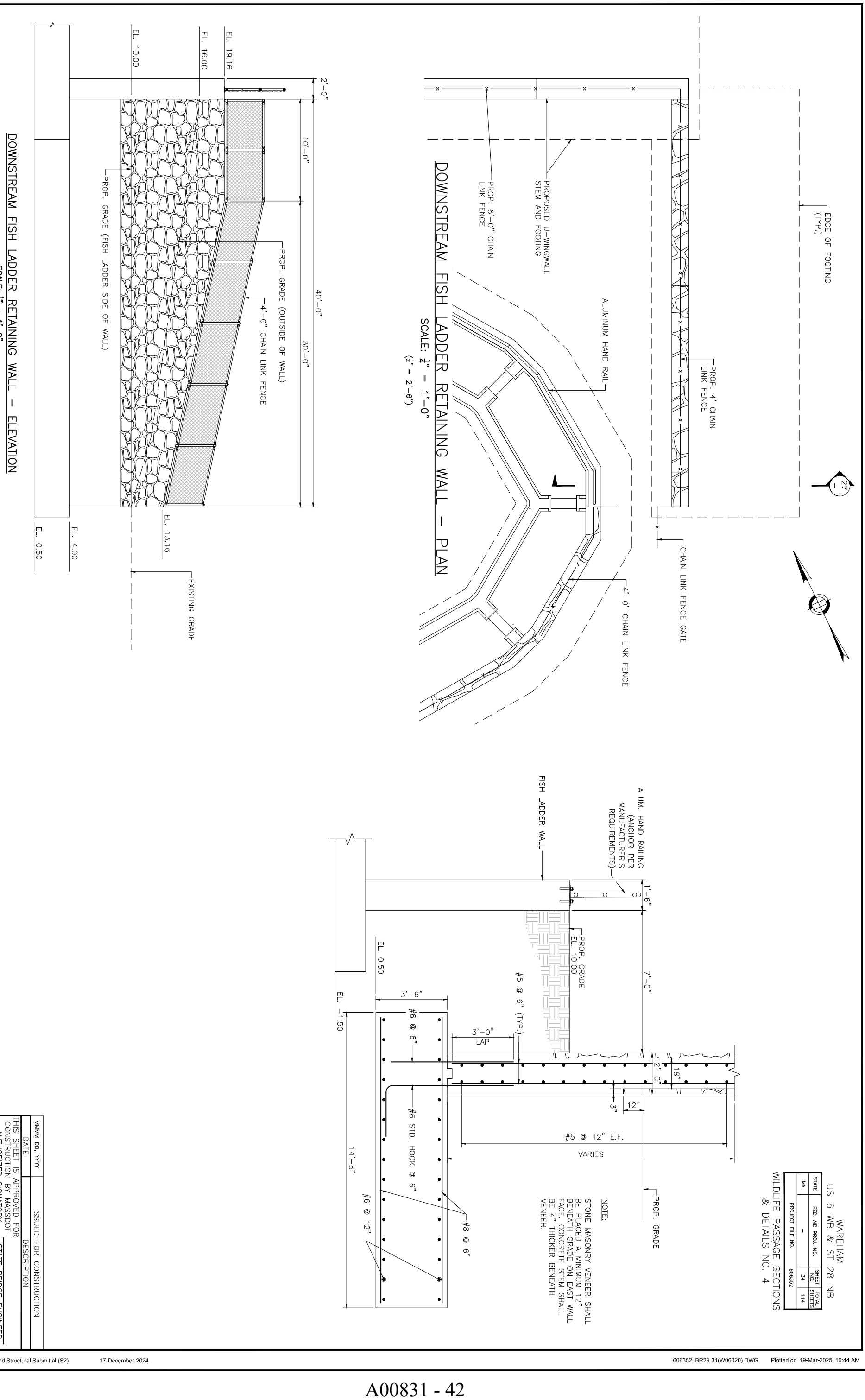
WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	–	SHEET NO.	TOTAL SHEETS
MA			33	114
PROJECT FILE NO. 606352				

Second Structural Submittal (S2) 17-December-2024

606352_BR29-31(W06020).DWG Plotted on 19-Mar-2025 10:44 AM

Proposal No. 606352-136278


EDGE OF FOOTING (TYP.)
PROP. 6'-0" CHAIN LINK FENCE
PROPOSED U-WINGWALL STEM AND FOOTING
ALUMINUM HAND RAIL
PROP 4' CHAIN LINK FENCE
CHAIN LINK FENCE GATE
4'-0" CHAIN LINK FENCE
DOWNSTREAM FISH LADDER RETAINING WALL - PLAN
SCALE: 1/4" = 1'-0" (1/4" = 2'-6")
27
EL. 19.16
EL. 16.00
EL. 10.00
2'-0"
10'-0"
40'-0"
30'-0"
PROP. GRADE (OUTSIDE OF WALL)
4'-0" CHAIN LINK FENCE
PROP. GRADE (FISH LADDER SIDE OF WALL)
EL. 13.16
EL. 4.00
EL. 0.50
EXISTING GRADE
DOWNSTREAM FISH LADDER RETAINING WALL - ELEVATION
SCALE: 1/4" = 1'-0" (1/4" = 2'-6")
ALUM. HAND RAILING (ANCHOR PER MANUFACTURER'S REQUIREMENTS)
FISH LADDER WALL
1'-6"
7'-0"
PROP. GRADE EL. 10.00
EL. 0.50
EL. -1.50
3'-6"
#5 @ 6" (TYP.)
#6 @ 6"
3'-0" LAP
2'-0"
18"
3"
12"
#5 @ 12" E.F.
VARIES
#6 STD. HOOK @ 6"
#6 @ 12"
#8 @ 6"
14'-6"
PROP. GRADE
NOTE:
STONE MASONRY VENEER SHALL BE PLACED A MINIMUM 12" BENEATH GRADE ON EAST WALL FACE. CONCRETE STEM SHALL BE 4" THICKER BENEATH VENEER.
WAREHAM
US 6 WB & ST 28 NB
WILDLIFE PASSAGE SECTIONS & DETAILS NO. 4
STATE: MA
FED. AID PROJ. NO.: -
PROJECT FILE NO.: 606352
SHEET NO.: 34
TOTAL SHEETS: 114
MMMM DD, YYYY
ISSUED FOR CONSTRUCTION
DATE
DESCRIPTION
THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT AUTHORIZED SIGNATORY:
STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE
SHEET ---- OF 77 SHEETS BRIDGE NO. W-06-020 (CCV)

DATE	DESCRIPTION
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION

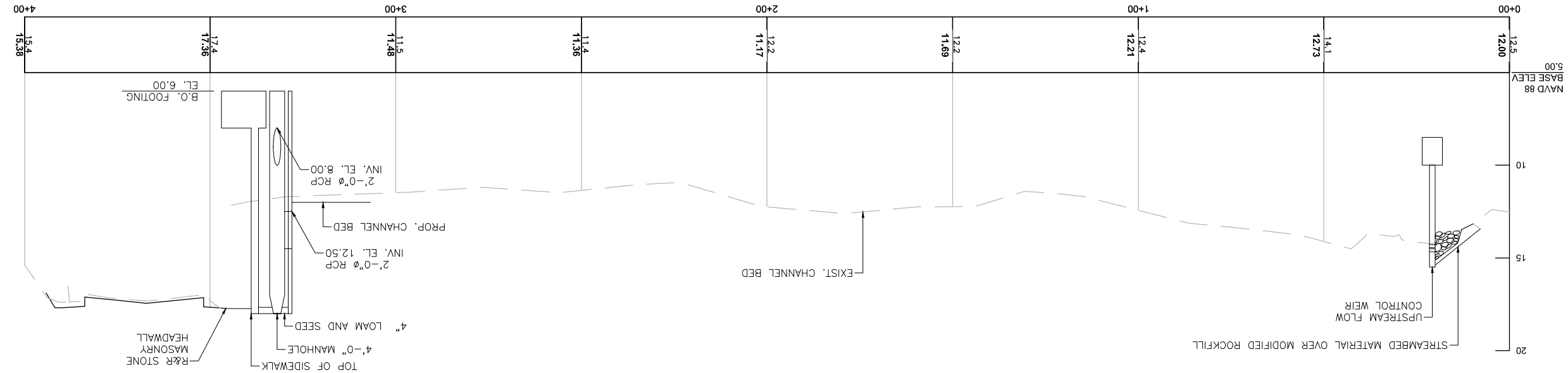
THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT

AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

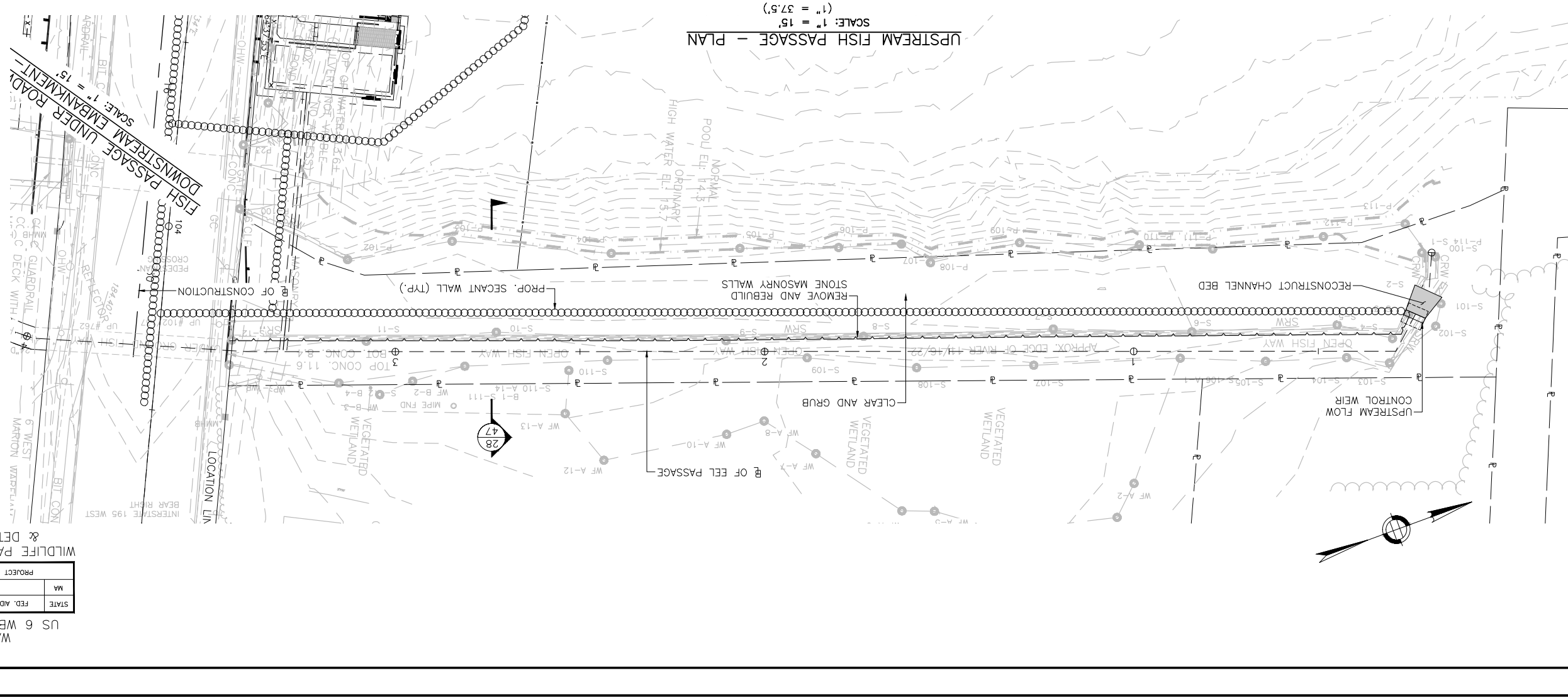
UPSTREAM FISH PASSAGE – PROFILE

HORIZONTAL 1"=15' (1" = 37.5')
VERTICAL 1"=5' (1" = 12.5')



UPSTREAM FISH PASSAGE – PLAN

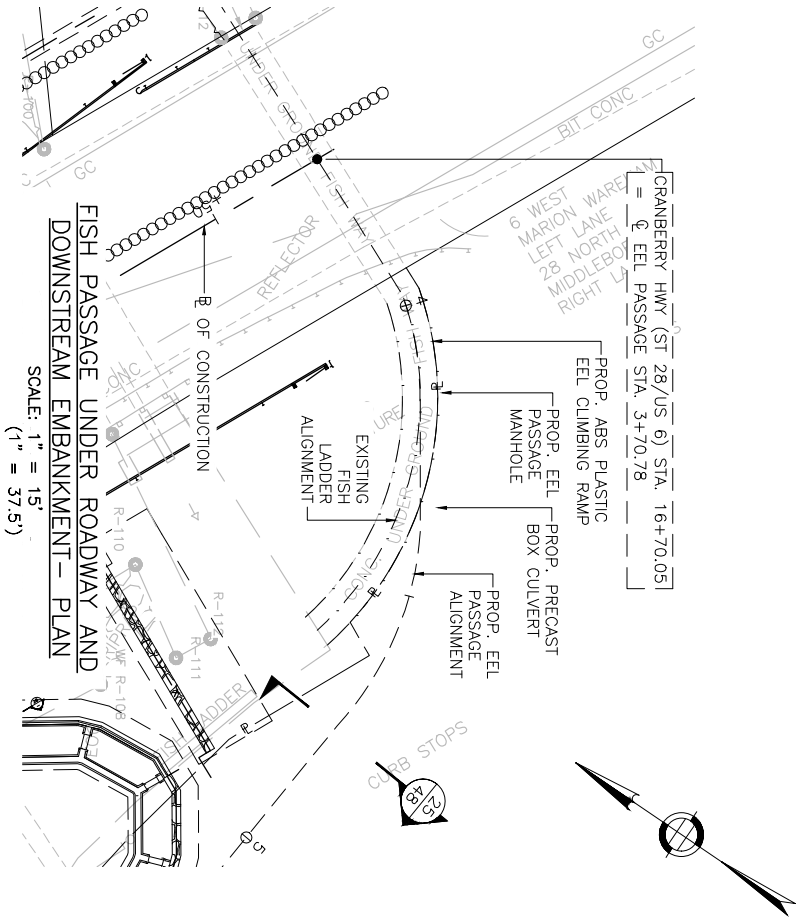
SCALE: 1" = 15'
(1" = 37.5')



WAREHAM
US 6 WB & ST 28 NB

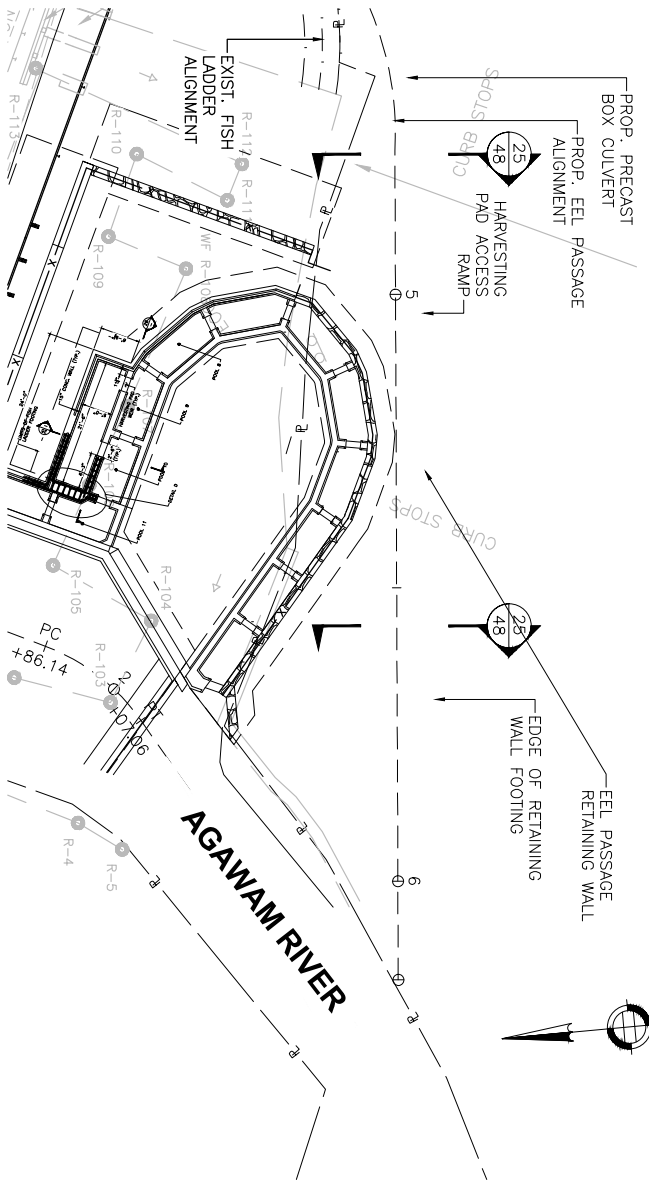
WILDLIFE PASSAGE SECTIONS & DETAILS NO. 5

STATE	FED. AID PROJ. NO.	–	SHEET NO.	TOTAL SHEETS
MA	PROJECT FILE NO. 606352		35	114



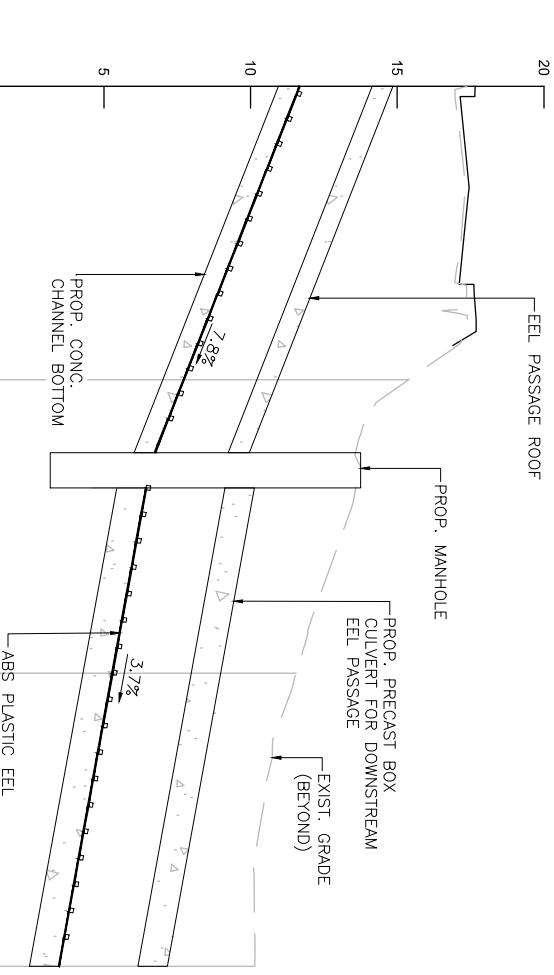
FISH PASSAGE UNDER ROADWAY AND DOWNSTREAM EMBANKMENT– PLAN

SCALE: 1" = 15' (1" = 37.5')



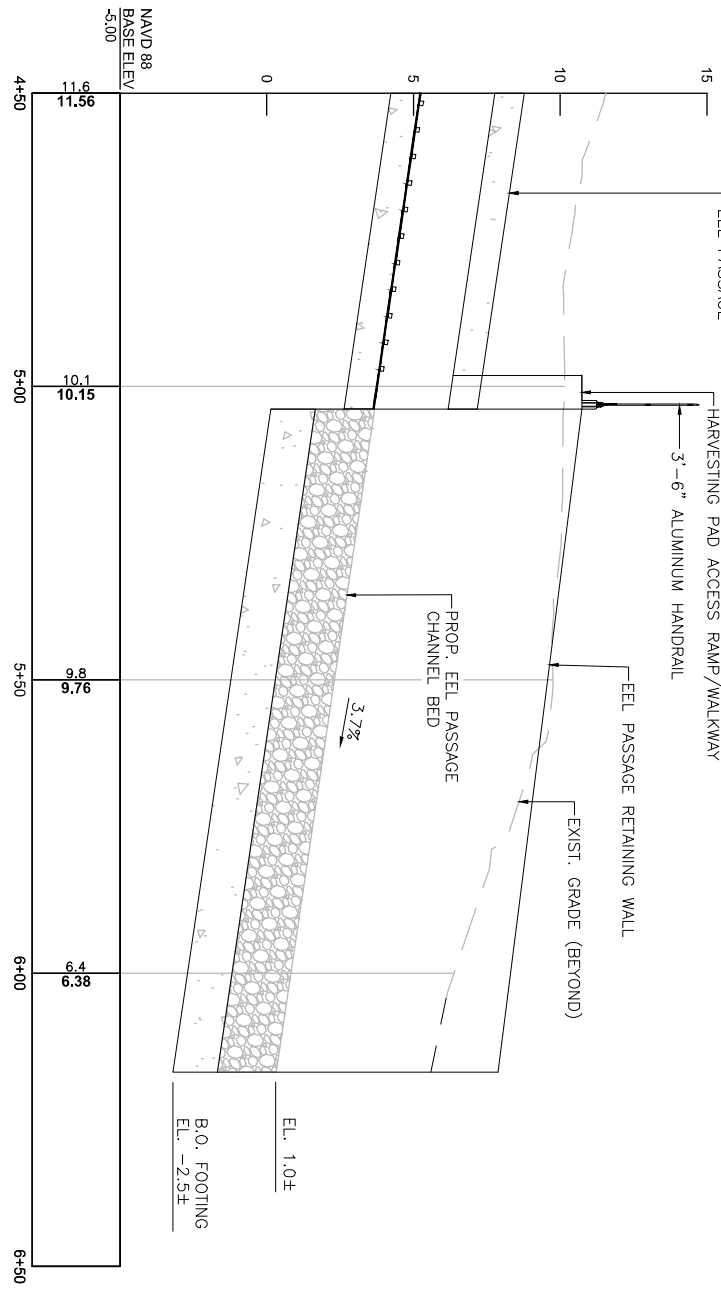
FISH PASSAGE UNDER ROADWAY AND DOWNSTREAM EMBANKMENT – PROFILE

HORIZONTAL 1"=15' (1" = 37.5')
VERTICAL 1"=3' (1" = 7.5')



DOWNSTREAM FISH PASSAGE – PROFILE

HORIZONTAL 1"=15' (1" = 37.5')
VERTICAL 1"=3' (1" = 7.5')



MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT

AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER

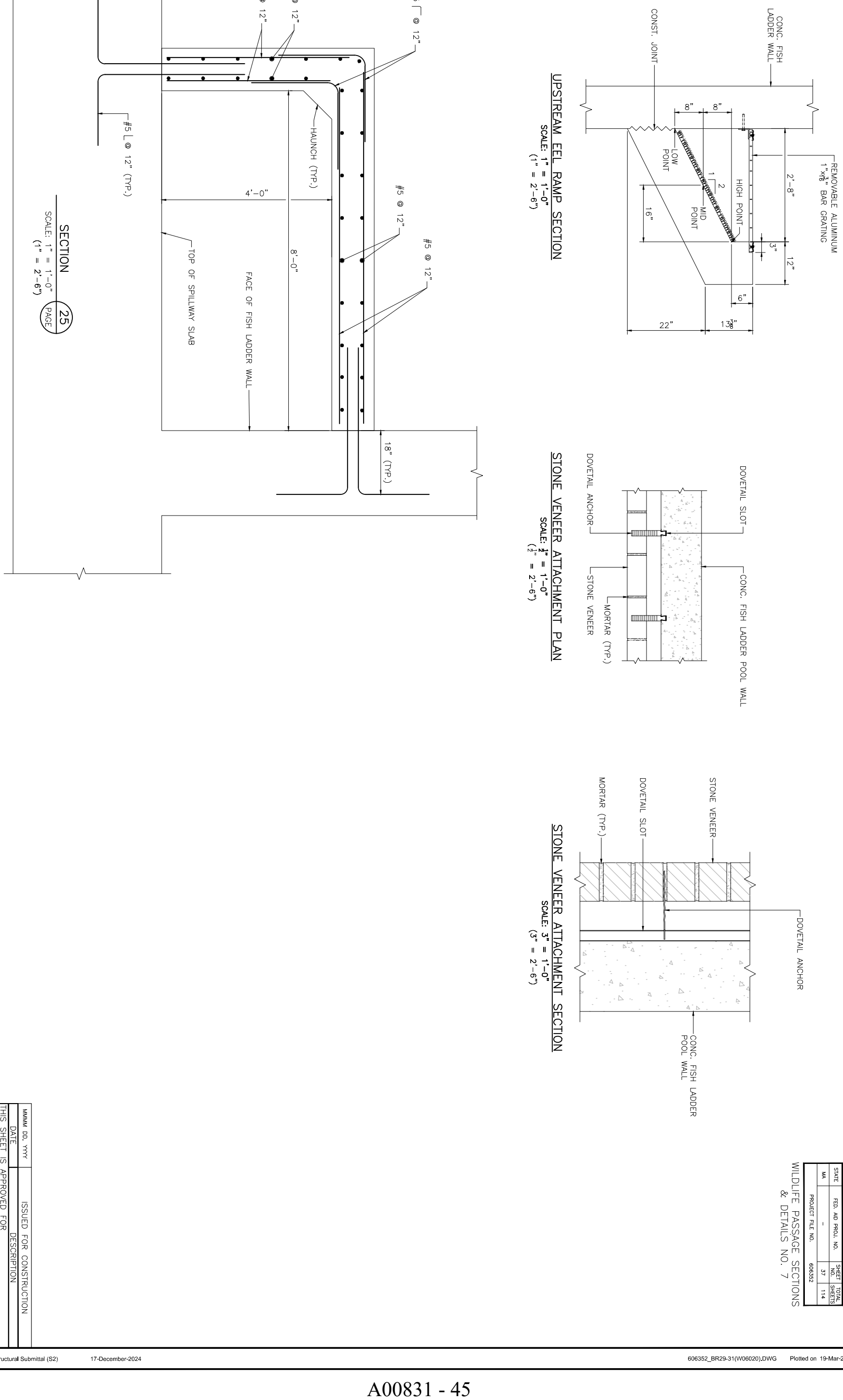
USE ONLY PRINTS OF LATEST DATE

WAREHAM
US 6 WB & ST 28 NB

WILDLIFE PASSAGE SECTIONS & DETAILS NO. 6

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	36	114
	PROJECT FILE NO. 606352		

SHEET ---- OF 77 SHEETS BRIDGE NO. W-06-020 (CCV)



SECTION
SCALE: 1" = 1'-0"
(1" = 2'-6")
25
PAGE

UPSTREAM EEL RAMP SECTION
SCALE: 1" = 1'-0"
(1" = 2'-6")

STONE VENEER ATTACHMENT PLAN
SCALE: 1/2" = 1'-0"
(1/2" = 2'-6")

STONE VENEER ATTACHMENT SECTION
SCALE: 3" = 1'-0"
(3" = 2'-6")

WAREHAM
US 6 WB & ST 28 NB
WILDLIFE PASSAGE SECTIONS & DETAILS NO. 7

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	37	114
PROJECT FILE NO.	606352		

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

SHEET ---- OF 77 SHEETS BRIDGE NO. W-06-020 (CCV)

DATE	DESCRIPTION
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

Second Structural Submittal (S2)
17-December-2024

A00831 - 46

606352_BR29-31(W06020).DWG Plotted on 19-Mar-2025 10:44 AM

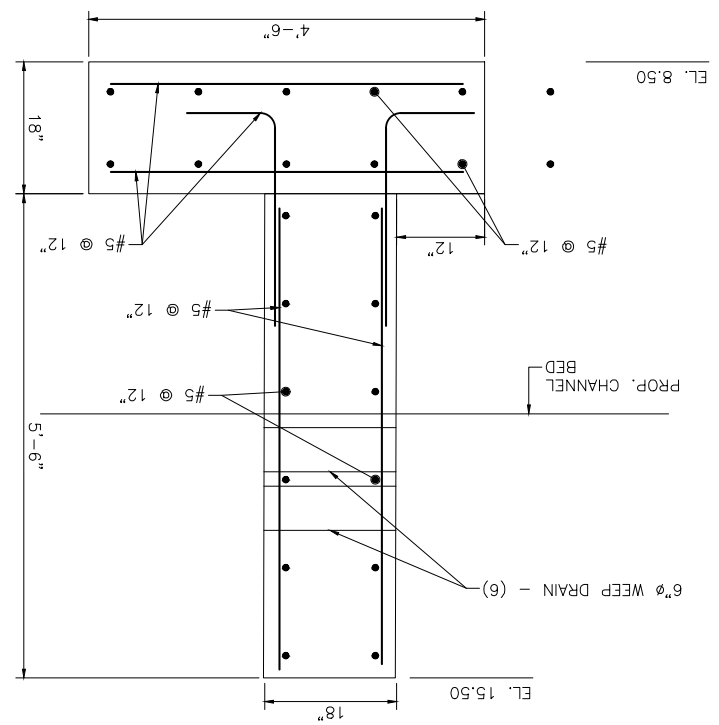
Proposal No. 606352-136278

WILDLIFE PASSAGE SECTIONS
& DETAILS NO. 8

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	–	MA
TOTAL SHEETS	SHEET NO.	38	114
PROJECT FILE NO.		606352	

UPSTREAM FLOW CONTROL WEIR
SCALE: 1" = 1'-0"
(1" = 2'-6")



SECTION 22
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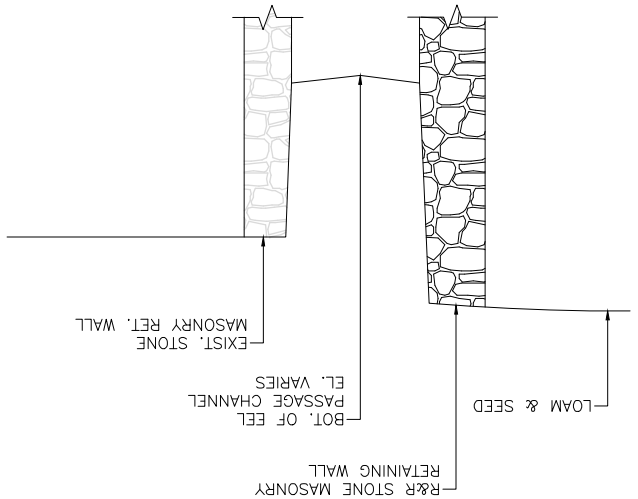
(1" = 2'-6")



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

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Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

July 30, 2025

Massachusetts Department of Transportation Highway Division
10 Park Plaza, Room 7360
Boston, MA 02116
ATTN: Courtney Walker

RE: 401 WATER QUALITY CERTIFICATION/**CORRECTED**
BRP WW 11, Minor Fill Project
BRP WW 08, Minor Dredge
Mill Pond Dam Replacement (Bridge No. W-06-020)
Wareham, Massachusetts

401 WQC Filing Number: 25-WW26-0006-APP
USACE Application No. NAE-2007-03255
MassDOT File Number: 606352

Dear Ms. Walker:

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 June 4, 2025. 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 will replace the Mill Pond Dam at the point where the Cranberry Highway (Route 6 westbound and Route 28 northbound) crosses the Agawam River in Wareham (the Project). The project encompasses spillway and superstructure improvements, embankment work, fishway and fish ladder improvements and pedestrian and bicycle improvements. It also includes installation of scour protection, full-depth reconstruction of the approaches, and Stormwater Control Measures. Bridge No. W-06-020 is considered to be functionally obsolete and the dam/spillway is considered a high hazard structure.

Existing Conditions

Cranberry Highway carries two lanes of westbound traffic over Mill Pond Dam. The roadway consists of two 11-foot travel lanes, a 7.5-foot shoulder on the south side of the roadway, and 2-foot shoulder on the north side, and a sidewalk on each side, totaling 40 feet 9 inches. Mill Pond Dam is a 16.5-foot high,

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285-foot-long earth fill embankment structure originally constructed in 1850 and includes a fishway, a primary spillway, a secondary spillway, and the earthen embankment. Flow outlets the dam through the primary and secondary (auxiliary) spillways which extend south under Cranberry Highway. The spillways discharge to two separate walled channels that converge to form the Agawam River. Mill Pond is upgradient of the dam.

The Agawam River is part of the Wareham River estuary and is tidally influenced up to the Mill Pond Dam. The river supports a historic fish run that includes one of the largest populations of river herring in the Buzzards Bay area. The fish run consists of a walled channel located to the east of the primary spillway. From Mill Pond, the fishway runs south along the east side of the dike to a fish ladder which in turn leads to a buried granite box culvert and then through an open channel at the outlet of the primary spillway. The fishway converges with the flow from the two spillways.

Bordering Vegetated Wetlands (BVW) are adjacent to the work area in multiple locations but will not be impacted. A majority of the project area is within the Federal Emergency Management Agency (FEMA) 1% annual chance of flooding zone (Zone AE). A portion of the Project is also located within MassWildlife's Natural Heritage and Endangered Species Program (NHESP) Estimated and Priority Habitats of Rare Species for the Shore Pygmy-weed (*Crassula aquatica*) and Long's Bittercress (*Cardamine longii*). NHESP has concluded that it is unlikely either species would be present within the work area.

The anadromous fish run includes both alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*). Alewife are listed as a species of special concern by NHESP. The Massachusetts Division of Marine Fisheries (MA DMF) determined that river herring is the target species for this fish passage improvement project with American eel (*Anguilla rostrata*) identified as the secondary species. The fish ladder will need to remain functional with sufficient flow for herring and other marine life to migrate up the Agawam River into Mill Pond through the spillway during construction.

Proposed Project

The Project will replace the existing spillway systems at the dam with a new spillway located upstream of the embankment and the 53-foot single span bridge that carries Cranberry Highway across the Agawam River. Full depth pavement reconstruction of the approaches will occur following installation of the new bridge.

The proposed bridge will provide pedestrian access throughout construction and, in the final condition, sidewalks on both the north and south sides of the roadway. Additionally, a striped buffered bike lane is proposed on the north side of the roadway to allow safer bicycle access over the dam and bridge. The new roadway will be widened by 2 feet 9 inches to incorporate the addition of this bike lane on the south side of the roadway,

In addition to the spillway and bridge work, the existing fish ladder will be replaced with a pool and weir fish ladder intended to provide improved aquatic connectivity at the site for river herring and other diadromous fish species. An eel ramp will be constructed in a similar alignment to the new fish ladder. Flow from the eel ramp will enter the river close to the entrance of the fish ladder to prevent a false attraction to another part of the downstream channel.

Impacts & Mitigation

In total, 22,088 square feet (sf) of impacts to LUW (13,017 sf permanent and 4,328 sf temporary) are required to complete the project. Impacts will primarily occur due to temporary dewatering, demolition of the existing spillway components, excavation of unsuitable materials from dewatered areas, grading, and installation of a new arched crested weir spillway and fish ladder. Widening of the spillway and bridge will create 4,086 sf of new LUW. A total of 5,283 cubic yards (cy) of dredging will occur; 4,893 cy within Mill Pond and 390 cy within the Agawam River.

Cofferdams will be installed and will remain in place for the majority of the project to minimize impacts within the waterway. In the upstream area, within Mill Pond, riprap is proposed to be installed around the arched concrete spillway. South of the proposed spillway, the stream channel will be reconstructed with 2 feet of modified rockfill, and 12 inches of natural streambed material will be placed on top. Along the floor of the fish ladder, the concrete will be lined with a stone veneer made from reused stone from the existing downstream masonry walls that are being demolished for the proposed bridge, spillway, and fish ladder construction. Along the floor of the eel passage, a synthetic material that will imitate grass will be installed to assist eels migrating up the laterally sloped passage.

The project will incorporate native upland plantings along the dike, select upstream areas outside of the dam embankment, along the downstream slopes leading to the proposed SCM, and the downstream area adjacent to the fish ladder. Large trees outside of the limits of work will be protected by tree protection devices to prevent damage to their root systems.

It is anticipated that MA DMF will continue to coordinate and collaborate with MassDOT during construction of this project. The Project will be subject to Time of Year (TOY) restrictions and other mitigation measures for diadromous fish species as prescribed by DMF and conditioned herein.

An alternatives analysis was completed in accordance with 314 CMR 9.00 and evaluated spillway design, fish ladder design and construction drawdown alternatives. The existing bridge and dam are structurally deficient and present a risk of bridge and dam failure; therefore, a no-build alternative is not practicable to meet project goals. Removal of the dam was also considered, but this alternative would result in a substantial adverse impact on the environmental resource created by the dam, including substantial adverse impacts to a significant cultural resource. The new span over the spillway will completely meet the Massachusetts Stream Crossing Standards.

The Project meets the Massachusetts Stormwater Management Standards to the maximum extent practicable (MEP) per 314 CMR 9.06(6). The widening of the bridge and surrounding approaches by 2 feet 9 inches will increase impervious surface within the Project limits by 3.8 percent (3,373 sf). The project proposes the installation of a bioretention basin with a sediment forebay in the southwest project quadrant to treat and attenuate stormwater before discharging to the Agawam River. Nine existing catch basins on site will be replaced with deep sump catch basins to increase the TSS removal on site.

Dredging will be completed to remove excess material within Mill Pond and the Agawam River for the installation of the new dam spillway and fish ladder as well as placement of riprap and natural streambed material. Sediment sample analytical results were compared to the Reportable Concentration (RC) S-1 criteria of the Massachusetts Contingency Plan (MCP). Results of the sediment

samples analyzed indicated that arsenic found within the soil exceeds the RC S-1 reporting criteria under the MCP by 8.6 parts per million (ppm). Excavated sediment can be reused on site or will be disposed of at an approved off-site facility to be determined.

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 and 9.07. Public notice was provided in the Wareham Week on March 6, 2025. 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:

    a) Application for Water Quality Certification: Reconstruction of Mill Pond Dam Route 6WB/28NB (Cranberry Highway) Wareham, MA. Prepared by Pare Corporation on behalf of MassDOT, dated February 2025, with cover letter and attachments. 401 WQC Filing Number: 25-WW26-0006-APP.

    b) MassDOT Response to MassDEP's Administrative Completeness and Technical Deficiency Review, Application No: 24-WW11-0003-APP Mill Pond Dam with attachments. Prepared by Pare Corporation on behalf of MassDOT, dated April 28, 2025.

    c) MassDOT Response to MassDEP's Second Administrative Completeness and Technical Deficiency Review Application, No: 24-WW11-0003-APP Mill Pond Dam with attachments. Prepared by Pare Corporation on behalf of MassDOT, dated June 4, 2025.

d) WILDLIFE PASSAGE DESIGN REPORT for Reconstruction of Mill Pond Dam MA00027 Route 6WB/28NB (Cranberry Highway) Wareham, MA. Prepared by Pare Corporation, dated July 2025.

e) Revised HYDRAULIC STUDY REPORT for Cranberry Highway (Route 28)/ Mill Pond Dam Over the Agawam River, Wareham, Massachusetts. Prepared by Pare Corporation, dated December 2021, Revised July 2025.

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 5. The name and contact information of the approved EM shall be provided to the Wareham Conservation Commission prior to the start of work. (Submittal)

3. A qualified **Fish Passage Engineer** with a minimum of five years of relevant professional experience in fish passage restoration projects shall be employed to oversee all in-water work as proposed in the application. The name, contact information, and qualifications of the fish passage engineer shall be provided to MassDEP for approval with a copy to the Wareham Conservation Commission prior to the Pre-Construction Meeting required in Condition 5. The fish passage engineer shall be present during specific project milestones, including but not limited to construction of the spillway, fish ladder, eel ramp, restoration of the riverbed and diversion of water to and from the fish ladder and eel ramp while under construction. **(Submittal)**

4. Prior to the Pre-Construction Meeting required in Condition 5, the applicant 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)**

5. A minimum of 21 days prior to the start of ground disturbance or vegetation clearing, MassDOT 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, a representative from the MassDOT Environmental Section and/or the District Environmental Engineer and a representative from MA DMF shall attend the Pre-Construction Meeting. **No work shall commence prior to the Pre-Construction Meeting.**

6. 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)**

7. A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan (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, MassDOT shall submit the CP/PP for review and approval. If the U.S. Environmental Protection Agency (EPA) Construction General Permit (CGP) applies, the Stormwater Pollution Prevention Plan (SWPPP) may serve as the CP/PP, provided 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)**

8. 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)**

9. The CP/PP shall identify, but shall not be limited to, staging and laydown areas in relation to BVW 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.

10. A minimum of 14 days prior to the start of work, MassDOT shall submit a Control of Water Plan for review and approval. The Plan shall include a description of proposed methods to isolate and dewater work areas within streams while maintaining stream flow, including but not limited to the method of isolation (e.g., steel sheeting or sandbag cofferdam), dewatering methods and locations and specifications for stream bypass systems as applicable. The Control of Water Plan shall include a plan depicting LUW and BVW boundaries, and the location of all relevant methods and materials which shall be located within the LUW impact areas approved herein. The plan shall meet the requirements of the CP/PP and be specific to the Project. Dewatering and stream bypasses shall be conducted under the supervision of the RE or other project staff with knowledge of these practices and comply with the applicable conditions identified herein. **(Submittal)**

11. 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.

12. Prior to the Pre-Construction Meeting, the boundaries of LUW and BVW shall be re-flagged where they are within 50 feet of the limits of work. 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 RE. All construction personnel shall be made aware of these markers.

13. Prior to any work within the 1% annual chance of flooding zone within Project limits, including mobilization or storage of equipment and materials, a Flood Contingency Plan shall be submitted to MassDEP for review and approval that includes at a minimum the following information and provisions **(Submittal)**:

    a) The RE and/or Contractor shall monitor the National Weather Service forecast daily, and upon issuance of a flood watch or flood warning for the Project area, the Flood Contingency Plan shall be implemented.

    b) Upon implementation of the Flood Contingency Plan, all construction equipment and materials located below the Base Flood Elevation (BFE) shall be removed and placed in an upland location above the BFE and outside of BVW and/or LUW.

    c) Anchored stationary equipment may remain below the BFE if demonstrated to be required and upon written approval from MassDEP. In the event semi-stationary equipment cannot be feasibly removed before the arrival of the storm, they shall be adequately secured and MassDEP shall be notified prior to the storm.

    d) A requirement to inspect and maintain all erosion and sedimentation controls, and stabilize all exposed soils as needed below the BFE prior to the storm shall be included.

    e) A plan depicting at a minimum, but not limited to, BVW and/or LUW boundaries, the Project limits, and the BFE boundary based on ground elevations shall be included.

    f) Staff and materials must be available 24 hours per day, seven days per week to implement the Flood Contingency Plan. The name, affiliation, title, email address, and phone number of each person responsible for implementing the Flood Contingency Plan shall be included.

    g) No work shall commence until the flood watch or flood warning has ended, all areas below the BFE have been inspected, and erosion and sedimentation controls are maintained as needed.

14. The Contractor shall develop an Invasive Plant Management Strategy (IPMS) to be submitted to MassDEP for review and approval prior to the Pre-Construction Meeting. The IPMS shall be implemented as approved by MassDOT. **(Submittal)**

15. If needed, use of herbicides to control invasive species shall be implemented in accordance with the approved IPMS and with the following requirements:

    a) Herbicides can only be applied by a Licensed Applicator;

    b) Applicants must provide MassDEP Material Safety Data Sheets (MSDS) of the product being used and must also keep MSDS sheets on site;

    c) Product registration in MA with Massachusetts Pesticide Product Registration Number must be confirmed with Massachusetts Department of Agricultural Resources Pesticide Division;

d) EPA Registration Number for the product must be identified;

e) Product label restricted use provisions must be followed; and

f) Applicants must contact MassDEP Wetlands Program, Dredge Unit to determine if a BRP WM 04 herbicide permit is required for any proposed application of herbicides in water bodies.

16. Final Construction Plans (the plans provided to the contractor) shall be submitted for review at least 30 days prior to the Pre-Construction Meeting. Sufficient supporting information, explanation, and documentation shall be provided to MassDEP and the Wareham Conservation Commission for any changes, and MassDEP may at its discretion require additional supporting documentation as a condition of review. Once MassDEP provides written approval, the updated set of plans shall become the "Final Plan of Record." The Plan shall be prepared and signed by a Professional Engineer in the Commonwealth of Massachusetts and shall incorporate all revisions and additions to the original plans that have been approved as discussed herein. **(Submittal)**

Construction Period

17. No more than **13,017 sf** of permanent and **4,328 sf** of temporary impacts to LUW shall occur. All work shall avoid unapproved impacts to LUW and BVW.

18. EM inspections shall occur at least once every fourteen calendar days and within 24 hours of a storm event that produces 0.5 inches or more of rain within a 24-hour period. 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.

19. The EM shall submit to MassDEP and the Wareham Conservation Commission at least one report every month during active construction and once every other 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 Wareham 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. 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.

22. Copies of CP/PP Inspection and Maintenance Log Forms shall be submitted to MassDEP within 14 days upon request.

23. The Project shall identify one individual with at least three years of experience with construction period erosion and sedimentation control to be responsible for erosion and sedimentation control inspections (CP/PP Inspector). Under the direction of the CP/PP Inspector, inspection and maintenance of erosion and sediment controls in active work areas may be performed by both the Contractor and RE or other MassDOT project staff. Maintenance is the responsibility of the Contractor; however, the permittee shall be ultimately responsible for erosion and sedimentation control failure. The EM, RE, and/or contractor shall immediately notify MassDEP and the Wareham Conservation Commission if any unauthorized discharges to BVWs, IVWs, or LUW occur.

24. 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.

25. 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.

26. Work within LUW shall be conducted in low or no-flow conditions to the extent practicable. Notice shall be provided to MassDEP and the Wareham Conservation Commission within 24 hours prior to the commencement of dewatering. Dewatering methods and location(s) shall be approved by the RE or other project staff with knowledge of these practices prior to use to ensure consistency with the approved Control of Water Plan, and shall be documented in the CP/PP. There shall be no discharge of untreated dewatered stormwater or groundwater to LUW or BVW. Any discharges shall be visibly free of sediment.

27. Additional erosion and sedimentation control materials shall be stored on-site at all times for emergencies and routine replacement. Materials shall be kept covered, dry, and accessible at all times. The CP/PP Inspector 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.

28. The Contractor shall monitor the National Weather Service forecast for updates, and upon issuance of a flood watch for the 1% annual chance of flooding zone, shall implement the flood contingency plan referenced in Condition 13.

29. 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 storm drains that discharge to wetland Resource Areas.

30. Stockpiles shall be located no less than 50 feet from LUW and BVW, catch basins, or other drainage conveyances that discharge to LUW and BVW.

31. 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 LUW and BVW and catch basins or other drainage conveyances that discharge directly or indirectly to LUW and BVW.

32. Refueling, washing, and cleaning of vehicles and other construction equipment shall not take place within 50 feet of LUW and BVW and any wash water shall be contained such that it does not drain toward LUW and BVW. MassDEP shall explicitly approve in writing any deviation to this condition for oversized stationary vehicles.

33. The contractor shall have spill containment kits on site. In the event of a release of fuels and/or oils, the local fire department, MassDEP Emergency Response and MassDEP Wetlands Program Highway Unit shall be contacted, and in addition, the MassDEP Bureau of Waste Site Cleanup shall be notified per the requirements of the Massachusetts Contingency Plan, 310 CMR 40.0000.

34. **No in-water, silt-producing work shall occur during the Time of Year (TOY) restriction between the dates of March 15th to July 15th and September 1st to November 15th. A TOY incursion waiver may be requested of MA DMF if the proposed turbidity barriers and cofferdams are installed prior to this TOY period and there is sufficient uninterrupted flow for fish passage.**

35. The Fish Passage Engineer or designee approved by MassDEP shall be on-site during cofferdam installation and dewatering to confirm no fish become entrapped within the cofferdams.

36. A MA DMF Fishway Construction Permit shall be obtained prior to construction. A copy shall be provided to MassDEP and MassDEP shall be notified of any design changes that may occur as a result of the fishway permit. **(Submittal)**

37. Construction vehicles or other vehicles or heavy equipment are prohibited from traversing over the proposed infiltration SCM to avoid compaction of soils during construction. **This area shall be demarcated by silt fence with signage, or high visibility fencing; demarcation shall occur prior to construction.** No vehicles or heavy equipment shall be permitted within the infiltration SCM following placement of the final materials without written approval from MassDEP. Proposed infiltration SCMs shall remain offline until final stabilization is achieved, unless written approval is obtained from MassDEP.

38. Construction vehicles and equipment shall not enter the BVW or LUW unless authorization is provided by way of this permit or amendment. The Contractor shall use equipment with boom reach capabilities and other measures to avoid inadvertent impacts to jurisdictional resource areas as a result of excavation, riprap placement, and/or bridge demolition materials.

39. A temporary shielding or containment system shall be in place beneath the bridge structure prior to removal and concrete excavation to prevent debris from falling into the water below. In the event that any debris accidentally enters the Agawam River, it shall be immediately retrieved. Notice shall be provided to MassDEP if debris enters the river and that it has been removed with photo-documentation (if practicable) submitted by email**.**

Dredging

40. MassDEP shall be notified one week prior to the start of dredging so that staff may inspect the work for compliance throughout the project.

41. No later than 21 days prior to commencement of dredging activity, a Dredged Material Dewatering Plan shall be submitted to MassDEP for review and approval. At a minimum, the Plan shall include but not be limited to the type of containment, method of dewatering (i.e. mechanical or by gravity), method of collecting the dewatered effluent and method of disposal. **(Submittal)**

42. All handling of contaminated sediment exceeding MCP RCS-1 criteria and authorized by this WQC shall be conducted under the direction of a Licensed Site Professional (LSP). Prior to the Pre-Construction Meeting required in Condition 5, the applicant shall provide MassDEP with the name, qualifications, and contact information of the LSP. **(Submittal)**

43. An Environmental Health & Safety Plan shall be required for the protection of workers from any exposure to known/suspected contaminants present in environmental media (including sediment which has been characterized as exceeding MCP RCS-1 criteria). A copy shall be provided to MassDEP within six weeks of the effective of this WQC or two weeks prior to the commencement of the dredging operation, whichever comes first.

44. Dredged sediment shall be sampled to determine the suitability for reuse or if offsite disposal is required. Sampling data including sampling methods and laboratory QA/QC data shall be provided to MassDEP within 48 hours once available from the analytical laboratory for review. Results of the chemical analysis shall be compared to the reuse levels in Policy COMM-97-001-Reuse and Disposal of Contaminated Soil at Massachusetts Landfills for reuse as landfill daily cover and to the Massachusetts Contingency Plan (MCP) RCS-1 criteria. The approved LSP required by Condition 42 will review the data to determine if the sediment exceeds these criteria and requires disposal at an out-of-state facility within ten calendar days. The data and LSP determination shall be submitted to MassDEP prior to transportation of this material. **(Submittal)**

45. Best Management Practices (BMPs) shall be employed by the contractor to protect resource areas located adjacent to the proposed staging/temporary dredged material stockpiling and dewatering areas. Sediment stockpiles shall be constructed in accordance with the MassDEP approved project plans, stabilized, bottom-lined if not placed on paved surfaces and securely covered with wind tear resistance tarpaulin, polyethylene sheeting or similar impermeable material at all times, and properly labeled. Stockpile covers shall be securely weighed down. Stockpiles shall also be secured to restrict access by the public and shall be set back at least 10 feet from temporary construction access roads or other areas and activities which could disturb the stockpiles and associated erosion controls; if the 10-foot setback cannot be met, then a MassDEP-approved barrier shall be provided. Inspection of the sediment containment and dewatering location and associated erosion controls shall be conducted daily and within 24 hours of a storm that produces 0.5 inches or more of rain. Any observed deficiency shall be corrected or repaired in a timely manner.

46. In the event of a precipitation or storm event, the site shall be secured beforehand in such a way as to protect resource areas and waters on site and downstream of the site, including covering of stockpiles of dredged material. Sediment stockpile areas shall be inspected in line with the frequency of the CP/PP required in Condition 7. Any observed deficiency shall be corrected or repaired in a timely manner to prevent discharge from the stockpiled material. If stormwater runoff and erosion is observed from stockpiled dredged material, additional erosion and/or damage prevention controls measures shall be implemented.

47. Dredging, stockpiling of dredged material, and offsite transport of dredged material shall be sequenced and conducted in a manner to limit stockpiling time. Sediment characterized as having concentrations exceeding the RCS-1 criteria shall not be stockpiled at the site longer than

90 days from the date of generation. Extensions may be requested to accommodate unforeseen delays subject to MassDEP approval.

48. Measures shall be in place to prevent turbid waters, due to dredging, demolition, or debris removal activities, from extending past the limits of work into the Agawam River. These measures can be items such as turbidity curtains and/or sheet piles.

49. If visual turbidity escapes the controls in place, as described in Condition 48, work shall stop immediately and MassDEP shall be notified within 24 hours. Work shall not resume until the issue is corrected and to the satisfaction of MassDEP.

50. All turbidity controls shall be inspected daily by the RE or a designated MassDOT Project Staff. If any damage is observed the controls in place will be replaced or repaired immediately.

51. If excavated sediment is disposed of off-site, MassDEP shall be notified in writing of the name and location of the upland licensed facilities accepting the dredged material for disposal or reuse for review and approval. If the licensed facility is located out of state, documentation shall be provided to MassDEP that the dredged material disposal/reuse has been approved and will be accepted by the receiving State. The dredged material shall not be transported to the facility without the concurrence of MassDEP.

52. If excavated sediment is disposed of off-site, Transportation and disposal of the dredged material shall be overseen by the LSP of record. A Bill-of-Lading (BOL) or a Material Shipping Record (MSR) shall be used to track the dredged material to the licensed disposal facility and/or proposed intermediate (stockpiling /dewatering) facility. A fully executed copy of the BOL or MSR shall be provided to MassDEP within 30 days of final shipment to the reused location or facility.

53. If excavated sediment is disposed of off-site, BMPs shall be implemented during transportation of the dredged material to the licensed receiving facility. At a minimum, when transported upon public roadways, all dredged material shall have no free liquid as determined by the Paint Filter Test or other suitably analogous methodology acceptable to MassDEP, and a tarpaulin or other means shall be used to cover the dredged material during transport.

Stream Mitigation

54. The Fish Passage Engineer 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 10 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.

55. A minimum of 14 days prior to installation of the streambed materials, the Fish Passage Engineer shall meet with the contractor to determine the suitability of stockpiled streambed material for reuse.

56. Upon completion of the LUW replication and restoration, the Fish Passage Engineer shall provide photographs and a summary of the completed work to MassDEP and the Wareham Conservation Commission. **(Submittal)**

57. 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 RE.

58. 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

59. All non-biodegradable temporary erosion controls shall be removed at the conclusion of work once the surrounding area has achieved final stabilization.

General Conditions

60. 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 tyler.lewis@mass.gov. **(Submittal)**

61. This WQC remains in effect for the same duration as the Section 404 permit that requires it.

62. No Special Condition set forth herein shall be construed or operate to prohibit MassDEP from taking enforcement against MassDOT or its contractors for any failure to comply with the terms and requirements of this WQC.

63. 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
Wetlands Program, Highway Unit
100 Cambridge Street, 8th floor
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):

1. the 401 Certification Transmittal Number;
2. the complete name of the applicant and address of the project;
3. 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;
4. 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;
5. a clear and concise statement that an adjudicatory hearing is being requested;
6. 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
7. 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

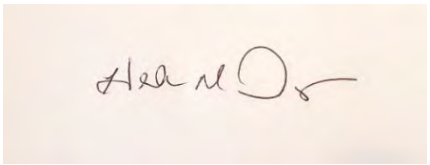
The hearing request along with a DEP Fee Transmittal Form and a valid check or money order payable to the Commonwealth of Massachusetts in the amount of one hundred dollars ($100) must be mailed to:

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 me at heidi.davis@mass.gov or Tyler Lewis at tyler.lewis@mass.gov.

Very truly yours,



Heidi M. Davis
Highway Unit Supervisor

Ecc: DEP – Maissoun Reda
USACE – Daniel Vasconcelas
MassDOT – Melissa Lenker
MassDOT – David Paulson
MA DMF – Brad Chase
MA DMF – Stephanie Berkman
Pare Corporation – Erika Klinkhammer – eklinkhammer@parecorp.com
Pare Corporation – Eric Silva – esilva@parecorp.com
Wareham Conservation Commission – Christine Santos - csantos@wareham.ma.us

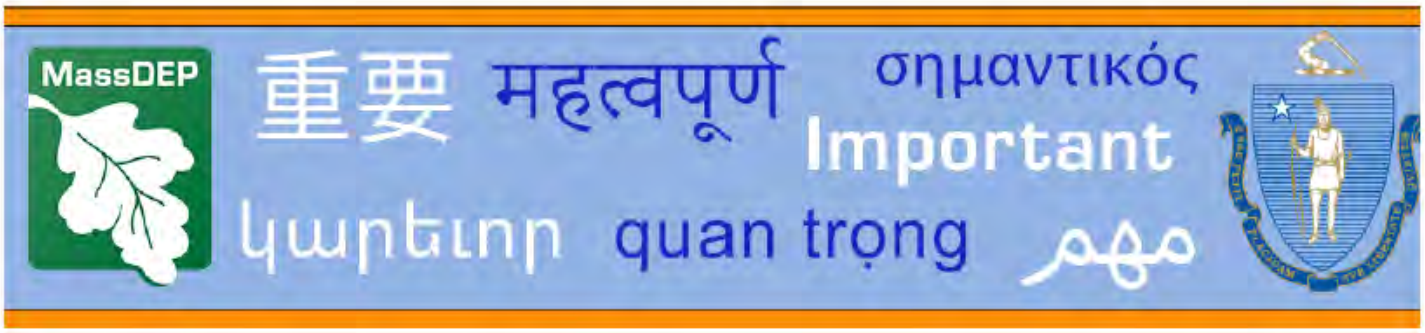
ATTACHMENT A
PRE-CONSTRUCTION SUBMITTAL CHECKLIST

Dam/Bridge Replacement (W-06-020), Cranberry Highway over Agawam River
Wareham, Massachusetts

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.

Pre-Construction Meeting Date: _____

Condition	Required Submittal	Due Date	Date Submitted	Date Approved
PRE-CONSTRUCTION SUBMITTAL REQUIREMENTS				
2	Name and contact information of the EM, including specific experience & years to meet requirement.	Prior to Pre-Construction Meeting		
3	Name and contact information of the Fish Passage Engineer	Prior to the Pre-Construction Mtg		
4	Name and contact information of the RE	Prior to Pre-Construction Meeting		
6	USACE Work-Start Notification Form	14 days prior to work start		
7	CP/PP	14 days prior to work start		
8	Verification of CP/PP Training	Prior to start of work		
10	Control of Water Plan	14 days prior to work start		
13	Flood Contingency Plan	Prior to any work within 1% annual chance of flooding zone		
14	Invasive Plant Management Strategy	Prior to Pre-Construction Meeting		
16	Final Plans	30 Days Prior to Pre-Construction Meeting		
36	MA DMF Fishway Construction Permit	Prior to start of work.		



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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DOCUMENT A00832

ARMY CORPS OF ENGINEERS

GENERAL PERMIT

MAGP 6-1-23

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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

1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) not located in riffle and pool complexes and non-tidal vegetated shallows.

2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, (c) not located in saltmarsh and tidal vegetated shallows.

3. Temporary, non-biological sampling devices in waters that do not restrict or concentrate movement of aquatic organisms and will not adversely affect the course, condition, or capacity of a waterway for navigation.

4. Scientific measurement devices, and small weirs and flumes constructed primarily to record water quantity and velocity provided the discharge of fill is limited to 25 cubic yards. These cannot obstruct or restrict the waterway course, condition, capacity, and location.

5. Temporary measuring devices and associated structures (e.g., anchors, buoys, etc.) in tidal and non-tidal waters that do not require a PCN or IP.

Pre-Construction Notification Required

1. Biological sampling devices, weirs or flumes, or the activity restricts or concentrates movement of aquatic organisms.

2. Permanent towers located in navigable waters that record and measure scientific data.

3. Devices that are not eligible for SV and do not require an IP.

Note: An SVN submittal to USACE is not required for temporary measuring devices with a footprint of <10 SF, with a profile of <3 feet high measured from the substrate and located in water deeper than -10 feet MLW.

GP 15. SURVEY ACTIVITIES (Authorities: §10 and §404)

Survey activities such as soil borings, core sampling, seismic exploratory operations, plugging of seismic shot holes and other exploratory-type bore holes, exploratory trenching, soil surveys, sampling, sample plots or transects for wetland delineations, and historic resources surveys.

Not authorized under GP 15 (IP required): (a) Permanent impacts that are >1 acre in tidal and non-tidal waters; >1000 SF in tidal saltmarsh, mud flats, or riffle and pool complexes; or >100 SF in tidal vegetated shallows; or (b) Temporary impacts in tidal waters that are >1 acre, unless the District Engineer waives this criterion by making a written determination concluding that the discharge of dredged or fill material will result in no more than minimal adverse environmental effects; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, (c) not located in saltmarsh and tidal vegetated shallows.	1. Exploratory trenching (see Note 2) occurs in waterways (e.g., streams, tidal waters). 2. Activities associated with the recovery of historic resources, and the drilling and discharge of excavated material from test wells for oil and gas exploration. 3. Seismic exploratory operations occur in tidal waters, the Connecticut River from the Turners Falls Dam to the MA/CT border, or the Merrimack River from the Essex Dam to the mouth. This is to protect endangered species. 4. Activities that are not eligible for SV and do not require an IP.

Notes:

1. An SVN submittal is not required for wetland delineations, and core sampling conducted for preliminary evaluation of dredge project analysis.
2. For the purposes of GP 15, the term “exploratory trenching” means mechanical land or underwater clearing of the upper soil profile to expose bedrock or substrate for the purpose of mapping or sampling the exposed material.
3. The discharge of drilling mud and cuttings may require a permit under §402 of the CWA.

GP 16. LAND AND WATER-BASED RENEWABLE ENERGY GENERATION FACILITIES (Authorities: §10 and §404), AND HYDROPOWER PROJECTS (Authority: §10 and §404)

Structures and work in tidal waters and discharges of dredged or fill material into tidal and non-tidal waters for the construction, expansion, modification or removal of: (a) Land-based renewable energy production facilities (e.g., solar, wind, biomass, geothermal) and their attendant features; (b) Water-based wind or hydrokinetic renewable energy generation projects and their attendant features; and (c) Discharges of dredged or fill material associated with hydropower projects. Attendant features may include, but are not limited to, land-based collection and distribution facilities, control facilities, and parking lots. For each single and complete project in (b) above, no more than 10 generation units (e.g., wind turbines or hydrokinetic devices) are authorized in navigable waters of the U.S. Upon completion of the pilot project (see note 2), the generation units, transmission lines, and other structures or fills associated with the pilot project must be removed to the maximum extent practicable.

Not authorized under GP 16 (IP required): (a) Permanent impacts that are >1 acre in non-tidal waters, >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in vegetated shallows; or (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
In non-tidal waters, the combined permanent and temporary impacts for land-based activities are (a) ≤5,000 SF, (b) not located in riffle and pool complexes and non-tidal vegetated shallows.	1. In non-tidal waters, the combined permanent and temporary impacts for land-based activities are (a) >5000 SF, or (b) located in vegetated shallows or riffle and pool complexes. 2. Permanent and temporary impacts in tidal waters. 3. Water-based wind or hydrokinetic renewable energy generation projects, and hydropower projects. 4. For all activities eligible for authorization under GP 16: a. The activity occurs in tidal waters or in, over or under navigable waters. b. Stream channelization, relocation, impoundment, or loss of streambed occurs. 5. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Utility lines constructed to transfer the energy from the land-based renewable generation or collection facility to a distribution system, regional grid, or other facility may be authorized by GP 6.
2. For the purposes of this GP, the term “pilot project” means an experimental project where the renewable energy generation units will be monitored to collect information on their performance and environmental effects at the project site.

GP 17. RESIDENTIAL, COMMERCIAL AND INSTITUTIONAL DEVELOPMENTS AND RECREATIONAL FACILITIES (AUTHORITIES: §404)

Discharges of dredged or fill material into non-tidal waters for the construction or expansion of: (a) Residences and residential subdivisions; (b) Residential, commercial and institutional building foundations and building pads; and (c) Recreational facilities such as playgrounds, playing fields, bikeways, trails, etc. This GP also authorizes attendant features that include, but are not limited to, roads, parking lots, garages, yards, and utility lines, and stormwater management facilities. This GP authorizes attendant features if they are necessary for the use of the project purpose.

Not authorized under GP 17 (IP required): (a) Permanent impacts that result in loss of non-tidal waters >1/2 acre; >1000 SF in riffle and pool complexes or vegetated shallows; or (b) Subsurface sewerage disposal systems in non-tidal waters.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) <5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. Stream channelization or relocation resulting in loss of streambed that is <200 LF.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≥5,000 SF, or (b) located in riffle and pool complexes or non-tidal vegetated shallows. 2. Stream and wetland crossings that require a PCN per GCs 20 TOY Restrictions and GC 31 Stream Work and Crossings & Wetland Crossings. 3. Stream channelization or relocation resulting in loss of streambed that is ≥200 LF. Stream impoundment activities of any kind. 4. Activities on USACE properties & USACE-controlled easements. 5. Activities that are not SV eligible and do not require an IP.

Notes:

1. Stream and wetland crossings (permanent and temporary), including those built with construction mats; and modifications (including sliplining), replacements or extensions to existing crossings.
2. See GC 22 for information on temporary construction mats.
3. Subdivisions: For residential subdivisions, the aggregate total loss of waters of United States authorized by this GP cannot exceed 1/2-acre. This includes any loss of waters of the United States associated with development of individual subdivision lots.

GP 18. AQUACULTURE (Authorities: §10 and §404)

(a) The installation of buoys, floats, racks, trays, nets, lines, tubes, containers, and other structures into navigable waters of the U.S.; (b) Discharges of dredged or fill material into tidal and non-tidal waters necessary for shellfish seeding, rearing, cultivating, transplanting, and harvesting activities; and (c) Shellfish seeding or brushing the flats projects. Any fill material imported to the project from offsite (this is limited to mineral growth medium used in culture trays) shall be clean and of comparable grain size to the native substrate. Activities authorized under this GP must have (a) their MA DMF Aquaculture Certificate letter for licensed shellfish aquaculture sites, (b) documentation that the applicant has coordinated with the U.S. Coast Guard regarding USCG Private Aids to Navigation standards, (c) their MEPA Certificate (if required), and (d) documentation that the applicant has contacted their local authorities (ex. harbormaster, select board, shellfish constable) for authorization of their facility.

Not authorized under GP 18 (IP required): (a) New, or expansions of, impoundments and semi-impoundments of tidal and non-tidal waters for the culture or holding of motile species such as lobster with an impounded area >½ acre; (b) Cultivation of a nonindigenous species (see Note 1) unless that species has been previously cultivated in the waterbody; (c) Cultivation of an aquatic nuisance species (see Note 1); (d) Attendant features such as docks, piers, boat ramps (see GP 4); (e) stockpiles, staging areas, or the deposition of shell material back into tidal and non-tidal waters as waste.

Self-Verification Eligible

1. In tidal waters, a new lease site area is (a) ≤2-acre, (b) not located in salt marsh, natural rocky habitat, or tidal vegetated shallows.

2. In tidal waters, *expansions* of existing lease sites not to exceed 2 acres for the entire site (e.g. 1 acre lease site increasing to a 2 acre lease site may qualify as SV). A PCN is required for expansions in salt marsh, natural rocky habitat, and tidal vegetated shallows.

3. Cages, racks that are elevated ≥2 feet above the ocean floor with legs within a lease site with ≤4 buoys marking the corners.

4. Floating cage strings with a single connecting line, ≤2 anchors and ≤2 end marker buoys per string within a lease site with ≤4 buoys marking the corners.

5. No activities located within 25 feet of tidal vegetated shallows.

6. Culture only indigenous species.

7. Not located in FNP or within a distance of three times the authorized depth of an FNP (see GC 15).

8. Not located in or impinge upon the value of any National Lands or Federal Properties.

9. Floating upweller docks that total ≤600 SF in area.

Pre-Construction Notification Required

1. Discharges of fill material associated with aquaculture >5,000 SF.

2. Research, educational, commercial-viability or experimental aquaculture gear activities >1,000 SF.

3. Kelp or finfish aquaculture.

4. Land-based hatchery intakes >3 inches in diameter.

5. Activities in water depths >10 feet mean low lower water (MLLW).

6. Activities with in-water lines, ropes or chains that are not SV eligible (see #3-4).

7. Activities occur in the Connecticut River from the Turners Falls Dam to the MA/CT border or the Merrimack River from the Essex Dam to the mouth. This is to protect endangered species.

8. New, or expansions of, impoundments and semi-impoundments for the culture or holding of motile species such as lobster with an impounded area ≤1/2 acre.

9. Activities that do not require an IP. Activities that do not require a PCN or an IP may be SV eligible.

Note: The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 defines: (a) nonindigenous species as “any species or other viable biological material that enters an ecosystem beyond its historic range, including any such organism transferred from one country into another”; and (b) aquatic nuisance species as “a nonindigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters.”

GP 19. MINING ACTIVITIES (Authorities: §10 and §404)

Discharges of dredged or fill material into non-tidal waters for mining activities, except for coal mining and metallic mineral mining activities.

Not authorized under GP 19 (IP required): (a) Permanent impacts >1 acre in non-tidal waters; or (b) Activities in tidal waters.

Self-Verification Eligible	Pre-Construction Notification Required
In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes, non-tidal vegetated shallows, and streams.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) >5,000 SF, or (b) located in riffle and pool complexes, non-tidal vegetated shallows, and streams. 2. The activity occurs in non-tidal navigable waters of the U.S. 3. Stream channelization, relocation, impoundment, loss of streambed, or discharge of tailings into streams occurs. 4. Work on USACE properties & USACE-controlled easements. 5. Activities that are not eligible for SV and do not require an IP.

GP 20. LIVING SHORELINES[1] (Authorities: §10 and §404)

Construction and maintenance of living shorelines to stabilize banks and shores in tidal waters. In non-tidal waters that are not subject to the ebb and flow of the tide, nature-based bank stabilization techniques such as bioengineering and vegetative stabilization may be authorized by GP 9. This GP authorizes those maintenance and repair activities in-kind that are necessary to address changing environmental conditions.

The following terms must be met for both SVs and PCNs as applicable: (a) Coir logs, coir mats, stone, native oyster shell, native wood debris, and other structural materials must be adequately anchored, of sufficient weight, or installed in a manner that prevents relocation in most wave action or water flow conditions, except for extremely severe storms; (b) For living shorelines consisting of tidal fringe wetlands, native plants appropriate for current site conditions, including salinity and elevation, must be used if the site is planted by the permittee; (c) Discharges of dredged or fill material into waters of the U.S., and oyster or mussel reef structures in navigable waters, must be the minimum necessary for the establishment and maintenance of the living shoreline; (d) If sills or other structural materials per PCN #4 must be constructed to protect fringe wetlands for the living shoreline, those structures must be the minimum size necessary to protect those fringe wetlands; (e) The activity must be designed, constructed, and maintained so that it has no more than minimal adverse effects on water and sediment movement between the waterbody and the shore and the movement of aquatic organisms between the waterbody and the shore; and (f) The living shoreline must be properly maintained and monitored, which may require periodic repair of sills, bioengineered components, or replacing sand fills after severe storms or erosion events. Vegetation may be replanted to maintain the living shoreline.

Not authorized under GP 20 (IP required): (a) The activity is ≥1000 feet in length along the bank (≥2000 LF both banks) unless waived by the District Engineer; or (b) The activity is >30 feet channel ward of mean low water in tidal waters; or (c) Upland reclamation activities; or (d) Stream channelization or relocation activities; or (e) Breakwaters, groins, jetties, or artificial reefs; or (f) Permanent impacts >1,000 SF in existing saltmarsh; >100 SF in existing tidal vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Tidal and non-tidal living shorelines ≤100 LF for each bank (≤200 LF for both banks). 2. Combined permanent and temporary impacts ≤5,000 SF in tidal waters, excluding existing salt marsh, tidal vegetated shallows, natural rocky habitat, and mudflats.	1. Tidal and non-tidal living shorelines >100 LF to <1000 LF (>200 LF to <2000 LF for both banks). 2. Permanent and temporary impacts in existing salt marsh, tidal vegetated shallows, or mudflats. 3. Work on USACE properties & USACE-controlled easements. 4. Use of stone sills, native oyster shell, native wood debris, or other structural materials.

Notes:

1. PCNs require monitoring for a minimum of 5 years in accordance with an approved restoration plan, unless otherwise determined by the USACE. The first year of monitoring will be the first year that the site has been through a full growing period after completion of construction and planting.
2. Applicants are encouraged to obtain a MEPA certificate prior to submitting a USACE permit application.

[1] A living shoreline has a footprint that is made up mostly of native material. It incorporates vegetation or other living, natural "soft" elements alone or in combination with some type of harder shoreline structure (e.g., oyster or mussel reefs or rock sills) for added protection and stability. Living shorelines should maintain the natural continuity of the land-water interface and retain or enhance shoreline ecological processes. Living shorelines must have a substantial biological component, either tidal or lacustrine fringe wetlands or oyster or mussel reef structures.

GP 21. AGRICULTURAL ACTIVITIES (Authority: §404)

Discharges of dredged or fill material in non-tidal waters for agricultural activities, including the construction of building pads for farm buildings. Authorized activities include: (a) installation, placement, or construction of drainage tiles, ditches, or levees; mechanized land clearing; land leveling; the relocation of existing serviceable drainage ditches; and similar activities; (b) construction of farm ponds, excluding perennial streams, provided the farm pond is used solely for agricultural purposes; and (c) discharges of dredged or fill material to relocate existing serviceable drainage ditches constructed in non-tidal streams.

Not authorized under GP 21 (IP required): (a) Permanent impacts that are >1 acre in non-tidal waters; or >1000 SF in riffle and pool complexes, or non-tidal vegetated shallows; (b) Work in tidal waters; or (c) Construction of farm ponds in perennial streams.

Self-Verification Eligible	**Pre-Construction Notification Required**
In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) >5,000 SF, or (b) located in riffle and pool complexes and non-tidal vegetated shallows. 2. Activities occur in non-tidal navigable waters of the U.S. 3. Stream channelization, relocation, impoundment, loss of streambed, or farm ponds in non-perennial streams occurs. 4. Activities that are not eligible for SV and do not require an IP.

Note: Some discharges for agricultural activities may qualify for an exemption under Section 404(f) of the CWA (see 33 CFR 323.4). This GP authorizes the construction of farm ponds that do not qualify for the CWA §404(f)(1)(C) exemption because of the recapture provision at §404(f)(2).

GP 22. RESHAPING EXISTING DRAINAGE DITCHES, CONSTRUCTION OF NEW DITCHES, AND MOSQUITO MANAGEMENT (Authorities: §10 and §404)

Discharges to modify the cross-sectional configuration of currently serviceable drainage ditches constructed in tidal and non-tidal waters, for the purpose of improving water quality by regrading the drainage ditch with gentler slopes, which can reduce erosion, increase growth of vegetation, and increase uptake of nutrients and other substances by vegetation. Also authorized are mosquito reduction activities.

Not authorized under GP 22 (IP required): Stream channelization, relocation, impoundments, or loss of streambed.

Self-Verification Eligible	**Pre-Construction Notification Required**
≤500 linear feet of drainage ditch will be reshaped provided excavated material is deposited in an upland area.	1. >500 linear feet of drainage ditch will be reshaped, excavated material is deposited in a water of the U.S., or the reshaping of the ditch increases the drainage capacity beyond the original as-built capacity or expands the area drained by the ditch as originally constructed (i.e., the capacity of the ditch is not the same as originally constructed or drains additional wetlands or other waters of the U.S.). 2. Permanent and temporary impacts in tidal vegetated shallows. 3. New ditches or relocation of drainage ditches constructed in waters of the U.S. (i.e., the location of the centerline of the reshaped drainage ditch is not approximately the same as the location of the centerline of the original drainage ditch). 4. Activities that are not eligible for SV and do not require an IP.

Note: Some ditch activities are exempt under Section 404(f) of the CWA (see 33 CFR 323.4).

GP 23. LINEAR TRANSPORTATION PROJECTS AND WETLAND/STREAM CROSSINGS (Authorities: §10 & §404)

Activities[1] required for the construction, expansion, modification, or improvement of linear transportation projects (e.g., driveways, roads, highways, railways, trails, airport runways, and taxiways) and attendant features. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats (see Note 1), necessary to construct the linear transportation project.

Not authorized under GP 23 (IP required): (a) Permanent impacts for any single and complete project that are >1 acre in non-tidal waters; >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows; (c) Non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars (see GP 17); or (d) New tide gates.

Self-Verification Eligible

1. In non-tidal waters, the combined permanent and temporary impacts are a) ≤5,000 SF; b) not located in riffle and pool complexes and non-tidal vegetated shallows; and c) meet the Massachusetts River and Stream Crossing Standards

2. Existing crossings (e.g., culverts, elliptical or arch pipes, etc.) are not modified by (a) decreasing the diameter of the crossing or (b) changing the friction coefficient, such as through slip lining (retrofitting an existing culvert by inserting a smaller diameter pipe), culvert relining or invert lining.

3. Stream channelization or relocation resulting in loss of streambed that is <200 LF.

Pre-Construction Notification Required

1. In non-tidal waters, the combined permanent and temporary impacts are a) >5,000 SF; b) located in vegetated shallows or riffle and pool complexes; or c) do not meet the Massachusetts River and Stream Crossing Standards (see note 4).

2. The activity occurs in tidal waters, salt marsh, or in, over or under navigable waters of the U.S.

3. Stream and wetland crossings that require a PCN per GC 20 TOY Restrictions and GC 31 Stream Work and Crossings & Wetland Crossings.

4. Stream channelization or relocation resulting in loss of streambed that is ≥200 LF. Stream impoundment activities of any kind.

5. Work on USACE properties & USACE-controlled easements.

6. Activities that are not eligible for SV and do not require an IP.

Notes:

1. See GC 22 for information on temporary construction mats.
2. Discharges of dredged or fill material incidental to the construction of bridges across navigable waters of the U.S. may be authorized under GP 8.
3. Loss of streambed does not require a PCN when bridge piers or similar supports are used.
4. In their PCN application submission to the USACE, applicants must explain why they are unable to meet the Massachusetts River and Stream Crossing Standards.
5. For tidal crossings, modeling is encouraged as a method to verify the proposed crossing would not be undersized and resilient to the effects of sea level rise.

[1] Stream crossings must conform with the MA Stream Crossing Guidelines when practicable and comply with all applicable GCs of this document (Section IV).

GP 24. TEMPORARY CONSTRUCTION, ACCESS, AND DEWATERING (Authorities: §10 and §404)

Temporary structures, work, and discharges, including cofferdams, necessary for construction activities or access fills or dewatering of construction sites that are not authorized under another GP activity.

Not authorized under GP 24 (IP required): (a) Permanent structures or impacts; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows; (c) Use of cofferdams to dewater wetlands or other aquatic areas to change their use; (d) Temporary stream crossings (see GPs 6, 17, 23); (e) Structures or fill left in place after construction is completed.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, temporary impacts are a) ≤5,000 SF; b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. In tidal waters, temporary impacts are a) ≤5,000 SF, b) ≤1,000 SF in mudflats and/or natural rocky habitat, and c) not located in saltmarsh and tidal vegetated shallows. 3. Structures in navigable waters of the U.S. provided impacts do not require a PCN and they are left in place ≤30 days.	1. In non-tidal waters, temporary impacts are a) >5,000 SF; b) located in riffle and pool complexes or non-tidal vegetated shallows. 2. In tidal waters, temporary impacts are a) >5,000 SF; b) >1,000 SF in mudflats and/or natural rocky habitat, or (c) located in saltmarsh and tidal vegetated shallows. 3. Activities in the Connecticut River from the Turners Falls Dam to the MA/CT border, or Merrimack River from the Essex Dam to the mouth, involving temporary impacts unless they are performed <5 feet waterward from OHW or HTL and in the dry. This is to protect endangered species; or 4. Activities not eligible for SV and do not require an IP.

Notes:

1. Turbidity or sediment resuspension is generally not considered to occur when properly using management techniques to work in dry conditions. See GC 25.
2. Total impact areas under SV Eligible 1-2 exclude use of temporary construction mats. See GC 22 for information on temporary construction mats.
3. An SVN submittal to USACE is not required for SV #3 above.

GP 25. EMERGENCY SITUATIONS (Authorities: §10 and §404)

Structures or work in or affecting navigable waters of the U.S. and the discharge of dredged or fill material into waters of the U.S., including wetlands, necessary for repair or protection measures associated with an emergency situation[1], MassDEP Emergency Declaration/Certification, or FEMA Declared Disaster. The activity shall be the minimum necessary to alleviate the immediate emergency unless that additional work would result in no more than minimal effects to aquatic environment and is necessary to reduce the potential for future failure or loss of the structure or site. Typical activities authorized under this GP include, but are not limited to, restoration of damaged areas; bank stabilization; temporary fills for staging, access, and dewatering; and, repair, replacement, or rehabilitation of existing structures and/or fills (i.e., roads, bridges, utility pipelines and flood control structures, including attendant features, and other existing structures located in waters of the U.S.).

For the restoration of areas damaged by storms floods, or other discrete events: (a) The restored area must not extend waterward of the ordinary high-water mark or high tide line that existed prior to the damage. (b) The slope of the restored area below the ordinary high-water mark or high tide line must not exceed the slope that existed prior to the damage. (c) The bottom elevation of the restored area must not exceed the bottom elevation that existed prior to the damage (i.e., the restored area must not result in a reduction in the depth of the waterbody that existed prior to the damage). (d) Except in cases of FEMA reimbursement, the activity must be initiated, under contract to commence, or funds shall be allocated for the activity within 30 days of authorization under GP 25.

Not authorized under GP 25 (IP required): (a) Permanent impacts for a single and complete project >1/2 acre in tidal waters, unless the district engineer waives this criterion by making a written determination concluding that the activity will result in no more than minimal adverse environmental effects; >1,000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >5,000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1,000 SF in vegetated shallows; (c) New structures or fills that did not previously exist before the storm event or other discrete event (see other GPs).

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Activities that qualify under a Severe Weather Emergency Declaration pursuant to 310 CMR 10.06(8) and/or receive an Emergency Certification pursuant to 310 CMR 10.06 and/or meet the requirements of 314 CMR 9.12(2) or (3); and 2. Activities eligible under a FEMA Declared Disaster that also comply with #1 above.	1. Activities that are eligible under a FEMA Declared Disaster and do not qualify under SV #1. 2. Minor deviations in the structure or fill area, including those to existing structures or fills are authorized due to changes in materials, construction techniques, requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to alleviate the emergency. 3. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Review the GCs (Section IV) to confirm if a PCN is not required elsewhere in this document.
2. If the activity is not a MassDEP Emergency Declaration/Certification, does not meet the requirements of 314 CMR 9.12(2) or (3), or is not a FEMA Declared Disaster, applicants must explain in writing why their activity qualifies as an emergency (see footnote) to be eligible under GP 25.
3. SV eligible activities qualify under the general 401 WQC MassDEP issued for the 2023 MA GPs (GC 9).

[1] An emergency, as determined by this office and 33 CFR 325.2(e)(4), is one which would result in an unacceptable hazard to life, a significant loss of property, or an immediate, unforeseen, and significant economic hardship if corrective action requiring a Department of the Army permit is not undertaken within a time period less than the normal time to process the request under standard processing procedures.

SECTION IV. GENERAL CONDITIONS:

To qualify for GP authorization, the applicant must comply with the following general conditions, as applicable, in addition to authorization-specific conditions imposed by the division or district engineer.

1. Other Permits
2. Federal Jurisdictional Boundaries
3. Single and Complete Projects
4. Use of Multiple General Permits
5. Suitable Material
6. Tribal Rights & Burial Sites
7. Avoidance, Minimization, and Compensatory Mitigation
8. Water Quality & Stormwater Management
9. Coastal Zone Management
10. Federal Threatened and Endangered Species
11. Essential Fish Habitat
12. National Lands
13. Wild and Scenic Rivers
14. Historic Properties
15. USACE Property and Federal Projects (§408)
16. Navigation
17. Permit/Authorization Letter On-Site
18. Storage of Seasonal Structures
19. Pile Driving and Pile Removal in Navigable Waters
20. Time of Year Restrictions
21. Heavy Equipment in Wetlands
22. Temporary Fill & Construction Mats
23. Restoration of Wetland Areas
24. Bank Stabilization
25. Soil Erosion and Sediment Controls
26. Aquatic Life Movements and Management of Water Flows
27. Spawning, Breeding, and Migratory Areas
28. Vernal Pools
29. Invasive Species
30. Fills Within 100-Year Floodplains
31. Stream Work and Crossings & Wetland Crossings
32. Utility Line Installation and Removal
33. Water Supply Intakes
34. Coral Reefs
35. Blasting
36. Inspections
37. Maintenance
38. Property Rights
39. Transfer of GP Verifications
40. Modification, Suspension, and Revocation
41. Special Conditions
42. False or Incomplete Information
43. Abandonment
44. Enforcement Cases
45. Previously Authorized Activities
46. Duration of Authorization

1. Other Permits. Authorization under these GPs does not obviate the need for the permittee to obtain other Federal, State, or local permits, approvals, or authorizations required by law. Permittees are responsible for obtaining all required permits, approvals, or authorizations. Activities that are not regulated by the State, but subject to USACE jurisdiction, may still be eligible for these GPs.

2. Federal Jurisdictional Boundaries.
a. Applicability of these GPs shall be evaluated with reference to Federal jurisdictional boundaries. Activities shall be evaluated with reference to "waters of the U.S." under the CWA (33 CFR 328) and "navigable waters of the U.S." under §10 of the Rivers and Harbors Act of 1899 (33 CFR 329). Permittees are responsible for ensuring that the boundaries used satisfy the Federal criteria defined at 33 CFR 328-329. These sections prescribe the policy, practice, and procedures to be used in determining the extent of the USACE jurisdiction. Note: Waters of the U.S. includes all waters pursuant to 33 CFR 328.3(a), and adjacent wetlands as the term is defined in 33 CFR 328.3(c).
b. Wetlands shall be delineated in accordance with the USACE Wetlands Delineation Manual and the most recent Northcentral/Northeast Regional Supplement. Wetland delineation and jurisdiction information is located at: www.nae.usace.army.mil/missions/regulatory/jurisdiction-and-wetlands and maps are located at www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit.
c. Vegetated shallows shall be delineated when present on the project site. Vegetated shallow survey guidance and maps are located at: www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit.
d. Natural rocky habitats shall be delineated when present on the project site. The definition of natural rocky habitats is in Section VII of the MA GP. Natural rocky habitat survey guidance and maps are located at: www.nae.usace.army.mil/ missions/regulatory/state-general-permits/massachusetts-general-permit.

3. Single and Complete Projects. The MA GP shall not be used for piecemeal work and shall be applied to single and complete projects. The term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers.
a. For non-linear projects, a single and complete project must have independent utility. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed, even if the other phases were not built, can be considered as separate single and complete projects with independent utility.
b. Unless USACE determines the activity has independent utility, all components of a single project and/or all planned phases of a multi-phased project (e.g., subdivisions should include all work such as roads, utilities, and lot development) shall be evaluated as one single and complete project.
c. For linear projects such as power lines or pipelines with multiple crossings, a "single and complete project" is all crossings of a single water of the U.S. (i.e., single waterbody) at a specific location. For linear projects crossing a single waterbody several times at separate and distant locations, each crossing is considered a single and complete project. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately. If any crossing requires a PCN review or an individual permit review, then the entire linear project shall be reviewed as one project under PCN or the individual permit procedures.

4. Use of Multiple General Permits. The use of more than one GP for a single and complete project is prohibited, except when the acreage loss of waters of the U.S. authorized by the GPs does not exceed the acreage limit of the GPs with the highest specified acreage limit. For example, if a road crossing over waters is constructed under GP 23, with an associated utility line

crossing authorized by GP 6, if the maximum acreage loss of waters of the U.S. for the total project is ≥1 acre it shall be evaluated as an IP.

5. Suitable Material & Discharge of Pollutants. No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). All activities involving any discharge into waters of the U.S. authorized under these GPs shall be consistent with applicable water quality standards, effluent limitations, standards of performance, prohibitions, and pretreatment standards and management practices established pursuant to the CWA (33 U.S.C. 1251), and applicable state and local laws. If applicable water quality standards, limitations, etc., are revised or modified during the term of this GP, the authorized work shall be modified to conform with these standards within six months from the effective date of such revision or modification, or within a longer period of time deemed reasonable by the District Engineer in consultation with the Regional Administrator of the EPA. Unless monitoring data indicates otherwise, applicants may presume that their activity complies with state water quality standards provided they are in compliance with the Section 401 WQC (Applicable only to the Section 404 activity).

6. Tribal Rights & Burial Sites

a. For all SV and PCN applications, prospective permittees shall follow the guidance set forth in Appendix A, Guidance for NHPA Section 106 Compliance in Massachusetts.

b. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

c. Many tribal resources are not listed on the National Register of Historic Places (NRHP) and may require identification and evaluation in collaboration with the identifying tribe and by qualified professionals. The Tribal Historic Preservation Officer (THPO) and State Historic Preservation Officer (SHPO) may be able to assist with locating information on:

i. Previously identified tribal resources; and
ii. Areas with potential for the presence of tribal resources.

d. Discovery of Previously Unknown Remains and Artifacts: If any previously unidentified human remains, cultural deposits, or artifacts are discovered while accomplishing the activity authorized by this permit, you must immediately notify the USACE of what you have found, and to the maximum extent practicable, cease work and avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The USACE will initiate the appropriate the Federal, Tribal, and state coordination required to determine if the items or remains are eligible for listing in the NRHP and warrant a recovery effort or can be avoided.

e. Burial Sites: Burial sites, marked or unmarked, are subject to state law (Massachusetts Unmarked Burial Law). Native American burial sites on federal or tribal land are subject to the provisions of Native American Graves Protection and Repatriation Act (NAGPRA). Regulated activities may not result in disturbance or removal of human remains until disposition of the remains has been determined by the appropriate authority under these laws, and the work is authorized by the USACE. Regulated activities which result in an inadvertent discovery of human remains must stop immediately, and the USACE, as well as the appropriate state and tribal authority, must be notified. Regulated work at inadvertent discovery sites requires compliance with state law or NAGPRA, as appropriate, prior to re-starting work.

7. Avoidance, Minimization, and Compensatory Mitigation. To qualify under the MA GP, activities must comply with Section V Mitigation Standards and the following as applicable:

a. Avoid and Minimize: Activities must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the U.S. to the maximum extent practicable at the project site. Avoidance and minimization are required to the extent necessary to ensure that the adverse effects to the aquatic environment (both area and function) are no more than minimal.

b. Compensatory mitigation for unavoidable impacts to waters of the U.S., including direct, indirect, secondary, and temporal loss, will generally be required for permanent impacts that exceed the thresholds identified in Section V, and may be required for temporary impacts, to offset unavoidable impacts which remain after all appropriate and practicable avoidance and minimization has been achieved and to ensure that the adverse effects to the aquatic environment are no more than minimal. Proactive restoration projects or temporary impact work with no secondary effects may generally be excluded from this requirement.
c. Mitigation proposals shall follow the guidelines found in the Compensatory Mitigation for Losses of Aquatic Resources; Final Rule April 10, 2008; 33 CFR 332. Prospective permittees may purchase mitigation credits in-lieu of permittee-responsible mitigation as compensation for unavoidable impacts to waters of the U.S. in the Commonwealth of Massachusetts.

8. Water Quality & Stormwater Management. The 401 WQC requirement applies to all activities listed under GPs 1-25, unless determined otherwise by MassDEP. Permittees shall also satisfy stormwater management requirements in Massachusetts.

a. General 401 WQC: MassDEP issued a WQC on April 21, 2023 which conditionally certifies all activities in GPs 1 – 24 eligible for SV and PCN so long as the activity is described in 314 CMR 9.03, and is not an activity described in 314 CMR 9.04, and so long as the activity meets all other requirements, terms and conditions of the WQC. The MassDEP WQC also conditionally certifies activities described in GP 25 so long as the activity meets all other conditions of the WQC. Emergency projects described in GP 25 must obtain an emergency certification or otherwise be authorized pursuant to 310 CMR 10.06, qualify under a Severe Weather Emergency Declaration pursuant to 310 CMR 10.06(8) issued by the MassDEP, or meet the requirements of 9.12(2) or (3) in order to be certified under the WQC. Prospective permittees may refer to the following link to determine if their activity is eligible: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/ Massachusetts-General-Permit/. The General 401 WQC is located here, and it provides detailed information regarding what activities are certified and the conditions for certification. Activities listed in 314 CMR 9.03 that are not exempt from the Wetland Protection Act must have a valid Final Order of Conditions (OOC) or Final Restoration Order of Conditions pursuant to 310 CMR 10.00 to be eligible under the General 401 WQC.
b. Individual 401 WQC: Prospective permittees shall contact MassDEP and apply for an individual 401 WQC if their activity does not qualify for a General 401 WQC as outlined above. MassDEP may issue, waive, or deny the individual 401 WQC on a case-by-case basis. All activities listed in 314 CMR 9.04 must obtain an individual 401 WQC from MassDEP to be eligible under these GPs. When an Individual 401 WQC is required for *PCN activities*, the prospective permittee shall submit their Individual 401 WQC application concurrently to MassDEP and USACE to comply with 40 CFR 121.
c. The prospective permittee is responsible for determining the appropriate 401 WQC requirement and submitting this information to the USACE at the time of their PCN application or when completing their SVN. Prospective permittees that are unsure of whether their activity has been certified should contact MassDEP for a determination.
d. As applicable, all activities shall be compliant with the Massachusetts Stormwater Handbook. The Stormwater Handbook can be accessed on the NAE Regulatory website here: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.
e. No work requiring authorization under Section 404 of the CWA may be performed unless (1) the prospective permittee qualifies for coverage under the April 21, 2023 General 401 WQC, (2) the prospective permittee receives an individual Section 401 WQC from the MassDEP, or (3) the MassDEP waives individual Section 401 WQC.

9. Coastal Zone Management. The permittee must obtain CZM consistency concurrence when an activity is located in the coastal zone in order to be eligible under the MA GP. This requirement

shall be satisfied by acquiring one of the following from the Massachusetts Office of Coastal Zone Management (MA CZM):

a. General CZM Federal Consistency Concurrence (General Concurrence): MA CZM has granted General Concurrence for all SV and PCN activities for GPs 1-25. The prospective permittee must obtain all applicable permits and approvals before construction of the authorized activity begins (e.g., before work begins on site). For SVs, General Concurrence is automatically granted and no further action is required from the prospective permittee. For PCNs, the USACE will coordinate with MA CZM to acquire General Concurrence as part of the PCN application review.
b. Individual CZM Federal Consistency Concurrence (Individual Concurrence): In certain cases, MA CZM may elevate any GP activity 1-25 and require Individual Concurrence. The prospective permittee must contact MA CZM and follow the procedures to obtain Individual Concurrence as determined appropriate by MA CZM.
c. Permittees must obtain CZM consistency concurrence as outlined above before commencing work authorized under these GPs.

10. Federal Threatened and Endangered Species

a. No activity is authorized under any GP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify designated critical habitat or critical habitat proposed for such designation. No activity is authorized under any GP which "may affect" a listed species or critical habitat, unless ESA section 7 consultation addressing the consequences of the proposed activity on listed species or critical habitat has been completed. See 50 CFR 402.02 for the definition of "effects of the action" for the purposes of ESA section 7 consultation, as well as 50 CFR 402.17, which provides further explanation under ESA section 7 regarding "activities that are reasonably certain to occur" and "consequences caused by the proposed action."
b. Other Federal agencies should follow their own procedures for complying with the requirements of the ESA (see 33 CFR 330.4(f)(1)). If a PCN is required for the proposed activity, the Federal permittee must provide USACE with the appropriate documentation to demonstrate compliance with those requirements. The USACE will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.
c. USFWS ESA-Listed Species: Non-federal applicants shall use the USFWS website, Information for Planning and Consultation (IPAC), to determine if their activity is located within the ESA-listed species range. The IPAC website can be accessed on the NAE Regulatory website: https://www. nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/. Applicants shall ensure they have an updated, valid species list before construction begins. This may require applicants to update their species list in IPAC before the start of construction. Note: Applicants should refer to the NAE Regulatory Website at the link above to determine if they have been designated as a non-federal representative. Applicants shall complete Section 7 consultation according to the guidance document located on the NAE Regulatory Website. After completing the Rangewide Determination Key and reaching the outcome "may affect, not likely to adversely affect", you may be required to wait up to 15 days before that outcome is final and compliance under Section 7 of the ESA is fulfilled.

i. *Self-Verification Criteria*: The activity is SV-eligible if:
   1) The activity is not located within the ESA-listed species range;
   2) Another (lead) Federal agency has completed Section 7 consultation; or
   3) The activity is located within the ESA-listed species range ***and*** USACE has designated the applicant as a non-federal representative under 50 CFR 402.08 of the ESA for all

species within the project's action area. As the non-federal representative, the applicant shall complete consultation through IPAC and reach the outcome of "no effect" or "not likely to adversely affect".

ii. *Pre-Construction Notification Criteria*: The activity requires a PCN if:

1) The activity is located within the ESA-listed species range ***and*** USACE has NOT designated the applicant as a non-federal representative under 50 CFR 402.08 of the ESA for all species within the project's action area;

2) The activity is located in designated or proposed critical habitat; or

3) The activity is located within the ESA-listed species range and completion of the IPAC determination key has resulted in the outcome of "may affect" or "may affect, likely to adversely affect"; or

4) A PCN is required elsewhere in this document.

d. NOAA-Listed Species: Non-federal applicants shall refer to the Section 7 Mapper for federally listed species to determine if any species are mapped as present. When NOAA-listed species are present, the applicant shall generate a species report through the mapper and submit this document as part of their PCN or SVN submission. The NOAA Fisheries' Section 7 Mapper can be accessed here on the NAE Regulatory website here: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

e. Authorization of an activity by an GP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word "harm" in the definition of "take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

11. Essential Fish Habitat (EFH).

a. SV eligible activities have been determined to result in no more than minimal adverse effects, provided the permittee complies with all terms and conditions of the MA GP as appliable to the activity. NMFS has granted General Concurrence [50 CFR 600.920(g)] for all SV eligible activities. These activities do not require project specific EFH consultation.

b. For PCN required activities, the applicant is required to describe and identify potential adverse effects to EFH and should refer to NOAA Fisheries' EFH Mapper (http://www.fisheries.noaa.gov/resource/map/essential-fish-habitat-mapper) and Omnibus Essential Fish Habitat Amendment 2 Volume 2: EFH and HAPC Designation Alternatives and Environmental Impacts (https://www.habitat.noaa.gov/application/efhmapper/oa2_efh_hapc.pdf). If an activity is located within EFH, the PCN application must contain:

1. A description of the action located in EFH.
2. An analysis of the potential adverse effects of the action on EFH and the managed Species.
3. Conclusions regarding the effects of the action on EFH.
4. Proposed mitigation, if applicable (refer to the mitigation thresholds located in Section V).

c. Federal agencies shall follow their own procedures for complying with the EFH requirements of the Magnuson-Stevens Fishery Conservation and Management Act. For activities requiring a PCN, the applicant is responsible for furnishing documentation that demonstrates consultation for EFH has been completed.

d. For PCN activities, no work may commence until EFH consultation as required by the Magnuson-Stevens Act has been completed.

12. National Lands. Activities that impinge upon the value of any National Wildlife Refuge, National Forest, National Marine Sanctuary, National Historic Landmarks or any other area administered by the National Park Service, U. S. Fish and Wildlife Service (USFWS) or U.S. Forest Service (USFS) require a PCN or Individual Permit. Federal land managers seeking authorization for activities located in the above listed National Lands may proceed under SV, unless a PCN is required elsewhere in this document.

13. Wild and Scenic Rivers. The following activities in designated river or study river segments in the National Wild and Scenic River (WSR) System require a PCN unless the Federal agency with direct management responsibility for such river, in Massachusetts this is generally the National Park Service, has determined in writing to the proponent that the proposed work will not adversely affect the WSR designation or study status:

a. Activities that occur in WSR segments, in and 0.25 miles up or downstream of WSR segments, or in tributaries within 0.25 miles of WSR segments;
b. Activities that occur in wetlands within 0.25 miles of WSR segments;
c. Activities that have the potential to alter free-flowing characteristics in WSR segments.

No GP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a “study river” for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.

As of May 10, 2023, affected rivers in Massachusetts include: the Taunton River (40 miles), Sudbury River (16.6 miles), Assabet River (4.4 miles), Concord River (8 miles), Nashua River (27 miles), Squannacook River (16.3 miles), Nissitissit River (4.7 miles), and the Westfield River, including West Branch, Middle Branch, Gendale Brook, East Branch, Drowned Land Brook, Center Brook, Windsor Jambs Brook, Shaker Mill Brook, Depot Brook, Savery Brook, Watson Brook, Center Pond Brook (78.1 miles). The most up to date list of designated and study rivers and their descriptions may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: http://www.rivers.gov/.

14. Historic Properties

a. For all SV and PCN applications, permittees shall follow the guidance set forth in Appendix A, Guidance for NHPA Section 106 Compliance in Massachusetts.

b. No undertaking authorized by these GPs shall cause effects[1] (defined in 36 CFR Part 800 and 33 CFR Part 325, Appendix C, and its Interim Guidance) on properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places (NRHP)[2], including previously unknown historic properties within the permit area, unless the USACE or another Federal action agency has satisfied the consultation requirements of Section 106 of the National Historic Preservation Act (Section 106). If another Federal agency is determined the lead federal agency for compliance with Section 106, applicant must obtain the appropriate documentation and provide this information to the USACE to demonstrate compliance with Section 106. The applicant shall not begin the activity until the USACE notifies them in writing that the documentation provided satisfies Section 106 requirements.

[1] Effect means the alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register of Historic Properties.
[2] See the NAE Regulatory website, National Register of Historic Places link here: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

c. Many historic properties are not listed on the NRHP and may require identification and evaluation by qualified historic preservation and/or archaeological consultants. The State Historic Preservation Officer (SHPO), Massachusetts Board of Underwater Archaeological Resources (BUAR), local historical societies, certified local governments, general public, and NRHP may also be able to assist with locating information on:

i. Previously identified historic properties; and
ii. Areas with potential for the presence of historic properties.

d. Discovery of Previously Unknown Remains and Artifacts: If any previously unidentified human remains, cultural deposits, or artifacts are discovered while accomplishing the activity authorized by this permit, you must immediately notify the USACE of what you have found, and to the maximum extent practicable, cease work and avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The USACE will initiate the Federal, State and tribal coordination required to determine if the items or remains warrant a recovery effort and/or if the site is eligible for listing in the National Register of Historic Places.

e. Section 110k: Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. § 306113) prevents the USACE from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106, has intentionally significantly adversely effected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the USACE, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the USACE is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties effected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or effects historic properties on tribal lands or effects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

f. Underwater Archaeological Resources: Under Massachusetts General Law Ch. 6, s.'s 179-180, and Ch. 91, s. 63, the BUAR has statutory jurisdiction within state waters and is the sole trustee of the Commonwealth's underwater heritage, charged with the responsibility of encouraging the discovery and reporting, as well as the preservation and protection, of underwater archaeological resources. Underwater archaeological resources located within the waters of the Commonwealth of Massachusetts are property of the Commonwealth, which holds title to these resources and retains regulatory authority over their use. Under Massachusetts General Law, no person, organization or corporation may "remove, displace, damage, or destroy" any underwater archaeological resources located within the Commonwealth's submerged lands except through consultation with the BUAR and in conformity with the permits it issues. https://www.mass.gov/orgs/board-of-underwater-archaeological-resources.

15. USACE Property and Federal Projects. (33 USC §408)

a. USACE projects and property can be found at: https://www.nae.usace.army.mil/Missions/Civil-Works/.

b. In addition to any authorization under these GPs, prospective permittee shall contact the USACE Real Estate Division (https://www.nae.usace.army.mil/Missions/Real-Estate-Division/) at (978) 318-8585 for work occurring on or potentially affecting USACE properties and/or USACE-controlled easements. Work may not commence on USACE properties and/or USACE-controlled easements until they have received any required USACE real estate documents evidencing site-specific permission to work.

c. Any proposed temporary or permanent occupation or alteration of a Federal project (including, but not limited to, a levee, dike, floodwall, channel, anchorage, breakwater, seawall, bulkhead, jetty, wharf, pier, or other work built or maintained but not necessarily owned by the United States),

is not eligible for SV and requires a PCN. This includes all proposed structures and work in, over, or under a USACE federal navigation project (FNP) or in the FNP's buffer zone. The buffer zone is an area that extends from the horizontal limits of the FNP to a distance of three times the FNP's authorized depth. The activity also requires review and approval by the USACE pursuant to 33 USC 408 (Section 408 Permission). The prospective permittee may reach out to the POCs located here: https://www.nae.usace.army.mil/ Missions/Section-408/.
d. Any structure or work constructed in a FNP or its buffer zone shall be subject to removal at the owner's expense prior to any future USACE dredging or the performance of periodic hydrographic surveys.
e. Where a Section 408 permission is required, written verification for the PCN will not be issued prior to the decision on the Section 408 permission request.

16. Navigation
a. No activity may cause more than a minimal adverse effect on navigation.
b. Any safety lights and signals prescribed by the U.S. Coast Guard, must be installed, and maintained at the permittee's expense on authorized facilities in navigable waters of the U.S.
c. There shall be no unreasonable interference with navigation by the existence or use of the activity authorized herein, and no attempt shall be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the activity authorized herein.
d. The permittee understands and agrees that if future U.S. operations require the removal, relocation, or other alteration of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from USACE, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the U.S. No claim shall be made against the U.S. on account of any such removal or alteration.

17. Permit/Authorization Letter On-Site. For PCNs, the permittee shall ensure that a copy of these GPs and the accompanying authorization letter are at the work site (and the project office) whenever work is being performed, and that all personnel with operational control of the site ensure that all appropriate personnel performing work are fully aware of its terms and conditions. The entire permit authorization shall be made a part of any and all contracts and sub-contracts for work that affects areas of USACE jurisdiction at the site of the work authorized by these GPs. This shall be achieved by including the entire permit authorization in the specifications for work. The term "entire permit authorization" means these GPs, including GCs and the authorization letter (including its drawings, plans, appendices, special conditions, and other attachments), and any permit modifications. If the authorization letter is issued after the construction specifications, but before receipt of bids or quotes, the entire permit authorization shall be included as an addendum to the specifications. If the authorization letter is issued after receipt of bids or quotes, the entire permit authorization shall be included in the contract or sub-contract as a change order. Although the permittee may assign various aspects of the work to different contractors or sub-contractors, all contractors and sub-contractors shall be obligated by contract to comply with all environmental protection provisions contained within the entire authorization letter, and no contract or sub-contract shall require or allow unauthorized work in areas of USACE jurisdiction. For SVs, the permittee shall ensure that a complete and signed copy of the SVN is present on site during construction and is made available for review at any time by USACE and other Federal, State, & Local regulatory agencies. A complete and signed copy of the SVN must be submitted to USACE Regulatory within 30 days of initiating construction of the authorized activity, unless stated otherwise in the applicable GP.

18. Storage of Seasonal Structures. Coastal structures such as pier sections, floats, etc., that

are removed from the waterway for a portion of the year (often referred to as seasonal structures) shall be stored in an upland location, located above MHW and not in tidal wetlands. These seasonal structures may be stored on the fixed, pile-supported portion of the structure that is seaward of MHW. This is intended to prevent structures from being stored on the marsh substrate and the substrate seaward of MHW.

19. Pile Driving and Pile Removal in Navigable Waters.
a. Derelict, degraded or abandoned piles and sheet piles in navigable waters of the U.S., except for those inside existing work footprints for piers, must be completely removed, cut and/or driven to 3 feet below the substrate to prevent interference with navigation, and existing creosote piles that are affected by project activities shall be completely removed if practicable. In areas of fine-grained substrates, piles must be removed by the direct, vibratory or clamshell pull method[1] to minimize sedimentation and turbidity impacts and prevent interference with navigation from cut piles. Removed piles shall be disposed of in an upland location landward of MHW or OHW and not in wetlands, tidal wetlands or mudflats.
b. A PCN is required for the installation or removal of structures with jetting techniques.
c. A PCN is required for the installation of >12 inch-diameter piles of any material type or steel piles of any size in tidal waters, unless they are installed in the dry. If piles are not installed in the dry:
i. Impact pile driving shall commence with an initial set of three strikes by the hammer at 40% energy, followed by a one-minute wait period, then two subsequent 3-strike sets at 40% energy, with one minute waiting periods, before initiating continuous impact driving.
ii. Vibratory pile driving shall be initiated for 15 seconds at reduced energy followed by a one-minute waiting period. This sequence of 15 seconds of reduced energy driving, one-minute waiting period shall be repeated two more times, followed immediately by pile-driving at full rate and energy.
iii. In addition to using a soft start at the beginning of the workday for pile driving as described in 19c(i-ii), a soft start must also be used at any time following a cessation of pile driving for a period of 30 minutes or longer.
d. Bubble curtains may be used to reduce sound pressure levels during vibratory or impact hammer pile driving.

20. Time-of-Year (TOY) Restrictions. Activities that include in-water work must comply with the TOY Restrictions below to be SV eligible, otherwise a PCN is required. PCN submittals shall contain written justification for deviation from the TOY Restrictions. The term “in-water work” does not include conditions where the work site is “in-the-dry” (e.g., intertidal areas exposed at low tide). The term “in-the-dry” includes work contained within a cofferdam so long as the cofferdam is installed and subsequently removed outside the TOY Restriction. The TOY restrictions stated in Appendix B of the MA DMF Technical Report TR-47[2] can apply instead for activities in tidal waters if (1) TOYs are provided for a specific waterbody where the activity is proposed and (2) the TOYs are less restrictive than below. The activity must also not require a PCN elsewhere in this document to be SV eligible.

[1] Direct Pull: Each piling is wrapped with a choker cable or chain that is attached at the top to a crane. The crane then pulls the piling directly upward, removing the piling from the sediment. Vibratory Pull: The vibratory hammer is a large mechanical device (5-16 tons) that is suspended from a crane by a cable. The vibrating hammer loosens the piling while the crane pulls up. Clamshell Pull: This can remove intact, broken or damaged pilings. The clamshell bucket is a hinged steel apparatus that operates like a set of steel jaws. The bucket is lowered from a crane and the jaws grasp the piling stub as the crane pulls up. The size of the clamshell bucket is minimized to reduce turbidity during piling removal.
[2] The MA DMF Technical Report TR-47: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/

	TOY Restriction (No work)
Non-tidal Waters	Defer to TR-47
Tidal Waters	January 15 – November 15

Alternate work windows proposed under a PCN will generally be coordinated with the USFWS and NMFS. Resulting written verifications may include species-specific work allowed windows.

21. Heavy Equipment in Wetlands. Operating heavy equipment (drill rigs, fixed cranes, etc.) within wetlands shall be minimized, and such equipment shall not be stored, maintained, or repaired in wetlands, to the maximum extent practicable. Where construction requires heavy equipment operation in wetlands, the equipment shall:

i. Have low ground pressure (typically ≤3 psi);

ii. Be placed on swamp/construction/timber mats (herein referred to as "construction mats" or "mats") that are adequate to support the equipment in such a way as to minimize disturbance of wetland soil and vegetation. See GC 22 for information on the placement of construction mats; or

iii. Be operated on adequately dry or frozen wetlands such that shear pressure does not cause subsidence of the wetlands immediately beneath the equipment and upheaval of adjacent wetlands. Construction mats are to be placed in the wetland from the upland or from equipment positioned on mats if working within a wetland. Dragging construction mats into position is prohibited. Other support structures that are capable of safely supporting equipment may be used with written USACE authorization.

22. Temporary Fill, Work & Construction Mats.

a. *Construction mats in non-tidal waters*: Temporary construction mats shall be in place ≤1 year *and* for one growing season or less to be SV eligible. A PCN is required if construction mats are in place >1 year *or* for more than one growing season. Construction mats can be placed in an area of any size in non-tidal waters. The activity may occur in segments to ensure the requirements for SV above are met, otherwise a PCN is required.

b. *Construction mats in tidal waters*: Temporary construction mats placed in an area <5,000 SF in tidal waters are SV eligible, provided those mats are in place ≤6 months. Temporary construction mats placed in an area ≥5,000 SF or in place >6 months in tidal waters require a PCN.

c. *Management of construction mats:* At a minimum, construction mats shall be managed in accordance with the following construction mat best management practices (BMPs):

1. Mats shall be in good condition to ensure proper installation, use, and removal.
2. As feasible, mats shall be placed in a location that will minimize the amount of mats needed for the wetland crossing(s).
3. Inspect mats prior to their re-use and remove any plant debris. Mats are to be thoroughly cleaned before re-use to prevent the spread of invasive plant species.
4. Impacts to wetland areas shall be minimized during installation, use, and removal of the mats.
5. Adequate erosion & sediment controls shall be installed at approaches to mats to promote a smooth transition to, and minimize sediment tracking onto, the mats.
6. In most cases, mats should be placed along the travel area so that the individual boards are resting perpendicular to the direction of traffic. No gaps should exist between mats. Place mats far enough on either side of the resource area to rest on firm ground.

d. A PCN is required for temporary fills in place >2 years. All temporary fills and disturbed soils shall be stabilized to prevent the material from eroding into waters of the U.S. where it is not authorized. Work shall include phased or staged development to ensure only areas under active development are exposed and to allow for stabilization practices as soon as practicable. Temporary fill must be placed in a manner that will prevent it from being eroded by expected high flows.

e. Activities that require unconfined temporary fill and are authorized for discharge into waters of the U.S. shall consist of material that minimizes effects to water quality.
f. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable when temporary structures, work, and discharges of dredged or fill material, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Materials shall be placed in a location and manner that does not adversely impact surface or subsurface water flow into or out of the wetland. Temporary fill authorized for discharge into wetlands shall be placed on geotextile fabric or other appropriate material laid on the pre-construction wetland grade where practicable to minimize impacts and to facilitate restoration to the original grade. Construction mats are excluded from this requirement.
g. Construction debris and deteriorated materials shall not be located in waters of the U.S.
h. Temporary fills, construction mats, and corduroy roads shall be entirely removed as soon as they are no longer needed to construct the authorized activity and the disturbed areas be restored to pre-construction contours and conditions.
i. Construction equipment, such as temporary barges in tidal waters, shall provide clearance above the substrate to avoid grounding onto the substrate during all tides.

23. Restoration of Wetland Areas.
a. Upon completion of construction, all disturbed wetland areas shall be stabilized with a wetland seed mix or plant plugs containing only plant species native to New England, and be appropriate for site conditions, including salinity and frequency of inundation, and shall not contain any species listed in the “Invasive and Other Unacceptable Plant Species” Appendix K of the New England District “Compensatory Mitigation Standard Operating Procedures” found at https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation.aspx.
b. The introduction or spread of invasive plant species in disturbed areas shall be prevented and controlled. Equipment shall be thoroughly cleaned before and after project construction to prevent the spread of invasive species. This includes, but is not limited to, tire treads and construction mats.
c. In areas of authorized temporary disturbance, if trees are cut in USACE jurisdiction, they shall be cut at or above ground level and not uprooted in order to prevent disruption of any kind to the wetland soil structure and to allow stump sprouts to revegetate the work area, unless otherwise authorized.
d. Wetland areas where permanent disturbance is not authorized shall be restored to their original condition and elevation, which under no circumstances shall be higher than the pre-construction elevation. Original condition means careful protection and/or removal of existing soil and vegetation, and replacement back to the original location such that the original soil layering and vegetation schemes are approximately the same, unless otherwise authorized.

24. Bank Stabilization.
a. Projects involving construction or reconstruction/maintenance of bank stabilization within USACE jurisdiction shall be designed to minimize environmental effects, effects to neighboring properties, scour, conversion of natural shoreline to hard armoring, etc. to the maximum extent practicable.
b. Projects involving the construction of new bank stabilization within USACE jurisdiction shall use bioengineering techniques and natural materials in the project design to the maximum extent practicable. Use of hard structures shall be eliminated or minimized unless the prospective permittee can demonstrate that use of bioengineering techniques is not practicable due to site conditions.
c. Where possible, bank stabilization projects shall optimize the natural function of the shoreline, including self-sustaining stability to attenuate flood flows, fishery, wildlife habitat and water quality protection, while protecting upland infrastructure from storm events that can cause erosion as well as impacts to public and private property.
d. No material shall be placed in excess of the minimum needed for erosion protection.
e. No material shall be placed in a manner that will be eroded by normal or expected high flows (properly anchored native trees and treetops may be used in low energy areas).

f. Native plants appropriate for current site conditions, including salinity, must be used for bioengineering or vegetative bank stabilization.
g. The activity must be properly maintained, which may require repairing it after severe storms or erosion events.

25. Soil Erosion and Sediment Controls.
a. Appropriate soil erosion and sediment controls[1] (hereinafter referred to as "controls") must installed prior to earth disturbance and maintained in effective operating condition during construction. Biodegradable wildlife friendly erosion controls should be used whenever practicable to minimize effects to water quality.
b. Activities in streams (rivers, streams, brooks, etc.) and tidal waters that are capable of producing sedimentation or turbidity should be done during periods of low-flow or no-flow, when the stream or tide is waterward of the work area. Controls may also be used to obtain dry work conditions (e.g., coffer dam, turbidity curtain). The prospective permittee must demonstrate in the project plans where the controls are proposed and how these controls would avoid and/or minimize turbidity or sedimentation.
c. A PCN is required for controls that encroach: i) >25% of the stream width measured from OHW in non-tidal diadromous streams from March 15 to June 30; or ii) >25% of the waterway width measured from MHW in tidal waters from Feb. 1 to June 30, or >50% of the waterway width measured from MHW in tidal waters from July 1 to Jan. 14. This is to protect upstream fish passage. Proponents must also maintain downstream fish passage throughout the project.
d. No dewatering shall occur with direct discharge to waters or wetlands. Excess water in isolated work areas shall be pumped or directed to a sedimentation basin, tank or other dewatering structures in an upland area adequately separated from waters or wetlands. Suspended solids shall be removed prior to discharge back into waters or wetlands from these dewatering structures. All discharge points back into waters and wetlands shall use appropriate energy dissipaters and erosion and sedimentation control BMPs.
e. Temporary controls shall be removed upon completion of work, but not until all exposed soil and other fills, as well as any work waterward of OHW or the HTL, are permanently stabilized at the earliest practicable date. Sediment and debris collected by these devices shall be removed and placed at an upland location in a manner that will prevent its later erosion into a waterway or wetland. Controls may be left in place if they are biodegradable and flows and aquatic life movements are not disrupted.

26. Aquatic Life Movements and Management of Water Flows.
a. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies and wetlands shall be:

i. Suitably spanned, bridged, culverted, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species; and
ii. Properly aligned and constructed to prevent bank erosion or streambed scour both adjacent to and inside the crossing.

[1] Appropriate soil erosion, sediment and turbidity controls include cofferdams, bypass pumping around barriers immediately up and downstream of the work footprint (i.e., dam and pump), installation of sediment control barriers (i.e., silt fence, vegetated filter strips, geotextile silt fences, filter tubes, erosion control mixes, hay bales or other devices) downhill of all exposed areas, stream fords, retention of existing vegetated buffers, application of temporary mulching during construction, phased construction, and permanent seeding and stabilization, etc.

b. To avoid adverse impacts on aquatic organisms, the low flow channel/thalweg shall remain unobstructed during periods of low flow, except when necessary to perform the authorized work.
c. For work in tidal waters, in-stream controls (e.g., cofferdams) should be installed in such a way as to not obstruct fish passage.
d. Riprap and other stream bed materials shall be installed in a manner that avoids organism entrapment in rock voids or water displaced to subterranean flow with crushed stone and riprap.
e. To the maximum extent practicable, the preconstruction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity shall not restrict or impede the passage of normal or high flows unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

27. Spawning, Breeding, and Migratory Areas.
a. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized under these GPs.
b. Activities in waters of the U.S. that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.
c. The applicant is responsible for obtaining any "take" permits required under the USFWS's regulations governing compliance with the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act. The applicant should contact the appropriate local office of the USFWS to determine if such "take" permits are required for a particular activity.
d. Information on spawning habitat for species managed under the Magnuson-Stevens Fishery Conservation and Management Act (i.e., EFH for spawning adults) can be obtained from NAE Regulatory website, Essential Fish Habitat section, at: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.
e. Information regarding diadromous fish habitat can be obtained from the following DMF website at: https://www.mass.gov/info-details/massgis-data-diadromous-fish.

28. Vernal Pools.
a. A PCN is required if a discharge of dredged or fill material is proposed within a vernal pool depression that is also a water of the U.S.
b. Vernal pools must be identified on the plans that show aquatic resource delineations.
c. Adverse impacts to vernal pools shall be avoided & minimized to the maximum extent practicable.

29. Invasive Species.
a. The introduction, spread or the increased risk of invasion of invasive plant or animal species on the project site, into new or disturbed areas, or areas adjacent to the project site caused by the site work shall be avoided. Construction mats shall be thoroughly cleaned before reuse to avoid spread of invasive species.
b. Unless otherwise directed by USACE, all applications for PCN non-tidal projects proposing fill in USACE jurisdiction shall include an Invasive Species Control Plan. Additional information can be found at: https://www.nae.usace.army.mil/Missions/Regulatory/Invasive-Species/, https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/.

30. Fills Within 100-Year Floodplains. The activity shall comply with applicable Federal Emergency Management Agency (FEMA) approved, Massachusetts Emergency Management

Agency (MEMA) approved and/or local floodplain management requirements. Applicants should contact FEMA and/or MEMA regarding floodplain management requirements.

31. Stream Work and Crossings & Wetland Crossings.
a. When feasible, all temporary and permanent crossings of waterbodies and wetlands (hereinafter referred to as "crossings") shall conform to the "Massachusetts River and Stream Crossing Standards" located at: https://www.mass.gov/doc/massachusetts-river-and-stream-crossing-standards/download or https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/. Projects that do not conform to these guidelines shall be reviewed under PCN or IP procedures.
b. Crossings shall be suitably culverted, bridged, or otherwise designed to withstand and to prevent the restriction of high flows, to maintain existing low flows, maintain water quality, and not obstruct the movement of aquatic life indigenous to the waterbody beyond the duration of construction.
c. Crossings shall be installed in such a manner as to preserve hydraulic capacity and flow, sediment transport, and organism passage at its present level, between the wetlands on either side of the road. The applicant shall take necessary measures to correct any wetland damage resulting from deficiencies in hydraulic capacity, sediment transport and organism passage.
d. Stream crossings shall utilize a natural mixed grain-size streambed material composition that matches upstream and downstream substrates to create a stable streambed. Substrate should function appropriately during normal and high flows without washing out. If natural streambed material is not utilized, a PCN is required.
e. Activities involving open trench excavation in flowing waters require a PCN. Work should not occur in flowing waters (requires using management techniques such as temporary flume pipes, culverts, cofferdams, etc.). Normal flows should be maintained within the stream boundary's confines when practicable. Projects utilizing these management techniques must meet all applicable terms and conditions of the GP, including the GCs in Section IV.

32. Utility Line Installation and Removal
a. Subsurface utility lines must be installed at a sufficient depth to avoid damage from anchors, dredging, etc., and to prevent exposure from erosion and stream adjustment.
b. When utility lines are installed via horizontal directional drilling, a frac-out contingency plan shall be present on site for the duration of construction. As necessary, the applicant shall immediately contain, control, recover, and remove drilling fluids released into the environment.
c. Abandoned or inactive utility lines must be removed and faulty lines (e.g., leaking hazardous substances, petroleum products, etc.) must be removed or repaired. A written verification from the USACE is required if they are to remain in place, e.g., to protect sensitive areas or ensure safety.
d. Utility lines shall not adversely alter existing hydrology, and trenches cannot be constructed or backfilled in such a manner as to drain waters of the U.S. (e.g., backfilling with extensive gravel layers, creating a French drain effect). In wetland areas, structures such as ditch plugs, cut-off walls, clay blocks, bentonite, or other suitable material shall be used within utility trenches to ensure that the trench through which the utility line is installed does not drain waters of the U.S. including wetlands.
e. Stockpiling of tree debris, to the extent where it has the effect of fill material, shall not occur in waters of the U.S. Tree debris shall be removed from waters of the U.S. and placed in uplands without causing additional disturbance to aquatic resources. Failure to meet this condition could change the bottom elevation of the wetland and be considered a discharge of fill material, and depending on the area of alteration, may require a PCN or IP.

33. Water Supply Intakes. No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

34. Coral Reefs. Impacts to coral reefs are not authorized under these GPs. Coral reefs consist of the skeletal deposit, usually of calcareous or silicaceous materials, produced by the vital activities of anthozoan polyps or other invertebrate organisms present in growing portions of the reef.

35. Blasting. Blasting in waters of the U.S. associated with work such as dredging, trenching, pile installation, etc. is not authorized under these GPs.

36. Inspections. The permittee shall allow USACE to make periodic inspections at any time deemed necessary to ensure that the work is being or has been performed in accordance with the terms and conditions of this permit. To facilitate these inspections, for activities requiring a PCN, the permittee shall complete and return the Certificate of Compliance when it is provided with a PCN verification letter. For SV-eligible activities, the permittee shall complete and submit the SVN to USACE within 30 days of initiating project construction, at which point, USACE may opt to inspect the activity to verify compliance with the terms and conditions of the GP. Post-construction engineering drawings may be required by USACE for completed work. This includes post-dredging survey drawings for any dredging work.

37. Maintenance. The permittee shall maintain the activity authorized by these GPs in good condition and in conformance with the terms and conditions of this permit. Some maintenance activities may not be subject to federal regulation under Section 404 in accordance with 33 CFR 323.4(a)(2). This condition is not applicable to maintenance of dredging projects. Prospective permittees should contact USACE to inquire about maintenance of dredging projects, and its eligibility under these GPs. Maintenance dredging is subject to the review thresholds in GP #7 as well as any conditions included in a written USACE authorization. Maintenance dredging includes only those areas and depths previously authorized and dredged.

38. Property Rights. Per 33 CFR 320.4(g)(6), these GPs do not convey any property rights, either in real estate or material, or any exclusive privileges, nor do they authorize any injury to property or invasion of rights or any infringement of Federal, State, or local laws or regulations.

39. Transfer of GP Verifications. When the work authorized by these GPs is still in existence at the time the property is transferred, the terms and conditions of these GPs, including any special conditions, will continue to be binding on the entity or individual who received the GP authorizations, as well as the new owner(s) of the property. If the permittee sells the property associated with a GP authorization, the applicant may transfer the GP authorization to the new owner by submitting a letter to USACE to validate the transfer. A copy of the GP authorization letter must be attached to the letter, and the letter must include the following statement: “The terms and conditions of these general permits, including any special conditions, will continue to be binding on the new owner(s) of the property.” This letter shall be signed by both the seller and new property owner(s).

40. Modification, Suspension, and Revocation. These GPs and any individual authorization issued thereof may be either modified, suspended, or revoked in whole or in part pursuant to the policies and procedures of 33 CFR 325.7; and any such action shall not be the basis for any claim for damages against the U.S.

41. Special Conditions. The USACE may impose other special conditions on a project authorized pursuant to these GPs that are determined necessary to minimize adverse navigational and/or environmental effects or based on any other factor of the public interest. Failure to comply with all conditions of the authorization, including special conditions, constitutes a permit violation and may subject the applicant to criminal, civil, or administrative penalties or restoration.

42. False or Incomplete Information. If USACE makes a determination regarding the eligibility of a project under these GPs, and subsequently discovers that it has relied on false, incomplete, or inaccurate information provided by the applicant, the authorization will not be valid, and the U.S. Government may institute appropriate legal proceedings.

43. Abandonment. If the permittee decides to abandon the activity authorized under these GPs, unless such abandonment is merely the transfer of property to a third party, he/she/they may be required to restore the area to the satisfaction of USACE.

44. Enforcement cases. These GPs do not apply to any existing or proposed activity in USACE jurisdiction associated with an on-going USACE or EPA enforcement action, until such time as the enforcement action is resolved or USACE or EPA determines that the activity may proceed independently without compromising the enforcement action.

45. Previously Authorized Activities.

a. Completed projects that received prior authorization from USACE (SV or PCN), shall remain authorized in accordance with the original terms and conditions of those authorizations, including their terms, GCs, and any special conditions provided in a written verification.

b. Activities authorized pursuant to 33 CFR 330.3 (activities occurring before certain dates) are not affected by these GPs.

46. Duration of Authorization.

These GPs expire on June 1, 2028. Activities authorized under these GPs will remain authorized until the GPs expire, unless discretionary authority has been exercised on a case-by-case basis to modify, suspend, or revoke the authorization in accordance with 33 CFR 325.2(e)(2). Activities authorized under GPs 1-25 that have either commenced (i.e., are under construction) or are under contract to commence in reliance upon this authorization will have until June 1, 2029 to complete the work. If requested by USACE, the permittee shall furnish documentation that demonstrates the project was under construction or under contract to commence by June 1, 2028. If work is not completed before June 1, 2029, the permittee must contact USACE. The USACE may issue a new authorization provided the project meets the terms and conditions of the MA GPs in effect at the time. Activities completed under the SV or PCN authorizations of these GPs will continue to be authorized after their expiration date.

SECTION V: MITIGATION STANDARDS

1. Mitigation Types

For all activities, applicants must (a) demonstrate how the project has been designed to avoid or minimize impacts to aquatic resources; and (b) describe measures taken to avoid or minimize impacts to aquatic resources through construction techniques and/or site access. Please see https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/ for assistance with preparing mitigation in accordance with the 2008 Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (33 CFR 332.3), hereafter referred to as "2008 Mitigation Rule."

Avoidance - Avoidance of impacts (direct and indirect) to aquatic resources means that project activities would not result in the placement of fill material or installation of a structure that could impact the resource area. Avoidance can include, but is not limited to, designing the project to avoid impacts to all or a portion of the aquatic resource areas.

Minimization - Minimization of impacts (direct and indirect) to aquatic resources means that measures are taken to ensure the amount and duration of impacts are limited to the maximum extent practicable. There are many minimization measures that could be implemented, prior to, during, or after the proposed activity, to ensure impacts are minimized. Examples include, but are not limited to:

- Permanent preservation of avoided aquatic features and buffer zone, in perpetuity. In these cases, the preserved area would be under a conservation easement and managed by conservation oriented third-party manager.
- Utilization of best management practices (BMPs) to ensure impacts are limited, and do not result in adverse impacts to the integrity and long-term functions of preserved/avoided features.

Compensatory Mitigation - Compensatory mitigation is generally required for PCN activities in which the impacts to the aquatic resources have been avoided and minimized to the maximum extent practicable but would still result in unavoidable adverse effects to the environment that are considered more than minimal or are contrary to the public interest. *Whatever the case may be, compensatory mitigation is no substitute for avoidance and minimization.*

2. Thresholds for Compensatory Mitigation

The basic objective of compensatory mitigation in the USACE Regulatory Program is to offset environmental losses resulting from unavoidable impacts to waters of the U.S. authorized by Department of the Army permits. **The following compensatory mitigation thresholds apply to all PCN activities that result in loss[1] of the resource area types listed below. Activities[2] in waters of the U.S. associated with the restoration, enhancement, and establishment of tidal and non-tidal aquatic resources are not considered loss and are not subject to the thresholds below.** Thresholds for different resource areas may not be combined to exceed 5,000 SF of total loss of all waters. The USACE will continue to evaluate projects on a case-by-case basis, and may in some cases require compensatory mitigation below these thresholds (e.g. minor impacts that add to a cumulative loss).

[1] See definition of loss in Section VII.
[2] These activities must result in net increases in aquatic resource functions and services to be exempted from the thresholds above.

Compensatory Mitigation Thresholds in Massachusetts		
Resource Area	**Non-Tidal Threshold**	**Tidal Threshold**
Stream	200 LF	200 LF
Bank Stabilization	500 LF	500 LF
Open Water	Project Dependent	Project Dependent
Wetland	5,000 SF	500 SF
Vernal Pool	All	N/A
SAV	Project dependent	25 SF
Mudflat	N/A	1,000 SF
Intertidal	N/A	1,000 SF

These thresholds can be utilized to determine at what point compensatory mitigation is required but are not used to determine how much mitigation may be needed to offset impacts to resources. Per the 2008 Mitigation Rule (33 CFR 332.3(f)(1)) "the amount of required compensatory mitigation must be, to the extent practicable, sufficient to replace lost aquatic resource functions. In cases where appropriate functional or condition assessment methods or other suitable metrics are available, these methods should be used where practicable to determine how much compensatory mitigation is required. If a functional or condition assessment or other suitable metric is not used, a minimum one-to-one acreage or linear foot compensation ratios must be used."

3. Compensatory Mitigation Hierarchy

Compensatory mitigation should follow the hierarchy as outlined in 33 CFR 332.3(b)(2-6) or current regulation. This hierarchy in order of preference includes: (1) Mitigation Bank credits, (2) In-Lieu Fee program credits, (3) permittee-responsible mitigation under a watershed approach, (4) permittee-responsible mitigation through on-site and in-kind mitigation, and (5) permittee-responsible mitigation through off-site and/or out-of-kind mitigation. If the proposed mitigation deviates from this mitigation hierarchy, the applicant **must** justify in writing why the proposed mitigation is environmentally preferable to the preferred method of compensatory mitigation (See 2008 Mitigation Rule). **In order for your application to be considered complete, you must provide a statement that discusses how your project will compensate for the loss or impact to aquatic resources.** If you are proposing permittee responsible mitigation, the 12 components of a mitigation plan (33 CFR 332.4(c)(2-14) must be addressed for your application to be considered complete. Prospective applicants are encouraged to contact USACE with questions at any time. Addressing the 12 components of a mitigation plan is commensurate with the amount of compensatory mitigation required, and USACE can assist prospective applicants with the level of information needed to satisfy each component.

For activities resulting in the loss of marine or estuarine resources, permittee-responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee.

4. In-Lieu Fee (ILF)

The purchase of credits from the Massachusetts In-Lieu Fee Program (MA ILFP) is the ***preferred*** method of compensatory mitigation in Massachusetts since, as of the issuance date of this GP, there are no mitigation banks available in Massachusetts. The applicant shall develop a mitigation plan that addresses the baseline conditions at the impact site and the number of credits to be provided (see 33 CFR 332.4(c)(1)(ii)).

The MA ILFP is administered by the Massachusetts Department of Fish & Game (DFG) in accordance with the 2008 Mitigation Rule at 33 CFR 332. The Mitigation Rule governs in-lieu fee compensatory mitigation associated with USACE permits under §404 of the Clean Water Act and/or §9 or §10 of the Rivers and Harbors Act of 1899.

MA ILFP Website: https://www.mass.gov/in-lieu-fee-program

Acceptance of an ILF payment into the ILFP established by the 2014 MA ILFP Instrument (link below) is an acknowledgement by DFG that it assumes all legal responsibility for satisfying the mitigation requirements of the USACE (i.e., the implementation, performance, and long-term management and monitoring of the compensatory mitigation project(s) approved under this Instrument and subsequent Compensatory Mitigation Plans). This transfer of legal responsibility is established by: 1) the approval of this In-Lieu Fee Instrument; 2) receipt by the district engineer of a Notice of Credit Sale and Transfer of Legal Responsibility to DFG that is signed by the DFG and the permittee and dated; and 3) the transfer of fees from the permittee to DFG.

MA ILFP Fact Sheet: https://www.mass.gov/files/documents/2017/01/sj/ilfp-fact-sheet-ma-ilfp-fees.pdf

MA ILFP Instrument: https://www.mass.gov/files/documents/2016/08/nd/ilfp-final-instrument-dfg.pdf

5. Permittee-Responsible

The USACE may determine that the proposed permittee-responsible compensatory mitigation is appropriate on a case-by-case basis. As described in the Compensatory Mitigation Hierarchy section above, applicants must justify in writing why the proposed mitigation is environmentally preferable to the purchase of ILF credits. Applicants are encouraged to contact the USACE prior to submission of a permit application to seek further guidance regarding USACE mitigation requirements.

Applicants will demonstrate their proposed compensatory mitigation in writing by addressing the 12 components of a mitigation plan (33 CFR 332.4(c)(2-14). *Please note that all elements must be addressed, or the permit application will be deemed incomplete.* In certain circumstances, the district engineer may determine that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)). Guidance on how to address these components can be found on the New England District Mitigation webpage: https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/

Performance standards will be used to measure the successfulness of the mitigation project. A successful mitigation project is one that is self-sustaining. For a mitigation project that will restore, enhance, or create wetlands, proper performance standards must address hydrology, hydric soils, and hydrophytic vegetation. The mitigation proposal must include an explanation of quantitative methods used to measure the success of performance standards (i.e., percent cover may be measured using vegetation plots, hydrology may be measured using data loggers, soil cores may be taken and evaluated for hydric soil indicators).

Monitoring methods should include quantitative sampling methods following established, scientific protocols. Sampling documentation, as part of monitoring reports, should include maps and coordinates (also shapefiles, if available) showing locations of sampling points, transects, quadrats, etc. In addition, permanent photo stations should be established coincident with sampling locations.

SECTION VI: FEDERAL & STATE AGENCY CONTACT INFORMATION & ORGANIZATIONAL WEBSITES

Federal Agencies

U.S. Army Corps of Engineers
Regulatory Division
696 Virginia Road
Concord, Massachusetts 01742-2751
(978) 318-8338 (phone); (978) 318-8303 (fax)
www.nae.usace.army.mil/missions/regulatory

U.S. Army Corps of Engineers
Navigation Division – Section 408
696 Virginia Road
Concord, Massachusetts 01742-2751
See link below for contact information:
https://www.nae.usace.army.mil/Missions/Section-408/

National Marine Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930
(978) 281-9300 (phone)
(*Federal endangered species & EFH)*

U.S. Fish & Wildlife Service
70 Commercial Street, Suite 300
Concord, New Hampshire 03301
(603) 223-2541 (phone)
(Federal endangered species)

National Park Service
15 State Street
Boston, Massachusetts 02109
(617) 223-5191 (phone)
(*Wild and Scenic Rivers*)

Bureau of Ocean and Energy Management
1849 C Street, NW
Washington D.C. 20240
202-208-6474 (phone)
(*Offshore Wind Facilities)*

Chief, Risk Analysis Branch
FEMA Region 1
99 High Street, 6th Floor
U.S. Department of Homeland Security
Boston, Massachusetts 02110
(617) 956-7576 (phone)

Commander (dpb)
First Coast Guard District
Battery Building
One South Street
New York, New York 10004-1466
(212) 514-4331 (phone); (212) 514-4337 (fax)
(*Bridge permits*)

U.S. Environmental Protection Agency
5 Post Office Square
Suite 100 (OEP06–3)
Boston, Massachusetts 02109-3912
(617) 918-1692 (phone)

State Agencies in Massachusetts

Massachusetts Department of Environmental Protection (MassDEP)	
DEP Division of Wetlands & Waterways	100 Cambridge Street, Suite 900 Boston, Massachusetts 02114 (617) 292-5695
Northeast Region	150 Presidential Way, Suite 300 Woburn, Massachusetts 01801 (978) 694-3200
Southeast Region	20 Riverside Drive, Route 105 Lakeville, Massachusetts 02347 (508) 946-2800
Central Region	8 New Bond Street Worcester, Massachusetts 01606 (508) 792-7650
Western Region	436 Dwight Street Springfield, Massachusetts 01103 (413) 784-1100

Massachusetts Office of Coastal Zone Management (CZM) Emails may be sent to: czm@mass.gov	
MA Office of Coastal Zone Management	100 Cambridge Street, Suite 900 Boston, Massachusetts 02114 (617) 626-1200
North Shore Region	2 State Fish Pier Gloucester, Massachusetts 01930 (978) 281-3972
South Shore Region	175 Edward Foster Road Scituate, Massachusetts 02066
Cape Cod and Islands Region	3195 Main Street, P.O. Box 220 Barnstable, MA 02630
South Coastal Region	81-B County Road, Suite E Mattapoisett, MA 02739

Massachusetts Historical Commission (MHC)	
Office Location:	220 Morrisey Boulevard Boston, Massachusetts 02125 (617) 727-8470

Massachusetts Board of Underwater Archaeological Resources (BUAR) Emails may be sent to: david.s.robinson@mass.gov	
Office Location:	100 Cambridge Street, Suite 900 Boston, Massachusetts 02114 (617) 626-1014

SECTION VII: Definitions & Acronyms

Artificial or Living Reef: A structure which is constructed or placed in waters for the purpose of enhancing fishery resources and commercial and recreational fishing opportunities.
Attendant Features: Occurring with or as a result of; accompanying.
Biodegradable: A material that decomposes into elements found in nature within a reasonably short period of time and will not leave a residue of plastic or a petroleum derivative in the environment after degradation. In contrast, degradable plastics break down into plastic fragments that remain in the environment after degradation. Examples of biodegradable materials include jute, sisal, cotton, straw, burlap, coconut husk fiber (coir) or excelsior. In contrast, degradable plastics break down into plastic fragments that remain in the environment after degradation. Photodegradable, UV degradable or Oxo-(bio)degradable plastics are not considered biodegradable under this GP.
Boating facilities: These provide, rent or sell mooring space, such as marinas, yacht clubs, boat yards, dockominiums, municipal facilities, land/home owners, etc. Not classified as boating facilities are piers shared between two abutting properties or municipal mooring fields that charge an equitable user fee based on the actual costs incurred.
Compensatory mitigation: The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved. Must comply with the applicable provisions of 33 CFR 332. See also the New England District Compensatory Mitigation Guidance at http://www.nae.usace.army.mil/Missions/Regulatory/Mitigation.aspx.
Construction mats: Constructions, swamp and timber mats (herein referred to as “construction mats”) are generic terms used to describe structures that distribute equipment weight to prevent wetland damage while facilitating passage and providing work platforms for workers and equipment. They are comprised of sheets or mats made from a variety of materials in various sizes. A timber mat consists of large timbers bolted or cabled together. Corduroy roads, which are not considered to be construction mats, are cut trees and/or saplings with the crowns and branches removed, and the trunks lined up next to one another. Corduroy roads are typically installed as permanent structures. Like construction mats, they are considered as fill whether they are installed temporarily or permanently.
Cumulative Impacts: The impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.1). Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous such piecemeal changes can result in a major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems. See 40 CFR 230.11(g).
Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.
Dredging:
Improvement Dredging: For the purposes of these GPs, this is dredging deeper than previously authorized by the USACE and dredged under that authorization.
Maintenance Dredging: For the purposes of these GPs, this is dredging from an area previously authorized by the USACE and dredged under that authorization. The USACE may require proof of authorization and dredging. Maintenance dredging typically refers to the routine removal of accumulated sediment to maintain the design depths of serviceable navigation channels, harbors, marinas, boat launches and port facilities. Maintenance dredging is conducted for navigational purposes and does not include any expansion of the previously dredged area. The USACE may

review a maintenance dredging activity as new dredging if sufficient time has elapsed to allow for the colonization of SAS, shellfish, etc.

New Dredging: For the purposes of these GPs, this is a) first time the USACE authorizes dredging of a particular location or b) dredging has not occurred for an extended period of time, and this has allowed for aquatic resources (i.e., eelgrass, shellfish, etc.) to redevelop in the area.

Dredged material & discharge of dredged material: These are defined at 33 CFR 323.2(c) and (d). The term dredged material means material that is excavated or dredged from waters of the U.S.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s) but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Ephemeral stream: A stream with flowing water only during, and for a short duration, after precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Erosion Controls: Appropriate soil erosion, sediment and turbidity controls include cofferdams, bypass pumping around barriers immediately up and downstream of the work footprint (i.e., dam and pump), installation of sediment control barriers (i.e., silt fence, vegetated filter strips, geotextile silt fences, filter tubes, erosion control mixes, hay bales or other devices) downhill of all exposed areas, stream fords, retention of existing vegetated buffers, application of temporary mulching during construction, phased construction, and permanent seeding and stabilization, etc.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area (33 CFR 332.2).

Expansions: Work that increases the footprint of fill, structures, depth of basin or drainage features, or floats, or slip capacity.

Essential Fish Habitat (EFH): The Federal Magnuson-Stevens Fishery Management and Conservation Act broadly defines EFH to include those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. See www.greateratlantic.fisheries.noaa.gov/habitat for more information.

Fill material & discharge of fill material: Material placed in waters of the U.S. where the material has the effect of either replacing any portion of a water of the U.S. with dry land or changing the bottom elevation of any portion of a water of the U.S. Fill material does not include any pollutant discharged into the water primarily to dispose of waste. These are defined at 33 CFR 323.2 (e) & (f).

Federal navigation projects (FNPs): These areas are maintained by the USACE; authorized, constructed and maintained on the premise that they will be accessible and available to all on equal terms; and comprised of USACE Federal anchorages, Federal channels and Federal turning basins. The buffer zone is equal to three times the authorized depth of a FNP. The following are FNPs in MA and more information, including the limits, is provided at www.nae.usace.army.mil/missions/navigation >> Navigation Projects:

- Andrews River, Harwich, MA
- Aunt Lydia's Cove
- Beverly Harbor
- Boston Harbor
- Buttermilk Bay Channel
- Canapitsit Channel
- Cape Cod Canal
- Chatham Harbor
- Cohasset Harbor
- Cross Rip Shoals, Nantucket Sound
- Cuttyhunk Harbor
- Dorchester Bay and Neponset River
- Duxbury Harbor
- Edgartown Harbor
- Essex River
- Fall River Harbor
- Falmouth Harbor
- Gloucester Harbor and Annisquam River
- Green Harbor
- Hingham Harbor
- Hyannis Harbor
- Ipswich River
- Island End River (Chelsea, MA)
- Kingston Harbor
- Lagoon Pond
- Little Harbor Woods Hole

Lynn Harbor
Malden River
Menemsha Creek
Merrimack River
Mystic River
Nantucket Harbor of Refuge
New Bedford and Fairhaven Harbor
Newburyport Harbor
Oak Bluffs Harbor
Pigeon Cove Harbor
Plymouth Harbor
Pollock Rip Shoals, Nantucket Sound
Provincetown Harbor
Red Brook Harbor
Rockport Harbor
Salem Harbor
Sandy Bay Harbor of Refuge
Saugus River
Scituate Harbor
Sesuit Harbor
Taunton River
Vineyard Haven Harbor
Wareham Harbor
Wellfleet Harbor
Westport River and Harbor
Weymouth Back River
Weymouth Fore and Town Rivers
Winthrop Harbor
Woods Hole Channel

Flume: An open artificial water channel, in the form of a gravity chute, which leads water from a diversion dam or weir alongside a natural flow. A flume can be used to measure the rate of flow.
FNP buffer zone: The buffer zone of a USACE Federal Navigation Project (FNP) is equal to three times the authorized depth of the FNP.
Frac out: During horizontal directional drilling (HDD) operations, drilling fluid travels up the borehole into a pit. When the borehole becomes obstructed or the pressure becomes too great inside the borehole, the ground fractures and fluid escapes to the surface and may affect surface waters.
Ground disturbance: Any activity that compacts, relocates, overturns, removes, mixes, or otherwise disturbs the ground, including under water. Ground disturbance can be caused by the use of hand tools (shovels, pick axe, posthole digger, etc.), heavy equipment (excavators, backhoes, bulldozers, dredgers, trenching and earthmoving equipment, etc.), and heavy trucks (large four wheel drive trucks, dump trucks and tractor trailers, etc.). Trenching, bulldozing, dredging, excavating, scraping, and plowing are typical examples of ground disturbance activities.
Height:width ratio: The height of structures shall at all points be equal to or exceed the width of the deck. For the purpose of this definition, height shall be measured from the marsh substrate to the bottom of the longitudinal support beam.
High Tide Line (HTL): The line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides 58 that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds. (33 CFR 328). Refer to the highest predicted tide for the current year at the nearest NOAA tide gage. https://tidesandcurrents.noaa.gov/map/index.html
Historic Property: Any prehistoric or historic site (including archaeological sites), district, building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).
Impacts:
Direct Impacts: Effects that are caused by the activity and occur at the same time and place (40 CFR 1508.7).
Indirect impacts: Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.
Secondary impacts: Effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material.

Information about secondary effects on aquatic ecosystems shall be considered prior to the time final section 404 action is taken by permitting authorities. Some examples of secondary effects on an aquatic ecosystem are: aquatic areas drained, flooded, fragmented; fluctuating water levels in an impoundment and downstream associated with the operation of a dam; septic tank leaching and surface runoff from residential or commercial developments on fill; and leachate and runoff from a sanitary landfill located in waters of the U.S. See 40 CFR 230.11(h).

Incidental Fallback: Incidental fallback is the redeposit of small volumes of dredged material that is incidental to excavation activity in waters of the U.S. when such material falls back to substantially the same place as the initial removal (33 CFR 323.2(d)(2)(iii)).

In the dry: Work that is done under dry conditions, e.g., work behind cofferdams or when the stream or tide is waterward of the work.

Independent utility: A test to determine what constitutes a single and complete non-linear project in the USACE Regulatory Program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Individual permit: A Department of the Army authorization that is issued following a case-by-case evaluation of a specific structure or work in accordance with the procedures of 33 CFR 322, or a specific project involving the proposed discharge(s) in accordance with the procedures of 33 CFR 323, and in accordance with the procedures of 33 CFR 325 and a determination that the proposed discharge is in the public interest pursuant to 33 CFR 320.

Intermittent stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Intertidal: The area in between mean low water and the high tide line.

Living reef: See the definition of “artificial or living reef.”

Living shoreline: A term used to describe a low-impact approach with a substantial biological component to shoreline protection and restoration along coastal shores, riparian zones, lacustrine fringe wetlands, or oyster or mussel reef structures. This approach integrates natural features to restore, enhance, maintain, or create habitat, functions, and processes while also functioning to mitigate flooding or shoreline erosion. Living shorelines may stabilize banks and shores with small fetch and gentle slopes that are subject to low-to mid-energy waves. A living shoreline has a footprint that is made up mostly of native material. It incorporates vegetation or other living, natural “soft” elements alone or in combination with some type of harder shoreline structure (e.g., oyster or mussel reefs or rock sills) for added protection and stability. Living shorelines should maintain the natural continuity of the land-water interface and retain or enhance shoreline ecological processes.

Loss of waters of the United States: Waters of the U.S. that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. The loss of stream bed includes the acres of stream bed that are permanently adversely affected by filling or excavation because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the U.S. is a threshold measurement of the impact to jurisdictional waters or wetlands for determining whether a project may qualify for a GP; it is not a net threshold that is calculated after considering compensatory mitigation that maybe used to offset losses of aquatic functions and services. Waters of the U.S. temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the U.S. Impacts resulting from activities that do not require Department of the Army authorization, such as activities eligible for exemptions under section 404(f) of the Clean Water Act, are not considered when calculating the loss of waters of the U.S.

Maintenance: The repair, rehabilitation, or in-kind replacement of any previously authorized, currently serviceable structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3 – "Activities occurring before certain dates," provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Maintenance includes minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards that are necessary to make repair, rehabilitation, or replacement are authorized. Currently serviceable means useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.
Maintenance Exemption: In accordance with 33 CFR 323.4(a)(2), any discharge of dredged or fill material that may result from any of the following activities is not prohibited by or otherwise subject to regulation under Section 404 of the CWA: "Maintenance, including emergency reconstruction of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, bridge abutments or approaches, and transportation structures. Maintenance does not include any modification that changes the character, scope, or size of the original fill design."
Mean high water: Line on the shore reached by the plane of the average high water. Where precise determination of the actual location of the line becomes necessary, it must be established by survey with reference to the available tidal datum, preferably averaged over a period of 18.6 years. Less precise methods, such as observation of the "apparent shoreline" which is determined by reference to physical markings, lines of vegetation, or changes in type of vegetation, may be used only where an estimate is needed of the line reached by the mean high water.
Mechanized land clearing: Land clearing activities using mechanized equipment such as backhoes or bulldozers with sheer blades, rakes or discs constitute point source discharges and are subject to section 404 jurisdiction when they take place in wetlands or waters of the U.S (Regulatory Guidance Letter 90-05).
Metallic mineral: Any ore or material to be excavated from the natural deposits on or in the earth for its metallic mineral content to be used for commercial or industrial purposes. "Metallic mineral" does not include thorium or uranium.
Minor deviations: Deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards, which are necessary to make repair, rehabilitation, or replacement are permitted, provided the adverse environmental effects resulting from such repair, rehabilitation, or replacement are minimal.
Natural Rocky Habitats: Intertidal and subtidal substrates of pebble-gravel, cobble, boulder, or rock ledge and outcrops. Manufactured stone (e.g., cur or engineered riprap) is not considered a natural rocky habitat. Natural rocky habitats are either found as pavement (consolidated pebble-gravel, cobble, or boulder areas) or as a mixture with fines (i.e., clay and sand) and other substrates. Rocky habitats as EFH are defined as follows: (1) All pebble-gravel, cobble, or boulder pavements; (2) Pebble-gravel mixed with fines: mixed substrate of pebble-gravel and fines where pebble-gravel is an evident component of the substrate (either through visual observation or within sediment samples). Sediment samples with a content of 10% or more of pebble-gravel in the top layer (6-12 inches) should be delineated; (3) Scattered cobble, scattered boulder, scattered cobble/boulder: mixed substate of cobble and/or boulder and other substrates. The aerial extent of cobbles and/or boulders should be delineated; and (4) All rock ledge outcrops: area should be delineated along the edge of the ledge/outcrop (as defined by NMFS Habitat and Ecosystems Services Branch, Gloucester, MA).
Navigable waters or Navigable waters of the U.S.: These waters are subject to section 10 of the Rivers and Harbors Act of 1899 and are defined as those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce (33 CFR Part 329). Work or structures in navigable

waters require permits pursuant to §9 and §10 of the Rivers and Harbors Act of 1899. Also see the definition of “waters of the U.S.” below.
Note: Currently the following non-tidal waters have been determined to be navigable waters of the U.S. subject to permit jurisdiction in Massachusetts: Merrimack River, Connecticut River, and Charles River to the Watertown Dam.
Nearshore disposal: This is defined in the USACE Coastal Engineering Manual as “(1) In beach terminology an indefinite zone extending seaward from the shoreline well beyond the breaker zone. (2) The zone which extends from the swash zone to the position marking the start of the offshore zone, typically at water depths of the order of 20m.” A nearshore berm is an artificial berm built in shallow water using dredged material. Often, the berm is intended to renourish the adjacent and downdrift shore over time under the influence of waves and currents.
Non-regulated activity: Only structures or fills that were previously authorized and are in compliance with the terms and condition of the original authorization can be maintained as a non-regulated activity under 33 CFR 323.4(a)(2). Minor deviations from the previously authorized footprint do not qualify as a non-regulated activity and require new authorization from the USACE. The state’s maintenance provisions may differ from the USACE and a project may require reporting and written authorization from the state.
Non-tidal wetlands: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. Non-tidal wetlands contiguous to tidal waters are located landward of the HTL (*i.e.,* spring HTL). Also see the definition of “Waters of the U.S.” below.
Oil or natural gas pipeline: Any pipe or pipeline for the transportation of any form of oil or natural gas, including products derived from oil or natural gas, such as gasoline, jet fuel, diesel fuel. heating oil, petrochemical feedstocks, waxes, lubricating oils, and asphalt.
Ordinary High Water Mark (OHWM): A line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas. See 33 CFR 328.3(e).
Overall project: The overall project, for purposes of these GPs, includes all regulated activities that are reasonably related and necessary to accomplish the project purpose. Also see the definition of “single and complete linear project.”
Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.
Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.
Permanent impacts: Permanent impacts means waters of the U.S. that are permanently affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent impacts include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody.
Preconstruction notification (PCN): A request submitted by the applicant to the USACE for confirmation that a particular activity is authorized by these GPs. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Preconstruction notification may be required by the terms and conditions of these GPs. A PCN may be voluntarily submitted in cases where PCN is not required and the applicant wants confirmation that the activity is authorized under these GPs.
Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions (33 CFR 332.2).
Real estate subdivision: Includes circumstances where a landowner or developer divides a tract of land into smaller parcels for the purpose of selling, conveying, transferring, leasing, or

developing said parcels. This would include the entire area of a residential, commercial or other real estate subdivision, including all parcels and parts thereof

Reconfiguration zone: A USACE authorized area in which permittees may rearrange pile-supported structures and floats without additional authorizations. A reconfiguration zone does not grant exclusive privileges to an area or an increase in structure or float area.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/ historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in again in aquatic resource area and functions (33 CFR 332.2).

Reference Site: Reference sites - Compensatory restoration, rehabilitation, and creation mitigation projects should seek to duplicate the features of reference aquatic resources or enhance connectivity with adjacent natural upland and aquatic resource landscape elements. Performance standards related to reference sites are encouraged. Mitigation project sites must be selected based on their ability to be, and continue to be, resistant to disturbance from the surrounding landscape, by locating them adjacent to refuges, buffers, green spaces, and other preserved natural elements of the landscape. In general, aquatic resource mitigation projects must be designed to be self-sustaining, natural systems within the landscape and climate in which they are located, with little or no ongoing maintenance and/or hydrologic manipulation.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area (33 CFR 332.2).

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation (33 CFR 332.2).

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Sedimentation: Sedimentation is defined as the process of deposition of a solid material from a state of suspension. Deposited sediments may accumulate and have temporal impacts to aquatic resource areas. See secondary effects definition above. For the purposes of this document, “greater than minimal sedimentation” is generally not considered to occur when using proper erosion controls (GC 25) or when sedimentation is considered “de minimis” 33 CFR 323.2(d)(5).

Single and complete linear project: A linear project is a project constructed for the purpose of getting people, goods, or services from a point of origin to a terminal point, which often involves multiple crossings of one or more waterbodies at separate and distant locations. The term “single and complete project” is defined as that portion of the total linear project proposed or accomplished by one owner/ developer or partnership or other association of owners/developers that includes all crossings of a single water of the U.S. (i.e., a single waterbody) at a specific location. For linear projects crossing a single or multiple waterbodies several times at separate and distant locations, each crossing is considered a single and complete project for the purposes of these GPs. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Single and complete non-linear project: For non-linear projects, the term “single and complete project” is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete

non-linear project must have independent utility (see the definition of “independent utility”). Single and complete non-linear projects may not be “piecemealed” to avoid the limits in a GP authorization.
Special aquatic sites (SAS): These include inland and saltmarsh wetlands, mud flats, vegetated shallows, sanctuaries and refuges, coral reefs, and riffle and pool complexes. These are defined at 40 CFR 230.3 and listed in 40 CFR 230 Subpart E.
Streambed: The stream substrate between the OHW marks on each side. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the streambed, but outside of the OHW marks, are not considered part of the streambed.
Stream channelization: The manipulation of a stream’s course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized stream remains a water of the U.S.
Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.
Temporal loss: The time lag between the loss of aquatic resource functions caused by the permitted impacts and the replacement of aquatic resource functions at the compensatory mitigation site(s) (33 CFR 332.2).
Temporary impacts: Temporary impacts include, but are not limited to, jurisdictional waters that are temporarily filled, flooded, excavated, or drained because of the regulated activity. Impacts are considered temporary when they are removed immediately upon completion of the activity. Note: An impact is considered temporary when the aquatic resource is restored to pre-project conditions, but effects to archaeological and/or cultural resources may be permanent in duration.
Tidal wetlands: A wetland that is subject to the ebb and flow of the tide. See the definition of “Waters of the U.S.” below.
Tide gates: Structures such as duckbills, flap gates, manual and self-regulating tide gates, etc. that regulate or prevent upstream tidal flows.
Turbidity: A measure of the level of particles such as sediment, plankton, or organic by-products, in a body of water. As the turbidity of water increases, it becomes denser and less clear due to a higher concentration of these light-blocking particles. Suspended solids are more likely to carry toxic chemicals, and can also negatively affect aquatic organisms, water temperature, and dissolved oxygen levels.
Utility line: Any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose that is not oil, natural gas, or petrochemicals. A utility line also includes any cable, line, or wire for the transmission for any purpose of electrical energy, telephone, and telegraph messages, and radio and television communication. The term ‘utility line’ does not include activities that drain a water of the U.S., such as drainage tile or French drains, but it does apply to pipes conveying drainage from another area.
Vegetated shallows: Permanently inundated areas that under normal circumstances support communities of rooted aquatic vegetation, such as eelgrass *(Zostera marina)* and widgeon grass (*Rupia maritima*) in marine systems (does not include salt marsh) as well as a number of freshwater species in rivers and lakes. These are a type of SAS defined at 40 CFR 230.43. Vegetated shallows are commonly referred to as submerged aquatic vegetation or SAV. Vegetated shallow survey guidance is located at www.nae.usace.army.mil/missions/regulatory /jurisdiction-and-wetlands. Maps of vegetated shallows in Massachusetts are located at www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit.
Vernal pools: For the purposes of these GPs, vernal pools are depressional wetland basins that typically dry up in most years and may contain inlets or outlets, typically of intermittent flow. Vernal pools range in both size and depth depending upon landscape position and parent material(s). In

most years, vernal pools support one or more of the following obligate indicator species: wood frog, spotted salamander, blue-spotted salamander, marbled salamander, Jefferson's salamander and fairy shrimp. However, they should preclude sustainable populations of predatory fish.

Water diversions: Water diversions are activities such as bypass pumping (e.g., "dam and pump") or water withdrawals. Temporary flume pipes, culverts or cofferdams where normal flows are maintained within the stream boundary's confines aren't water diversions. "Normal flows" are defined as no change in flow from pre-project conditions.

Waters of the United States (U.S.) These waterbodies are the waters where permits are required for the discharge of dredged or fill material pursuant to §404 of the CWA. These waters include but are not limited to navigable waters of the U.S. and tidal wetlands and include many non-tidal wetlands and other waterbodies. See definitions for navigable waters of the U.S., tidal wetlands, waterbody, and non-tidal wetlands. (33 CFR 328)

Waterbody: Examples of "waterbodies" include oceans, coastal waters, rivers, streams, ditches, lakes, ponds, and wetlands. If a wetland is adjacent to a waterbody determined to be a water of the U.S., that waterbody and any adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)).

Weir: A barrier across a river designed to alter the flow characteristics. In most cases, weirs take the form of a barrier, smaller than most conventional dams, across a river that causes water to pool behind the structure and allows water to flow over the top. Weirs are commonly used to alter the flow regime of a river, prevent flooding, measure discharge and help render a river navigable.

Wetland: Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. The Corps of Engineers Wetlands Delineation Manual in conjunction with the associated regional supplement should be used to determine if a wetland is present and delineate wetland boundaries.

Acronyms

BMPs	Best Management Practices
BUAR	Massachusetts Board of Underwater Archaeological Resources
CWA	Clean Water Act
CZM	Coastal Zone Management
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
EFH	Essential Fish Habitat
FNP	Federal Navigation Project
GC	General Condition
GP	General Permit
HTL	High Tide Line
IP	Individual Permit
LID	Low impact development
MassDEP	Massachusetts Department of Environmental Protection
MA DMF	Massachusetts Division of Marine Fisheries
MHC	Massachusetts Historical Commission
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Water
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
OHW	Ordinary High Water Mark
PCN	Preconstruction Notification
SAS	Special Aquatic Sites
SF	Square Feet
SV	Self-Verification
SHPO	State Historic Preservation Officer
THPO	Tribal Historic Preservation Officer
USFWS	U.S. Fish and Wildlife Service
USCG	U.S. Coast Guard
USFS	U.S. Forest Service
USGS	U.S. Geological Service
WQC	Water Quality Certification

Appendix A: Guidance for NHPA Section 106 Compliance in Massachusetts

1. Purpose & Applicability

Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) (54 U.S.C § 306108), requires Federal agencies to take into account the effects of their undertakings on Historic Properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. Therefore, in order for an activity to be eligible for authorization under the 2023 Massachusetts General Permit, the USACE must consider the effect the activity may have on historic properties. Historic properties may include, but are not limited to, historic districts, archaeological districts, sites, buildings, structures, objects, sacred sites, traditional cultural places, and traditional cultural landscapes that are included in, or eligible for inclusion in, the National Register of Historic Places (NRHP).

This guidance applies to projects that require authorization under Section 404 of the Clean Water Act (33 U.S.C. § 1344) and/or Section 10 of the Rivers and Harbors Act (33 U.S.C. §403) and will assist applicants when evaluating and documenting the presence of historic properties within or near their project site(s). The prospective applicant will evaluate their proposed project using the criteria below to determine if their project has the potential to affect historic properties and if so, whether or not historic properties are present or are likely to be present. All activities authorized under these GPs shall follow the terms outlined in General Condition 14: Historic Properties and General Condition 6: Tribal Rights & Burial Sites. Prospective applicants shall complete their due diligence according to the procedures below for their application to be deemed complete.

2. No Potential to Affect Historic Properties

Certain activities do not have the potential to cause effects on historic properties, assuming such historic properties were present, based on the nature of the activity and site-specific conditions. Therefore, these activities **do not** require historic property identification efforts or notification of the SHPO, THPOs, and/or BUAR under Section 106. The USACE has determined the following activities within the stated parameters have no potential to affect historic properties:

General Permit	Activity Parameters
1	Temporary buoys, markers and similar structures that are placed during winter events on ice and removed before spring thaw.
2	Repair or rehabilitation of structures that are less than 45 years in age. Any temporary structures or fills or work necessary to complete repairs or rehabilitation must not result in any ground disturbance.
3	Maintenance and replacement of moorings that are less than 45 years in age.
6	Maintenance, repair, replacement, or removal of utility lines, oil or natural gas pipelines, outfall or intake structures, and/or appurtenant features that are less than 45 years in age when all access, staging, and ground disturbance is strictly limited to previously disturbed areas (including any previous ground disturbance). Replacement must be in kind or smaller in size. Installation of tide gates on outfall structures that are less than 45 years in age.
7	Maintenance dredging of previously dredged areas where dredging does not extend beyond the original bottom elevations.

	Disposal of dredged material at an existing established and USACE-approved confined aquatic disposal cell. Beach nourishment in ongoing existing nourishment areas.
11	Fish and wildlife harvesting and attraction devices and activities.
13	Cleanup of hazardous and toxic waste materials, including contaminated sediments, that are less than 45 years in age.
16	Removal of land-based and water-based renewable energy generation facilities and hydropower projects that are less than 45 years in age.
18	Installation of buoys, floats, racks, trays, nets, lines, tubes, containers, and other structures for previously authorized by the USACE and ongoing aquaculture activities. Discharges of dredged or fill material into tidal or non-tidal waters necessary for shellfish seeding, rearing, cultivating, transplanting, and harvesting activities for previously authorized and ongoing aquaculture activities.
20	Maintenance activities for existing living shorelines excluding maintenance activities that require new ground disturbance such as excavation or re-sloping of the bank/shoreline.
22	Reshaping or maintenance of existing drainage ditches less than 45 years in age excluding ditch enlargement.
23	Placement of temporary and removable linear transportation and wetland/stream crossings that have no ground disturbance prior to placement, during placement, and during removal (i.e., placed on the surface and subsequently removed within one year of placement).
24	Placement of temporary and removable crossings and cofferdams that have no ground disturbance prior to placement, during placement, and during removal (i.e., placed on the surface and subsequently removed within one year of placement).
25	Emergency repair of existing structures and/or fills less than 45 years in age.

3. Historic Property Identification

If the activity does not fit under the criteria above, the following historic property identification efforts must be completed to demonstrate compliance with Section 106 of the NHPA. This includes documenting previously identified and unidentified historic properties in the project area.

a. Previously Identified Historic Properties: The prospective applicant shall document if previously identified historic properties are present on or adjacent to the project site by notifying the Massachusetts Historical Commission (MHC) and the Massachusetts Board of Underwater Archaeological Resources (BUAR), as appropriate, of the proposed project. The MHC and BUAR will check their records for the presence of any previously identified historic properties. The following outlines how prospective applicants should notify the MHC and BUAR.

i. The prospective applicant will notify the SHPO and BUAR to identify any previously recorded cultural resources. Applicants shall mail a completed Project Notification Form[18], project narrative, location (coordinates), plans, soil maps, and information on known cultural resources to the MHC. The MHC does not accept submissions via email. Applicants shall email or mail this information to the BUAR when the activity is located in lakes, ponds, rivers, and/or navigable waters in MA. Emailed file attachments should be <10MB. Any files >10MB shall be delivered via a file exchange system or the hard copy documents shall be mailed. Preferred contact information is listed below.

ii. **When sending this information, applicants must also document proof of receipt OR proof the information was delivered.** Proof of receipt constitutes a certified mail receipt, read email receipt, or other mail/email/online tracking services that document the information has reached the intended recipient(s). Proof the information was delivered constitutes a certificate of mailing, email delivery receipt, or other mail/email/online services that document the information was sent at a particular time. When using proof of delivery such (e.g., certificate of mailing), applicants should add 5 days to the 30-day notification period so the mail has time to reach its intended recipient. When using proof of receipt, the applicant may begin the 30-day notification period from the date received by the intended recipient.

iii. When mailing or emailing the application materials, applicants should include the following statement: “Please send responses to this notification directly to the USACE via email: cenae-r-ma@usace.army.mil or address regular mail responses to: Regulatory Division, U.S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, Massachusetts 01742-2751.” Email responses to the USACE are strongly preferred. The SHPO and BUAR will contact the USACE and cc the applicant(s) within 30 days of receiving the notification if their records indicate that historic properties are located in the project vicinity, and if additional review and/or surveys are recommended to ensure NHPA compliance. If the SHPO and/or BUAR do not respond within 30 days of receiving the notification, is it presumed that no known historic properties are present.

b. Previously Unidentified Historic Properties: The prospective applicant shall evaluate the project site and determine the sensitivity for the presence of historic properties if the project site has not been previously surveyed for cultural resources within the last 10 years. If the sensitivity is determined to be moderate to high, an intensive archaeological and/or architectural survey is required to investigate the potential presence of historic properties. The individual conducting this survey must meet the Secretary of the Interior’s Standards for Professional Qualifications (48 FR 44738-44739) in the discipline relevant to a particular resource type. For example, archeologists should not document and evaluate buildings or structures and architectural historians should not document and evaluate archaeological sites. The identification and qualifications for those participating in any survey and evaluation of resources should be included with the survey results. The criteria listed below are indicators of low sensitivity for the presence of historic properties for consideration when determining if an archaeological or architectural survey is needed.

Low sensitivity indicators:

- Previous archaeological and/or architectural survey within the last 10 years with negative results.
- In a location created in modern times (i.e., built on fill placed within the last 45 years or within an area excavated within the last 45 years).
- USACE has reviewed the project description and determined that a survey is not warranted based on the proposed activity and its location.

State survey guidance and standards are provided in the September 1995 Historic Properties Survey Manual Guidelines for the Identification of Historical and Archaeological Resources in Massachusetts available. State survey guidance and standards for underwater surveys are provided

[18] https://www.sec.state.ma.us/mhc/mhcform/formidx.htm

in the Board of Underwater Archaeological Resources' 2022 Policy Guidance on Archaeological Investigations and Related Survey Standards for the Discovery of Underwater Archaeological Resources. This guidance is available on the NAE Regulatory website: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

Please note, a negative result from MHC and/or BUAR does not necessarily mean no historic properties are present. Often proposed project sites have not been previously subject to a survey, so historic properties which may be present have not been previously recorded.

4. Tribal Coordination

Prospective applicants shall mail the Project Notification Form, project narrative, location (coordinates), plans with locus map, soil maps, and information on cultural resources to the Wampanoag Tribe of Gay Head (Aquinnah), Mashpee Wampanoag Tribe, Narragansett Indian Tribe, and/or Stockbridge-Munsee Community Band of Mohican Indians with interests in the project location. Preferred tribal contact information, including their respective areas of interest, can be found below. Applicants shall follow the same procedures as identified in Section 3(a)i-iii above when notifying Tribes of the proposed activity. Applicants shall provide the USACE with any responses received from the tribe(s) with their PCN application. If a tribe does not respond within 30 days of receiving the notification, the applicant shall provide USACE with all documentation of tribal outreach with their SV or PCN submission (e.g., emails, letters, phone call log, etc.). If the tribe indicates the presence of a previously unrecorded cultural resource, including a traditional cultural property (TCP) or traditional cultural landscape (TCL), a PCN is required.

5. Effect Determination

The project may have the potential to affect historic properties and/or tribal resources if 1) notification recipients respond within 30 calendar days of notification with concerns, 2) historic properties eligible for listing, or potentially eligible for listing in the NRHP, are present or 3) tribal resources are known to be present. The USACE may need to further review the project to confirm potential effects to historic properties and/or tribal resources. A PCN is required for any activity that may affect a historic property.

The USACE may determine the project will have 'no effect' on historic properties (i.e., no historic properties affected) when procedures outlined in Section 3 above are followed and no cultural resources are identified. Similarly, if historic properties are identified and will be completely avoided, the USACE may determine 'no effect.'

6. Contact Information:

Massachusetts Historical Commission

The Massachusetts Archives Building
220 Morrissey Boulevard
Boston, Massachusetts 02125

No email. Applicants or their representatives must send project information via certified mail and submit the certified mail receipt to the USACE or send via regular mail and submit proof of delivery.

Area of concern: All of Massachusetts.

Massachusetts Board of Underwater Archaeological Resources (BUAR)

100 Cambridge Street, Suite 900
Boston, Massachusetts 02114
Email: david.s.robinson@mass.gov

Applicants or their representatives must send project information via email (***strongly preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: All waterbodies in Massachusetts.

Wampanoag Tribe of Gay Head (Aquinnah)

Bettina Washington
Tribal Historic Preservation Officer (THPO)
20 Black Brook Road
Aquinnah, Massachusetts 02535
Email: thpo@wampanoagtribe-nsn.gov

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: All of Massachusetts.

Mashpee Wampanoag Tribe

ATTN: David Weeden
Tribal Historic Preservation Officer (THPO)
483 Great Neck Road South
Mashpee, Massachusetts 02649
Email: 106review@mwtribe-nsn.gov
Cc: David.weeden@mwtribe-nsn.gov

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: All of Massachusetts.

Narragansett Indian Tribe

ATTN: John Brown
Tribal Historic Preservation Officer (THPO)
Narragansett Indian Longhouse
4425 South County Trail
Charlestown, Rhode Island 02813
Email: tashtesook@aol.com

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: Massachusetts east of the Connecticut River.

Stockbridge-Munsee Community Band of Mohican Indians

ATTN: Jeff Bendremer
Tribal Historic Preservation Manager
Stockbridge-Munsee Community
Tribal Historic Preservation Extension office
86 Spring Street
Williamstown, Massachusetts 01267
Email: thpo@mohican-nsn.gov

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: West of the Connecticut River and Northfield, Montague, Miller's Falls, Turner's Falls, Sunderland, Amherst, Hadley, South Hadley, Chicopee, Springfield and Longmeadow.

APPENDIX B PRE-CONSTRUCTION NOTIFICATION

U.S. Army Corps of Engineers (USACE), New England District (NAE)

PRE-CONSTRUCTION NOTIFICATION (PCN)

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332.

Principal Purpose The information provided will be used in evaluating activities under Pre-Construction Notification procedures within New England.

Routine Uses This information may be shared with other federal, state, and local government agencies during the application review process. Submission

Disclosure of requested information is voluntary. However, if information is not provided the PCN application cannot be fully evaluated nor can USACE render a permit decision.

Instructions The applicant must complete ALL required sections of this document before their submission to USACE. The PCN submission to USACE shall include one set of drawings which show the location and character of the proposed activity, statements that address each required field below, and documentation that supports each field (e.g., emails, letters, description/narrative, phone calls, surveys, reports, etc.). Electronic submissions to the following address are strongly preferred: cenae-r-ma@usace.army.mil. The email subject line shall contain the following: General Permit #, PCN, City/Town, and date submitted. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY USACE)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (*agent is not required*)
First - Middle - Last -	First - Middle - Last -
Company -	Company -
E-mail Address -	E-mail Address -
6. APPLICANT'S ADDRESS:	9. AGENT'S ADDRESS:
Address-	Address-
City - State - Zip - Country -	City - State - Zip - Country -
7. APPLICANT'S PHONE NOs. with AREA CODE	10. AGENT'S PHONE NOs. with AREA CODE
a. Residence b. Business c. Fax d. Mobile	a. Residence b. Business c. Fax d. Mobile

STATEMENT OF AUTHORIZATION

11. I hereby authorize, _____ to act on my behalf as my agent in the processing of this general permit PCN application and to furnish, upon request, supplemental information in support of this general permit PCN application.

_____ _____

SIGNATURE OF APPLICANT DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME or TITLE (*see instructions*)

13. NAME OF WATERBODY, IF KNOWN (*if applicable*)	14. PROPOSED ACTIVITY STREET ADDRESS (*if applicable*)
15. LOCATION OF PROPOSED ACTIVITY (*see instructions*)	City: State: Zip:
Latitude: °N Longitude: °W	

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (*see instructions*)

State Tax Parcel ID: Municipality:

Section: Township: Range:

17. DIRECTIONS TO THE SITE.

18. IDENTIFY THE SPECIFIC GENERAL PERMIT(S) YOU PROPOSE TO USE:

19. DESCRIPTION OF PROPOSED GENERAL PERMIT ACTIVITY (*see instructions*)

20. DESCRIPTION OF PROPOSED MITIGATION MEASURES (*see instructions*)

21. PURPOSE OF GENERAL PERMIT ACTIVITY (*Describe the reason or purpose of the project, see instructions*)

22. Quantity of Wetlands, Streams, or Other Types of Waters Directly Affected by Proposed General Permit Activity (*see instructions*)

Area (square feet)	Length (linear feet)	Volume (cubic yards)	Duration	Purpose

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site.

23. List any other GP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project on any related activity (*see instructions*)

24. If the proposed activity will result in the loss of aquatic resources that exceed those identified in the New England District Compensatory Mitigation Thresholds, explain how the compensatory mitigation requirement will be satisfied. (*see instructions*)

25. Is Any Portion of the General Permit Activity Already Complete? ☐ Yes ☐ No If Yes, describe the completed work:

26. List the name(s) of any species listed as endangered or threatened under the Endangered Species Act that might be affected by the proposed GP activity or utilize the designated critical habitat that might be affected by the proposed GP activity. (*see instructions*)

27. List any historic properties that have the potential to be affected by the proposed GP activity or include a vicinity map indicating the location of the historic property or properties. Attach relevant project information, along with any responses received from project notifications to this submittal. (*see instructions*)

28. For a proposed GP activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, identify the Wild and Scenic River or the "study river":

29. If the proposed GP activity also requires permission from the USACE pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, have you submitted a written request for section 408 permission from the USACE district having jurisdiction over that project? ☐ Yes ☐ No

If "yes", please provide the date your request was submitted to the USACE District:

30. Does the activity require a 401 Water Quality Certification (WQC)? If so, specify the type of 401 WQC that is required (general or individual). In cases where an individual 401 WQC is required, provide the date the 401 WQC certification request was submitted to the certifying authority and their contact information.

31. If the terms of the GP(s) you want to use require additional information to be included in the PCN (i.e. sampling and analysis plan), please include that information in this space or provide it on an additional sheet of paper marked Block 30. (*see instructions*)

32. I certify that the information in this pre-construction notification is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

The Pre-Construction Notification must be signed by the person who desires to undertake the proposed activity (applicant) and, if the statement in block 11 has been filled out and signed, the authorized agent.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Instructions for Preparing a

Department of the Army

General Permit (GP) Pre-Construction Notification (PCN)

Blocks 1 through 4. To be completed by the U.S. Army Corps of Engineers.

Block 5. Applicant' Name. Enter the name and the e-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the PCN, please attach a sheet of paper with the necessary information marked Block 5.

Block 6. Address of Applicant. Please provide the full address of the party or parties responsible for the PCN. If more space is needed, attach an extra sheet of paper marked Block 6.

Block 7. Applicant Telephone Number(s). Please provide the telephone number where you can usually be reached during normal business hours.

Blocks 8 through 11. To be completed, if you choose to have an agent.

Block 8. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, consultant, or any other person or organization. Note: An agent is not required.

Blocks 9 and 10. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where they can be reached during normal business hours.

Block 11. Statement of Authorization. To be completed by the applicant, if an agent is to be employed.

Block 12. Proposed General Permit Activity Name or Title. Please provide a name identifying the proposed GP activity, e.g., Windward Marina, Rolling Hills Subdivision, or Smith Commercial Center.

Block 13. Name of Waterbody. Please provide the name (if it has a name) of any stream, lake, marsh, or other waterway to be directly impacted by the GP activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 14. Proposed Activity Street Address. If the proposed GP activity is located at a site having a street address (not a box number), enter it in Block 14.

Block 15. Location of Proposed Activity. Enter the latitude and longitude of where the proposed GP activity is located. Indicate whether the project location provided is the center of the project or whether the project location is provided as the latitude and longitude for each of the "corners" of the project area requiring evaluation. If there are multiple sites, please list the latitude and longitude of each site (center or corners) on a separate sheet of paper and mark as Block 15.

Block 16. Other Location Descriptions. If available, provide the Tax Parcel Identification number of the site, Section, Township, and Range of the site (if known), and / or local Municipality where the site is located.

Block 17. Directions to the Site. Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site. You may also provide a description of the location of the proposed GP activity, such as lot numbers, tract numbers, or you may choose to locate the proposed GP activity site from a known point (such as the right descending bank of Smith Creek, one mile downstream from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed GP activity site if known. If there are multiple locations, please indicate directions to each location on a separate sheet of paper and mark as Block 17.

Block 18. Identify the Specific General Permit(s) You Propose to Use. List the number(s) of the General Permit(s) you want to use to authorize the proposed activity (e.g., GP 4).

Block 19. Description of the Proposed General Permit Activity. Describe the proposed GP activity, including the direct and indirect adverse environmental effects of the proposed activity. The description of the proposed activity should be sufficiently detailed for USACE to determine that the adverse environmental effects of the activity will be no more than minimal. Identify the materials to be used in construction, as well as the methods by which the work is to be done.

Provide drawings to show that the proposed GP activity complies with the terms of the applicable GP(s). Drawings should contain sufficient detail to provide an illustrative description of the proposed GP activity, but do not need to be detailed engineering plans. The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 19.

Block 20: Description of Proposed Mitigation Measures. Describe any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed GP activity. The description of any proposed mitigation measures should be sufficiently detailed for USACE to determine how the measures would avoid and minimize adverse environmental effects. If adverse effects exceed the New England District compensatory mitigation thresholds, you must document how compensatory mitigation would be satisfied in Block 24.

Block 21. Purpose of General Permit Activity. Describe the purpose and need for the proposed GP activity. What will it be used for and why? Also include a brief description of any related activities associated with the proposed project. Provide the approximate dates you plan to begin and complete all work.

Block 22. Quantity of Wetlands, Streams, or Other Types of Waters Directly Affected by the Proposed General Permit Activity. For discharges of dredged or fill material into Waters of the U.S., provide the amount of wetlands, streams, or other types of waters filled, flooded, excavated, or drained by the proposed GP activity. For structures or work in Navigable Waters of the U.S. subject to Section 10 of the Rivers and Harbors Act of 1899, provide the amount of navigable waters filled, dredged, occupied by one or more structures (e.g., aids to navigation, mooring buoys) by the proposed GP activity. The area of impact includes the structures or fills with direct or indirect effects to waters of the U.S. The length of impact includes the length of a stream, including is banks, that are directly affected by the structures or fills. The duration of impact should be identified as temporary (xx days) or permanent. The impact purpose should briefly describe what structure or fill is responsible for the impact.

Block 23. Identify Any Other General Permit(s), Regional General Permit(s), or Individual Permit(s) Used to Authorize Any Part of Proposed Activity or Any Related Activity. List any other GP(s) or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. For linear projects, list other separate and distant crossings of waters and wetlands authorized by these GPs that do not require PCNs. If more space is needed, attach an extra sheet of paper marked Block 23.

Block 24. Compensatory Mitigation Statement for Losses Greater Than the New England District Compensatory Mitigation Thresholds. New England District requires compensatory mitigation at a minimum one for one replacement ratio or greater for all aquatic resource losses that require a PCN and exceed the New England District Compensatory Mitigation Thresholds, unless USACE determines in writing that either some other form of mitigation is more environmentally appropriate or the adverse environmental effects of the proposed GP activity are no more than minimal without compensatory mitigation, and provides an activity specific waiver of this requirement. Describe the proposed compensatory mitigation for wetland losses greater than the New England District Compensatory Mitigation Thresholds or provide an explanation of why USACE should not require wetland compensatory mitigation for the proposed GP activity. If more space is needed, attach an extra sheet of paper marked Block 24.

Block 25. Is Any Portion of the General Permit Activity Already Complete? Describe any work that has already been completed for the GP activity.

Block 26. List the Name(s) of Any Species Listed As Endangered or Threatened under the Endangered Species Act that Might be Affected by the General Permit Activity. If you are not a federal agency, and if any listed species or designated critical habitat might be affected or is in the vicinity of the proposed GP activity, or if the proposed GP activity is located in designated critical habitat, list the name(s) of those endangered or threatened species that might be affected by the proposed GP activity or utilize the designated critical habitat that might be affected by the proposed GP activity. If you are a Federal agency, and the proposed GP activity requires a PCN, you must provide documentation demonstrating compliance with Section 7 of the Endangered Species Act.

Block 27. List Any Historic Properties that Have the Potential to be Affected by the General Permit Activity. If you are not a federal agency, and if any historic properties have the potential to be affected by the proposed GP activity, list the name(s) of those historic properties that have the potential to be affected by the proposed GP activity. Provide all relevant documentation about these historic properties in the PCN submittal. If you are a Federal agency, and the proposed GP activity requires a PCN, you must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.

Block 28. List the Wild and Scenic River or Congressionally Designated Study River if the General Permit Activity Would Occur in such a River. If the proposed GP activity will occur in a river in the National Wild and Scenic River System or in a river officially designated by Congress as a "study river" under the Wild and Scenic Rivers Act, provide the name of the river. For a list of Wild and Scenic Rivers and study rivers, please visit http://www.rivers.gov/

Block 29. General Permit Activities that also Require Permission from the USACE Under 33 U.S.C. 408. If the proposed GP activity also requires permission from the USACE under 33 U.S.C. 408 because it will temporarily or permanently alter, occupy, or use a USACE federal authorized civil works project, indicate whether you have submitted a written request for section 408 permission from the USACE district having jurisdiction over that project.

Block 30. 401 Water Quality Certification. As described above, specify if the activity requires a 401 WQC from the certifying authority.

Block 31. Other Information Required For General Permit Pre Construction Notifications. The terms of some of the General Permits include additional information requirements for preconstruction notifications:

* Maintenance – information regarding the original design capacities and configurations of the outfalls, intakes, small impoundments, and canals.
* Temporary Construction, Access, and Dewatering – a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-project conditions.
* Repair of Uplands Damaged by Discrete Events – documentation, such as a recent topographic survey or photographs, to justify the extent of the proposed restoration.
* Commercial Shellfish Aquaculture Activities – (1) a map showing the boundaries of the project area, with latitude and longitude coordinates for each corner of the project area; (2) the name(s) of the species that will be cultivated during the period this GP is in effect; (3) whether canopy predator nets will be used; (4) whether suspended cultivation techniques will be used; and (5) general water depths in the project area (a detailed survey is not required).Dredging – (1) a proposed sampling and analysis plan shall be provided to USACE for approval prior to its execution. Pre-application meetings are encouraged.
* Beach Nourishment – sediment grain size should be determined for the length of the beach where nourishment is proposed. The frequency and locations of sediment sampling shall be sufficient to identify the sediment composition of the beach profile. This data shall be consolidated to generate a sediment gradation curve for each sampled transect. Each sampled transect should also be identified on the project plans (drawings).

If more space is needed, attach an extra sheet of paper marked Box 31.

Block 32. Signature of Applicant or Agent. The PCN must be signed by the person proposing to undertake the GP activity, and if applicable, the authorized party (agent) that prepared the PCN. The signature of the person proposing to undertake the GP activity shall be an affirmation that the party submitting the PCN possesses the requisite property rights to undertake the GP activity (including compliance with special conditions, mitigation, etc.).

DELINEATION OF WETLANDS, OTHER SPECIAL AQUATIC SITES, AND OTHER WATERS

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current wetland delineation manual and regional supplement published by the USACE. The permittee may ask the USACE to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the USACE does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. The 60-day PCN review period will not start until a delineation has been completed.

DRAWINGS AND ILLUSTRATIONS

General Information.

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity Map, a Plan View or a Typical Cross Section Map. Identify each illustration with a figure or attachment number. For linear projects (e.g. roads, subsurface utility lines, etc.) gradient drawings should also be included. Please submit one copy of all drawings on 8½ x 11 inch plain white paper (electronic submissions preferred). Use the fewest number of sheets necessary for your drawings or illustrations. Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross section). While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate, and contain all necessary information.

ADDITIONAL INFORMATION AND REQUIREMENTS

For proposed GP activities that involve discharges into waters of the United States, water quality certification from the State, Tribe, or EPA must be obtained or waived. Some States, Tribes, or EPA have issued water quality certification for one or more GPs. Please check the New England District website to see if water quality certification has already been issued for the GP(s) you wish to use. For proposed GP activities in coastal states, state Coastal Zone Management Act consistency concurrence must be obtained, or a presumption of concurrence must occur. Some States have issued Coastal Zone Management Act consistency concurrences for one or more GPs. Please check the New England District website to see if Coastal Zone Management Act consistency concurrence has already been issued for the GP(s) you wish to use.

APPENDIX C SELF-VERIFICATION NOTIFICATION

U.S. Army Corps of Engineers (USACE)

SELF-VERIFICATION NOTIFICATION (SVN)

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332.

Principal Purpose This information will be used in evaluating activities under Self-Verification procedures within Massachusetts.

Routine Uses Routine uses will include: (1) Documenting compliance with the terms and conditions of the General Permit (GP) for activities that may require authorization pursuant to one or more of USACE's Regulatory authorities. (2) Records may be referred to other Federal, State, and local agencies for evaluation and enforcement purposes.

Disclosure Failure to fully comply and abide by the GP terms and conditions prior to commencing work and after completion project may result in formal enforcement action, up to and including monetary penalties and/or legal action, pursuant to 33 CFR Part 326.

Instructions The permittee must complete ALL required sections of this document before commencing USACE-regulated activities. A copy of this completed SVN must be kept on site during construction and be made available for review by USACE and other Federal, State, & Local regulatory authorities at any time. Within 30 days of initiating project construction, the permittee shall submit the completed SVN to USACE. The SVN shall be submitted to USACE as **ONE signed document** that includes project plans and documentation that supports each field (e.g., emails, letters, description, phone calls, surveys). Electronic submissions to the following address are strongly preferred: cenae-r-ma-sv@usace.army.mil. The email subject line shall contain the following: GP #, SVN, City/Town, and date submitted.

(ITEMS 1 THRU 3 TO BE FILLED BY USACE)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED

APPLICANT AND AGENT INFORMATION

4. APPLICANT'S NAME	7. AGENT'S ADDRESS:
First - Middle - Last -	First - Middle - Last -
Company -	Company -
E-mail Address -	E-mail Address -
5. APPLICANT'S ADDRESS:	8. AGENT'S ADDRESS:
Address-	Address-
City - State - Zip - Country -	City - State - Zip - Country -
6. APPLICANT'S PHONE NOs. w/AREA CODE	9. AGENTS PHONE NOs. w/AREA CODE
a. Residence b. Business c. Fax	a. Residence b. Business c. Fax

NAME, LOCATION, AND DESCRIPTION OF PROJECT SITE

10. PROJECT NAME OR TITLE

11. FILE NUMBER(S) OF PREVIOUS USACE ACTIONS ON THE SITE (if applicable)	12. NAME OF WATERBODY
13. PROJECT COORDINATES (in decimal degrees)	14. PROJECT STREET ADDRESS (if applicable)
Latitude: ◦N Longitude: ◦W	Address
	City - State - Zip -

ACTIVITY TYPE, PROJECT IMPACTS, AVOIDANCE & MINIMIZATION

15. GENERAL PERMIT ACTIVITIES (CHECK ALL THAT APPLY)

1 ☐	6 ☐	11 ☐	16 ☐	21 ☐
2 ☐	7 ☐	12 ☐	17 ☐	22 ☐
3 ☐	8 ☐	13 ☐	18 ☐	23 ☐
4 ☐	9 ☐	14 ☐	19 ☐	24 ☐
5 ☐	10 ☐	15 ☐	20 ☐	25 ☐

16. SUMMARY OF PROJECT IMPACTS (*see instructions*)

Area (square feet)	Length (linear feet)	Volume (cubic yards)	Duration

17. PROJECT PLANS (BY CHECKING THE BOXES BELOW, YOU CERTIFY THESE ITEMS ARE COMPLETE) (*see instructions*)

- ☐ a. Plans shall at least contain the following: Vicinity Map, Plan View, and Typical Cross Section View of the proposed activity.
- ☐ b. All direct, indirect and secondary impacts from USACE regulated activities are shown on the project plans.
- ☐ c. The size of the impact area for each activity (acre, square feet, linear feet) are shown on the project plans.
- ☐ d. For discharges of fill material (§404), the volume of fill material is identified on the project plans.
- ☐ e. The duration of each impact, permanent or temporary (X days), is identified on the project plans.
- ☐ f. Do activities with permanent impacts result in the loss of waters? If so, this is identified on the project plans.
- ☐ g. All aquatic resources in the vicinity of the USACE regulated activities are delineated on the project plans.

18. AVOIDANCE & MINIMIZATION (BY CHECKING THE BOXES BELOW, YOU CERTIFY THESE CRITERIA ARE MET) (*see instructions*)

- ☐ a. The project has been designed to avoid and minimize impacts to aquatic resources.
- ☐ b. The footprint of activities in waters of the U.S. has been reduced to only what is necessary to achieve the overall project purpose.
- ☐ c. All practicable measures have been taken to avoid and minimize impacts to aquatic resources through construction techniques and site access (e.g., Best Management Practices, Time of Year Restrictions).
- ☐ d. All temporary impacts from USACE regulated activities will be restored upon completion of construction and the project area will be returned to pre-construction contours and conditions.

COMPLIANCE WITH FEDERAL REGULATIONS & SUPPLEMENTAL INFORMATION

19. DUE DILIGENCE (*see instructions*)

Complete the entries below to document compliance with the following Federal requirements. Construction may NOT begin if a PCN is/may be required, and you must contact USACE to determine permitting requirements. Documentation that demonstrates how the activity complies with each field below shall be submitted to the USACE as noted in the instructions block. See each General Condition (GC) in the GP for how to comply with each requirement.

a. State Historic Preservation Officer	Select Option		
b. Massachusetts BUAR	Select Option		
c. Tribal Historic Preservation Officers	Select Option		
d. Endangered Species Act - NOAA	Select Option		
e. Endangered Species Act - USFWS	Select Option		
f. Northern Long Eared Bat (ESA)	Select Option		
g. Essential Fish Habitat	Select Option		
h. Wild & Scenic Rivers	Select Option		
i. 401 Water Quality Certification 401	Select Option		
	401 WQC/OOC File Number:	OOC issued:	401 issued:
j. Section 408 Permission	Select Option		
k. Coastal Zone	Select Option		
l. Construction Mats	Select Option		
m.Time of Year Restrictions	Select Option		
n. Vernal Pools	Select Option		
o. Sediment & Erosion Controls	Select Option		
p. Stream/Wetland Crossings	Select Option		

20. AQUACULTURE ACTIVITIES - GP 18 (*see instructions*)

- ☐ a. If required, an Aquaculture Certification from the Massachusetts Division of Marine Fisheries was obtained prior to commencing work.
- ☐ b. Coordination with the U.S. Coast Guard pursuant to Private Aids to Navigation has occurred prior to commencing work.
- ☐ c. If required, a MEPA Certificate was obtained from the Massachusetts Environmental Protection Agency prior to commencing work. Select Option
- ☐ d. The prospective permittee contacted local authorities (e.g. harbormaster, select board, shellfish constable) for authorization of their facility prior to commencing work.

21. ADDITIONAL INFORMATION/ATTACHMENTS (*see instructions*)

- ☐ a. The project plans are enclosed in this SVN submittal (see block 17).
- ☐ b. The activity Select Option funded through the Bipartisan Infrastructure Bill (also known as the Infrastructure Investment and Jobs Act).
- ☐ c. All required state, local and federal approvals were acquired prior to starting construction in USACE jurisdiction.
- ☐ d. After construction of the activity is completed, a complete Certificate of Compliance will be submitted to USACE.

22. IS THERE ANOTHER LEAD FEDERAL AGENCY:

☐ YES ☐ NO

23. STATEMENT OF AUTHORIZATION *(see instructions)*

I certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

24. SIGNATURES *(see instructions)*

I hereby certify that the information in this Self-Verification Notification is complete and accurate. As the applicant or their duly authorized agent, I certify the activity was completed in accordance with the terms and conditions of the GP. This includes all applicable terms, general conditions, and activity-specific GP criteria. I agree to allow the duly authorized representatives of the Corps of Engineers Regulatory Program and other regulatory or advisory agencies to enter upon the premises of the project site at reasonable times to evaluate inspect and photograph site conditions. This consent to enter the property is superior to, takes precedence over, and waives any communication to the contrary. For example, if the property is posted as “no trespassing” this consent specifically supersedes and waives that prohibition and grants permission to enter the property despite such posting.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Instructions for Preparing a
Department of the Army
General Permit (GP) Self-Verification

Blocks 1 through 3. To be completed by the Corps of Engineers.

Block 4. Applicant' Name. Enter the name and the e-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the self-verification, please attach a sheet of paper with the necessary information marked Block 4.

Block 5. Address of Applicant. Please provide the full address of the party or parties responsible for the self-verification. If more space is needed, attach an extra sheet of paper marked Block 5.

Block 6. Applicant Telephone Number(s). Please provide the telephone number where you can usually be reached during normal business hours.

Blocks 7 through 9. To be completed, if you choose to have an agent.

Block 7. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, consultant, or any other person or organization. Note: An agent is not required.

Blocks 8 and 9. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where they can be reached during normal business hours.

Block 10. Proposed General Permit Activity Name or Title. Please provide a name identifying the proposed GP activity, e.g., Windward Marina, Rolling Hills Subdivision, or Smith Commercial Center.

Block 11. File Number(s) of Previous USACE Actions on the Site Please provide any known USACE file number. If the activity does not have a known USACE file number, you may state N/A.

Block 12. Name of Waterbody. Please provide the name (if it has a name) of any stream, lake, marsh, or other waterway to be directly impacted by the GP activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 13. Proposed Activity Coordinates. Please enter the latitude and longitude of where the proposed GP activity is located. Indicate whether the project location provided is the center of the project or whether the project location is provided as the latitude and longitude for each of the "corners" of the project area. If there are multiple sites, please list the latitude and longitude of each site (center or corners) on a separate sheet of paper and mark as Block 13.

Block 14. Proposed Activity Street Address. If the proposed activity is located at a site having a street address (not a box number), enter it in Block 14.

Block 15. General Permit Activity Type. Please select all GP activity types that apply to the proposed activity. A list of GP activity types can be found in Section III of the GP.

Block 16. Summary of Project Impacts. Please provide ALL proposed impacts, both temporary and permanent in duration, that are located in Waters of the United States. The area of impact shall be provided in square feet (SF). When applicable, impacts that result in conversion of stream bank or shoreline must also be identified in linear feet (LF). Dredging or the discharge of dredged or fill material shall also include the volume, cubic yards (CY), of material removed from or placed into Waters of the U.S. If more entries are required, please attach a table matching the desired format in Block 16.

Block 17. Project Plans. Please verify that items a-g are included in the project plans. Three types of illustrations are necessary to properly depict the proposed work. These illustrations or drawings are identified as a Vicinity Map, a Plan View (Aerial view) and a Cross Section Map. For linear projects (e.g. roads, subsurface utility lines, etc.) gradient drawings (longitudinal profile) should also be included. Plans must accurately depict the existing conditions and all aspects of the proposed activity located in waters of the U.S. Please submit one copy of all drawings formatted to print on 8½ x 11 inch or 11 x 17 inch plain white paper. Use the fewest number of sheets necessary for your drawings or illustrations. Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross section). While illustrations need not be certified engineering sheets; they should be clear, accurate, contain all necessary information, and depict all proposed work. Each submission must also include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current wetland delineation manual and regional supplement published by USACE.

Block 18. Avoidance & Minimization. Please verify that items a-d have been implemented for the proposed activity.

Block 19. Due Diligence. Please complete all the fields and submit documentation to USACE to demonstrate compliance with the above requirements. This Documentation may include emails, letters, meeting notes, phone call log, project narrative, project plans, a species list from the NOAA Section 7 Mapper, a completed copy of the IPAC determination keys, etc. Documentation should be limited to what is necessary to demonstrate how the proposed activity meets each requirement. Refer to the MA GP, Appendix A, for specific guidance on the identification of previously identified historic properties and previously unidentified historic properties. Endangered Species: *The applicant must be designated as the non-federal representative for the purposes of Section 7 consultation to select the Rangewide D-Key options. Otherwise, the applicant shall select the following option when IPAC indicates the NLEB is present: "The activity IS located within the NLEB Species Range (PCN Required)."

Block 20. Aquaculture Activities. Please verify that items a-d have been obtained or completed prior to commencing work in waters of the U.S.

Block 21. Additional Information/Attachments. Please verify that items a-d have been completed prior to commencing work in waters of the U.S.

Block 22. Lead Federal Agency. Please identify if there is another lead federal agency involved with the proposed activity. Enter the lead federal agency name (e.g., the Federal Emergency Management Agency, FEMA) and the agency's designated person of contact for the activity.

Block 23. Statement of Authorization. The applicant shall sign this section for all activities. If an agent is to be employed, the agent shall sign this section.

Block 24. Signatures. The SVN must be signed by the person proposing to undertake the GP activity, and if applicable, the authorized party (agent) that prepared the SVN. The signature of the person proposing to undertake the GP activity shall be an affirmation that the party submitting the SVN possesses the requisite property rights to undertake the GP activity.

US Army Corps of Engineers®
New England District

APPENDIX D: PCN APPLICATION CHECKLIST

The following information shall be submitted for all PCNs for USACE to properly evaluate your application. Some applications may require more information and this checklist is offered as a tool to assist applicants with submitting a complete application.

SECTION 1: GENERAL APPLICATION INFORMATION

1. ☐ Complete the Pre-Construction Notification document (Appendix B).
2. ☐ Specify which local/state/federal authorizations are required for the project and if any have been obtained or applied for at the time of USACE application submittal.
3. ☐ Identify all funding sources the project will receive or has received to date. Provide any relevant information in the application submission.
4. ☐ Is this part of a larger project that is being implemented in phases? If so, describe the project schedule and how each phase will be implemented.
5. ☐ Describe the existing conditions on the site and the general land use in the vicinity of the project at the time application submittal.
6. ☐ Provide any historic information available that you may have of project area, e.g., existing USACE permit numbers, the names under which the permits were obtained if the permit numbers are unknown, construction dates and proof of prior existence (aerials, photos, town hall records, affidavits, state or local permits, etc.) to verify that the project predates regulation and is "vested".[19]
7. ☐ The anticipated start and end dates for construction.

SECTION 2: WETLAND DELINEATION

8. ☐ Data used to support aquatic resource boundary determinations (delineation forms, delineation map(s) that show the locations of each aquatic resource in the project area, aerial and ground photographs, LIDAR imagery, national wetland inventory maps, soil maps, national hydrography dataset maps, floodplain maps, historical imagery, etc.).
9. ☐ Photographs of the wetland(s) and/or waterway(s) where impacts are proposed. Photos at low tide are preferred for work in tidal waters.
10. ☐ Indicate the relationship of the project area to waters of the U.S., i.e., adjacent wetlands, tidal influence or hydraulic connectivity through culverts, or other conveyances, etc.
11. ☐ At minimum the delineation map/figure should include the following:
    a. Contour lines showing topography.
    b. North arrow.
    c. Bar and text scale.
    d. Legend.
    e. Drawn project boundary.
    f. High tide line, mean high water, mean low water, ordinary high water mark, and/or wetland boundaries.
    g. Captions with a unique name for each aquatic resource and the area or length of the aquatic resource within the project area.

[19] Vested is exempt (someone or something) from a new law or regulation.

h. Appropriate landmarks and features (e.g., culverts, special aquatic sites, etc.).
i. Points showing the paired upland and wetland delineation locations for tidal and non-tidal wetlands only.

SECTION 3: AVOIDANCE & MINIMIZATION

12. ☐ Describe specific measures taken to avoid impacts to aquatic resources or describe why aquatic resources could not be avoided while achieving the project purpose and need.
13. ☐ For impacts to aquatic resources that could not be avoided, describe specific considerations/ measures taken to minimize the area of proposed impacts to aquatic resources in designing the project.
14. ☐ Describe specific measures taken to avoid and minimize the proposed direct, indirect, and secondary impacts to aquatic resources and their functions through construction techniques and timing.
15. ☐ If applicable, provide a restoration plan that describes how all temporary fills and structures will be removed and the area restored to pre-impact conditions (see GC 22).
16. ☐ If applicable, provide an Invasive Species Control Plan (see GC 29). For sample control plans, see www.nae.usace.army.mil/missions/regulatory/invasive-species.
17. ☐ If applicable, describe how the proposed wetland/waterbody crossing is compliant with GC 31, Stream Work and Crossings, and Wetland Crossings.

SECTION 4A: PROJECT IMPACTS

18. ☐ Describe the overall project and the activities located in Waters of the U.S. (WOTUS) that you are seeking authorization for.
19. ☐ Identify the following for project impacts in WOTUS:
    a. ☐ Direct, indirect, secondary impacts[20] within WOTUS.
    b. ☐ The size of each impact (square feet or acres, or linear feet).
    c. ☐ For discharges of fill material (§404), specify the volume of fill material to be discharged (cubic yards).
    d. ☐ The impact duration from each activity, permanent or temporary (X days).

SECTION 4B: PROJECT PLANS

20. ☐ Submit project plans that depict all impacts in WOTUS. On the project plans, applicants shall provide:

    General Information

    a. ☐ Plan view and typical cross-section view sheets that show the existing and proposed conditions. These illustrations should each be identified with a figure number, date of the map, the project title, the name of the applicant and the type of illustration (vicinity map, plan view, or cross section).
    b. ☐ Drawings, sketches, or plans that are legible, reproducible (color is encouraged, but features must be distinguishable in black and white), drawn to scale, and no larger than 11”x17” and 10 MB when submitted in digital format. Numeric and graphic/bar scales must agree, and plan details must be measurable using a standard engineer’s scale on printed plans. Reduced plans are not acceptable.
    c. ☐ The north arrow and remove miscellaneous non-wetland or water project related features such as conduits, utility poles, guardrails, etc.

[20] See definitions section for the definitions of direct, indirect, secondary impacts.

d. ☐ Clearly draw the overall limits of work, staging areas, disposal sites, access routes, and any permittee responsible mitigation sites. These areas may include both aquatic resources and upland areas.
e. ☐ Names or numbers of all roads in the site's vicinity and ownership and numbers of abutting parcels.
f. ☐ Datum in plan and elevation views. The horizontal datum shall be in the NAD 83 Massachusetts State Plane Coordinate System (INSERT) in U.S. survey feet. The vertical data in coastal projects shall be referenced to either MLLW or the North American Vertical Datum of 1988 (NAVD 88). Both the distance and depth units shall be U.S. survey feet and specified on the project plans.

Aquatic Resources & Project Impacts

g. ☐ Delineation of all aquatic resource types on site including salt marsh; other special aquatic sites (vegetated shallows, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges); other waters, such as lakes, ponds, vernal pools, natural rocky habitat (tidal only), and perennial, intermittent, and ephemeral streams.
h. ☐ Identify the substrate type (cobble/gravel, organic detritus, sand/shell, silt, mud) and the approximate percentage of each substrate type on site. Grain sizes shall be based on Wentworth grain size classification scale for granules, pebbles, cobbles, and boulders. Sediment samples with a content of 10% or more of pebble-gravel-cobble and/or boulder in the top layer (6-12 inches) should be delineated and material with epifauna/macroalgae should be differentiated from bare pebble-gravel-cobble and boulder.
i. ☐ The direction of ebb and flood in tidal waters and direction of flow in non-tidal waters.
j. ☐ In tidal waters, the project boundary distance from special aquatic sites identified in 20g above if within 25 feet from that resource.
k. ☐ USACE jurisdictional boundaries including ordinary high-water mark (OHWM), high tide line (HTL), mean high water (MHW). Other boundaries include mean low water (MLW), mean lower low water (MLLW), as applicable.
   - Non-tidal: OHWM and/or wetland boundaries.
   - Tidal (structures/work only): MHW, MLW.
   - Tidal (Fill and Structures/work): HTL, MHW, MLW.
   - Tidal (Dredging/Beach Nourishment): HTL, MHW, MLW, MLLW.
l. ☐ Identification of each aquatic resource with a unique name (ex. Wetland 1, Wetland 2, Tributary 1, Beaver Brook, Atlantic Ocean) and the size of each aquatic resource within the project area (square feet or acres).
m. ☐ Impacts to each aquatic resource with captions denoting the size of each impact (square feet, acres, or linear feet) and the duration of the impact (ex. Permanent, Temporary (X days).

SECTION 4C: PROJECT PLANS - SPECIFIC PROJECT INFORMATION

21. ☐ For projects involving Navigation, Structures, Dredging, and/or Beach Nourishment, the applicant shall also address the following:

Navigation

a. ☐ Identify the locations of adjacent Federal navigation project (FNP) and/or state/local navigation projects on the project plans.
b. ☐ Specify the distance between the FNP and proposed project boundary, the authorized depths of the FNP, and state plane coordinates of seaward end(s) of project structures near an FNP.

Structures

a. ☐ Identification of the piling type (steel, timber, concrete) and diameter to be removed and/or installed.
b. ☐ Specify the minimal height of the structures' frame over saltmarsh. To meet the SV threshold, piers must be ≤4 feet in width and this minimal height must achieve a 1.5:1 ratio (i.e., a 4-foot-wide pier is 6 feet above a saltmarsh).
c. ☐ For floats, the methods of securing them (piles, bottom anchors) and for keeping them off substrate (skids, stops) at low water. To meet the SV threshold, a minimum depth of 18-inches of water should be maintained below a floating dock/structure at lower tide levels.

Dredging

a. ☐ The area (SF, acre) and volume (CY) of material to be dredged waterward of MHW for each dredge location.
b. ☐ Dredge boundaries.
c. ☐ Bathymetry for existing, proposed, and historical (include dates and USACE permits) dredge depths.
d. ☐ The likely final angle of repose of the side cuts based on the physical characterization of the material to be dredged and based upon the high/ medium/low, wave or current energy of the location.
e. ☐ Label area whether the dredging is new, maintenance, improvement, or a combination.
f. ☐ Location of the disposal site (include location sheet). NOTE: For projects proposing open water, nearshore disposal, or beach nourishment, contact USACE as early as possible for sampling and testing protocols. Sediment testing, including physical (e.g., grain-size analysis), chemical and biological testing may be required. Sampling/testing of sediments without such contact should not occur and if done, will be at the applicant's risk.
g. ☐ The methods and areas used to retain or prevent dredged material from running back into the wetland or waterway. Provide the capacity of the storage area and points of runback, including the overflow route, into the aquatic system.
h. ☐ For open-water disposal, explain why inland or beneficial reuse sites are not practicable.
i. ☐ Show the finished top elevation of the disposal site.

Beach Nourishment

a. ☐ For beach nourishment, identify the disposal footprint, existing and proposed nourishment profiles (multiple profiles are appropriate if the site is more than 150 feet long or non-contiguous), total fill area (SF) and volume (CY), fill area and volume waterward of the HTL, and delineation of dunes, banks, existing beach vegetation, and contours.
b. ☐ For beach nourishment identify the substrate type (fine sand, sand, cobble, boulder) and/or grain-size of existing material.

SECTION 5: STRUCTURES

22. ☐ For projects with the removal of existing pilings identify the number, type (steel, timber, concrete) and diameter of pilings to be removed and the methodology for removal (cut off at mud line, pulling, vibratory, etc.).
23. ☐ For projects with the installation of new pilings identify the number, type (steel, timber, concrete) and diameter of pilings to be installed and the methodology for installation (vibratory hammer, impact hammer etc.).
24. ☐ Identify any existing structures and moorings in waters adjacent to the proposed activity, their dimensions, and the distance to the limits and coordinates of any proposed mooring field or reconfiguration zone. For reconfiguration zone and mooring fields, provide the coordinates for all

corners based on the Massachusetts State Plane Coordinate System. Specify the maximum number of slips and/or moorings within proposed reconfiguration zones or anchorage areas.

25. ☐ The dimensions of the structure or work and extent of encroachment waterward of MHW and from affixed point on the shoreline or upland.
26. ☐ Shoreline of adjacent properties and property boundary offset for structures. In narrow waterbodies, the distance to opposite shoreline, waterway width, and structures across from proposed work.
27. ☐ For new commercial boating facilities, anchorage areas or reconfiguration zones, provide a description of the type of vessels that would use the facility, and any plans for sewage pump-out facilities, fueling facilities and contingency plans for oil spills.
28. ☐ See Sections 4A-C above.

SECTION 6: AQUACULTURE

29. ☐ Identify the coordinates for lease area corners and gear configuration area on the project plans.
30. ☐ Identify the proposed aquaculture gear type (buoys, floats, racks, trays, nets, lines, tubes, cages, containers, and other structures). Provide the impacts for each aquaculture gear type (see Section 4A 19a-d).
31. ☐ For a GP 18 to be valid, applicants must have (a) their MA DMF Aquaculture Certification letter for licensed shellfish aquaculture sites, (b) documentation that the applicant has coordinated with the U.S. Coast Guard regarding USCG Private Aids to Navigation standards, (c) their MEPA Certificate (if required), and (d) documentation that the applicant has contacted their local authorities (ex. harbormaster, select board, shellfish constable) for authorization of their facility.
32. Provide information on site the operation, maintenance, and access. Will the site be accessed via boat, kayak, etc.? Will cages be removed in the winter? How often will gear be checked on? Is there an operations plan for the proposed aquaculture area?
33. ☐ See Sections 4A-C above.

SECTION 7: DREDGING

34. ☐ Sampling plan requests for new, improvement or maintenance dredging must submit completed **Dredged Material Evaluation checklist found at Dredged Material Evaluation Checklist, Sampling and Analysis Plan Requirements from Applicant (army.mil)** and identify the method of handling/transporting the dredged material.
35. ☐ Identify grain-size of material to be dredged (e.g., silty sand) and provide any existing sediment grain size and bulk sediment chemistry data from the proposed project or nearby projects. Include information on any recent spills of oil and/or other hazardous materials and/or nearby outfalls. Document the information source, e.g., EPA database, the harbormaster or fire chief. If there are none, state “none”.
36. ☐ See Section 4A, 4B and 4C, Dredging 21(a-i) above.

SECTION 8: WETLAND/WATERBODY CROSSINGS

37. ☐ For the stream crossing, identify the crossing methodology on the project plan (e.g., dam and pump, dry, wet, etc.). Submit a waterway crossing sequencing plan with the application.
38. ☐ If the project includes a permanent crossing of a tidal waterway, your project design should be modified to match the velocity, depth, cross-sectional area, and substrate of the existing waterbody adjacent to the crossing and provide documentation (hydraulic analysis including low lying property analysis) that the size of the crossing will not restrict tidal flow over the full natural tide range and will not adversely affect abutting infrastructure.

39. ☐ If the work includes a permanent crossing of a non-tidal stream, your project design should be modified to match the culvert gradient of the existing stream channel profile, provide clearance for ≥1.2 times bank full width and conveyance should be embedded ≥1-2 feet for box culverts and pipe arches or ≥1-2 feet and at least 25 percent for rounded pipes/culverts in accordance with the Massachusetts Stream Crossing Standards. Provide the basis for any variation to this requirement.
40. ☐ If the work includes a permanent crossing of a non-tidal stream, the structure should be designed to include a natural bottom substrate within the conveyance that matches the characteristics of the substrate in the natural stream channel and the character of the banks (mobility, slope, stability, confinement, grain and rock size). The conveyance should be designed with a minimum openness ratio ≥0.82-feet (0.25-meters). For how to calculate openness ratio and stream simulation ecological approach for road and stream crossings, see https://www.nae.usace.army.mil/Missions/Regulatory/Stream-and-River-Continuity/.

SECTION 9: COMPENSATORY MITIGATION

41. ☐ Does the project require Compensatory Mitigation[21] for impacts to Waters of the U.S.? (See Section V in the 2023 Massachusetts General Permit)
42. ☐ If the project requires mitigation, does the selected compensatory mitigation option (i.e., In-Lieu Fee, permittee-responsible mitigation) deviate from the order of the options presented in §332.3(b)(2)-(6)? If so, please explain why. https://www.ecfr.gov/current/title-33/chapter-II/part-332/section-332.3
43. ☐ For any compensatory mitigation that involves preservation, the applicant must use a site protection instrument to preserve the parcel in perpetuity. (Conservation Easement, Deed Restriction, etc.) https://www.mass.gov/service-details/conservation-restriction-review-program.

SECTION 10: HISTORIC PROPERTIES & NOTIFICATIONS TO SHPO, THPOs, BUAR

44. ☐ Notify the SHPO, Massachusetts Historical Commission, of the Project via Certified Mail and include proof of delivery or receipt in the application package (See Appendix A).
45. ☐ As applicable, notify the THPOs, Narragansett Indian Tribe, Wampanoag Tribe of Gay Head (Aquinnah), and Mashpee Wampanoag Tribe, of the Project via email OR mail and include proof of delivery or receipt in the application package (See Appendix A).
46. ☐ As applicable, notify the BUAR via email (*strongly preferred*) OR mail and include proof of delivery or receipt in the application package (See Appendix A).
47. ☐ Include responses to this notification in the permit application.
48. ☐ As applicable, information on historic properties (Tribal and Archaeological) within the project area should be provided in the permit application.

SECTION 11: ENDANGERED SPECIES & ESSENTIAL FISH HABITAT

49. ☐ Provide a USFWS Information for Planning and Consultation (IPaC) Official Species List from https://ecos.fws.gov/ipac and the email of the individual who generated the list (see GC 10 of the 2023 Massachusetts General Permit for more information).
50. ☐ Provide a species list from the NMFS Section 7 Endangered Species Act mapper at https://noaa.maps.arcgis.com/apps/webappviewer/index.html.
51. ☐ Provide a species list from the NMFS Essential Fish Habitat Mapper at https://www.habitat.noaa.gov/apps/efhmapper/?page=page_3.

[21] Your mitigation proposal must be consistent with the December 29, 2020 Compensatory Mitigation Standard Operating Procedures at https://www.nae.usace.army.mil/Portals/74/docs/regulatory/Mitigation/Compensatory-Mitigation-SOP-2020.pdf and 2008 Mitigation Rule.

52. ☐ If the project will generate turbidity, describe the extent of turbidity and if erosion controls will be used to contain turbidity. If turbidity controls are not operationally feasible, explain the basis for your conclusion and identify any other measures that you will implement to minimize resuspension of sediment.
53. ☐ Identify the substrate type and any aquatic resources that will be affected by the proposed action. (SAV, salt marsh, sand, silt/clay, rocky/hard bottom)
54. ☐ For projects which will include the installation of pilings/sheet-piles, identify the substrate at the project site (sand, cobble, silt/mud/clay), the installation method (vibratory hammer, impact hammer, combination) and indicate whether the following “soft start” procedures at beginning of the workday and after a 30-minute period of rest will be deployed:
    a. ☐ Vibratory Pile Installation: pile driving will be initiated for 15 seconds at reduced energy followed by a one-minute waiting period. This sequence of 15 seconds of reduced energy driving, one-minute waiting period will be repeated two additional times, followed immediately by pile-driving at full rate and energy.
    b. ☐ Impact Pile Installation: pile driving will commence with an initial set of three strikes by the hammer at 40% energy, followed by a one-minute wait period, then two subsequent 3-strike sets at 40% energy, with one-minute waiting periods, before initiating continuous impact driving.
55. ☐ If the project involves dredging, describe any dredge history, number of dredge events to be covered by the permit, erosion/sediment controls, dredge type, intake structures (mesh screen size), dredged material disposal site.
56. ☐ For project activities associated with structures, identify the number, type (drill barge, work boat, tugboat, etc.), and size of any temporary vessels that will be used. Specify measures that will be implemented to ensure vessels are not berthed in shallow water or will “ground out” at low tide.
57. ☐ For aquaculture projects identify whether any component of the gear is seasonal (will be removed annually) or will be in place year-round. If gear will be present year-round and will be variably managed (e.g., floating in summer, bottom in winter) identify month/date for such configurations.
58. ☐ For aquaculture projects identify whether the project will involve use of an existing vessel or new vessel. Identify the length for all work vessels and identify the distance round trip from vessel berthing location and aquaculture area.
59. ☐ For project activities associated with docking structures (either commercial, industrial, or recreational) identify the number, type (motorized/non-motorized, jet-ski, sailboat, kayak, canoe, other that will be berthed there and the sizes of each.
60. ☐ Information required for Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act:
    a. Results of an eelgrass survey completed per the INSERT.
    b. Essential Fish Habitat Assessment to determine project-related impacts to essential fish habitat, using guidance developed by the National Marine Fisheries Service.
61. ☐ A document containing the following information (requirements of 50 CFR §600.920(e)(3)):
    a. Description of proposed action.
    b. Analysis of potential adverse effects on essential fish habitat.
    c. Conclusions regarding the effects of the action on essential fish habitat.
    d. If applicable, proposed mitigation.
    e. Analysis of alternatives to the proposed action.
    f. Other:

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DOCUMENT A00840

MASSACHUSETTS
Department of Environmental Protection
Water Quality Certificate Application
And
Army Corps of Engineers Permit Application

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APPLICATION FOR WATER QUALITY CERTIFICATION

BRP WW 26

Pare Project No. 22147.02

Reconstruction of Mill Pond Dam MA00027
Route 6WB/28NB (Cranberry Highway)
Wareham, MA

MassDOT Project No. 606352

Applicant:

Massachusetts Department of Transportation
Highway Division
10 Park Plaza
Boston, MA 02116

Prepared by:

PARE CORPORATION
8 Blackstone Valley Place
Lincoln, RI 02865

FEBRUARY 2025

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

MassDOT
Massachusetts Department of Transportation
Highway Division

February 27, 2025

Heidi Davis
Massachusetts Department of Environmental Protection
Wetlands Program
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: Water Quality Certification
Mill Pond Dam Replacement (Bridge No. W-06-020)
Wareham, MA
MassDOT Project 606352

Dear Ms. Davis,

The Massachusetts Department of Transportation, Highway Division (MassDOT) is submitting this application for Water Quality Certification for the replacement of the Mill Pond Dam (W-06-020) where Cranberry Highway (Route 28) crosses the Agawam River in Wareham, MA under the MassDOT bridge exemption.

MassDOT is proposing a bridge replacement (W-06-020) replacing the spillway and fish ladder. The project requires a Water Quality Certification under Section 401 and Pre-Construction Notification under Section 404 of the Clean Water Act. The project will impact approximately 22,088 square feet (SF) of cumulative permanent and temporary impacts to WOTUS. Within the non-tidal waters of Mill Pond, proposed work includes 4,328 SF of temporary and 13,017 SF of permanent impacts, with the proposed footprint of fill and dredge equal to the permanent impact area and a proposed dredge value of 4,893 CY (below OHW). Within the tidal waters of the Agawam River, proposed work includes 446 SF of temporary and 4,297 SF of permanent impacts, with the fill footprint the same as permanent impacts. However, the dredge footprint will only include 2,388 SF and a proposed quantity of 390 CY (below High Tide Line) and 275 CY (below Mean High Water). There are no wetland impacts proposed.

A pre-application meeting for this project was held on August 8, 2023 with the Massachusetts Department of Environmental Protection. The project proponent hereby certifies that all information contained herein is true, accurate, and complete to the best of my knowledge and belief. The project proponent hereby requests that the certifying authority review and take action on this CWA 401 certification request within the applicable reasonable period of time.

If you require any additional information regarding the project, please contact me at (857) 262-0757 or by email at courtney.l.walker@dot.state.ma.us.

Sincerely,

Courtney Walker

Courtney Walker
Environmental Analyst
MassDOT Highway Division, Environmental Services

Cc: Harry Adolphe, MassDOT

Dan Vasconcelos, Army Corps of Engineers
Kevin Newton, Army Corps of Engineers
Ryan Hale, MassDEP
Tyler Lewis, MassDEP
Erika Klinkhammer, Pare Corporation
Eric Silva, Pare Corporation
Christine Santos, Wareham Conservation Commission

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

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

MassDOT
Massachusetts Department of Transportation
Highway Division

February 27, 2025

Dan Vasconcelos
Regulatory Division
Department of the Army
New England District, Corps of Engineers
696 Virginia Road
Concord, MA 01742

RE: Pre-Construction Notification Application
Mill Pond Dam Replacement (Bridge No. W-06-020)
Wareham, MA
MassDOT Project 606352

Dear Mr. Vasconcelos,

The Massachusetts Department of Transportation, Highway Division (MassDOT) is submitting this application for Pre-Construction Notification Application for the replacement of the Mill Pond Dam (W-06-020) where Cranberry Highway (Route 28) crosses the Agawam River in Wareham, MA under the MassDOT bridge exemption.

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Sincerely,

Courtney Walker

Courtney Walker
Wetlands and Water Resources Coordinator
MassDOT Highway Division, Environmental Services

Cc: Harry Adolphe, MassDOT
Heidi Davis, MassDEP
Tyler Lewis, MassDEP
Ryan Hale, MassDEP
Erika Klinkhammer, Pare Corporation
Eric Silva, Pare Corporation
Christine Santos, Wareham Conservation Commission

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

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Massachusetts Department of Transportation

MILL POND DAM

SECTION 1

ADMINISTRATIVE DOCUMENTATION

401 WQC Public Notice
BRP 26 Online Application
USACE PCN Form

PUBLIC NOTICE

Massachusetts Department of Environmental Protection
Division of Wetlands and Waterways
100 Cambridge Street, Suite 900
Boston, MA 02114

Pursuant to 33 U.S.C. 1341 and M.G.L. c. 21 §43 and 33 U.S.C. 1341 M.G.L. c. 21 §§ 26 - 53, notice is given of a 401 Water Quality Certification application for the replacement of Bridge No. W-06-020 carrying Cranberry Highway (Route 28) over the Agawam River in Wareham by the Massachusetts Department of Transportation – Highway Division, 10 Park Plaza, Room 7360, Boston, MA 02116. The project includes the replacement of the existing spillway system at the Mill Pond dam with a new spillway located upstream combined with a single span steel beam bridge to carry Route 6. The project also plans to enhance aquatic connectivity with an upgraded fish ladder, and improve the accommodations of vehicle, bicycle, and pedestrian users of the bridge. Information may be obtained from the Massachusetts Department of Transportation – Highway Division at the above address, Attention Courtney Walker or by emailing courtney.l.walker@dot.state.ma.us. Written comments should be sent to Heidi Davis, MassDEP Wetlands Program, 100 Cambridge Street, Suite 900, Boston, MA 02114 or heidi.davis@mass.gov within 21 days of this notice.

Any group of ten persons, any aggrieved person, or any governmental body or private organization with a mandate to protect the environment who submits written comments within 21 days of this notice may appeal the Department's Certification. Failure to submit written comments before the end of the public comment period may result in the waiver of any right to an adjudicatory hearing.

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
Department of Environmental Protection
100 Cambridge Street 9th Floor Boston, MA 02114 • 617-292-5500

Maura T. Healey
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

WW26 - Combined Licenses/Permits for Waterways and Water Quality Certification Application

Permittee Information

Name: MassDOT Highway Division
Phone: (857) 262-0757
Address: 10 PARK PLAZA
BOSTON, MA 02116

Application Submitter Information

Name: ERIKA KLINKHAMMER
Phone: (401) 344-4100
Address: 8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865

Location Information

Mill Pond (non-tidal) and Agawam River (tidal)
0 CRANBERRY HIGHWAY (RT. 6/28) WAREHAM, MA 02571
Latitude: 41.762648
Longitude: 70.676097

Pre-Consultation Information

Have you consulted with MassDEP about the combined application process?	Yes
Date you consulted with MassDEP	08/08/2023

Application Information

Please select the 401 Water Quality Certification for Dredging Application (if applicable)	WW07 - 401 Major Dredging - Major >= 5000 cubic yards
Please select the 401 Water Quality Certification for Fill/Excavation Application (if applicable)	WW10 - 401 Major Fill and Excavation - Major >= 5000 square feet

Other Primary Location Info

Parcel ID	N/A
Municipality	WAREHAM

Project Location Info

Will the project occur in multiple municipalities?	No

Pre-Application Information

Has the DEP Agency specified that you are exempt from this process?	No
Has the project's Sampling Analysis Plan been approved by the DEP Agency? If yes, please attach a document 'DEP Sampling Analysis Plan' in the document section.	Yes

Project Information

Project Name	Reconstruction of Mill Pond Dam MA00027, Route 6WB/28NB (Cranberry Highway)
Have you completed the Public Notice as per 314 CMR 9.00? If yes, please attach a completed ‘Proof of Public Notice’ document in the document section.	No
Will the proposed project occur in any wetlands or waters designated as 'Outstanding Resource Waters'?	No
Identify the loss, or alteration, in square feet for Land under water	22088
Identify the loss, or alteration, in square feet for Other Resources	0

Material to be Dredged

Briefly describe in general the proposed project or activity, including the purpose and intended use of the project, and the duration of the work within any waterbody	MassDOT Project File 606352: to be processed under the MassDOT/MassDEP ISA. This project consists of the removal and replacement of the existing primary and secondary spillways, fishway and fish ladder. Dredged material will include pond and river bottom substrate in order to prepare the areas for the proposed spillway construction. Duration of work within water will be ~4 years through phased construction while maintaining base flows through the existing spillway and fish way/fish ladder.
Proposed Start Date	11/30/2025
What is the expected frequency of maintenance dredging of this project?	N/A
Length of the proposed project (If applicable, please include the maximum and minimum)	N/A

Width of the proposed project (If applicable, please include the maximum and minimum)	N/A
Depth of the proposed project (If applicable, please include the maximum and minimum)	N/A
Volume of the proposed project(Cubic yards)	5,283
Type of proposed project	Improvement dredging
Briefly describe the physical dredging operation (such as., dredging methods), the method of release of the dredged material into the disposal site, and the name of the contractor if other than the applicant. (Please attach a detailed document - "Dredging and Disposal Operation" in the document section of the application)	Dredging operations will take place in the dry, behind cofferdams in the upstream and downstream portions of the work area, to prevent mobilization of sediments disturbed during construction.
Briefly describe all measures designed to avoid and minimize adverse impacts of the project on aquatic life and the aquatic ecosystem. Where impacts cannot be avoided or minimized, what mitigation measures are proposed? (If necessary, please attach a document - "Performance Standard to avoid and minimize and mitigate impact" in the document section of the application)	Erosion and sedimentation control measures (i.e., compost filter tubes or similar) will be installed prior to the start of any excavation, demolition, or other earthwork activities. Cofferdams will be installed in the upstream impoundment and downstream spillway areas to allow the construction of the new spillway, fish ladder, and culvert to be performed in the dry, thus reducing the potential for sediment to mobilize and migrate downstream during construction. Time of Year restrictions placed by the MA Div. of Marine Fisheries will be adhered to in order to protect diadromous fish species and their migration patterns. Base flows will be maintained during construction by leaving the primary spillway and fish ladder/fishway in place during construction of the new spillway and fish ladder. After the new components are constructed and operational, the existing spillway will be demolished.
Does the proposed project have any past history of chemical or oil spills of discharge?	No
Does the proposed project have any past history of Upstream or on-site industrial or municipal discharge within 1,000 feet of the proposed project?	No
Does the proposed project have any past history of chronic pollutant loading from port or harbor use and/or other sources of pollutants? (eg. CSO or POTW discharges)	No

Proposed Ocean Site

Location of proposed disposal site and its physical boundaries	N/A; dredged material will not be disposed of in an ocean site
Has the site been designated by the State or E.P.A. as a dredge disposal site?	No
If no, give a brief description of the characteristics of the proposed disposal site and an explanation as to why no currently designated site is feasible for this project.	N/A; dredged material will not be disposed of in an ocean site

Is the anticipated disposal site located within a designated ocean sanctuary as established by federal law or G.L.c. 132A, sec. 13?	No

Disposal/Dewatering Land Site

Location of proposed disposal and dewatering sites and physical boundaries	It is anticipated that soil, stone masonry, and concrete will be excavated from the site. The sediment analysis showed that there are elevated levels of arsenic within the pond. There are areas that will require fill within certain areas upstream and downstream. The Sediment Analysis Report recommends that soil removed from the site can be reused in upstream locations and within the pond as fill, however, it recommends if the fill is used in other locations in the project area, that those areas be tested to determine if the same arsenic levels exist. If the levels are similar to those found in the sediment samples, then the soil can be reused in those areas, otherwise it will be required to be removed from the site and properly disposed. Stone masonry materials are anticipated to be reused as stone veneer for portions of the proposed fish ladder, and any excess material stockpiled with the Town for reuse elsewhere. All excavated concrete shall be removed and disposed of from the site at an approved facility. For dredging in areas below OHW, the Contractor shall be required to install a cofferdam and dewatering system so their operations are completed in the dry. Any water that is pumped from the work area will be required to be treated in a dewatering basin to remove solids, before being released back into the waterway, or stored in containers that will be removed from the site for proper disposal at an area outside of the work area. The system will be Contractor designed based on the specifications and permit requirements provided in the Contract Documents. Possible locations for dewatering basins have been provided on the plans for each phase of construction.
Indicate drainage characteristics of dewatering and disposal sites from the results of test pits, borings, and percolation tests as applicable	For dredging in areas below OHW, the Contractor shall be required to install a cofferdam and dewatering system so their operations are completed in the dry. Any water that is pumped from the work area will be required to be treated in a dewatering basin to remove solids, before being released back into the waterway, or stored in containers that will be removed from the site for proper disposal at an area outside of the work area. The system will be Contractor designed based on the specifications and permit requirements provided in the Contract Documents. Possible locations for dewatering basins have been provided on the plans for each phase of construction.
How long are the dewatering and disposal sites estimated to be in use from this project?	Duration of construction, approx. 4 years

Proposed Barge Site

Are you proposing dewatering of dredged sediment on a barge? If yes, please attach a document 'Plans for adequate containment' in the document section.	No

Grain Size Analysis

Number of Sieve	Percentage of total by weight passing
4	51
10	39
40	21
60	14
200	5.9
4	51
10	35
40	17
60	11
200	3.8

Additional Information

Is your project subject to U.S. Army Corps of Engineers – Section 404 of Federal Clean Water Act? If yes, please attach a document 'USACE Authorization' in the document section.	Yes
USACE File Number	TBD
Is your project subject to Massachusetts Environmental Policy Act (MEPA)? If yes, application cannot be submitted until 1) the MEPA process is completed and 2) a Final certificate issued by MEPA is submitted to the “Document(s)” Tab. If no, please attach a document with justification that this project is not subject to MEPA review in the document section (including addressing the applicability of the MEPA review thresholds at 301 CMR 11.03)	No
Is your project subject to Massachusetts Wetlands Protection Act?	No
Is the project going to impact Eelgrass bed? If yes, please attach a document 'Eelgrass Management Plan' in the document section.	No
Does this project contain an attached written Alternatives Analysis? If yes, please attach a document 'Alternatives Analysis' in the document section.	Yes

If yes, does this Alternatives Analysis screen all practicable alternatives to the proposed discharge that would have less adverse impact on the aquatic ecosystem?	Yes
Does this project require a license from the Federal Energy Regulatory Commission?	No
Is any of your proposed work exempt from the Massachusetts Wetlands Protection Act or taking place in a federal non-state wetland?	Yes
If yes, please provide additional information	Exempt from MEPA and WPA under the 2014 Massachusetts Transportation Bond Bill Bridge Exemption

Statement and Disclosures

Proposed dredging activity or dredged material management might occur within Rare Species Habitat as defined at 314 CMR 9.02. By checking this box, you agree that you have consulted with the Natural Heritage and Endangered Species Program of the Massachusetts Division of Fisheries and Wildlife. Please attach a 'NHESP Determination Letter or Conservation Management Permit' in the document section.	
Any in-water activity may effect fish or shellfish, spawning and/or habitat. By checking this box, you agree that you have consulted with Massachusetts Division of Marine Fisheries (DMF) and/or Massachusetts Division of Fisheries and Wildlife (DFW) about Time of Year Restriction (TOY). Please attach Consultation Letter from DMF and/or DFW in the document section.	Yes
Date on Letter from DMF and/or DFW	01/11/2022

Project Information

Project Name	Reconstruction of Mill Pond Dam MA00027, Route 6WB/28NB (Cranberry Highway)
Proposed Activity	MassDOT Project File 606352: to be processed under the MassDOT/MassDEP ISA. This project consists of the removal and replacement of the existing primary and secondary spillways, fishway and fish ladder. Construction will be phased to allow continuous flow from Mill Pond into Agawam River through the existing and proposed spillways and fish ladders.

Project Type

Industrial

Utility	
Real Estate Subdivision	
Institutional	
Other	Yes
Please provide additional information for the selection of your project major type	Transportation

Proposed Areal Extent Info

Bordering Vegetated Wetland (sqft)	0
Isolated Vegetated Wetland (sqft)	0
Non-tidal Land Under Water (sqft)	17345
Salt Marsh (sqft)	0
Land Under the Ocean (sqft)	4743
Intertidal Zone (sqft)	0
Total cumulative loss (sqft)	22088

Compliance with 314 CMR 9.00

Does the proposed project meet the definition of a Single and Complete Project at 314 CMR 9.02?	Yes
Does the proposed project include "multi-phased activities"?	No
Does the proposed project meet the definition of an Ecological Restoration Project?	No
Have you completed the Public Notice as per 314 CMR 9.05(3)? If yes, please attach a completed 'Proof of Public Notice' document in the document section.	No
Does the required Alternatives Analysis screen all practicable alternatives to the proposed discharge that would have less adverse impact on the aquatic ecosystem?	Yes
Does this proposed project meet the definition of Water-Dependent at 314 CMR 9.02?	Yes
Is the proposed project restricted to access to one dwelling unit?	No
Will the cumulative discharges of dredged or fill material to Waters of the United States within the Commonwealth exceed 1 acre in areal extent?	No

Report the areal extent, as expressed in square feet, of all proposed restoration or replication of Bordering Vegetated Wetlands and/or Isolated Vegetated Wetlands	N/A
Will any proposed discharges of dredged or fill material or any proposed restoration or replication occur within Rare Species Habitat as defined at 314 CMR 9.02?	Yes
If yes, does the Permittee presently hold a “no adverse effect determination” and/or a “no take determination”, or a Conservation and Management Permit from the Natural Heritage and Endangered Species Program of the Massachusetts Division of Fisheries and Wildlife? Also, please attach a document 'NHESP Determination Letter or Conservation Management Permit' in the document section.	No
Will the proposed project include or consist of the construction of a new non-tidal crossing of any Land Under Water?	No
Will the proposed project include or consist of the construction of a new tidal crossing of any Land Under Water?	No
Will the proposed project include or consist of the repair, replacement, and/or expansion of an existing non-tidal crossing of any Land Under Water?	Yes
If yes, will such repair, replacement, and/or expansion of an existing crossing comply with the Massachusetts River and Stream Crossing Standards (March 8, 2012) to the maximum extent practicable (see Practicable at 314 CMR 9.02)?	Yes
Will the proposed project include or consist of the repair, replacement, and/or expansion of an existing tidal crossing of any Land Under Water?	Yes
If yes, will such repair, replacement, and/or expansion of an existing tidal crossing be designed in a manner that does not restrict tidal flow over the full natural tidal range to the maximum extent practicable (see Practicable at 314 CMR 9.02)?	Yes
Does the proposed project include any amount of discharges of dredged or fill material to any Outstanding Resource Water?	No
Will any proposed "discharge of dredged or fill materials" occur within any certified Vernal Pool (as defined at 314 CMR 9.02)?	No

Additional Information

Is your project subject to Massachusetts Environmental Policy Act (MEPA)?	No
Is your project subject to Massachusetts Wetlands Protection Act?	No
Is your project subject to Massachusetts Public Waterfront Act?	No
Is your project subject to Massachusetts Historical Commission?	Yes
MHC File Number (if available)	RC.48506
Date of MHC Determination Letter (if available)	01/16/2025
Is your project subject to Massachusetts Bureau of Underwater Archeological Resources?	Yes
BUAR File Number (if available)	Notification letters sent 1/17/21 and 11/27/23; No comments received
Is your project subject to U.S. Army Corps of Engineers – Section 404 of Federal Clean Water Act?	Yes
USACE File Number (if available)	TBD

List of Documents

Documents	Required Documents: 1. Alternatives Analysis 2. Characteristics of the proposed ocean disposal site 3. Consultation Letter from DMF and/or DFW 4. DEP Sampling Analysis Approval 5. Dredging and Disposal Operation 6. Grain Size Analysis 7. NHESP Determination Letter or Conservation Management Permit 8. Plans for adequate containment during dewatering on a barge 9. Project Narrative 10. Project Plan Set 11. Site Plans 12. USGS Quadrangle Map

Special Fee Provision

Exemption	Yes
Exemption Type	State Agency (only applicable if fee < or = to $100)
Exclusion (special agreement or policy)	
Substitution (ASP/IRP)	
Double Fee for Enforcement	
Hardship payment extension request	

Attachments

Name	Description	Type	Latest Updated
_ALTERNATIVES ANALYSIS_SEE PROJECT NARRATIVE.docx	'O SECTION VI. OF THE PROJECT NAF	Alternatives Analysis	02/28/2025
MADMF to Pare 1-11-22.pdf	MADMF to Pare 1-11-22	Consultation Letter from DMF and/or DFW	02/28/2025
RE_ Wareham Sediment Sampling Plan 606352.pdf	Sediment Sampling Plan approval	DEP Sampling Analysis Approval	02/28/2025
Mill Pond Dam - Dredge Description.pdf	Mill Pond Dam Dredge Description	Dredging and Disposal Operation	02/28/2025
_GRAIN SIZE ANALYSIS_SEE WQC PACKAGE UNDER PROJECT NARRATIVE.docx	:o Sediment Sampling Report in Sec 6 of	Grain Size Analysis	02/28/2025
_NHESP CORRESPONDENCE_SE E WQC PACKAGE UNDER PROJECT NARRATIVE.docx	correspondence with MassDOT on Rare	NHESP Determination Letter or Conservation Management Permit	02/28/2025
606352_WQC_Feb25.pdf	incl. narrative (wo Hydraulic Study and P	Project Narrative	02/28/2025
USGS QUADRANGLE_SEE WQC PACKAGE UNDER PROJECT NARRATIVE.docx	Refer to Section 2 of WQC package	USGS Quadrangle Map	02/28/2025
_OCEAN DISPOSAL SITE_NA.docx	N/A	Characteristics of the proposed ocean disposal site	02/28/2025
Wareham - Mill Pond Dam Section 106 and PNF documentation (606352).pdf	Section 106 and PNF documentation	MHC Determination Letter	02/28/2025
606352_Permit Plans_Feb25.pdf	Permit Plan Set	Project Plan Set	02/28/2025
_SITE PLANS_NA.docx	Refer to 'Project Plan Set' document	Site Plans	02/28/2025
DEWATERING ON BARGE_NA.docx	N/A	Plans for adequate containment during dewatering on a barge	02/28/2025

Application Contacts

Name	Organization Name	Contact Person	Telephone #	Contact Type	Email
ERIKA, KLINKHAMMER	n/a	n/a	(401) 344-4100	Application Prepared By	eklinkhammer@parecorp.com

Certification Information

Individual
ERIKA KLINKHAMMER
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
United States

Telephone #: (401) 344-4100
E-mail: eklinkhammer@parecorp.com

I certify that I have read and understand the instructions that accompany this application and that the statements made as part of this application are true, complete, and correct and that no material information has been omitted. By checking the box below, I understand and agree that I am electronically signing and filing this application.

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 Disclosure This information may be shared with other federal, state, and local government agencies during the application review process. Submission 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 - Courtney Middle - Last - Walker
Company - MA Department of Transportation - Highway Division
E-mail Address - courtney.l.walker@dot.state.ma.us

8. AUTHORIZED AGENT'S NAME AND TITLE (*agent is not required*)
First - Erika Middle - Last - Klinkhammer
Company - Pare Corporation
E-mail Address - eklinkhammer@parecorp.com

6. APPLICANT'S ADDRESS:
Address- 10 Park Plaza, Room 7360
City - Boston State - MA Zip - 02116 Country - U.S.

9. AGENT'S ADDRESS:
Address- 8 Blackstone Valley Place
City - Lincoln State - RI Zip - 0286 Country - U.S.

7. APPLICANT'S PHONE NOs. with AREA CODE
a. Residence b. Business c. Fax d. Mobile
857-262-0757

10. AGENT'S PHONE NOs. with AREA CODE
a. Residence b. Business c. Fax d. Mobile
4013344100

STATEMENT OF AUTHORIZATION

11. I hereby authorize, Pare Corporation 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.

Courtney Walker — SIGNATURE OF APPLICANT
2/25/2025 — DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME or TITLE (*see instructions*)
Culvert and Dam Replacement on Cranberry Highway at Route 28

13. NAME OF WATERBODY, IF KNOWN (*if applicable*)
Mill Pond (non-tidal) and Agawam River (tidal)

14. PROPOSED ACTIVITY STREET ADDRESS (*if applicable*)
Cranberry Highway (Rt.6/Rt.28)
City: Wareham State: MA Zip: 02571

15. LOCATION OF PROPOSED ACTIVITY (*see instructions*)
Latitude: 41.762648 °N Longitude: 70.676097 °W

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (*see instructions*)

State Tax Parcel ID: Municipality: Wareham

Section: Township: Range:

17. DIRECTIONS TO THE SITE.

The dam is accessible from I-495 as follows: Follow I-495 South towards Cape Cod; I-495 becomes Rt 25. Take Exit 1 and bear right at the end of the Ramp onto Rt 28/Rt 6 East; Follow for 0.6 miles and take left onto Depot Street; Take first left on Rt 28/Rt 6 West (Cranberry Highway) and follow 0.15 miles to parking lot on left (south side) of the street.

18. IDENTIFY THE SPECIFIC GENERAL PERMIT(S) YOU PROPOSE TO USE:

GP 2. MAINTENANCE
GP 23. LINEAR TRANSPORTATION PROJECTS AND WETLAND/STREAM CROSSINGS

19. DESCRIPTION OF PROPOSED GENERAL PERMIT ACTIVITY (*see instructions*)

This project consists of the removal and replacement of the existing primary and secondary spillways, fishway, and fish ladder. No direct impacts to Vegetated Wetlands are anticipated with the proposed work. Base flow within the upstream portion of the fishway will be maintained to retain the VW hydrology east of the exposed fishway portion. Construction will be phased to allow continuous flow from Mill Pond into Agawam River through the existing and proposed spillways and fish ladders. The project will result in an overall benefit to the fish run.

20. DESCRIPTION OF PROPOSED MITIGATION MEASURES (*see instructions*)

No direct impacts to VWs are anticipated. In areas where loss to WOTUS is proposed, mitigation areas (replacement of WOTUS) are proposed by means of expanding the downstream channel to create a wider spillway and the installation of a new fish ladder. Restoration plantings will be provided along the upstream banks and dike, and the downstream areas surrounding the new fish ladder and stormwater basin to provide native vegetation within the limits of disturbance to offset the loss of native vegetation required to be removed for dam safety regulations and in order for the scope of work to be performed.

21. PURPOSE OF GENERAL PERMIT ACTIVITY (*Describe the reason or purpose of the project, see instructions*)

During recent inspections, the bridge was found to be in poor condition, with several deficiencies noted throughout the structure. The replacement is proposed to remedy the functionally obsolete Mill Pond dam system by correcting its structural, operational and maintenance, and capacity deficiencies, while enhancing the traditional cultural use of the site as an anadromous fish run and accommodating vehicular, bicycle, and pedestrian users of the bridge.

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
17,345		5,283	Permanent	Fill in WOTUS (Mill Pond and Agawam River)
15,405*		3,680	Permanent	Dredge in WOTUS (Mill Pond and Agawam River)
4,743			4 years	Temp dewatering impacts to Mill Pond and Agawam
				*fill areas overlap dredge areas;totals are not cumulative

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*)

401 Water Quality Certification, DMF Fishway Construction Permit, DCR ODS Ch. 253 Dam Safety Permit.

24. If the proposed activity will result in the loss of aquatic resources that exceed those identified in the New England District Compensatory Mitigation Thresholds, explain how the compensatory mitigation requirement will be satisfied. (*see instructions*)

N/A

25. Is Any Portion of the General Permit Activity Already Complete? [ ] Yes [X] No If Yes, describe the completed work:

26. List the name(s) of any species listed as endangered or threatened under the Endangered Species Act that might be affected by the proposed GP activity or utilize the designated critical habitat that might be affected by the proposed GP activity. (*see instructions*)

According to the USFWS IPaC tool, 2 federally listed endangered species may occur within the project limits, the Northern Long-Eared Bat and Plymouth Redbelly Turtle. In addition, the proposed threatened species, the Monarch Butterfly, and the proposed endangered species, the Tricolored Bat, are also mapped in the project locus. Consultation with USFWS for the NLEB will take place between this submission and the date of advertisement.

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*)

The dam and associated fishway, which will be impacted by the project, are historic resources, recorded in the Massachusetts Historical Commission's (MHC) Inventory of Historic and Archaeological Assets of the Commonwealth as the Agawam Herring Run/Dam (MHC #WRH.924), which are elements within the Agawam Village (MHC #WRH.H).

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 [ ] 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.

Major Fill and Major Dredge 401 WQC (individual) to be submitted to the MA Department of Environmental Protection.

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*)

The Sediment Sampling Analysis results are attached as a separate document to the combined WQC/USACE application package.

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.

Courtney Walker	2/25/2025		2/27/2025
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.

Massachusetts Department of Transportation
MILL POND DAM

SECTION 2
FIGURES

Figure 1 – Site Location Map
Figure 2 – Annotated Aerial Photograph
Figure 3 – Resource Impact Map
Figure 4 – FEMA Firmette
Figure 5 - NWI Map

SITE LOCATION MAP

SCALE: 1"= 2,000'

8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
(401) 334-4100

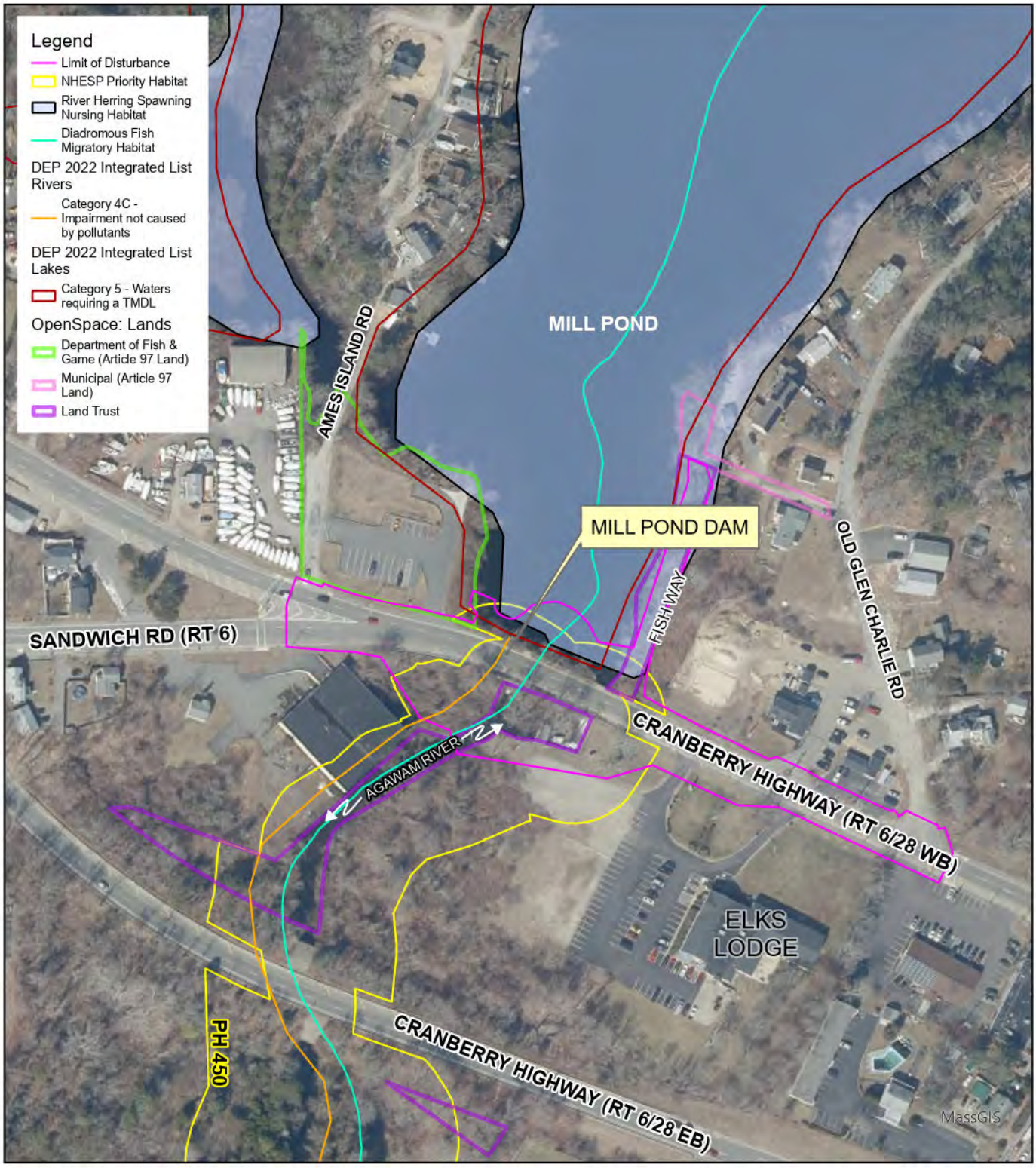
10 LINCOLN ROAD, SUITE 210
FOXBORO, MA 02035
(508) 543-1755

PARE PROJECT No. 22147.02 JANUARY 2024

FIGURE 1

MILL POND DAM/BRIDGE RECONSTRUCTION
WAREHAM, MA

MassDOT Project No. 606352



MASS GIS

ANNOTATED AERIAL PHOTOGRAPH

SCALE: 1" = 200'

N
W E
S

8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
(401) 334-4100

10 LINCOLN ROAD, SUITE 210
FOXBORO, MA 02035
(508) 543-1755

PARE PROJECT No. 22147.02

JANUARY 2025

FIGURE 2

MILL POND DAM/BRIDGE RECONSTRUCTION
WAREHAM, MA

MassDOT Project No. 606352

PARE CORPORATION
ENGINEERS · SCIENTISTS · PLANNERS
10 LIMITED AVENUE, SUITE 210
FOXBORO, MA 02035
508-543-1755

N

MILL POND DAM

DAM/BRIDGE RECONSTRUCTION
WAREHAM, MA

1"=50'

0" 1"
BAR IS ONE INCH ON ORIGINAL DRAWING

PROJECT NO.: 22147.02
DATE: FEBRUARY 2025
SCALE: AS NOTED
DRAWN BY: SJP & JJP
APPROVED BY: EAK

RESOURCE IMPACTS MAP

National Flood Hazard Layer FIRMette

FEMA

70°40'53"W 41°45'59"N

70°40'15"W 41°45'32"N

Proposal No. 606532-136278

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

1:6,000

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.

A00840 - 28

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 12/29/2023 at 10:50 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.

FIGURE 4

U.S. Fish and Wildlife Service
National Wetlands Inventory

Mill Pond Dam, Wareham, MA

February 21, 2025

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Proposal No. 606532-136278

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Massachusetts Department of Transportation
MILL POND DAM

SECTION 3
EXISTING CONDITIONS PHOTOGRAPHS

Photo No. 1: View of the Cranberry Highway (Rt. 28) bridge over Mill Pond Dam and Agawam River, facing west.

Photo No. 2: View of Cranberry Highway facing east.

Photo No. 3: Upstream view of Mill Pond and a concrete stop log structure associated with the secondary spillway. Facing north from Cranberry Highway.

Photo No. 4: Downstream view of Agawam River that outlets from the auxiliary spillway. Facing south from Cranberry Highway.

Photo No. 5: View of the Elks Lodge parking lot, herring harvesting shed, and overall downstream area facing northwest towards Cranberry Highway.

Photo No. 6: View of the primary spillway and discharge channel that flows from a concrete box culvert. Facing north towards Cranberry Highway.

Photo No. 7: Downstream view of the primary spillway channel, fish ladder, and harvesting shed facing west. The concrete underground fishway conveys flow directly below the stone wall (bottom left).

Photo No. 8: View of Agawam River facing upstream and the outlet from the auxiliary spillway, and the convergence with the primary spillway channel (right). Facing north towards Cranberry Highway.

Photo No. 9: View of the public parking and boat launch access for Mill Pond, facing north from Cranberry Highway.

Photo No. 10: View of vegetated area and concrete drain outlet located south of Cranberry Highway and west of Agawam River, facing northwest towards Cranberry Highway.

Photo No. 11: View of the downstream banks of Agawam River facing south.

Photo No. 12: View of the aboveground fishway that flows into a concrete underground passage, facing north.

Photo No. 13: View of the open fishway channel, facing southeast towards Cranberry Highway.

Photo No. 14: View of the fishway outlet that flows from Mill Pond, facing north.

Massachusetts Department of Transportation

MILL POND DAM

SECTION 4

NARRATIVE PROJECT DESCRIPTION

I. Introduction

The Massachusetts Department of Transportation, Highway Division (MassDOT), is proposing to replace the Mill Pond Dam in Wareham, Massachusetts, at the point where Cranberry Highway (Route 28) crosses the Agawam River. The purpose of the project is to remedy the functionally obsolete Mill Pond dam system by correcting its structural, operational and maintenance, and capacity deficiencies, while enhancing the traditional cultural use of the site as a diadromous fish run, enhancing aquatic connectivity with a functionally upgraded fish ladder, and accommodating vehicular, bicycle, and pedestrian users of the bridge. Concurrently, formalized ownership and maintenance roles and responsibilities are needed to allow for future safe and reliable operation and maintenance of the Mill Pond Dam and culvert.

Mill Pond Dam is a 16.5 ft. high, 285 foot long earth fill embankment structure carrying State Route 28 and U.S. Route 6, westbound, over the Agawam River. The dam consists of five major elements: a fish way, a primary spillway, a secondary spillway, an outlet pipe, and the earthen embankment. The dam has a reported maximum storage capacity of 1,768 acre-feet is a Large size, Class I (High) hazard potential structure as classified by 302 CMR 10.00. As such, the spillway design flood (SDF) for the structure is one-half the probable maximum flood event (½ PMF). Hydraulic and hydrologic (H&H) studies performed as part of this evaluation indicate insufficient capacity at this structure to accommodate flows associated with the SDF.

The proposed scope of the project includes replacing the existing spillway system at the dam with a new spillway located upstream of the embankment combined with a single span steel beam bridge to carry Route 6 West across the spillway discharge channel. The spillway and dam improvement project has been designed to safely accommodate a ½ PMF SDF as required by current state dam safety regulations. The bridge has been designed to pass flows in accordance with MassDOT standards with additional design considerations for dam safety requirements. In addition to the spillway/bridge work, the existing fish way and fish ladder will be replaced with a more efficient pool and weir fish ladder intended to benefit the diadromous fish species that travel the Agawam River.

Due to impacts within the waterway upstream and downstream from the dam/bridge, this project requires a 401 Water Quality Certification (WQC) under the Massachusetts Department of Environmental Protection (DEP), Bureau of Resource Protection – Wetlands and Waterways. The project will also require a Pre-Construction Notification (PCN) under the U.S. Army Corps of Engineers (USACE) General Permits for Massachusetts, a Fishway Construction Permit under the Massachusetts Department of Marine Fisheries (MADMF), and a Chapter 253 Dam Safety Permit.

This Application for WQC addresses impacts to water resources subject to Sections 401 and 404 of the Clean Water Act, and 314 CMR 9.00 (the Water Quality Regulations) as administered by the Massachusetts Department of Environmental Protection, and also serves as a joint application for USACE approval under the General Permit for Massachusetts. The project qualifies for the Bridge Exemption under the 2014 Massachusetts Transportation Bond Bill. As such, the work is exempt from the Massachusetts Wetlands Protection Act (310 CMR 10.00), the Regulations of the Massachusetts

Environmental Policy Act (301 CMR 11.00), and the Massachusetts Waterways Regulations (310 CMR 9.00).

Due to the nature and location of the proposed work, the project will result in unavoidable impacts to Waters of the United States (WOTUS) associated with Mill Pond and the Agawam River. Impacts to WOTUS resources and migratory fish passage ("fish run") have been minimized to the extent practicable. No impacts to Vegetated Wetlands are anticipated. Proposed work includes approximately 22,088 square feet (SF) of cumulative permanent and temporary impacts to WOTUS. Within the non-tidal waters of Mill Pond, proposed work includes 4,328 SF of temporary and 13,017 SF of permanent impacts, with the proposed footprint of fill and dredge equal to the permanent impact area and a proposed dredge value of 4,893 CY (below OHW). Within the tidal waters of the Agawam River, proposed work includes 446 SF of temporary and 4,297 SF of permanent impacts, with the fill footprint the same as permanent impacts however the dredge footprint will only include 2,388 SF and a proposed quantity of 390 CY (below High Tide Line) and 275 CY (below Mean High Water). The proposed project will result in permanent fill in select areas of WOTUS transitioning these areas to upland, however the expansion of the proposed spillway and new fish ladder will offset these impacts by creating new WOTUS in select areas. Work within WOTUS includes temporary dewatering, demolition of existing spillway components, excavation of unsuitable materials from dewatered areas (dredging), grading, and installation of a new arched crested weir spillway and fish ladder within WOTUS associated with the Mill Pond and Agawam River. Impacts to natural resource areas will be mitigated through the construction and installation of a new functioning fish ladder while keeping the existing fish ladder in operation during the construction period for migratory fish passage, and native restoration plantings throughout upstream and downstream upland areas adjacent to the impoundment and discharge channel, and proper installation and maintenance of erosion and sedimentation control best management practices.

II. Existing Conditions

2.1 Description of the Dam and Appurtenances

Mill Pond Dam is located in Wareham, Massachusetts where the Cranberry Highway (Route 6/28) crosses the Agawam River. The resulting impoundment to the north of the dam is Agawam Mill Pond. The original date of construction is not clear; however, an imprint on the bridge parapet wall on the crest of the dam indicates a date of 1850. It has also been reported that the dam was originally constructed as water supply for a mill located a short distance downstream. Current uses of the approximately 150-acre impoundment include recreation and water supply for cranberry growing operations.

Mill Pond Dam is a 16.5' high, 285' long earth fill embankment structure carrying U.S. Route 6 westbound and State Route 28 northbound, over the Agawam River. The dam with a reported maximum storage capacity of 1,768 acre-feet is a Large size, Class I (High) hazard potential structure as classified by 302 CMR 10. An approximately 6' wide by 300' long earthen dike containing a natural bottom fish way extends Northward from the east side of the dam along the length of the dike.

The dam consists of five major elements: a fish way, a primary spillway, secondary spillway, an outlet pipe, and the earth embankment. Flow through the dam is accomplished through a primary spillway and secondary (auxiliary) spillway, both of which travel under Cranberry Highway and outlet downstream of the dam. The primary spillway consists of a concrete sluiceway of 11.5 feet wide by 6.5 feet high. Discharges are controlled by a two-bay concrete box culvert fitted with wooden stop logs (controls) on the downstream end. The stop log structure has a total weir length of 9.8 feet. Downstream of the stoplog structure, a rectangular, rubble masonry walled channel makes a ninety degree turn to the right about 40 feet below the stoplog structure. The channel follows a path parallel to the toe of the dam until joining the outlet channel from the secondary spillway. There are two energy-dissipating steps in the primary spillway outlet channel where the channel makes the right turn.

The secondary spillway is a 5-foot diameter metal pipe culvert located about 112 feet left of the right abutment. Discharge is controlled by a concrete stoplog structure on the upstream side. The stoplog structure is fitted with wooden stoplogs and has a weir length of 5.4 ft.

An 18-inch diameter pipe passes through the dam near the midpoint. Outflow is controlled at a 6-foot wide by 8-foot long by 6-foot high upstream concrete intake structure. The type of gate is unknown. Beyond the downstream toe of the dam the pipe is encased in concrete. The pipe passes over the primary spillway outlet channel and is believed to lead to the site of a now razed mill once located below the dam. The outlet end of the pipe is not visible. It is not known if the pipe is pressurized. It appears the pipe no longer serves any useful purposes.

The fish ladder also directs some flow from the pond to the downstream area. The downstream side of the main spillway consists of stone and mortar training walls, some with concrete caps, and there is an elevated wooden shed with a concrete slab underneath used to access the dam from the downstream side

for harvesting herring. The existing geometric conditions of the superstructure over the spillways are as follows:

W-06-020(9LH) Primary Spillway

Number of Lanes:	2
Skew:	0 degrees
Structure Length:	11'-6" ±
Clear span:	2 Spans: 4'-10" ± Each
Year Built:	1911
Elevations (NAVD88):	
a. Upstream bottom of pond	8.1±
b. Downstream Invert	6.8±
c. Top of stop logs	13.6±

W-06-020(8KD) Fish Ladder

Number of Lanes:	2
Skew:	0 degrees
Structure Length:	115'-0" ±
Clear span:	4'-0" ±
Year Built:	1850

W-06-020(8M1) Secondary Spillway

Number of Lanes:	2
Skew:	0 degrees
Structure Length:	16'-5" ±
Clear span:	5'-0" ±
Year Built:	1850
Elevations (NAVD88):	
a. Upstream Invert	10.9±
b. Downstream Invert	5.3±
c. Top of Stop logs	14.1±

No formal operations and maintenance (O&M) procedures or formal manual exist for the dam system. The dam is owned and regulated by the Commonwealth of Massachusetts, Department of Conservation and Recreation (MADCR), Office of Dam Safety (ODS) (State Dam ID# 7-12-310-3). MassDOT regularly maintains the roadway. The A.D. Makepeace Company, the largest cranberry grower in Wareham, operates the spillways and is identified as the emergency caretaker. A.D. Makepeace operates controls (stop log operations) as needed to regulate flow rates in response to releases of water from upstream cranberry operations, to maintain the level of impoundment to provide water supply to cranberry growers, and to provide additional storage in anticipation of significant rainfall events. Additionally, operations are completed to seasonally support fish migration.

Recent inspections of the Dam found it to be in **Poor** condition with numerous deficiencies, which included the following:

- Overgrown tree and brush vegetation along the upstream and downstream slopes of the dam and along the dike;
- Steep upstream slopes at the dam and dike with areas of erosion and no evidence of slope protection;
- Areas of stained saturation along the toe of the downstream slope between the primary and auxiliary spillways;
- Dam embankment slopes and downstream stone masonry walls do not meet required factors of safety;
- Deterioration at the primary spillway structure including a void and areas of missing mortar at the upstream training wall and concrete deterioration at the outlet structure;
- High phreatic surface with observed leakage near the primary spillway;
- Unknown condition of the 18-inch diameter pipe that extends through embankment from the concrete intake structure to beyond the downstream channel near STA 15+60;
- Deterioration at the auxiliary spillway structure including areas of deteriorated concrete at both the upstream and downstream headwalls of the structure, corrosion within the outlet pipe, and potential displacement of accumulated stones within the discharge area;
- Accumulated debris at the trash rack within the fish way;
- Missing mortar with vegetative growth in joints of the stone masonry training walls of the downstream channel. depressions adjacent to the stone masonry training walls;
- Cap stones displaced along the downstream wall of the dike;
- Inadequate hydraulic capacity to accommodate the spillway design flood; and
- Additional maintenance deficiencies and potential dam safety concerns.

2.2 Fish Ladder Description

An anadromous fish run is present at the left abutment of the dam. The fish ladder consists of a 5-foot-wide by 3.5-foot-high buried rectangular stone structure that begins as an open channel at the outlet of the primary spillway, flows through a buried granite box culvert under Route 28, continues along a fishway east of the dike, and exits into Mill Pond approximately 325 feet north of the dam. The fishway is along the east side of an earthen dike that extends northward from the earthen dam and retains Mill Pond. The fishway channel runs along the downstream side of the dike, which is lined with dry set, cut granite block retaining walls. The fish ladder also directs some flow from the pond to the downstream area.

The current fish ladder is where the herring and other fish can travel through the dam, up to Mill Pond. There is also a pool area under the existing storage shed, originally constructed to harvest herring. During certain phases of construction, a fish ladder with sufficient flow must remain open to allow the migration from the Agawam River to Mill Pond.

The fishway appears to have been constructed around 1836. In a Phase II Inspection/Evaluation Report prepared in April 2009, the fish ladder was determined to be in poor condition. The Town of Wareham, via the Town of Wareham Harbormaster, is responsible for the operation of the fish ladder.

2.3 Roadway Description

Cranberry Highway (Route 6 westbound and 28 northbound) is an Urban Minor Arterial Road that runs through the Town of Wareham. The section of Route 6/28 that crosses the dam carries only Route 6 westbound and Route 28 northbound, as the eastbound/southbound direction is carried by a parallel roadway, located approximately 500' to the south. Cranberry Highway is not part of the National Highway System. The existing geometric conditions of the approach roadway are as follows:

Number of Lanes:	2 lanes, Westbound only
Useable Shoulders:	Approximately 7'-6"
Sidewalk Width:	South: 4'-3" ±; North: 5'-0" ±
Design Speed:	40 mph
Present ADT:	11,300 vehicles
Percentage Truck Traffic:	2%

The eastern approach horizontal alignment is tangent. The western approach horizontal alignment consists of an approximate 200-foot radius curve from approximately 75 to 175 feet west of the bridge leading to a split where Cranberry Highway (Route 28 NB) continues to the right and Sandwich Road (Route 6 WB) to the left.

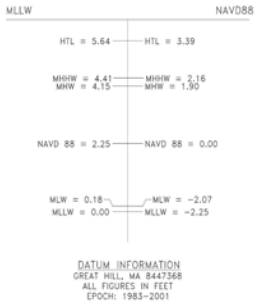
2.4 Existing Hydraulics at the Structure Site

Mill Pond Dam is considered a Large, High Hazard Potential structure. Mill Pond has a drainage area of approximately 11.4 square miles as indicated in the National Inventory of Dams. According to the 1981 Army Corps of Engineers Phase I Report, Maple Springs Brook drains the western portion of the drainage area and Agawam River drains the eastern portion. These two water courses meet at Mill Pond. During construction, the impoundment level will need to be maintained for environmental reasons and, during harvesting of the cranberry bogs upstream of the dam. The fish ladder must remain operational at specific times during construction so that anadromous fish and other marine wildlife movement patterns are not disturbed.

Mill Pond has a normal pool elevation of approximately 14.3'. The dam's existing spillway design flood elevation is 18.8' and the crest elevation is approximately 18' at the left abutment with some sloping along the crest. These elevations are based on the NAVD 1988 elevations. The spillway design flood according to State of Massachusetts regulations is ½ PMF. Considering the current configuration of the dam, Mill Pond Dam cannot currently accommodate the flows of a ½ PMF event. Based on the hydrological and hydraulic (H&H) analysis model results, the existing dam can accommodate storm events in excess of the 500-year storm event. However, during the ½ PMF storm event (SDF), the peak impoundment elevation is expected to be El. 18.8, which will result in dam/roadway overtopping up to 0.8 feet.

2.5 Tidal Datum

The tidal datum for this project was established using the closest NOAA tidal station with a datum based on the present EPOCH Period, 1983-2001, Station 8447368, Great Hill, in Marion MA. This station is located south of the mouth of the Wareham River in Buzzards Bay. The station is considered inactive, and the tidal datum is not referenced to NAVD88, but referenced to MLLW. The benchmarks for this station had a recent NOAA OPUS reading from June 14, 2021, and was referenced in NAVD88. Based on this benchmark elevation, Pare was able to convert the tidal datum into NAVD88 for use on this project. Pare also performed a field check of the benchmark to confirm the elevation with RTK GPS and was within the tolerance noted from the NOAA reading. The next closest NOAA tidal station was Onset Beach, Station 8447277, but did not have any benchmark elevation or information that could be used to convert from MLLW to NAVD88.



2.6 Utilities

A 12” water main and 6” gas main are buried beneath Cranberry Highway and travel along the length of the dam. Overhead utilities are present on both the downstream and upstream sides of the roadway. The overhead utilities on the upstream side of the dam are located on the crest between the edge of curb and the start of the upstream slope of the dam. The overhead utilities on the downstream side of the dam are located near the top of the downstream slope.

2.7 Wetlands

Wetlands in the vicinity of the project area were delineated by Pare on July 26 & 27, 2017 and revisited for delineation to confirm accuracy and refresh missing flags on September 21, 2022. Wetlands in the vicinity of proposed work are described briefly below and are described in greater detail in the Wetland Delineation Report, included in Section 5.

Wetland resource areas identified in the vicinity of the dam include the Banks and Waters of the US associated with the Mill Pond, Agawam River, and fish run; two areas of Vegetated Wetlands east of the upstream fishway; and 100-year Floodplain associated with the impoundment and the outlet. The Mill Pond located upstream of the dam is approximately 150 acres in size. Mill Pond Dam discharges through a culvert (primary spillway) and corrugated metal pipe (auxiliary spillway) beneath Cranberry Highway into the Agawam River, which extends southwest from the roadway. Vertical stone masonry walls flank the river on either side and define most of the delineated bank in this area. Along the upstream side of the

dam, the banks of the pond consist of gradual, sandy, and earthen slopes densely colonized by a variety of trees, saplings, shrubs, climbing vines and herbaceous species. The pond bottom in this location consists of organic muck, and no floating vegetation was observed within the immediate vicinity of the spillway. A shallow area in the southwest corner of the pond west of the auxiliary spillway contained some emergent vegetation.

The dam's primary and auxiliary spillway outlets discharge to two separate walled channels that converge to form the Agawam River. The raceway directly downstream from the primary spillway is approximately 12-feet wide and has a concrete bottom. Downstream of the raceway, the channel broadens and the river bottom consists of an unconsolidated mucky substrate with rocky areas. The river has a sparsely vegetated bottom of muck and rock in this location. A concrete harvesting pad is located between the two spillway sections beneath an existing storage shed.

An anadromous fish run consisting of a walled channel is located to the east of the primary spillway. The above ground portion of the fishway is contained by stone masonry walls within the earthen dike upstream of the impoundment. Within the downstream channel, an Alaskan Steepass fish ladder leads to a belowground rectangular conduit leading beneath the roadway and outletting within the fishway upstream.

2.8 Water Quality and Floodplain

According to the Final Massachusetts Integrated List of Waters for the Clean Water Act 2022 Reporting Cycle (May 2023)("the 303(d) list), the Agawam River (WBID: MA95-28) from Outlet Mill Pond, Wareham to the Wareham Wastewater Treatment Plant (WWTP), is designated as Category 4C Waters, "impairment not caused by a pollutant." The impairment is caused by fish passage barrier. The Aquatic Life Use for this Agawam River assessment unit (MA95-28) is assessed as Not Supporting based on the barrier to diadromous fish passage at the Mill Pond Dam. From the WWTP outfall to the river's confluence with Wankinco River (forming the headwaters of the Wareham River), just north of the Route 6 bridge, the Agawam River (WBID: MA95-29) is designated as Category 5 Waters on the 303(d) list, "waters requiring a TMDL" for algae, fecal coliform, nitrogen, and nutrient/eutrophication biological indicators. Mill Pond (WBID: MA95105) is designated as Category 5 Waters on the 303(d) list, "waters requiring a TMDL". The waterbody is impaired due to fish passage barrier, non-native aquatic plants, and harmful algal blooms. The Aquatic Life Use for Mill Pond (MA95105) continues to be assessed since the 2018 303(d) list as Not Supporting with the non-native aquatic plants impairment for *Myriophyllum heterophyllum*. An impairment for fish passage barrier has been added since the 2018 303(d) list based on the barrier to diadromous fish passage at Mill Pond Dam.

According to the FEMA Flood Insurance Rate Map (FIRM) for the Town of Wareham (Map Number 25023C0493K, effective date July 6, 2021), an area of 100-year floodplain encompasses a majority of the project area both upstream and downstream of the dam. Floodplain on the site is located within Zone AE, with flood elevations determined at 14 feet upstream and downstream of the dam.

2.9 Drainage Conditions

Under current drainage conditions, stormwater is collected in two existing drainage systems identified in the project area: one east and one west of the dam, both discharging south to the Agawam River. The eastern drainage system consists of one catch basin receiving runoff from Route 6 (Cranberry Highway) and discharging directly to the Agawam River southeast of the Mill Pond Dam. The western drainage system consists of 5 catch basins receiving runoff from the shoulders of Route 6 (Sandwich Road) and Route 28 (Cranberry Highway) connecting to a 12" trunkline discharging to a grassed area southwest of the Mill Pond Dam and ultimately discharging to the Agawam River.

2.10 Historical and Archaeological Resources

The dam and associated fishway, which will be impacted by the project, are historic resources, recorded in the Massachusetts Historical Commission's (MHC) Inventory of Historic and Archaeological Assets of the Commonwealth as the Agawam Herring Run/Dam (MHC #WRH.924), which are elements within the Agawam Village (MHC #WRH.H). The dam/fish run and the 80-acre village have both been recommended as eligible for listing in the National Register of Historic Places (NRHP) at the local level under Criterion A. The dam was the site of the former Agawam Nail Works, circa 1820, which was preceded by a 17th-century gristmill. Only remnants of the existing mill foundation remain. The fishway appears to have been constructed around 1836 and remains operational today. Also in the immediate vicinity are two mill sites recorded in the MHC archaeological site files. Site WRH-HA-19 represents the site of the ca. 1685 Israel earing Gristmill. On a 1795 map of Wareham a "Mill" and the name Fearing is shown at the site indicating the site had been used by the family for generations. The Agawam Iron Works (WRH-HA-23) was started by Thomas Savary in 1820 and was located just south of, and adjacent to, the herring run/dam.

Although scheduled to be supported by state funds, the project requires permitting by the U.S. Army Corps of Engineers (Simon 2010), and thus must comply with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800). Section 106 requires that undertakings take into account their effects on historical resources listed in or eligible for listing in the National Register of Historic Places. MassDOT's Cultural Resources Unit (CRU) reviewed the project plans and evaluated the need for archaeological survey in the project area. The CRU determined that the proposed project may affect significant historical and archaeological resources related to historic-period use of the Area of Potential Effect (APE); some pre-Colonial Native American use of the river was also expected.

Archaeological and Historical Services, Inc. (AHS) conducted a reconnaissance/site assessment of the APE, to ascertain the potential for intact archaeological remains to be present, and that fishway and other identified historic components be identified, assessed relative to the eligibility criteria of the NRHP. The assessment concluded that the Agawam Herring Run site qualifies for the National Register listing as a Traditional Cultural Property. Based on the results of the survey, only one of the components of the Agawam River Herring Run and Dam complex - the herring run/fishway – is eligible for individual listing in the NRHP based on its structural integrity and character as well as its historical associations with a long tradition of herring fishing at this location and its role in the historical and industrial

development of the area. Other components, including the dam, concrete spillways and culverts, fish house, fish ladder, and outlet pipe were not found to be eligible for individual listing in the NRHP as the dam has been rebuilt a number of times and the remainder of the features are all modern structures/intrusions that have compromised the integrity of the complex. This information was shared with the MHC in a letter dated January 14, 2016 from MassDOT. MHC responded with a letter dated February 11, 2016, stating that the Traditional Cultural Property should also include the extant fish house, harvesting platform, and fish ladder as they contribute to the significance of the historical property.

MassDOT's CRU continues to coordinate with MHC throughout the permitting process to comply with Section 106 of the National Historic Preservation Act of 1966 and are striving to obtain a "no adverse effect" determination for the project as proposed.

2.11 Natural Heritage

Per the Massachusetts Natural Heritage and Endangered Species Program (NHESP), the portion of the site surrounding the dam and downstream area including the Agawam River is located within an area of mapped Priority Habitats of Rare Species (PH 450). NHESP species include the Shore Pygmy-weed (*Crassula aquatica*) and Long's Bittercress (*Cardamine longii*). MassDOT and NHESP have coordinated on these species and concluded there will be no need for a plant survey as it is unlikely either species would be present within the work area. NHESP correspondence is included in Section 9 and as an attachment to the WQC online application.

2.12 Fisheries and Wildlife

Each spring, the anadromous fish migrate from the coastal water through the major river systems and several smaller brooks in Wareham, including the Agawam River, to reach freshwater ponds to spawn. According to the MADMF, the river herring run size at Mill Pond Dam and Fishway is approximately 20,000 to 50,000 fish, from April 1st to May 15th. The National Marine Fisheries Service (NMFS) has listed both species of river herring, Alewife and Blueback Herring, as species of concern due to an overall decline coast wide.

MADMF has maintained a Diadromous Fish Restoration Priority List (Priority List) since 2005 to document the status of fish passageways and barriers and to guide decisions for river herring restoration planning. Mill Pond Dam was included in MADMF's 2022 update of the Priority List (July 21, 2022) and it ranked No. 2 in MassDEP's Region 4, which includes 84 towns and cities in southeastern Massachusetts, as a fish passage improvement project. River herring (the collective name for alewife, *Alosa psuedoharengus*, and blueback herring, *Alosa aestivalis*) is identified as the target species, with American eel (*Anguilla rostrata*) identified as the secondary species. MADMF has also identified a variety of additional diadromous fish species as utilizing the Agawam River/Mill Pond complex for migratory habitat, including American shad (*Alosa sapidissima*), rainbow smelt (*Osmerus mordax*), Atlantic tomcod (*Microgadus tomcod*), and white perch (*Morone americana*). In a response to fisheries information request from Pare, MADMF included time of year restrictions for in-water, silt-producing activities to protect the diadromous fish passage, spawning, and juvenile development to the above

mentioned species from March 15- July 15, as well as the fall juvenile alewife emigration from September 1 – November 15. A copy of the MADMF letter is included in Section 9.

According to the U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Conservation online mapping tool, two (2) federally listed endangered species may occur within the project limits, the Northern Long-Eared Bat (*Myotis septentrionalis*) and Plymouth Redbelly Turtle (*Pseudemys rubriventris bangsi*). In addition, one (1) proposed threatened species, the Monarch Butterfly (*Danaus plexippus*) and one (1) proposed endangered species, the Tricolored Bat (*Perimyotis subflavus*), are also mapped in the project locus. MassDOT reached out to NHESP for any information about Redbelly Turtle and it was determined that the state had no records of individuals or habitat within the project action area.

The project is not located within designated critical habitat of the Northern Long-Eared Bat (NLEB), a species listed as Endangered with 4(d) Rule under the Endangered Species Act of 1973. The project is consistent with the NLEB Final 4(d) rule issued on January 14, 2016, as the project activities are not located within 0.25 miles of a known hibernacula or within 150 feet of a known maternity roost tree, as shown within the latest dataset provided by MassWildlife.

This project is anticipated to be consulted with the USFWS through the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and Federal Transit Administration (FTA) Programmatic Biological Opinion for Transportation Projects in the Range of the Indiana Bat and Northern Long-Eared Bat revised February 5, 2018, and amended March 31, 2023. MassDOT will commence consultation with USFWS between this submission and the date of advertisement.

The fish ladder will need to remain open with sufficient flow for herring and other marine life to migrate up the Agawam River into Mill Pond through the spillway during construction. Extensive coordination with MADMF is being conducted to ensure natural migration patterns are not interrupted.

In addition, there are several cranberry bogs that draw from the Agawam River and are dependent on dam flows as part of their operation. The demands of the cranberry bogs fluctuate throughout the year so the flow through the dam during construction must be so that these demands can be met.

2.13 Other Environmental Resources

According to the most recent available MassGIS data, no mapped certified or potential vernal pools, Outstanding Resource Waters, or Areas of Critical Environmental Concern are located on or in the vicinity of the site. Additionally, the site is not located within any Estimated Habitat of rare wildlife. The project area is not located near a National Wild and Scenic River, National Wildlife Refuge, Marine Sanctuary, National Park, or any area administered by the National Park Service.

2.14 Sediment Sampling and Grain Size Analysis

4,893 cubic yards (CY) of dredging is proposed to Mill Pond and 390 CY of dredging is proposed to the Agawam River (below HTL el. 3.39). Total dredging therefore exceeds the 100 CY threshold for Water

Quality Certification established by 310 CMR 9.00 and sediment sampling is required. In July 2023, Pare personnel collected two (2) core sediment samples for chemical and physical analysis from the following locations: western boundary of the proposed Project area (SED-1), and the eastern boundary of the proposed Project area (SED-2). Each core sample was comprised of four (4), 6-inch vertical grab samples collected between 0-2 ft below ground surface (bgs). Core locations were selected to provide generally uniform spatial distribution of areas to be disturbed with consideration to accessibility and sampler safety. The sediment samples were collected in laboratory-provided glassware and transported under proper chain-of-custody to New England Testing Laboratory, Inc. (NETLAB) of West Warwick, Rhode Island for chemical and physical analysis.

Pare compared the chemical results to two screening criteria: Massachusetts Contingency Plan (MCP): 310 CMR 40.0000 Method 1 S-1/GW-1 and the MassDEP 401 Water Quality (WQ) Regulations - Threshold Effects Concentration (TEC) criteria and Probable Effects Concentration (PEC) criteria as described in the *MassDEP Revised Sediment Screening Values, Interim Technical Update*. The MCP Method 1 S-1/GW-1 standards are used to evaluate reuse of dredge material for upland use. The sediment screening values are used to evaluate the potential risk of harm to the environment from sediment contamination, if any, if the sediment is reused within the riverbed.

The analytical results from the sediment samples indicated:

- Samples were screened with a photoionization detector (PID) and did not exceed background levels for total volatile organic compounds (TVOCs).
- No detections of EPH, SVOCs, PCBs, VOCs, or pesticides above laboratory reporting limits.
- SED-2 detected arsenic at 28.6 mg/kg, which is below the sediment screening value but exceeds the MCP Method 1 S-1/GW-1 of 20 mg/kg.
- No other metals were detected above their respective Method 1 S-1/GW-1 or respective sediment screening values.

The results of the sieve analysis indicated that sample SED-1 is characterized as a dark olive brown gravel with silt and sand, and sample SED-2 is characterized as a dark olive brown gravel and sand. The silt content (i.e., particles passing the #200 sieve) for SED-1 and SED-2 are 5.9%, and 3.8%, respectively. The MassDEP guidance document entitled *Dam Removal and Wetland Regulations* indicates the following with respect to fine-grained sediments:

"Fine-grained sediments (i.e., those passing the #200 sieve) have a higher potential for having chemical contaminant adsorption. Fine-grained sediments, whether or not contaminated, are also more likely to be transported as the river sediment load to distant points downstream and ultimately to the ocean."

Samples with high percentages of fines (i.e., greater than 10% according to the MassDEP Dam Removal guidance document) pose a higher risk of mobilizing and distributing potentially contaminated sediment downstream during construction. Based on the results of the sieve analysis for the selected sediment samples, the silt content is below the 10% threshold specified by MassDEP, suggesting that there is a

lower likelihood that sediment will mobilize during construction and be distributed downstream. The Project will install a cofferdam to prevent mobilization of sediments disturbed during construction.

The Sediment Analysis Report, included under Section 6 in this WQC application, recommends that soil removed from the site can be reused in upstream locations and within the pond as fill, however, it recommends if the fill is used in other locations in the project area, that those areas be tested to determine if the same arsenic levels exist. If the levels are similar to those found in the sediment samples, then the soil can be reused in those areas, otherwise it will be required to be removed from the site and properly disposed.

III. Proposed Project

MassDOT is proposing reconstruction of the Mill Pond Dam and appurtenant structures to provide a long-term solution to the noted deficiencies. The scope of the project includes replacing the existing spillway systems at the dam with a new spillway located upstream of the embankment combined with a single span steel beam bridge to carry Cranberry Highway across the Agawam River. The spillway and dam improvement project has been designed to safely accommodate a ½ PMF SDF as required by current Massachusetts Dam Safety standards with additional design considerations for dam safety requirements. In addition to the spillway/bridge work, the existing fish ladder will be replaced with a more efficient pool and weir fish ladder intended to benefit the diadromous fish species that travel the Agawam River. A draft copy of the Wildlife Passage Report is included under Section 7 to provide additional information on the fish ladder design criteria.

The construction is proposed to be completed in six (6) phases, with temporary traffic control setups provided for each phase. It is estimated that construction will take approximately 4 years to complete, with an anticipated start in the Fall of 2025 and completion is Fall 2029.

3.1 Dam Improvements

Embankment work: The scope of embankment work includes:

a. Clearing and grubbing: Clear trees, brush and other unwanted woody vegetation from the dam and dike as shown on the Project Plans. Grub remaining stump and root systems within the footprint of the dam. Fill resulting voids with approved material compacted in lifts to subgrade for the specific treatment (i.e., loam and seeds, riprap, etc.).
b. Upstream slope: Regrade the upstream slope of the dam and dike to a more uniform and manageable slope (2 H: 1V); install upstream slope protection.
c. Upstream slope protection: Install riprap slope protection inclusive of geotextile fabric, bedding stone, and armor stone.
d. Downstream slope: Remove section of slope to accommodate proposed spillway discharge area. Regrade the downstream slope to a more uniform and maintainable slope, 3H:1V. Provide retaining walls in areas including:
    1. In the area of the proposed primary spillway outlet, new concrete training walls to the left and right of the outlet.
    2. In the area of the dam embankment, provide concrete retaining walls between the roadway and the proposed fish ladder and concrete retaining walls around the south and east of the proposed fish ladder. The walls to the east and south of the fish ladder will utilize stone from the existing downstream walls to create a stone veneer over the concrete walls.
e. Site improvements: Install a public access area along the dike to allow access to visitors and provide seating areas utilizing the existing stone slabs from the dam embankment. Establish a maintainable surface coverage within the limit of the dike.

Spillway and Superstructure Improvements: The scope of spillway and superstructure improvements includes:

a. Address hydraulic capacity limitations: Remove existing primary and auxiliary spillway and replace with a structure that meets the spillway design flood according to State of Massachusetts regulations of ½ PMF. The new spillway will be an arch sharp crested weir spillway. To provide the required discharge capacity, the weir is geometry is proposed to be a 180º arc with a radius of approximately 21 feet with linear segments at each end. This configuration provides a total weir length of approximately 184 linear feet.
b. Superstructure: The spillway will direct flow under an approximately 53-foot span bridge carrying Cranberry Highway to the Agawam River downstream. The bridge abutments will function as training walls through the dam embankment, and proposed training walls will extend approximately 30' into the channel downstream to continue to direct flow past the limits of the dam.
c. Low level outlet: A low level outlet is proposed to the east of the spillway which will provide a means to regulate the level of the pond in anticipation of large storm events, maintenance, and irrigation of cranberry bogs adjacent to Mill Pond. A concrete chamber will be constructed with a slide gate on the north side of the chamber that can be manually operated. A 36-inch diameter pipe will direct flow from the chamber, under the embankment, and into the spillway to discharge downstream.
d. The existing primary spillway will remain operational during construction of the proposed spillway. Once the proposed spillway is operational, the existing spillway and culvert will be removed in the latter phases of the construction.

Existing fishway improvements: The existing upstream portion of the fishway, running along the east of Mill Pond Dam and under Cranberry Highway to the Agawam River, is considered an important cultural resource due to its historic nature. The proposed restoration of the channel is described below:

a. The existing stone masonry walls in the upstream area are in disrepair due to the root systems of vegetation on the dike separating the pond from the fishway. The vegetation will be cleared from the dike to prevent future structural issues of the dam structure due to roots systems. The stones of the wall will be removed as required to grout and reset them to create a more stable structure.
b. The area on the dike will be loamed and seeded and appropriate native mitigation plantings will be placed to replace some of the vegetation lost due to clearing.
c. The fish way exit will be reconfigured to maintain flow into the fish way while preventing fish from utilizing the passage with a fixed weir structure. Flow that travels through the fixed weir will be channeled to an inlet structure which will have an outlet pipe from the end of the fish way, through the dam embankment, and into the low level outlet chamber.
d. Areas of the existing fish way that are buried under the roadway and in the downstream area will be decommissioned by removal of the existing stone that can be utilized elsewhere on site for landscaping.

Cutoff wall within the dam embankment: Remedial measures to prevent the observed seepage and reduce the level of phreatic surface in the embankment are proposed to increase the overall stability of the dam embankment. The cutoff wall approach includes the following:

a. A secant wall with concrete encased steel W-beams will be constructed along the construction phase line within the center of the dam embankment. The wall will be designed to support the embankment for traffic to travel over the dam during construction, and to resist flooding if the main cofferdam around the work area fails during construction.
b. The sheeting will be cut a minimum of 2-feet below grade and left in place after construction to function as a permanent cutoff wall to limit seepage in the downstream area and improve dam safety.
c. The sheeting around the abutment will be sealed with a concrete collar to prevent seepage at the interface of the sheeting and concrete abutment.

Fish Ladder: A new step and pool fish ladder is proposed to provide improved aquatic connectivity at the site for river herring and other diadromous fish species. The schematic approach includes the following:

a. Construct a fish ladder upstream and downstream of the proposed spillway. The new fish ladder system includes:
    1. Rectangular reinforced concrete pools with stone veneer walls in the downstream area, and rectangular pools under the bridge and upstream of the dam that are integral with the proposed bridge substructure.
    2. A fish ladder entrance at the Agawam River capable of maintaining flow during tide changes in the river.
    3. A harvesting pad in the downstream area that allows flow to be diverted to the pad and allows easier access for harvesting herring.
    4. A slide gate at the fish ladder exit that can be used to limit flow in the fish ladder and allow the flow to be stopped to allow maintenance of the fish ladder and provide access to inspect the bridge structure.
b. Cultural site improvements: In order to retain the cultural significance at the site, the wooden storage shed will be removed and replaced with a replica in a new location adjacent to the new harvesting pad. In addition to the shed and fish ladder matching existing aesthetics, the area will also include a walkway leading from the downstream area to the new harvesting pad, including gated access limited to the tribal members, dam operators, and Town officials.

3.2 Supplemental Site Improvements

Pedestrian & Bicycle Improvements: The proposed bridge will provide pedestrian access throughout construction and, in the final condition, sidewalks on both the north and south sides of the roadway. Additionally, a striped buffered bike lane is proposed on the north side of the roadway to allow safer bicycle access over the dam and bridge.

Informative panels: To better inform the visiting public of the environmental and cultural heritage of the site, panels with information about the herring run and surrounding area will be provided at the site. It is anticipated that these will be placed in the downstream area near the fish ladder, and also on the dike which will be reconstructed to allow access to pedestrians and provide seating areas utilizing the existing stone slabs located on the dam embankment.

3.3 Water Main Relocation

The existing 10" water main located on the north side of the roadway will be cut and capped on the east side of the dam near STA 20+10 and to the west near STA 12+00. A new section of 12" water main will connect to the existing water main and turn south to cross over the bridge beneath the roadway.

A new hydrant will be installed in the southwest corner of the site to provide a relief valve to clean out and purge system. Flushed effluent will enter the proposed stormwater treatment area to the south of the hydrant and get treated before discharging to the Agawam River.

3.4 Stormwater Management

In order to address the increase in impervious cover from the sectional widening of the roadway, the project includes a stormwater management system designed to comply with MassDEP Stormwater Handbook standards in accordance with 314 CMR 9.00. The proposed sectional widening at the south side of the roadway at the structure will result in a net increase of approximately 3,354 SF of paved surface on the site. The stormwater control measure (SCM) for the site is designed to incorporate features that address flow rate, quantity of runoff, and quality of runoff from the redeveloped site. The proposed stormwater best management practice (BMP) consists of a bioretention basin to treat and attenuate stormwater flows before discharging to the Agawam River. The proposed SCM will be located off of the southwestern corner of the dam where an existing outfall currently discharges to the river. The basin will be sized to provide the water quality needed and will have an overflow spillway to control stormwater flows to the existing downstream resource area. The stormwater design will seek to utilize low impact development and utilize the existing drainage structures to minimize excavation activities near the river. The existing drainage conditions and proposed stormwater management improvements are described in the Stormwater Management Report, included under Section 8.

3.5 Control of Water/Dewatering

To avoid prolonged environmental impacts during construction phase dewatering activities, construction will be completed without a drawdown of the pond. To protect the waterway from unintended damage during removal and replacement of structures, and to restrict sediment migration during construction, cofferdams will be installed prior to construction. The cofferdam in the pond and at the phase line within the dam, will consist of secant pile walls that are designed to protect the work area and dam while diverting flow to the existing main spillway and fish ladder. Other locations of control of water in the downstream area or as required for reconstruction of the upstream fish way will be contractor designed. The overall footprint of the proposed cofferdams is shown on the following Project Plan sheets: Construction Plan No.1, Wetland Impact Plan, and the Bridge & Spillway Demolition Plan. Upon

completion of the work, all areas of temporary disturbance will be restored to the appropriate pre-existing grades.

The proposed cofferdams will be designed to accommodate construction in the dry while maintaining the integrity of the dam during construction when it is most vulnerable. The cofferdams will be installed in separate phases with different configurations based on the operations required for each phase. During Phases 1 and 2 the main spillway will be utilized to maintain flow through the dam, with flow also moving through the existing fish way and fish ladder. After the proposed spillway is completed and operational, the main spillway will be decommissioned in phases. The Sequence of Construction provided in Section IV of this narrative and on the accompanying Project Plans provides more details on the anticipated control of water locations and sequencing.

After completion of the proposed spillway, the cofferdam will be removed to allow flow through the proposed spillway and fish ladder. The secant wall will be cutoff a minimum of 2-feet below the mudline of the pond, and the pond bottom will be restored or regraded with riprap, depending on the location. Complete removal of the entire secant wall is not feasible due to the extensive excavation that would be required due to the depth of the wall below grade. Other locations within the project area where control of water is installed will be removed completely or cut a minimum of 2-feet below grade, as required by the Contractor's operations.

While most of the control of water and support of excavation will be designed by the Contractor, the large cofferdam required during Phases 1 and 2 has been designed to meet the MADCR Office of Dam Safety (ODS) requirements to obtain the Chapter 253 permit for the dam reconstruction. Phase 2 is of greater concern for ODS where the excavation will be the deepest relative to the height of water anticipated. To provide additional security for the dam, the proposed support of excavation at the phase line will be designed to withstand flooding forces if the cofferdam in the pond were to fail or overtop.

Effluent removed from behind the cofferdams will be pumped to dewatering basins in upland locations. The potential dewatering basin locations are shown on the plans. Dewatering is anticipated to remain in place for the duration of work within the impoundment and downstream spillway locations, which will vary depending on phasing, for approximately 4 years coinciding with the anticipated duration of construction.

3.6 Erosion and Sedimentation Controls

In addition to the Control of Water measures described above, erosion and sedimentation controls consisting of compost filter tubes or similar will be utilized project-wide along the perimeter of the proposed work limits. To protect the waterway from deposition of materials during demolition, debris containment measures will be attached to the underside of the structures.

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.

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. The CGP requires that inspections be performed by a qualified individual as outlined in the CGP. MassDOT requires proof of completion of a 4 hour minimum sedimentation and erosion control training class current to the latest CGP. This individual can be, but not limited to, someone that is either a certified inspector, certified professional, or certified storm water inspector. The documentation shall be included as an appendix in the SWPPP. The inspector's qualifications shall be submitted to the Engineer for approval prior to beginning any work. This individual shall be on-site during construction to perform these inspections. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Contractor shall provide an alternate inspector. Written weekly inspection forms, storm event inspection forms, and Monthly Summary Reports must be completed and provided to the Engineer. Monthly Summary Reports must include a summary of construction activities undertaken during the reporting period, general site conditions, erosion control maintenance and corrective actions taken, the anticipated schedule of construction activities for the next reporting period, any SWPPP amendments, and representative photographs.

The Contractor is responsible for preparation of the Plan, all SWPPP certifications, inspections, reports and any and all corrective actions necessary to comply with the provisions of the CGP. The Standard Specifications require adequate erosion control for the duration of the Contract. All control measures must be properly selected, installed, and maintained in accordance with manufacturer specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately or is no longer adequate, it is the responsibility of the Contractor to replace or modify the control for site conditions at no additional cost to the Department. Contractor must maintain all control measures and other protective measures in effective operating conditions and shall consider replacement of erosion controls for each construction season.

3.7 Restoration

To offset unavoidable impacts and losses to WOTUS and surrounding native vegetation, MassDOT is proposing to provide mitigation through native upland plantings along the dike, select upstream areas outside of the dam embankment, along the downstream slopes leading to the proposed stormwater BMP, and the downstream area adjacent to the fish ladder. The selected locations will provide native vegetation within the limits of disturbance to offset the loss of native vegetation required to be removed for dam safety regulations and in order for the scope of work to be performed. Large trees outside of the limits of work will be protected by tree protection devices to prevent damage to their root systems. The proposed restoration areas are shown on the landscape plans included in the Project Plans.

3.8 Historic and Archaeological Considerations (compliance with Section 106)

Based on coordination with environmental and historical agencies during design, several solutions were discussed to preserve the historical elements and provide a context sensitive design that suits the nature of the project area. It was agreed that by repairing the stone walls, although labor intensive, the open portion of the dike would be the most appropriate way to preserve the cultural resource. The portion under the roadway and in the downstream area will be preserved to the maximum extent practicable with repair and rehabilitation likely for certain areas, mostly anticipated under the roadway. Some portions in the downstream area will have to be removed to accommodate the proposed fish ladder, but the materials will be repurposed elsewhere on the site.

The proposed fish ladder will likely need to be operational before the existing fish ladder can be decommissioned. A concrete harvesting pad will be included in the design of the proposed fish ladder to allow harvesting of the herring by the Town and native tribes. The flow would be diverted from the fish ladder onto the harvesting pad by using adjustable weirs and/or stoplogs. The harvesting pad design will also allow fish that are not chosen for harvesting to enter back into the fish ladder stream.

IV. Anticipated Construction Sequence

The temporary erosion and sedimentation controls (compost filter tubes, etc.) will be in place prior to the start of any excavation, demolition, or other earthwork activities. The 100-year flood elevations for construction will be used for the design of control of water, cofferdams, and temporary shoring during construction for Phases 1 and 2. The top of the cofferdams and control of water shall be a minimum of 1-foot higher than the required flood elevations for construction. The dewatering operations will include the use of settling basins to treat excavation water prior to discharge into the adjacent waterway.

No staging area has been identified on the plans, as it is up to the Contractor to coordinate that with property owners. However, it is anticipated that the Elks Lodge parking lot in the downstream area of the project site will be utilized by the Contractor. It is anticipated that this area will also be utilized as a potential stockpile location. The parking lot at the boat ramp to the northwest of the project site cannot be utilized for these purposes due to limitations on the use of the property attributable to its Article 97 designation.

Construction equipment used will be determined by the contractor and is anticipated to be typical equipment utilized for bridge and roadway construction. This may consist of excavators, loaders, concrete pump trucks, pile installation equipment, paving equipment, vibratory rollers, and other heavy construction machinery. Additionally, trucks will be utilized to haul materials such as stone, gravel, and concrete, to and from the site.

The phased sequence of construction operations is anticipated to be as follows:

Phase 1 (estimated 9 months)

Phase 1A

- Temporarily relocate southern overhead utilities to the utility poles on the north side of the dam.
- Place traffic control measures and shift westbound travel lanes to the northern portion of existing structure.
- Install support of excavation along the phase line. Place temporary shoring and control of water measures for Phases 1 and 2.
- Remove and dispose of the southern portion of existing auxiliary spillway, concrete box culvert and storage shed.

Phase 1B

- Construct the southern portion of proposed bridge structure, with the exception of the sidewalk and bridge rail (to be completed in a later phase), spillway, and middle portion of the fish ladder,
- Construct the downstream training walls and grouted riprap scour apron downstream of spillway.
- Relocate the water main and gas main to proposed superstructure.
- Partially demolish the downstream portion of the existing primary spillway. Construct the temporary vehicular and pedestrian bridge over the existing spillway.

Phase 2 (estimated 12 months)

Phase 2A

- Permanently relocate the overhead utilities to the south side of the dam
- Place traffic control measures and shift westbound travel lanes to the southern portion of proposed superstructure.
- Remove and dispose of the remaining northern portion of existing auxiliary spillway and concrete box culvert structures.

Phase 2B

- Construct the northern portion of proposed bridge structure, spillway, low level outlet chamber, and upstream portion of fish ladder.
- Remove the earth support around structure while abandoning remaining portions in place.
- Remove the upstream and downstream control of water measures and divert flow to proposed spillway in preparation for the removal of the existing primary spillway.

Phase 3 (estimated 6 months)

- Place traffic control measures and shift westbound travel lanes to the northern portion of structure. Install upstream and downstream temporary control of water measures for fish ladder construction and demolition of existing culvert and spillway.
- Construct the downstream portion of the fish ladder and divert flow to proposed fish ladder in preparation of removal/abandoning of existing fishway/spillway.

Phase 4 (estimated 6 months)

- Place traffic control measures remove the southern westbound lane, maintaining one westbound travel lane.
- Remove and dispose of portions of primary spillway and fishway, fish ladder and temporary bridge.

Phase 5 (estimated 9 months)

- Place traffic control measures and shift the westbound lanes to the southern portion of the proposed superstructure.
- Remove and dispose portions of existing primary spillway and the remaining portion of the existing fish ladder under the roadway.
- Reconstruct the upstream portion of the existing fish ladder retaining walls and dike.

Phase 6 (estimated 6 months)

- Grade the downstream channel and remove the remaining water control measures from upstream and downstream of the dam.
- Place traffic controls and shift the westbound travel lanes to the north side of the roadway.
- Remove and dispose of the temporary wearing surface.
- Construct the southern sidewalk and install the S3-TL4 rail and protective screen.
- Construct the proposed stormwater treatment system consisting of a sediment forebay and bioretention basin in the southwest embankment.
- Finish landscaping of the project area including loam and seed and any required plantings. Install the proposed storage shed and proposed site amenities and signage.
- Place the final paving, striping, and signage. Remove remaining traffic control measures and open roadway to final traffic pattern.

V. Wetland Impacts and Mitigation

Resource area impacts associated with the project include both temporary and permanent impacts to WOTUS associated with Mill Pond and the Agawam River. The proposed limits of work include approximately 17,345 SF of cumulative permanent and temporary impacts to land below OHW of Mill Pond (below el. 15.7) and 4,743 SF to tidal waters of the Agawam River (below HTL el. 3.39) for a total impacts to WOTUS of 22,088 SF. No impacts to Vegetated Wetlands are proposed. Temporary impacts include areas of temporary cofferdam installation and dewatering in the upstream and downstream areas to allow work to be performed in the dry, including installation of the phased cofferdams. Permanent impacts to WOTUS will result from areas of dredge to remove unsuitable materials in advance of installation of the spillway components, permanent loss of WOTUS from fill within the downstream primary spillway, culvert, and fishway culvert, and reconfiguration of the existing fish ladder. Permanent impacts will consist of both dredge and fill areas, which overlap in most portions of the project. Replacement spillway and fish ladder structures are proposed within WOTUS which have been included in the fill calculations below. Replacement of lost WOTUS is provided by the expansion of the proposed primary spillway and select areas of the new fish ladder. These temporary and permanent impacts are necessary to complete the bridge and dam reconstruction process and allow the work to be performed safely in dry conditions. Cofferdams will be installed in phases while adhering to the MADMF time of year restriction windows prohibiting silt-producing activities. However, work may be performed during the fall TOY restriction while contained behind cofferdams with the primary spillway remaining open to maintain flow through the dam and through the existing fish way and fish ladder.

Impacts to the waterway will be minimized by the formation of cofferdams, to restrict the migration of sediment into the channel, pond, and sensitive diadromous fish habitat. Impacts to vegetated wetlands have been avoided entirely, and hydrology to the existing vegetated wetlands east of the fishway will be maintained through the post construction condition. Sufficient erosion and sedimentation controls will be utilized sitewide to restrict transport of sediment to downstream and downgradient areas. Pare and MassDOT are coordinating with NOAA NMFMS GARFO for Essential Fish Habitat (EFH) consultation to ensure proper avoidance, minimization, and mitigation measures (if necessary) are applied to protect EFH.

Permanent and temporary impacts to WOTUS, including permanent dredge and fill activities, are described in detail in the following sections.

5.1 Dredging

Dredging within the pond and river is proposed to remove excess or unsuitable material upstream and downstream of the bridge and dam, prepare for the installation of the proposed spillway and fish ladder features, and prepare for the placement of protective riprap within Mill Pond Dam and the Agawam River. Dredging is also proposed in order to achieve necessary grades prior to the installation of structures, sediment, or riprap material. The proposed footprint of dredging includes only portions of areas of permanent impacts to WOTUS, shown on Tables 1 below.

The proposed dredge area includes 13,017 SF within Mill Pond below OHW el. 15.7 on the upstream side of the dam and bridge, to dredge approximately 4,893 CY of embankment material. Dredging will occur from between bank flags P-9 and P-10, along the western dam embankment, east to approximately bank flag P-103, along the eastern dike embankment and from the southern edge of the pond north to the northern limit of proposed grading and/or riprap. Dredging will occur within and surrounding the proposed spillway, in the area of the proposed fish ladder structures, in areas of proposed riprap, and in areas where WOTUS will transition to upland by decommissioning the primary spillway. The primary focus of dredging in these areas is to both achieve desired grades and to remove unsuitable pond bed material, as fill and structures will be placed throughout the dredging area. The fill and structures require a stable substrate in order to ensure long-term viability.

The proposed dredge area in the Agawam River includes 2,388 SF to remove 390 CY of material below the HTL (el 3.39) and 275 CY of material below MHW (el. 1.9) of the Agawam. On the downstream side of the dam and bridge in the tidal Agawam River, dredging will occur throughout the entire eastern channel of the primary spillway, from the outlet (bank flag R-113) to the confluence with the auxiliary spillway outlet (bank flag R-104). Dredging will occur in this area to remove unsuitable stream bed material (sand and gravel streambed material) to prepare for both structures and fill materials. Structures such as the existing concrete harvesting pad and fish ladder will also be removed from the stream bed in this area. Dredging is also proposed south of the auxiliary spillway outlet from bank flags R-1 and R-100 south to approximately bank flags R-4 and R-103. Unsuitable stream bed material will be dredged from this area to prepare for the placement of riprap material. Lastly, a small area of dredging is proposed after (south of) the confluence of the two stream channels within the primary Agawam River channel, beneath a portion of the proposed fish ladder. Within the area south of the confluence of the two channels, unsuitable material will be dredged to prepare for the installation of the fish ladder.

Table 1. Permanent Dredge/Fill Impact Quantities

		Cut			Fill		
		Cut Area (SF)	Thickness (ft)	Volume (CY)	Fill Area (SF)	Thickness (ft)	Volume (CY)
Upstream Mill Pond (below OHW el. 15.7)	**Embankment Cut**	13017	10.15	4893			
	Riprap				6451	4	956
	Spillway Footing				4250	3.5	551
	Spillway Wall				90	80	267
	Fish Ladder				625	8.75	203
	Low Level Outlet				110	15.7	64
	Existing Culverts				1491	15.7	867
	Total	13017		**4893**	13017		**2908**
Downstream Agawam River (below HTL el. 3.39)	***Spillway***						
	Slab	1100	3.89	159	1100	3.89	159
	Streambed Restoration	308	3	35	308	3	35
	Fish Ladder & Retaining Walls						
	Structure	980	5.39	196	980	5.39	196
	Earth Fill				1909	5.39	382
	Total	2388		**390**	4297		**772**
Downstream Agawam River (below MHW el. 1.9)	***Spillway***						
	Slab	1100	2.4	98	1100	2.4	98
	Streambed Restoration	308	3	35	308	3	35
	Fish Ladder & Retaining Walls						
	Structure	980	3.9	142	980	3.9	142
	Earth Fill				1909	3.9	276
	Total	2388		**275**	4297		**551**

5.2 Filling

Fill material is proposed within the pond and river in the form of riprap stones, concrete spillway and fish ladder structures, repurposed stones within channel walls and the fish ladder, a concrete discharge apron, and sediment. Fill is proposed upstream and downstream of the dam and bridge in the same area as permanent impacts to WOTUS, shown on the Wetland Impact Plan (Sheet 11 in the Project Plans) and Tables 1 & 2. A cross-section showing areas of fill within Mill Pond and Agawam River is provided on Sheet 12 in the Project Plans.

The proposed permanent fill area upstream side of the dam within Mill Pond below OHW el. 15.7 includes approximately 13,017 SF and 2,908 CY of fill material. Fill structures in this area consist of the primary arch crest weir spillway along with the concrete slab at the base of the spillway and the northern section of the proposed fish ladder. Riprap stone is proposed surrounding the spillway and to either side (east/west) of the spillway in order to regrade the upstream slope of the dam and dike to a more uniform and manageable slope (2 V: 1V) and for upstream slope protection. Earthen fill is proposed in certain areas where WOTUS is being transitioned to upland areas and surrounding/within proposed rip rap areas.

Within the tidal waters of the Agawam River, the proposed permanent fill area includes approximately 4,297 SF in the downstream area (below HTL and MHW). Fill quantities total 772 CY below HTL and 551 CY below MHW. The entire eastern channel of the Agawam River, from the primary spillway channel (bank flag R-113) to its confluence with the secondary spillway (bank flag R-104) will be filled with earthen fill and will transition to mostly upland areas. The only area that will not become upland is where the pool and weir portions of the fish ladder (where water will continuously flow) are proposed as these areas will remain as WOTUS. Other areas will be transitioned to mitigation planting areas (discussed in Section 3.7 of this narrative), the fish ladder structure, and the proposed eel passage channel adjacent to the proposed fish ladder. Downstream of the existing secondary culvert and proposed primary spillway, riprap stones will be placed along the riverbed. Lastly, south of the confluence of the two stream channels within the primary Agawam River channel, the southern terminus of the new fish ladder is proposed. This fill will be primarily the fish ladder structure and will not consist of sediment or riprap material.

5.3 Loss of Waters of the United States

Permanent loss of WOTUS is proposed on the downgradient side of the dam, as the existing easternmost box culvert/spillway is being removed and replaced with the proposed spillway and bridge to the west. As such, the portion of the river immediately downgradient of said box culvert will become upland area, and the riverbed immediately downgradient of the proposed spillway will be widened. Downstream of the dam and bridge, loss of WOTUS is necessary where the fish ladder is proposed within the existing Agawam River. The pool and weir portion of the fish ladder is not considered to be a loss of WOTUS as water will still continuously flow through these areas, however the walls and structure itself, which surround the pools and weirs, is considered a loss.

Upstream of the bridge and dam, permanent loss of WOTUS within Mill Pond is proposed in the location of the upstream inlet structure for the fish and eel ladders, where filling and grading will increase the elevation of certain Mill Pond edge areas above the Ordinary High-Water (OHW) elevation (15.7). The OHW elevation was determined by averaging the elevation of Mill Pond bank flags that are away from the influence of erosion along the upstream dam embankment (flags P-1 through P-11 and P-102 through P-114). This average elevation was then used as an indicator for the edge of WOTUS under proposed conditions, and loss of WOTUS in Mill Pond was determined to be the difference between the delineated bank edge and the proposed 15.7 elevation contour.

Loss of WOTUS is shown as grey hatching on the Wetland Impact Plan in the Project Plans (Sheet 11 of the Plans). Total project impacts are summarized in Table 2 with the Loss of WOTUS shown in the fifth column, below.

Table 2. WOTUS Impact Calculations

RESOURCE AREA	TEMPORARY IMPACTS TO WOTUS* (SF)	PERMANENT IMPACTS TO WOTUS* (SF)	TOTAL IMPACTS TO WOTUS* (SF)	LOSS OF WOTUS* (SF)	REPLACEMENT WOTUS* (SF)	NET LOSS OF WOTUS* (SF)**
MILL POND (UPSTREAM OF THE DAM)***	4,328	13,017	17,345	3,496	2,639	857
AGAWAM RIVER (DOWNSTREAM OF THE DAM)	446	4,297	4,743	2,618	1,447	1,172
TOTALS	**4,773**	**17,314**	**22,088**	**6,114**	**4,086**	**2,029**

*WATERS OF THE US

**Net loss of WOTUS calculated from subtracting replacement WOTUS from loss of WOTUS .

***Includes impacts within structures (culverts)

5.4 Replacement Waters of the United States

In order to mitigate the unavoidable loss of WOTUS, the design incorporates replacement areas of WOTUS downstream of the dam in areas bordering the Agawam River. Replacement areas include portions of the Agawam River that will be widened to accommodate the width of the proposed new spillway and bridge structure as well as the proposed fish ladder and eel passage structures. These areas are only considered replacement WOTUS where they are proposed over existing upland areas and where water from the Agawam River/Mill Pond will consistently flow. Areas in which the proposed expansion of the Agawam River, the associated fish ladder, and associated eel passage are located underground or beneath the bridge, were also included in replacement area calculations as these areas will be designed to resemble natural conditions, where available. Where possible, the existing streambed material will be stockpiled and reused in the channel. A Special Provision will be included in the Contract documents which provides a gradation for material brought from off-site to be used as streambed material. All areas that are considered replacement WOTUS currently exist as disturbed upland areas.

Replacement WOTUS is shown as cubed hatching on the Wetland Impact Plan in the Project Plans and quantified in Table 2 above.

5.5 Permanent Impacts to Waters of the United States

Permanent impacts to WOTUS are necessary to complete the proposed reconstruction and improvements to the dam, bridge, and fish ladder, and have been minimized to the extent possible. The proposed permanent impacts to Mill Pond include approximately 13,017 SF in all of the previously described loss of WOTUS areas, as well as areas that will be altered but will remain as WOTUS. Permanent impacts involving alteration include the construction of the proposed spillway, all areas in which grading is proposed, dredge and fill areas, abandonment and filling in the primary spillway and underground fishway, and all areas in which riprap stones are proposed. On the upstream embankment of the dam, riprap that is 3-feet thick will be placed over 12-inches of crushed stone. This riprap is for protection against erosion of the dam embankment during large storm events. In areas above ordinary high water the riprap will be infilled and seeded with a native seed mix for wetland enhancement that is beneficial to waterfowl. Please note not all the permanent impact area reported for Mill Pond is within the pond as the value includes the areas within the three culvert structures which results in impacts to WOTUS within manmade structures and not native pond material.

Permanent impacts to the Agawam River below HTL and MHW include approximately 4,297 SF of tidal waters. These impacts are necessary in all of the previously mentioned loss of WOTUS areas, including the area south of the ancillary spillway and east of the main river channel where the river will be partially filled in and become upland in some locations surrounding the proposed fish ladder. Additionally, immediately south of the proposed spillway, the stream channel will be reconstructed with 2-feet of modified rockfill, and streambed restoration will be provided by topdressing the rockfill with 12-inches of natural streambed material. This modified rockfill is required to prevent erosion at the base of the spillway due to storm surges that reach the dam.

Permanent impacts to WOTUS are shown as dotted hatching on the Wetland Impact Plan in the Project Plans and quantified in Table 2 above.

5.6 *Temporary Impacts to Waters of the United States*

Temporary disturbance is limited to areas within the temporary cofferdam installation, and dewatering areas outside of the limits of permanent impacts. The temporary impact areas both upstream and downstream are limited to dewatered areas and worker access with temporary contractor designed control of water measures. The access is required to install riprap and streambed restoration material once the spillway construction has been completed. At this time, the type and size of control of water measures are unknown. Please refer to Section 3.5 of this narrative for a detailed description of dewatering activities. Temporary impacts are shown as diagonal hatching on the Wetland Impact Plan in the Project Plans and quantified in Table 2 above.

5.7 *Impacts to Floodplain*

According to the FEMA Flood Insurance Rate Map (FIRM) for the Town of Wareham (Map Number 25023C0493K, effective date July 6, 2021), an area of 100-year floodplain encompasses a majority of the project area both upstream and downstream of the dam. Floodplain on the site is located within Zone AE, with Flood Elevations determined at 14 feet upstream and downstream of the dam. However, that base flood elevation was determined based upon the expected 100-year storm surge of the Wareham River. There was no riverine model completed by FEMA for the Agawam River.

As the flagged OHW of Mill Pond is located at elevation 15.7, the floodplain is contained entirely within the WOTUS on the site. Impacts to floodplain therefore matches the temporary and permanent impacts to WOTUS on the upgradient northern side of the roadway. The elevation of the roadway and adjacent shoulders are entirely above 14 feet in elevation and therefore none of the bridge or roadway work is located within floodplain.

Impacts to floodplain are focused to the south of the roadway on either side of the Agawam River. Generally, the elevation of the site drops below 14 feet along the mid slope of the road shoulder. On the west side of the River, impacts will include grading areas of fill and excavation to create the proposed bioretention area. Due to the numerous constraints of the site, including private property limits and natural resource areas, the bioretention area must be located where proposed and partially within the floodplain of the river. To the east of the existing Agawam River, impacts to floodplain include the installation of the new fish ladder, widening of the River via excavation, and grading. In addition, the parking area, walkway to harvesting pad, shed, and an observation area are proposed surrounding the fish ladder within the floodplain. Following construction of the above mentioned structures and surfaces, pervious areas will be planted with trees, shrubs, and native seed mixes.

The results of the H&H analysis show that the proposed project will result in a slight reduction in flood levels upstream of the dam and will not result in changes in flood levels downstream of the dam. Areas of mapped floodplain (below el. 14) will have various cuts and fills throughout the site, however the increased capacity of the spillway will offset areas of fill which include reshaping upstream slopes and adding the stormwater treatment bioretention basin downstream. Under proposed conditions, the dam spillway will have controls to operate the dam before and during large storm events to decrease the likelihood of the dam overtopping. As such, a cut/fill analysis for floodplain areas was not conducted due to the findings of the H&H analysis that prove there will not be an increase in flood elevations. Please refer to the Hydraulic Study Report included as Section 11 and fish passage design memorandum included in Section 7 of this Application for additional information. Please note that since the Hydraulic Study was completed in 2021 it was discovered that the normal pool elevation is slightly higher than in the original analysis. After final design of the fish ladder hydraulics is completed, a revised H&H report will be compiled with all the information provided in these appendices.

5.8 *Mitigation*

The proposed project uses a multifaceted approach to mitigate for impacts to WOTUS and native vegetation on the site. The overall project will result in an improvement to fish passage through the existing crossing. In order to directly compensate for lost WOTUS, new areas of the Agawam River will be created within the proposed spillway where the existing pipe culvert will be replaced with a much wider, open bottom bridge. Streambed restoration will occur in the area downstream of the proposed spillway in order to restore a natural streambed atop proposed riprap channel protection. In addition, the proposed fishway ladder and eel passage will provide new WOTUS where inundated. Along the floor of the fish ladder, the concrete will be lined with a stone veneer made from reused stone from the existing downstream masonry walls that are being demolished for the proposed bridge, spillway, and fish ladder construction. Along the floor of the eel passage, a synthetic material that will imitate grass will be installed to assist eels migrating up the laterally sloped passage. Replacement WOTUS is shown as cubed hatching on the Wetland Impact Plan in the Project Plans and quantified in Table 2 above.

Impacts to diadromous fish run will be mitigated by enhancing aquatic connectivity through the installation of a functionally upgraded fish ladder, as well as control of water measures installed outside of TOY restrictions to avoid turbidity within the adjacent WOTUS that could disrupt migration patterns. As discussed in the alternatives analysis in the following section, as a result of coordination with MADMF, the Pool and Weir fish ladder was chosen due to its effectiveness at other locations in New England for similar species and the aesthetics of this type of fish ladder. The herring run is a popular destination during the spring months and this fish ladder will provide a better viewing experience for visitors and will more closely match the natural aesthetics of the location. While the overall alignment and type of fish ladder will change in the proposed condition, the design is anticipated to provide improved aquatic connectivity, a more natural and effective type of fish ladder to enhance EFH, and continuous fish passage throughout construction activities.

Impacts to native vegetation along the earthen banks of pond, earthen dike, and downstream upland areas will be mitigated by a comprehensive native restoration planting plan for upland and riverine locations. Protective riprap installed outside the limits of spillway and fish ladder components will be top dressed at the OHW elevation and above with compost and an Ernst Conservation Seed mix “Waterfowl Buffet Mix for Wetland Enhancement” (MassDOT Item 751.765). Upland areas between the proposed guardrails and sidewalk will be seeded with a mid-height pollinator seed mix, and native tree(s) will be planted adjacent to sidewalk outside of the limits of the dam embankment. The earthen dike will be restored with a mosaic of native shrub species under seeded with the Ernst Waterfowl Buffet seed mix. No trees may be replaced in this area according to dam safety regulations, as it is an integral part of the dam, however trees outside of the limits of work will be protected during construction. The landscape design along the dike includes a 6’ wide aggregate walkway along the centerline, native plantings throughout, interpretive signs, seating areas, viewing areas, and salvaged granite steps to the water’s edge for fishing access. The landscape design will offer dense plantings in a majority of the eastern side to deter the public from access to the aboveground fishway for safety reasons, and will include select openings with informative, interpretive signs surrounded by grasses and perennials for viewing purposes. Salvaged granite blocks will be utilized as bench seating at the north end of the dike and as steps in a select area on the western side of the dike to

provide fishing access above OHW. The western side of dike will be restored with clusters of mixed shrub plantings under seeded with native seed mix on the pond side of walkway with openings for viewing purposes. Within the downstream areas, a mid-height pollinator mix will be seeded along, upgradient, and downgradient from side slopes of the bioretention basin, and the area upstream and east of the fish ladder viewing area, as well as mixed woody plantings. The bioretention basin bottom will be seeded with a MassDOT Wetland Riparian mix (Item 765.553), and the side slopes with a Steep Slope Mid-Height mix (Item 765.472). The bioretention basin outfall will be top-dressed with compost and a Roadside Riverbank mix (Item 765.442). Tree and shrub plantings are proposed on the downhill side of the bioretention basin along with the pollinator mix, to restore native shade trees within the project area and offer shade to the Agawam River. Shade trees and shrub plantings are also proposed around the proposed fish ladder to protect against predation and shade the fish ladder, and shade trees will be installed in an area of proposed lawn between the fish ladder and the driveway to the Elks Lodge parking lot.

Examples of native plantings proposed throughout pervious areas to the north and south of the dam include, but are not limited to, the following species: Tulip Poplar (*Liriodendron tulipifera*), Swamp White Oak (*Quercus bicolor*), Eastern Red Cedar (*Juniperus virginiana*), Buttonbush (*Cephalanthus occidentalis*), Spicebush (*Lindera benzoin*), Northern Bayberry (*Myrica pensylvanica*), Arrowwood (*Viburnum dentatum*), and various native grasses, perennials, and seed mixes.

VI. Alternatives Analysis

During the development of the project approach and project design, a variety of design alternatives were reviewed and evaluated in an effort to identify a repair approach which would address dam safety deficiencies, meet the goals for the project, and limit the extent of required impacts to the resource areas within the work area. The following sections present a summary of some of the options considered as part of the design process.

6.1 No Build

In the No Build Alternative, MassDOT would do nothing to address the deteriorated structural condition of Mill Pond Dam. As required by Massachusetts General Laws, MassDOT would continue to conduct annual inspections, and document the conditions of the dam. Additionally, MassDOT would continue to maintain and update the dam's EAP. It is assumed that A.D. Makepeace would continue to operate the spillways and the Town of Wareham would continue to operate the fish ladder.

In the No Build Alternative, a clear definition of responsibilities regarding ownership, operations, and maintenance would not be attained. It is anticipated that the conditions of Mill Pond Dam would continue to deteriorate, potentially resulting in a dam failure or a dangerous condition and presenting a public safety concern. Because the No Build Alternative would not meet the Project Purpose and Need, it is not considered to be a prudent alternative. Therefore, MassDOT does not recommend the No Build Alternative for further consideration.

6.2 Removal

To address the safety and stability concerns at Mill Pond Dam, removal of the dam has been identified in the MassDOT dam inspection reports as an alternative to implementing the required repairs. While this alternative would address the safety concerns of the dam, it would result in a substantial adverse impact on the environmental resource created by the dam, including substantial adverse impacts to a significant cultural resource, as well as other adverse environmental impacts. Further, the Removal Alternative would not meet the Project Purpose and Need. As a result, the Removal Alternative is not a prudent alternative and MassDOT does not recommend the Removal Alternative for further consideration.

6.3 Rehabilitation

In the Rehabilitation Alternative, MassDOT would implement remedial measures to address only the most pressing observed deficiencies of Mill Pond Dam. The focus of the Rehabilitation Alternative would be on preserving the existing dam features and would include:

- Clearing the dam and dike of trees, brush, and other vegetation and loaming and seeding the slope of the dam embankment to establish grass cover;
- Repairing the concrete deterioration along the primary and auxiliary spillway walls;
- Rehabilitating the fish passage;
- Filling the observed depression at the downstream side of the dam and addressing the soil loss along the primary spillway;
- Addressing the hydraulic capacity limitations by widening the primary and auxiliary spillways;
- Addressing the embankment stability factors of safety less than required;
- Regrading the upstream slope of the dam and dike and installing upstream slope protection;
- Addressing the downstream wall stability factors of safety less than required;
- Providing a cutoff to address the phreatic surface in the dam.

The rehabilitation alternative would include extended construction timeframes, control of water measures, and site complications due to the roadway on the crest of the dam. Impacts to WOTUS would result in a similar footprint of disturbance as a full replacement, described in the next section, in order to address upstream slope stability issues, hydraulic capacity limitations, and downstream slope/wall stability issues. The Rehabilitation Alternative would also include monitoring conditions for future subsidence and conducting additional studies and evaluations for future rehabilitation and maintenance. While the rehabilitation and remedial measures alternatives explored carry an overall lower construction cost, they would not provide a cost effective, long-term solution to the observed deficiencies at the dam and fish ladder.

Like the No Build Alternative, in the Rehabilitation Alternative, a clear definition of responsibilities regarding ownership, operations, and maintenance would not be attained. Responding to the immediate remediation needs would not meet the Project Purpose and Need to address the ongoing structural deterioration, which would result in unacceptable safety or operational problems, or provide pedestrian and bicycle accommodations along Cranberry Highway. As a result, the Rehabilitation Alternative is not considered to be a prudent alternative and MassDOT does not recommend the Rehabilitation Alternative for further consideration.

6.4 Reconstruction (Selected Alternative)

The replacement alternative was determined to be the only alternative that would meet the project's purpose and need. A replacement of the dam structure requires removing the primary and auxiliary spillway and fish ladder/fishway, in order to provide a replacement structure that properly addresses the hydraulic capacity issues and its capacity to pass the SDF while providing optimal aquatic passage. Full

replacement also allows for removal of unsuitable soils within the downstream embankment to address issues of erosion and loose soils while providing a new wall designed to provide a stable cross section under all loading conditions, including accounting for traffic loads along the top of the wall. A new superstructure constructed over the proposed spillway will provide additional pedestrian and bicycle accommodations. The replacement alternative provides a replacement dam structure, roadway, and fish passage that addresses the operational and maintenance deficiencies, corrects the inadequate hydraulic capacity of the existing system, and provides the most beneficial fish ladder design for diadromous fish species in the Agawam River and Mill Pond.

The following sections describe the superstructure, spillway, and fish ladder design alternatives considered by MassDOT, including a description of overall costs and constructability, and impacts to wetland resource areas. Lastly, a description of the proposed Replacement Alternative design option and the construction approach.

6.4.1 Superstructure Design Alternatives

Precast elements were considered to expedite construction and impacts to the travelling public. The project is proposed to be constructed in phases due to the high traffic volumes on Cranberry Highway and the restrictions due to dam operations. The span of the bridge over the new spillway is dictated by the width of the spillway outlet channel. Additional span length accommodates the fish ladder which is proposed to be located along the east abutment face. Therefore, either alternative considered would have the same area of impacts to the surrounding upstream and downstream resource areas (WOTUS).

Phasing of the project to maintain traffic, pedestrian and bicycle traffic, stream flow, and wildlife passage throughout the duration of the work is proposed. Base flow and storm flow will be discharged through the dam throughout construction to maintain the level of the impoundment at safe operating levels. The maintenance of flow must also be completed in such a manner as to not disrupt fish migration. The preliminary phasing plan includes maintaining the existing primary spillway and fish ladder throughout construction of the proposed bridge and spillway. Based upon preliminary evaluations, it appears that the primary spillway should be sufficient to accommodate flow throughout construction; however, additional evaluations are required to determine potential impacts to the channel walls downstream of the spillway and the actual maximum discharge capacity that may be required during construction phases of the project. If the primary spillway cannot provide sufficient discharge capacity, alternative means of bypassing flows or accommodating storm flows will need to be considered.

Alternative 1 – Prestressed NEXT Beam

This single-span superstructure consists of NEXT D type precast prestressed beams with an 8” top flange that will serve as the deck. Advantages to this alternative include but are not limited to: ease of phased construction, concrete more suitable than steel in close proximity to water, precast units can be installed in most weather conditions, and offsite curing allows for better quality control of the product. Disadvantages include the weight of the beams requiring larger construction equipment than the PBU option, future deck replacement would require removal and replacement of the entire beam unit, added

cost for widening the sidewalk, and repairs are very difficult, if not impossible, to the prestressing of the beams.

Alternative 2 – Prefabricated Bridge Unit (PBU)

This single-span superstructure consists of rolled steel beams with an 8" composite concrete deck. Advantages to this alternative include lightweight of PBU reduces shipping and erection equipment requirements; the beams, deck, and sidewalk can be splayed to match the curb alignment; more cost effective than NEXT beams for future maintenance. Disadvantages include slightly higher construction cost, steel less durable in moist environments, and recoating of steel sections may be required during the service life of the structure.

Selected Superstructure Type

Based on consideration of the installation effort, construction time, and the life cycle benefits, the Prefabricated Bridge Unit (PBU) appears to be the most suitable option for this project location. This option's main advantages over the NEXT beam option include lighter weight of the components and assembled superstructure, the ability to repair damaged components, and the ability to accommodate the splayed beam more easily on the downstream side of the superstructure. The only real disadvantage of this option is the steel's susceptibility to corrode in environments with high moisture. This weakness will be mitigated by the use of hot-dip galvanizing.

Although both options have the ability to be constructed in phases, the PBU's have formwork custom made for each unit allowing more flexibility with beam spacing than is available with the NEXT Beams.

6.4.2 Spillway Design Alternatives

The proposed main spillway will be located just upstream of where the existing auxiliary spillway is located. The existing main spillway will be removed and back filled. The spillway will have to accommodate a flow equal to ½ the Probable Maximum Flood (PMF) in accordance with 302CMR10. The spillway width varied for each alternative that was evaluated during the development of the hydraulic study.

The following provides a brief summary of the design options explored for the proposed spillway. Each option was designed to provide a spillway that will provide discharge capacity to meet the spillway design flood requirements for the site. The arched sharp crest weir was chosen after preliminary conceptual design of the spillway types was evaluated and coordination with MassDOT resulted in the type being considered most suitable for the project site.

Alternative 1 – Straight Ogee Weir Spillway

An ogee spillway would consist of a linear reinforced concrete gravity spillway section located upstream and parallel to the axis of the dam. The spillway would include an ogee profile to increase the weir efficiency. Based upon conceptual designs, the ogee would need to be approximately 118-feet long. The

weir would be constructed with return walls to the embankment at either end that could be designed to include the level control/low level outlet gate. The linear configuration reduces the overall extent that the spillway extends into the impoundment area; however, the overall length of the work would be increased to roughly 118-feet overall. The forming of the ogee curve requires complicated formwork and will require significant effort during concrete finishing of the spillway face to ensure a smooth flow of water over the spillway face, thus increasing the duration of dewatering within the impoundment. The ogee spillway alternative would result in the smallest footprint of the analyzed alternatives resulting in the lowest impact to the impoundment area but for an overall longer duration and carry the lowest construction costs.

Alternative 2 – Straight Labyrinth Spillway

The labyrinth spillway design consists of two cycles of 1-foot thick concrete weir wall. The labyrinth spillway consists of walls in a "W" configuration that provides the required weir length to meet spillway design flood requirements within a smaller footprint than traditional linear spillways. This configuration allows for the weir to be sized to have an overall width similar to the width of the anticipated bridge clear span opening to be located downstream of the spillway. The weir would be constructed on a reinforced concrete mat slab that could be incorporated into the channel beneath the bridge. Based upon conceptual designs, the weir would have an overall length of approximately 240 linear feet within a 50-foot wide by 60 foot long (upstream to downstream) footprint. Due to the irregular shape, there would be complicated formwork and reinforcing details at the turns in the walls. The labyrinth spillway alternative would result in a larger footprint of impacts within the impoundment and slightly higher construction cost compared to Alternative 1. Due to it irregular shape, debris is more likely to be trapped within the spillway channels, requiring more frequent maintenance to remove debris.

Alternative 3 – Arched Sharp Crested Weir Spillway (Selected Alternative)

The arched spillway consists of an arched 1.5-foot thick concrete weir wall. To provide the required discharge capacity, the weir is estimated to be a 180º arc with a radius of approximately 50 feet and 13.5 foot long linear segments at each end. This configuration provides a total weir length of approximately 184 linear feet. A slide gate to provide level and low level discharge control can be incorporated into either end of the weir. The weir would be found upon a reinforced concrete apron integral to the channel beneath the bridge. This option would require a similar footprint to Alternative 2, extending upstream into the impoundment; however, the width of the footprint would increase to approximately 100-feet. The construction of this spillway will require standard reinforcing details and formwork to construct the arch. Local agencies are familiar with this spillway type making maintenance of the spillway easier. Of the three alternatives analyzed, the arched spillway alternatives carries the greatest construction cost and footprint of impacts within the impoundment. However, this alternative is the easiest to construct therefore requires the least amount of work within dewatered areas and will require the least amount of maintenance in the future.

Alternative 4 – Gated Spillway

During the earlier stages of this schematic design process, a gated spillway within the footprint of the proposed bridge was considered. While this option appears to provide the lowest initial construction cost, this option exceeded the operation and maintenance goals for the project due to the number of gates that would need to be adjusted during storm events and the expense associated with required maintenance of those gates. This alternative was not explored further; therefore, no analysis of resource area impacts was provided.

6.4.3 Fish Ladder Design Alternatives

As part of the reconstruction of Mill Pond Dam, a replacement fish ladder design will be incorporated that would improve the migration of several target diadromous fish species that migrate to Mill Pond via the Agawam River. During preliminary design, Pare coordinated with MADMF to determine a suitable fish ladder type to replace the existing fish ladder which is inefficient due to the limited flow range and areas susceptible to predation. The design was based on the latest guidelines available from the National Oceanic and Atmospheric Administration (NOAA), the United States Geological Service (USGS), the USFWS, and the MADMF, along with coordination with MassDOT – Highway Division Environmental Section, and MADMF for site specific information and requirements.

The proposed fish ladder will be located in the downstream area between what are now the existing auxiliary and primary spillways. The fish ladder entrance would be located downstream of the proposed bridge and will turn back to fit the steps in elevation required to transport diadromous species from the river to the pond. The final portion of the fish ladder would travel under the bridge along the east abutment before exiting into the impoundment, east of the proposed spillway.

The following provides a brief summary of the design options explored for the proposed fish ladder. The Pool and Weir fish ladder was selected after close coordination with MADMF to choose the most beneficial fish ladder for the marine life in the Agawam River and Mill Pond.

Alternative 1 – Denil Ladder

This type of fish ladder is a rectangular chute with baffles extending from the bottom and sides. It is most commonly used in small streams, especially in the Northeast. Due to the highly turbulent nature of Denil Fish Ladders, they provide good attraction flows, but resting pools are usually required. MADMF believes this design would suit the migratory patterns of the marine life that travels in the Agawam River.

Alternative 2 – Alaskan Steeppass

This type of baffle fish ladder is a prefabricated, modular version of the Denil Ladder. It is narrower, steeper, and has a more complex baffle configuration than the Denil Ladder. Due to its slope, the operating flow range is limited. This type of ladder is typically used in retrofits, where the lift elevation

must fit within the space available. This type is currently in use at Mill Pond Dam and MADMF studies show that this type of spillway is inefficient for the types of diadromous species in the Agawam River.

Alternative 3 – Pool and Weir (Selected Alternative)

This type of fish ladder includes pools separated by weirs that step up at each pool to achieve the elevation required form the entrance to the exit of the fish ladder. The ladder is designed by creating flow conditions that allow each pool to be used by the fish to recover from the energy demand required to swim through the weirs. These ladders can be designed to have a more natural appearance by designing them into the landscape using the existing stone masonry walls that will be removed as part of the spillway replacement. Due to the popularity of the herring run at this location, this option would be the most aesthetically pleasing option. This type of fish ladder has been used effectively in other communities around New England for fish passage.

Alternative 4 – Rehabilitation of the Existing Fish Ladder

This option involves complete rehabilitation and reconstruction of the existing stone masonry fish ladder, including the open and underground segments of the fishway. According to MADMF population counts of the fish ladder, this ladder is not as efficient as other alternatives. It would also be the most expensive alternative, as repairing the stone masonry walls, the constraints within the underground portions of the fish ladder, impacts to vegetated wetlands, and the length of the open portions on the upstream side of the dam are all labor intensive.

Selected Fish Ladder Structure

The selected alternative based on coordination with MADMF is the Pool and Weir fish ladder due to its effectiveness at other locations in New England for similar species and the aesthetics of this type of fish ladder. The herring run is a popular destination during the spring months and this fish ladder will provide a better viewing experience for visitors and will more closely match the natural aesthetics of the location.

Repairs to the existing above ground portion of the fishway will be completed to preserve the historically significant resource.

6.4.4 Drawdown Alternatives

Construction dewatering is necessary in order to minimize the transport of sediment to upstream and downstream areas outside of the immediate work area, and in order for contractors to perform work safely in the dry. During Preliminary Design, a construction drawdown was considered and following initial feedback, the No Drawdown alternative was further investigated and selected.

Alternative 1 – Construction Phase Drawdown

A 2-ft drawdown of Agawam Mill Pond was considered for a period of 2 years during construction of the new spillway, however due to public concerns and the long-term impacts to adjacent vegetated wetlands

and active cranberry bogs, this alternative is no longer considered a viable alternative. Furthermore, a drawdown for a period of two years would cause extensive vegetated wetland and WOTUS impacts resulting in complex and time consuming environmental permitting further adding to the overall project cost and schedule.

Alternative 2 – No Drawdown (Selected Alternative)

Pare has designed a cofferdam system approved by the ODS to allow work to be performed in the dry that eliminates the need for a drawdown of the Mill Pond impoundment for the duration of spillway construction (~2 years). By eliminating the drawdown, overall impacts to the entire pond system and extensive cranberry bogs and vegetated wetlands contiguous to the pond are avoided, and impacts are minimized to the necessary workspace in the immediate areas surrounding the roadway, dam embankment, spillway, and fish ladder/fishway. This avoidance and minimization alternative was selected as the appropriate drawdown alternative.

VII. Compliance with the Massachusetts Stream Crossing and Stormwater Management Standards

7.1 Massachusetts Stream Crossing Standards

The proposed project consists of replacement of the existing culverts with a bridge, spillway, and fish ladder to improve the condition of the high hazard dam. This compliance form is being completed under the assumption that this dam could be removed in the future and the bridge would still be required to function as a crossing at this location. The spillway and fish way could be removed while maintaining the bridge structure with some modifications including embedding the proposed abutment/spillway slab. It is assumed that the slab would be backfilled with a minimum of 2-feet of material in the stream with up to 4-feet along the faces of the abutment to create a dry bank for wildlife passage.

Standard	Compliance Commentary
1. TYPE OF CROSSING	
• General: Spans (bridges, 3-sided box culverts, open bottom culverts or arches) are strongly preferred. **• Optimum: Use a bridge.**	Proposed crossing is a single span bridge; therefore, compliance is optimal.
2. EMBEDMENT	
• All culverts should be embedded (sunk into stream) a minimum of 2 feet, and round pipe culverts at least 25%. **• If pipe culverts cannot be embedded this deep, then they should not be used.** **• When embedment material includes elements >15 inches in diameter, embedment depths should be at least twice the D84 (particle width larger than 84% of particles) of the embedment material.**	Not applicable; Crossing is a bridge.
3. CROSSING SPAN	
• General: Spans channel width (a minimum of 1.2 times the bankfull width of the stream). **• Optimum: Spans the streambed and banks (at least 1.2 times bankfull width) with sufficient headroom to provide dry passage for wildlife.**	Estimated bankful width is 33 feet; Clear span is 50 feet which is a ratio of 1.52 and exceeds the 1.2 threshold. Rise = Assumed to be 6.6 feet with dry banks under the bridge during normal flow conditions. This was based on an assumed reconstruction of the pond and channel if the spillway and dam were to be removed.
4. OPENNESS	
• General: 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. **• Optimum: Openness ratio of at least 1.64 feet (0.5 meters) and minimum height of 6 feet. If conditions significantly reduce wildlife passage near a crossing (e.g., steep embankments, high traffic volumes, and physical barriers), maintain a minimum height of 8 feet (2.4 meters) and openness ratio of 2.46 feet (0.75 meters).**	Average Cross Section Area = 375 SF Cross Length = 72 feet A/L=5.21>>0.82 therefore OK A/L>5.21 therefore optimum is met. Height >6 at the assumed dry bank therefore minimum is met.

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.	In the event that the dam is removed, the spillway slab will be buried in substrate matching conditions upstream and downstream of the crossing. Channel substrate will be restored to its native state.
6. WATER DEPTH AND VELOCITY	
• Water depths and velocities are comparable to those found in the natural channel at a variety of flows.	During the dam removal the approach channel would be designed and constructed to maintain acceptable velocities and water depths.

7.2 Massachusetts Stormwater Management Standards

The proposed Project complies with the MassDEP Stormwater Management Standards (the Stormwater Standards) to the maximum extent practicable. Under the Stormwater Standards, the Project is considered a redevelopment project because it involves maintenance and improvement of an existing roadway. In conjunction with the structural work, roadway related construction will also occur and includes, but is not limited to: reconstruction of the approaches to the bridge via roadway reconstruction and pavement micro mill and overlay; remove, handle, haul, reset and replace granite curbing as needed; replacement of bituminous sidewalk on both sides of the roadway with sectional widening on the south side of the roadway at the structure; installation of a 5-foot wide buffered westbound bike facility within the project limits; pavement striping; installation of new signage; and all other incidentals needed to complete the work.

The Project has been designed to meet the Stormwater Standards to the maximum extent practicable and to improve upon existing conditions. Compliance with the applicable standards is addressed and discussed in greater detail within the Stormwater Management Report, included in Section 8 of this application.

VIII. Summary

The proposed project is made necessary by the deteriorated condition of the existing dam, bridge and fish ladder, and replacement represents the most economically and environmentally viable alternative to provide a long-term solution to the noted deficiencies. Impacts to the waterways upstream and downstream of the dam structure are the minimum necessary to achieve the project goal. Impacts to VW have been avoided entirely.

Temporary and permanent impacts to WOTUS have been reduced to the minimum amount necessary to complete the project.

In accordance with 314 CMR9.05(3)(a)-(g), a public notice of this WQC application will be sent to a newspaper of general circulation.

The applicant respectfully requests that MassDEP find these measures adequately protective of the interests identified in the 401 Water Quality Regulations and issue a Water Quality Certificate approving the work shown on the accompanying plan set.

Specifications to be included in the contract include the following:

- 102.3 Herbicide Treatment Of Invasive Plants
- 102.33 Invasive Plant Management Strategy
- 181.11 to 181.14 Soil Disposal
- 115.1 to 115.3 Demolition
- 698.4 Geotextile Fabric For Permanent Erosion Control
- 751.765 Compost And Seed Over Modified Rockfill
- 756. NPDES Storm Water Pollution Prevention Plan
- 765.635 Native Seeding And Establishment
- 765.413, 765.472, 765.553 Native Seed Mixes
- 983.9 Streambed Restoration
- 991.1 Control Of Water

Massachusetts Department of Transportation

MILL POND DAM

SECTION 5

WETLAND DELINEATION DOCUMENTATION

PROJECT TITLE: Mill Pond Dam Flagging

DATE: 7/28/17

LOCATION: Wareham, Massachusetts

WEATHER: Sunny; 75 degrees

PARE JOB NO.: 14199.14

PERFORMED BY: Lauren Gluck, P.W.S
Erika Klinkhammer
(wetlands re-delineated on 9/21/2022 by E. Klinkhammer and Seaver Anderson)

DISCUSSIONS AND COMMENTS

Wetland resource areas in the vicinity of the Mill Pond Dam were defined and delineated in accordance with the methodology specified in the publication entitled The Regional Supplement to the Corps of Engineers Wetland Delineation Manual: North Central and Northeast Region, Version 2.0 (U.S. Army Corps of Engineers, January 2012). Inspection and delineation of wetlands were completed on July 26, 2017 and July 27, 2017. Wetlands were revisited on September 21, 2022 and this field report has been updated to include additional information regarding any changes in wetland boundaries.

Mill Pond Dam impounds the Agawam River to the north of Cranberry Highway (Route 6 & 28) in the town of Wareham. The Massachusetts Department of Transportation (DOT), as the applicant, is proposing a footprint bridge/dam replacement project to provide repairs and improvements to the structure. The delineation was completed in order to determine Ordinary High Water (OHW) of the pond and river and limits of freshwater wetlands in the vicinity of the proposed work area. According to the most recent available MassGIS data, no mapped certified or potential vernal pools, Outstanding Resource Waters, Estimated Habitats of Rare Wetland Wildlife, or Areas of Critical Environmental Concern are located on or in the vicinity of the site. According to MassGIS data layer PRIHAB_POLY (NHESP, 2021), the portion of the site surrounding and including the Agawam River is located within an area of mapped Priority Habitats of Rare Species (PH 450).

Pink field flags were placed at appropriate intervals along the wetland/upland borders in the vicinity of the work area, as well as along the OHW of the pond and river. Primary parameters evaluated in the delineation of freshwater wetlands included vegetation, indicators of wetland hydrology, and hydric soil indicators. The OHW in the project vicinity were delineated according to bankful indicators such as first observable break in slope and drift lines. Observed wetland hydrologic indicators and soils are described in the following sections and within the attached U.S. Army Corps of Engineers Wetland Determination Data Forms. Wetland resource areas within the vicinity of the site include the following: **Bordering Vegetated Wetlands, Land Under Waterbodies/Waterways, Bank, 100-foot Buffer Zone, 200-foot Riverfront Area,** and **Bordering Land Subject to Flooding.**

WETLAND DESCRIPTIONS

Mill Pond

Bank

Mill Pond is a 150-acre impoundment of the Agawam River located directly north of Cranberry Highway in Wareham. The edges of the impoundment upstream of the dam are defined in Section 10.54(2) of the

Regulations as Bank. The Ordinary High Water (OHW) mark of the pond was delineated in the vicinity of the proposed dam and roadway work. Flag series P-1 to P-23 and P-100 to P-114 were placed along the southern and eastern edges of the pond in the vicinity of the dam. Bankful indicators consisted of first observable break in slope and drift lines. The banks in this area are comprised of sandy mineral soils. The bank hosts a dense community of trees, saplings, shrubs, and emergent vegetation. The bank of Mill Pond has an associated 100-foot buffer zone.

Flag series P-1 to P-23 begins west of the boat launch area and continues east along the bank toward the secondary concrete inlet structure between flags P-16 and P-17. Vegetation between P-1 and P-12 consists of a highly overgrown area of dense shrubs and climbing vines with a sizeable section of Japanese Knotweed and Multiflora Rose. The dense bank immediately east of the secondary spillway at P-17 was overgrown and impassible, therefore the pink field flag was hung on the adjacent chain link fence to indicate the approximate location of the bank, and the GPS point was moved three feet towards the pond within the AutoCAD drawing. Bank between P-13 and P-22 was located at the toe of slope from the roadway, downgradient of a chain-link fence. This portion of bank was heavily colonized with saplings, shrubs, and climbing vines. The series ends at the western side of the primary spillway at P-23, and the P-100 series begins at the opposite (eastern) side of spillway. This series continues in a northerly direction along the earthen bank and ends at the concrete/stone fish ladder inlet. Typical vegetation located along the delineated bank includes, but is not limited to, the following species:

Common Name	Scientific Name	Indicator Status
Red Maple	*Acer rubrum*	FAC
Norway Maple	*Acer platanoides*	NI
White Pine	*Pinus strobus*	FACU
Autumn Olive	*Elaeagnus umbellata*	NI
Speckled Alder	*Alnus rugosa*	FACW
Arrowood	*Viburnum dentatum*	FAC
Barberry	*Berberis thunbergii*	FACU
Japanese Knotweed	*Polygonum cuspidatum*	FACU
Tartarian Honeysuckle	*Lonicera tartarica*	FACU
Sweet Pepperbush	*Clethra alnifolia*	FAC
Highbush Blueberry	*Vaccinium corymbosum*	FACW
Sweet Gale	*Myrica gale*	OBL
Greenbrier	*Smilax rotundifolia*	FAC
Oriental Bittersweet	*Celastrus orbiculatus*	UPL
Poison Ivy	*Toxicodendron radicans*	FAC
Cinnamon Fern	*Osmunda cinnamomea*	FACW

Land Under Waterbody

According to 10.56(2) of the Regulations, land under Mill Pond is classified as **Land Under Waterbodies**. The pond consists of approximately 150 acres of open water. No floating or emergent vegetation was observed along the edges of the impoundment at the time of delineation. Within the vicinity of the dam, the pond bottom consists of a thick organic muck.

Agawam River

Mill Pond Dam discharges through a culvert (primary spillway) and corrugated metal pipe (auxiliary spillway) beneath Cranberry Highway into the Agawam River, which extends southwest from the roadway. The edges of the dam's perennial outlet are defined in Section 10.54(2) of the Regulations as **Bank**. The banks of the river in the vicinity of the dam were delineated in two flag series: series R-1 through R-5 defines the western bank of the overflow spillway outlet, and series R-100 through R-113 defines the peninsula separating the two outlet channels. Vertical stone masonry walls flank the river on either side and define the majority of the delineated bank in this area. No flags were hung on the eastern and southerly walls, and these banks of the primary outlet are defined on the survey as the vertical face of bank. Typical species of vegetation located along the banks are listed in the following table:

Common Name	Scientific Name	Indicator Status
Red Maple	*Acer rubrum*	FAC
Silky Dogwood	*Cornus amomum*	FACW
Oriental Bittersweet	*Celastrus orbiculatus*	UPL
Multiflora Rose	*Rosa multiflora*	FACU
Tatarian Honeysuckle	*Lonicera tatarica*	FACU
Foxgrape	*Vitis labrusca*	FACU
Glossy Buckthorn	*Frangula alnus*	FAC
Japanese Knotweed	*Polygonum cuspidatum*	FACU
Common Rush	*Juncus effusus*	FACW

Land Under Waterway

According to 10.56(2) of the Regulations, land under the Agawam River is classified as **Land Under Waterways**. The raceway directly downstream from the primary spillway is approximately 12 feet wide and has a concrete bottom. Downstream of the raceway, the channel broadens and the river bottom consists of an unconsolidated sandy, gravel, and mucky substrate with rocky areas. At the time of delineation, the primary spillway outlet passed rapid flow. A small patch of Pickerelweed (*Pontederia cordata*) was observed within a slow-moving portion along the side of the channel. The delineated portion of the river downstream from the raceway was approximately 55 feet wide and appeared to be several feet deep in most areas.

200-Foot Riverfront Area

According to Section 10.58 (2) of the Regulations, the Agawam River is perennial and thus has an associated 200-foot Riverfront Area. The Riverfront Area encompasses the entire dam, the adjacent mill buildings, and residential land to the east.

Fish Run

An anadromous fish run begins at the upstream eastern edge of the impoundment, extends through the forested area east of the impoundment within a walled channel then under the roadway, and discharges at the eastern side of the primary spillway outlet. Anadromous fish species including Herring reportedly use this raceway during the spawning season. This channel is not a perennial river or stream, and therefore does not receive a 200-foot Riverfront Area.

Bank

According to 10.54(2) of the Regulations, the edges of this man-made channel are defined as bank. The channel is defined by flag series S-1 through S-12 to the west and S-100 to S-113 to the east. The series begins along the eastern edge of the impoundment at the upstream end of the channel and generally follows along the top of the stone block walls to the west and east, ending downstream where the channel enters under the north side of the roadway. Typical species of vegetation located along the banks are listed in the following table:

Common Name	Scientific Name	Indicator Status
Red Maple	*Acer rubrum*	FAC
White Oak	*Quercus alba*	FACU
Arrowwod	*Viburnum dentatum*	FAC
Autumn Olive	*Elaeagnus umbellata*	NI
Greenbrier	*Smilax rotundifolia*	FAC
Glossy Buckthorn	*Frangula alnus*	FAC
Multiflora Rose	*Rosa multiflora*	FACU
Japanese Knotweed	*Polygonum cuspidatum*	FACU
Jewelweed	*Impatiens capensis*	FACW
Poison Ivy	*Toxicodendron radicans*	FAC
Oriental Bittersweet	*Celastrus orbiculatus*	UPL

Land Under Waterway

According to 10.56(2) of the Regulations, land under the fish run is classified as **Land Under Waterways**. It consists of a sandy, stony bottom that was mostly unvegetated at the time of delineation. The channel passed rapid flow at the time of delineation.

Bordering Vegetated Wetlands

Flag series were placed along the edges of two **Bordering Vegetated Wetlands** (as defined in Section 10.55(2) of the Regulations) in the vicinity of the project area. Wetlands delineated include Wetland A and Wetland B, which are both located along the eastern side of the fish run. According to Section 10.02 (2)(b), each of these wetlands has a 100-foot buffer zone. Each of the delineated areas are described below, and USACE Wetland Edge Determination Data Forms have been completed for each.

Wetland A

Flag series A-1 through A-14 defines the edge of a pocket of BVW located along the eastern edge of the fish run. The series begins along the edge of the fish run near flag S-106 and extends east before turning south and west to rejoin the fish run at flag S-110. The wetland is colonized by shrubs and borders along the edge of a densely vegetated upland area dominated by monolithic stand of Japanese Knotweed. The wetland contains mucky soils throughout and appears to be fed by surface runoff from the adjacent residential areas, seepage from the fish ladder, and is also likely to receive temporary overflow from the adjacent waterway during storm events. Indicators of wetland hydrology included leaf staining and saturated hydric soils. Wetland vegetation observed included, but is not limited to, the following:

Common Name	Scientific Name	Indicator Status
Bebb Willow	*Salix bebbiana*	FACW
Arrowwood	*Viburnum dentatum*	FAC
Jewelweed	*Impatiens capensis*	FACW
Japanese Knotweed	*Polygonum cuspidatum*	FACU
Multiflora Rose	*Rosa multiflora*	FACU
Speckled Alder	*Alnus incana*	FACW
Virginia Creeper	*Parthenocissus quinquefolia*	FACU
Oriental Bittersweet	*Celastrus orbiculatus*	UPL

Wetland B

Flag series B-1 through B-4 defines the edge of a pocket of BVW located along the eastern edge of the fish run downstream from the A-series BVW. The wetland is similar in nature to the A-series wetland being bordered by a dense upland stand of Japanese Knotweed and the fish run to the west, however this wetland is much smaller in size and contains less diversity of wetland vegetation. The wetland occupies a low-lying area between flags S-111 to the north and S-112 to the south and contains mucky soils throughout. Wetland hydrology appears to be a combination of overland flow from the roadway and seepage from the fish run wall. Wetland vegetation observed included, but is not limited to, the following:

Common Name	Scientific Name	Indicator Status
Jewelweed	*Impatiens capensis*	FACW
Japanese Knotweed	*Polygonum cuspidatum*	FACU
Foxgrape	*Vitis labrusca*	FACU

Bordering Lands Subject to Flooding

According to the FEMA Flood Insurance Rate Map (FIRM) for the Town of Wareham (Map Number 25023C0493K, effective date July 6, 2021), an area of **Bordering Land Subject to Flooding** (defined under Rule 10.57(2)(a) of the Regulations) encompasses a majority of the project area both upstream and downstream of the dam. Floodplain on the site is located within Zone AE, with Flood Elevations determined at 14 feet upstream and downstream of the dam.

LHG/EK

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Photo 1: View of Mill Pond displaying highly overgrown bank near flag P-12 facing west.

Photo 2: Concrete inlet structure between flags P-16 and P-17.

Photo 3: Overall view of P-series pond edge.

Photo 4: Stone and concrete primary inlet structure between flags P-23 and P-100.

Photo 5: Beginning of S-series open fish ladder joining Mill Pond bank series between P-119 and P-120.

Photo 6: Overall view of BVW A-series wetland east of fish ladder.

Photo 7: Pocket of BVW B-series wetland east of fish ladder.

Photo 8: Downstream river discharging from primary spillway outlet (R-1 series flags).

Photo 9: View of downstream river discharging from secondary spillway outlet. R-100 series to the west (right) joins R-1 series flags to the south (top of photo).

U.S. Fish and Wildlife Service
National Wetlands Inventory

Mill Pond Dam, Wareham, MA

January 3, 2024

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mill Pond Dam City/County: Wareham/Plymouth Sampling Date: 9/21/22

Applicant/Owner: MassDOT State: MA Sampling Point: A5 upland

Investigator(s): E. Klinkhammer & S.Anderson - Pare Corporation Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Footslope Local relief (concave, convex, none): Concave Slope (%): 2-5% +/-

Subregion (LRR or MLRA): LRR R Lat: 41.766515 Long: -70.672378 Datum: NAD83

Soil Map Unit Name: 1- Water (nearby map unit: 259C Carver loamy coarse sand, 8 to 15 percent slopes) NWI classification: N/A (upland)

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation X, 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: A5 upland

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer platanoides	40	Y	UPL
2. Ulmus rubra	10	Y	FAC
3.			
4.			
5.			
6.			
7.			
	50	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. Polygonum cuspidatum	90	Y	FACU
2. Acer platanoides	10	N	UPL
3.			
4.			
5.			
6.			
7.			
	100	= Total Cover	
Herb Stratum (Plot size: 5')			
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1. Celastrus orbiculatus	20	Y	UPL
2.			
3.			
4.			
	20	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

Vegetation highly disturbed, invasives species present throughout including significant stands of Japanese Knotwood within upland and along wetland boundary.

SOIL

Sampling Point: A5 upland

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 - 16"	10YR 3/1	95%	7.5YR 3/4	5%			LFS	Ap

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Sandy soils

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mill Pond Dam City/County: Wareham/Plymouth Sampling Date: 9/21/22

Applicant/Owner: MassDOT State: MA Sampling Point: A5 wetland

Investigator(s): E. Klinkhammer & S.Anderson - Pare Corporation Section, Township, Range: _____

Landform (hillslope, terrace, etc.): toe of slope (depressed area) Local relief (concave, convex, none): Concave Slope (%): 2-5% +/-

Subregion (LRR or MLRA): LRR R Lat: 41.766515 Long: -70.672378 Datum: NAD83

Soil Map Unit Name: 1- Water (nearby map unit: 259C Carver loamy coarse sand, 8 to 15 percent slopes) 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)
- X 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 _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): 12"
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: A5 wetland

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
	40 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Alnus incana	40	Y	FACW
2. Salix sp.	20	Y	FAC
3. Viburnum dentatum	10	N	FAC
4. Polygonum cuspidatum	10	N	FACU
5.			
6.			
7.			
	80 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Impatiens capensis	70	Y	FACW
2. Polygonum cuspidatum	20	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1. Parthenocissus quinquefolia	5	Y	FACU
2.			
3.			
4.			
	5 = 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: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: A5 wetland

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
1/2 - 0"	10YR 2/1	100%						Oe
0 - 12"	10YR 2/1	95%	5YR 3/4	5%	C	M	LFS	Ap
12-16+"	10YR 3/2	100%					LS	C

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- 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 (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

Saturated at 0", water at 12".

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mill Pond Dam City/County: Wareham/Plymouth Sampling Date: 9/21/22

Applicant/Owner: MassDOT State: MA Sampling Point: B3 upland

Investigator(s): E. Klinkhammer & S.Anderson - Pare Corporation Section, Township, Range: _____

Landform (hillslope, terrace, etc.): terrace adjacent to depressed area Local relief (concave, convex, none): concave Slope (%): 2-5% +/-

Subregion (LRR or MLRA): LRR R Lat: 41.765714 Long: -70.672335 Datum: NAD83

Soil Map Unit Name: 1- Water (nearby map unit: 700A Udipsamments, wet substratum, 0 to 3 % slopes NWI classification: N/A (upland)

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation X, 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	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes _____	No X	

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: B3 upland

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Polygonum cuspidatum	100	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	100 = Total Cover		
Herb Stratum (Plot size: 5')			
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		
Woody Vine Stratum (Plot size: 30')			
1. None			
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	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

Vegetation highly disturbed, significant stand of Japanese Knotwood within upland and along wetland boundary.

SOIL

Sampling Point: B3 upland

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0 - 16+"	10YR 2/1	100%					LFS	Ap

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Sandy soils

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Mill Pond Dam City/County: Wareham/Plymouth Sampling Date: 9/21/22

Applicant/Owner: MassDOT State: MA Sampling Point: B3 wetland

Investigator(s): E. Klinkhammer & S.Anderson - Pare Corporation Section, Township, Range: _____

Landform (hillslope, terrace, etc.): toe of slope Local relief (concave, convex, none): concave Slope (%): 2-5% +/-

Subregion (LRR or MLRA): LRR R Lat: 41.765714 Long: -70.672335 Datum: NAD83

Soil Map Unit Name: 1- Water (nearby map unit: 700A Udipsamments, wet substratum, 0 to 3 % slopes 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)
- X 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 _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): 14"
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: B3 wetland

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
	40 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Polygonum cuspidatum	10	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	10 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Impatiens capensis	80	Y	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1. Vitis labrusca	15	Y	FACU
2.			
3.			
4.			
	15 = 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% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	80	x 2 =	160
FAC species	0	x 3 =	0
FACU species	25	x 4 =	100
UPL species	0	x 5 =	0
Column Totals:	105 (A)		260 (B)

Prevalence Index = B/A = 2.48

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: B3 wetland

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
1/2 - 0"	7.5YR 2.5/1	100%						Oe
0 - 12"	10YR 3/2	95%	5YR 3/3	5%	C	M	LFS	Ap
12-16+"	10YR 3/1	100%					LS	Bw

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- 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 (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

Saturated at 0", water at 14".

Massachusetts Department of Transportation

MILL POND DAM

SECTION 6

SEDIMENT SAMPLING REPORT

Engineers Scientists Planners
parecorp.com

PARE CORPORATION

DATE: January 30, 2024

TO: Harry Adolphe
Project Manager
MassDOT – Highway Division

FROM: Al Hanscom, LSP

Re: **Technical Memorandum re: Sediment Screening**
Mill Pond Dam Reconstruction Project
Cranberry Highway (Route 28), Wareham MA
(Pare Project No.: 22147.02)

On July 7, 2023, Pare collected two (2) core sediment samples for chemical and physical analysis from the following locations: western boundary of the proposed Project area (SED-1), and the eastern boundary of the proposed Project area (SED-2). SED-1 was comprised of a vertical split of sediment collected between 0 and 2 feet below the surface of the sediment. SED-2 was comprised of a vertical split of sediment collected between 0 and 2 feet below sediment surface. Core locations are indicated on Attachment A. The sediment samples were placed in laboratory-provided glassware and transported under proper chain-of-custody to New England Testing Laboratory, Inc. (NETLAB) of West Warwick, Rhode Island for chemical and physical analysis. In accordance with 314 CMR 9.07(2), the sediment samples were analyzed for the following parameters:

- Total Metals (Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc)
- Polychlorinated Biphenyls (PCBs)
- Extractable Petroleum Hydrocarbons (EPH)
- Volatile Organic Compounds (VOCs)
- Semi-Volatile Organic Compounds (SVOCs)
- Total Organic Carbon (TOC)
- Pesticides
- Percent Water
- Grain Size Distribution – Wet Sieve (ASTM D422)

Attachment B includes a summary of the chemical results. A copy of the analytical laboratory report, including the sieve analysis, is provided in Attachment C.

Pare compared the analytical results to two (2) screening criteria: Massachusetts Contingency Plan (MCP): 310 CMR 40.0000 Method 1 S-1/GW-1 and the MassDEP 401 Water Quality (WQ) Regulations - Threshold Effects Concentration (TEC) criteria and Probable Effects Concentration (PEC) criteria as described in the *MassDEP Revised Sediment Screening Values, Interim Technical Update*. The MCP Method 1 S-1/GW-1 standards are used to evaluate re-use of dredge material in upland applications. The sediment screening values are used to evaluate the potential risk of harm to the environment from sediment contamination, if any, if the sediment is re-used within the riverbed.

The analytical results from the sediment samples indicated:

- Samples were screened with a photoionization detector (PID) and did not exceed background levels for total volatile organic compounds (TVOCs).
- There were no detections of EPH, PCBs, VOCs, or pesticides above laboratory reporting limits.
- SED-2 detected arsenic at 28.6 mg/kg, which is below the sediment screening value of 33 mg/kg but exceeds the MCP Method 1 S-1/GW-1 of 20 mg/kg.
- No other metals were detected above their respective Method 1 S-1/GW-1 or respective sediment screening values.

The results of the sieve analysis indicate that sample SED-1 is characterized as a dark olive brown gravel with silt and sand, and sample SED-2 is characterized as a dark olive brown gravel and sand. The silt content (i.e., particles passing the #200 sieve) for SED-1 and SED-2 are 5.9%, and 3.8%, respectively. The MassDEP guidance document entitled *Dam Removal and Wetland Regulations* indicates the following with respect to fine-grained sediments:

> *"Fine-grained sediments (i.e., those passing the #200 sieve) have a higher potential for having chemical contaminant adsorption. Fine-grained sediments, whether or not contaminated, are also more likely to be transported as the river sediment load to distant points downstream and ultimately to the ocean."*

Samples with high percentages of fines (i.e., greater than 10% according to the MassDEP Dam Removal guidance document) pose a higher risk of mobilizing and distributing potentially contaminated sediment downstream during construction. Based on the results of the sieve analysis for the selected sediment samples, the silt content is below the 10% threshold specified by MassDEP, suggesting that there is a lower likelihood that sediment will mobilize during construction and be distributed downstream. Furthermore, the Project is expected to include installation of a cofferdam that would prevent mobilization of sediments disturbed during construction.

Recommendations

Based on the results of sediment sampling and analysis, we recommend the following options for sediment management:

1. **In-Stream Reuse:** The re-use of dredged sediments is environmentally feasible for management within the streambed, as none of the sediment sample results exceeded their respective sediment screening values. Prior to re-use within the streambed, Contractor should properly characterize any sediment proposed to confirm its suitability for re-use.

2. **Upland Reuse:** Although arsenic concentration in one of the sediment screening sample results exceeded the MCP Method 1 S-1/GW-1 cleanup standard, the MCP does provide for re-use of material outside the boundary of the stream under the MCP's anti-degradation policy. In this case, naturally arsenic is known to exist in the vicinity of the Site. If the sediment is to be re-used in an upland location, Contractor should properly characterize the sediment designated for landside re-use and compare the analytical results with contaminant concentrations at the receiving site to avoid degradation of the receiving site. Such sediment characterization results should be submitted to Pare for review prior to re-use.

3. **Off-Site Disposal:** If off-site management of excess sediment is proposed, an acceptable receiving site/facility will need to be identified. Pare recommends that any off-site management of excess sediment include:
   - LSP review of the proposed receiving site/facility operating permit to determine its suitability to accept excess sediments generated at the Project Site.
   - Supplemental sediment sampling and analyses of the dewatered sediment will be required prior to acceptance by the selected Receiving Facility or off-site management location.
   - Observation/screening/documentation of the loading of any sediments for off-site management by an Environmental Professional.
   - Use of proper transport documentation (i.e., Material Shipping Record), in conjunction with an opinion letter from Contractor's LSP.

Attachments:
A – Sediment Sampling Plan
B – Table 1 - Summary of Sediment Analytical Results
C – Laboratory Certificates of Analysis & Chain-of-Custody Documentation

ATTACHMENT A
SEDIMENT SAMPLING PLAN

HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS
NONE	SEE BELOW	SEE BELOW	SEE BELOW

LEGEND:

- SEDIMENT SAMPLING LOCATION

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	17
PROJECT FILE NO.	606352		

CONSTRUCTION PLAN

SEE INSET A

NAD 83

INSET A

INSET B

SEE INSET B

Sed-1

Sed-2

CRANBERRY HWY

SANDWICH RD

PRIVATE WAY

AGAWAM POND BOAT LAUNCH

AGAWAM MILL POND

AGAWAM RIVER

#2844 CRANBERRY HWY MAP 129 LOT 1074 N/F COMMONWEALTH OF MASSACHUSETTS

2850 CRANBERRY HWY MAP 129 LOT 1077 N/F JOHN L. CHURCHILL JR. BOOK 28696 PAGE 348

#2848 CRANBERRY HWY MAP 129 LOT 1078 N/F WAREHAM LAND TRUST INC. BOOK 37870 PAGE 247

#2845 CRANBERRY HWY MAP 129 LOT 1049 N/F WAREHAM LAND TRUST INC. BOOK 37870 PAGE 247

#2844 CRANBERRY HWY N/F COMMONWEALTH OF MASSACHUSETTS MAP 129 LOT 1148C BOOK 11494 PAGE 48

2849 CRANBERRY HWY N/F WAREHAM B P O ELKS #1548 MAP 129 LOT 1150 BOOK 3061 PAGE 48

2843 2-STORY WAREHOUSE BUILDING

PROP FINAL OVERHEAD UTILITIES
PROP FULL DEPTH CONSTRUCTION
PROP SHLOALT
PROP BRIDGE WORK (SEE BRIDGE PLANS)
COFFERDAM
R&R 6" VERT CURB
PROP TEMP UTILITY POLE
PROP FULL DEPTH CONSTRUCTION
PROP HMA SW
CONTROL OF WATER (TYP.)
PROP FINAL LOCATION FOR UTILITY POLE
PROP TEMP UTILITY POLE
PROP LOAM & SEED
PROP PERM EASE
PROP MILL AND OVERLAY
PROP HMA DWY
R&R 6" VERT CURB
1+47.76 ROUTE 28 - CENTER= 101+12.39 CRANBERRY HIGHWAY
PROP 5' HMA SW
R&R 6" VERT CURB
CONSTRUCTION ℄
RET UP
L=289.88' R=1200.00'
Δ=13° 50' 27"
PRC +29.76
PC
SURVEY ℄
S 87° 56' 52" W 106.12'
MEET EXIST PVMT
SAWCUT
+00.00
BY
PT +94.81
+01.45
L=165.03' R=720.00'
Δ=13° 07' 57"
398.55'
N 64° 37' 53" W
PROP PERM EASE
PROP 5' HMA SW
TIE INTO EX GUARDRAIL
SAWCUT
RET UP
PROP LOAM & SEED
R&R 6" VERT CURB
PROP FINAL LOCATION FOR UTILITY POLE
PROP COMPOST FILTER TUBE FOR EROSION CONTROL (TYP)
LIMIT OF WORK ℄ STA. 00+78.87
N2739695.2542
E880699.8889
APPROX. PROPERTY LINE
PROP CEM CONC SW
CONTROL OF WATER
R&D EXIST GAS PROP GAS (BY OTHERS)
APPROX. PROPERTY LINE
PROP FINAL LOCATION FOR UTILITY POLE
R&D EXIST GAS PROP GAS (BY OTHERS)
PROP SHLOALT
OPTIONAL TEMPORARY FISH WAY BYPASS DURING CONSTRUCTION
PROP FINAL LOCATION FOR UTILITY POLE
PROP 5' HMA SW
R&R 6" VERT CURB
PROP LOAM & SEED
98±
S64°37'53"E
1925 SHLO NO. 2313
PROP PERM EASE
PROP LOAM & SEED
R&R 6" VERT CURB
PROP FINAL LOCATION FOR UTILITY POLE
PROP 5' HMA SW
ETR CURB
MEET EXIST DWY
SAWCUT
S 64° 45' 06" E 501.00'
MEET EXIST PVMT
ADJ CB
ETR CURB & SW
PROP MILL AND OVERLAY
PROP HMA DWY
RET UP
LIMIT OF WORK ℄ STA. 6+58.85
N739476.3175
E881234.9312
R&D EXISTING INLET STRUCTURE AND REPLACE WITH HDPE PIPE AND CONC. HEADWALL
PROP TEMP EASE
REBUILD STONE MASONRY WALLS LINING FISHWAY
HDPE PIPE TO CONTROL FLOW IN FISHWAY
REBUILD STONE MASONRY WALLS LINING THE FISHWAY
RET UP
PROP 5' HMA SW
R&R 6" VERT CURB
PROP LOAM & SEED
PROP FINAL AERIAL UTILITIES

NOTE TO REVIEWER:

SURVEY DATA SHOWN IS FROM 2008 AND THEREFORE SOME FEATURES SHOWN MAY BE OUTDATED. A NEW SURVEY IS EXPECTED TO BE COMPLETED AND WILL BE INCORPORATED IN THE 75% DESIGN SUBMISSION

0 20 50 100

SCALE: 1" = 20'

Proposal No. 606532-136278

606352_HDA(CONST PLAN).DWG Plotted on 17-Dec-2021 4:53 PM

A00840 - 109

ATTACHMENT B
TABLE 1 - SUMMARY OF SEDIMENT ANALYTICAL RESULTS

Table 1 - Summary of Sediment Analytical Results
Mill Pond Dam Reconstruction Project
Wareham MA
Pare Project No. 22174.02

Sample ID:	SED-1		SED-2				
Date Sampled:	7/7/2023		7/7/2023				
Parameter	Sample Result	Reporting Limit	Sample Result	Reporting Limit	Units	MCP Method 1 S-1 & GW-1 Standard	MassDEP Stage I Sediment Screening Values
Extractable Petroleum Hydrocarbons (MADEP-EPH)							
Naphthalene	ND	0.41	ND	0.42	mg/kg	4	NA
2-Methylnaphthalene	ND	0.41	ND	0.42	mg/kg	0.7	NA
Phenanthrene	ND	0.41	ND	0.42	mg/kg	10	NA
Acenaphthene	ND	0.41	ND	0.42	mg/kg	4	NA
Acenaphthylene	ND	0.41	ND	0.42	mg/kg	1	NA
Fluorene	ND	0.41	ND	0.42	mg/kg	1000	NA
Anthracene	ND	0.41	ND	0.42	mg/kg	1000	NA
Fluoranthene	ND	0.41	ND	0.42	mg/kg	1000	NA
Pyrene	ND	0.41	ND	0.42	mg/kg	1000	NA
Benzo(a)anthracene	ND	0.41	ND	0.42	mg/kg	7	NA
Chrysene	ND	0.41	ND	0.42	mg/kg	70	NA
Benzo(b)fluoranthene	ND	0.41	ND	0.42	mg/kg	7	NA
Benzo(k)fluoranthene	ND	0.41	ND	0.42	mg/kg	70	NA
Benzo(a)pyrene	ND	0.41	ND	0.42	mg/kg	2	NA
Indeno(1,2,3-cd)pyrene	ND	0.41	ND	0.42	mg/kg	7	NA
Dibenz(a,h)anthracene	ND	0.41	ND	0.42	mg/kg	0.7	NA
Benzo(g,h,i)perylene	ND	0.41	ND	0.42	mg/kg	1000	NA
C9-C18 Aliphatic Hydrocarbons	ND	16.4	ND	16.9	mg/kg	1000	NA
C19-C36 Aliphatic Hydrocarbons	ND	16.4	ND	16.9	mg/kg	3000	NA
C11-C22 Aromatic Hydrocarbons	ND	8.21	ND	8.46	mg/kg	1000	NA
General Chemistry							
Total Organic Carbon	10	0	8	0	Percent	NA	NA
Solids, Percent	80.7	0.05	78.3	0.05	Percent	NA	NA
Pesticides							
alpha-BHC	ND	1.98	ND	2.07	ug/kg	NA	NA
gamma-BHC (Lindane)	ND	1.98	ND	2.07	ug/kg	3	2.4
beta-BHC	ND	1.98	ND	2.07	ug/kg	NA	NA
delta-BHC	ND	1.98	ND	2.07	ug/kg	NA	NA
Heptachlor	ND	1.98	ND	2.07	ug/kg	300	NA
Aldrin	ND	1.98	ND	2.07	ug/kg	80	NA
Heptachlor epoxide	ND	1.98	ND	2.07	ug/kg	100	2.5
gamma-Chlordane	ND	1.98	ND	2.07	ug/kg	see Chlordane	NA
alpha-Chlordane	ND	1.98	ND	2.07	ug/kg	see Chlordane	NA
Chlordane	ND	19.8	ND	20.7	ug/kg	5000	3.2
4,4'-DDE	ND	3.95	ND	4.12	ug/kg	6000	3.2
Endosulfan I	ND	1.98	ND	2.07	ug/kg	NA	NA
Dieldrin	ND	1.98	ND	2.07	ug/kg	80	1.9
Endrin	ND	1.98	ND	2.07	ug/kg	10000	2.2
4,4'-DDD	ND	3.95	ND	4.12	ug/kg	8000	4.9
Endosulfan II	ND	1.98	ND	2.07	ug/kg	NA	NA
Endrin aldehyde	ND	1.98	ND	2.07	ug/kg	NA	NA
4,4'-DDT	ND	3.95	ND	4.12	ug/kg	6000	4.2
Methoxychlor	ND	3.95	ND	4.12	ug/kg	200000	NA
Endosulfan sulfate	ND	1.98	ND	2.07	ug/kg	NA	NA
Endrin Ketone	ND	1.98	ND	2.07	ug/kg	NA	NA
Toxaphene	ND	19.8	ND	20.7	ug/kg	NA	NA
Polychlorinated Biphenyls (PCBs)							
2,4'-Dichlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,2',5-Trichlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,4,4'-Trichlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,2',3,5'-Tetrachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,2',5,5'-Tetrachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,3',4,4'-Tetrachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
3,3',4,4'-Tetrachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
3,4,4',5-Tetrachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,2',4,5,5'-Pentachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,3,3',4,4'-Pentachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,3,4,4',5-Pentachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,3',4,4',5-Pentachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2',3,4,4',5-Pentachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
3,3',4,4',5-Pentachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,2',3,3',4,4'-Hexachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,2',3,4,4',5'-Hexachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,2',4,4',5,5'-Hexachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,3,3',4,4',5-Hexachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,3,3',4,4',5'-Hexachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,3,4',4,5',5-Hexachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
3,3',4,4',5,5'-Hexachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,2',3,3',4,4',5-Heptachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,2',3,4,4',5,5'-Heptachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,2',3,4',5,5',6-Heptachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,3,3',4,4',5,5'-Heptachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,2',3,3',4,4',5,6-Octachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
Decachlorobiphenyl	ND	3	ND	3	ug/kg	NA	NA
Total PCBs	ND	varies	ND	varies	ug/kg	NA	60

Table 1 - Summary of Sediment Analytical Results
Mill Pond Dam Reconstruction Project
Wareham MA
Pare Project No. 22174.02

Sample ID:	SED-1		SED-2				
Date Sampled:	7/7/2023		7/7/2023				
Parameter	Sample Result	Reporting Limit	Sample Result	Reporting Limit	Units	MCP Method 1 S-1 & GW-1 Standard	MassDEP Stage I Sediment Screening Values
Semivolatile organic compounds							
1,2,4-Trichlorobenzene	ND	160	ND	165	ug/kg	2000	NA
1,2-Dichlorobenzene	ND	160	ND	165	ug/kg	9000	NA
1,3-Dichlorobenzene	ND	160	ND	165	ug/kg	3000	NA
1,4-Dichlorobenzene	ND	160	ND	165	ug/kg	700	NA
Phenol	ND	160	ND	165	ug/kg	1000	NA
2,4,5-Trichlorophenol	ND	160	ND	165	ug/kg	4000	NA
2,4,6-Trichlorophenol	ND	160	ND	165	ug/kg	700	NA
2,4-Dichlorophenol	ND	160	ND	165	ug/kg	700	NA
2,4-Dimethylphenol	ND	406	ND	419	ug/kg	700	NA
2,4-Dinitrophenol	ND	406	ND	419	ug/kg	3000	NA
2,4-Dinitrotoluene	ND	160	ND	165	ug/kg	700	NA
2,6-Dinitrotoluene	ND	160	ND	165	ug/kg	NA	NA
2-Chloronaphthalene	ND	160	ND	165	ug/kg	NA	NA
2-Chlorophenol	ND	160	ND	165	ug/kg	700	NA
2-Methylnaphthalene	ND	160	ND	165	ug/kg	700	NA
Nitrobenzene	ND	160	ND	165	ug/kg	NA	NA
2-Methylphenol	ND	160	ND	165	ug/kg	NA	NA
2-Nitroaniline	ND	160	ND	165	ug/kg	NA	NA
2-Nitrophenol	ND	406	ND	419	ug/kg	NA	NA
3,3'-Dichlorobenzidine	ND	406	ND	419	ug/kg	3000	NA
3-Nitroaniline	ND	160	ND	165	ug/kg	NA	NA
4,6-Dinitro-2-methylphenol	ND	406	ND	419	ug/kg	NA	NA
4-Bromophenyl phenyl ether	ND	160	ND	165	ug/kg	NA	NA
4-Chloro-3-methylphenol	ND	160	ND	165	ug/kg	NA	NA
4-Chloroaniline	ND	160	ND	165	ug/kg	1000	NA
4-Chlorophenyl phenyl ether	ND	160	ND	165	ug/kg	NA	NA
4-Nitroaniline	ND	160	ND	165	ug/kg	NA	NA
4-Nitrophenol	ND	406	ND	419	ug/kg	NA	NA
Acenaphthene	ND	160	ND	165	ug/kg	4000	NA
Acenaphthylene	ND	160	ND	165	ug/kg	1000	NA
Aniline	ND	160	ND	165	ug/kg	NA	NA
Anthracene	ND	160	ND	165	ug/kg	1000000	57
Benzo(a)anthracene	ND	160	ND	165	ug/kg	7000	110
Benzo(a)pyrene	ND	160	ND	165	ug/kg	2000	150
Benzo(b)fluoranthene	ND	160	ND	165	ug/kg	7000	27.3
Benzo(g,h,i)perylene	ND	160	ND	165	ug/kg	1000000	NA
Benzo(k)fluoranthene	ND	160	ND	165	ug/kg	70000	NA
Benzoic acid	ND	1230	ND	1270	ug/kg	NA	NA
Biphenyl	ND	49	ND	*51*	ug/kg	50	NA
Bis(2-chloroethoxy)methane	ND	160	ND	165	ug/kg	NA	NA
Bis(2-chloroethyl)ether	ND	160	ND	165	ug/kg	700	NA
Bis(2-chloroisopropyl)ether	ND	160	ND	165	ug/kg	700	NA
Bis(2-ethylhexyl)phthalate	ND	493	ND	507	ug/kg	90000	NA
Butyl benzyl phthalate	ND	160	ND	165	ug/kg	NA	NA
Chrysene	ND	160	ND	165	ug/kg	70000	170
Di-n-octyl phthalate	ND	246	ND	254	ug/kg	NA	NA
Dibenz(a,h)anthracene	ND	160	ND	165	ug/kg	700	33
Dibenzofuran	ND	160	ND	165	ug/kg	NA	NA
Diethyl phthalate	ND	160	ND	165	ug/kg	10000	NA
Dimethyl phthalate	ND	406	ND	419	ug/kg	700	NA
Di-n-butyl phthalate	ND	246	ND	254	ug/kg	NA	NA
Fluoranthene	ND	160	ND	165	ug/kg	1000000	420
Fluorene	ND	160	ND	165	ug/kg	1000000	77
Hexachlorobenzene	ND	160	ND	165	ug/kg	700	NA
Hexachlorobutadiene	ND	160	ND	165	ug/kg	30000	NA
Hexachlorocyclopentadiene	ND	406	ND	419	ug/kg	NA	NA
Hexachloroethane	ND	160	ND	165	ug/kg	700	NA
Indeno(1,2,3-cd)pyrene	ND	160	ND	165	ug/kg	7000	NA
Isophorone	ND	160	ND	165	ug/kg	NA	NA
Naphthalene	ND	160	ND	165	ug/kg	4000	180
N-Nitrosodimethylamine	ND	160	ND	165	ug/kg	NA	NA
N-Nitrosodi-n-propylamine	ND	160	ND	165	ug/kg	NA	NA
N-Nitrosodiphenylamine	ND	160	ND	165	ug/kg	NA	NA
Pentachlorophenol	ND	406	ND	419	ug/kg	3000	NA
Phenanthrene	ND	160	ND	165	ug/kg	10000	200
Pyrene	ND	160	ND	165	ug/kg	1000000	200
m&p-Cresol	ND	320	ND	330	ug/kg	NA	NA
Pyridine	ND	160	ND	165	ug/kg	NA	NA
Azobenzene	ND	160	ND	165	ug/kg	NA	NA
Total Dichlorobenzene	ND	160	ND	165	ug/kg	NA	NA
Total Metals							
Arsenic	8.38	1.38	**28.6**	1.39	mg/kg	**20**	33
Cadmium	ND	0.69	ND	0.7	mg/kg	70	5
Chromium	41.3	0.69	72.3	0.7	mg/kg	100	110
Copper	16.3	2.77	ND	2.78	mg/kg	NA	150
Lead	86.3	0.69	38.8	0.7	mg/kg	200	130
Nickel	10.5	0.69	3.36	0.7	mg/kg	600	49
Zinc	42.2	2.8	32.9	2.8	mg/kg	1000	460
Mercury	ND	0.15	ND	0.157	mg/kg	20	0.18

Table 1 - Summary of Sediment Analytical Results
Mill Pond Dam Reconstruction Project
Wareham MA
Pare Project No. 22174.02

Sample ID:	SED-1		SED-2				
Date Sampled:	7/7/2023		7/7/2023				
Parameter	Sample Result	Reporting Limit	Sample Result	Reporting Limit	Units	MCP Method 1 S-1 & GW-1 Standard	MassDEP Stage I Sediment Screening Values
Volatile Organic Compounds 8260C (5035-LL)							
Acetone	109	36	ND	36	ug/kg	6000	NA
Benzene	ND	5	ND	5	ug/kg	2000	NA
Bromobenzene	ND	5	ND	5	ug/kg	NA	NA
Bromochloromethane	ND	5	ND	5	ug/kg	NA	NA
Bromodichloromethane	ND	5	ND	5	ug/kg	100	NA
Bromoform	ND	5	ND	5	ug/kg	100	NA
Bromomethane	ND	5	ND	5	ug/kg	500	NA
2-Butanone	ND	21	ND	20	ug/kg	4000	NA
tert-Butyl alcohol	ND	5	ND	5	ug/kg	NA	NA
sec-Butylbenzene	ND	5	ND	5	ug/kg	NA	NA
n-Butylbenzene	ND	5	ND	5	ug/kg	NA	NA
tert-Butylbenzene	ND	5	ND	5	ug/kg	NA	NA
Methyl t-butyl ether (MTBE)	ND	5	ND	5	ug/kg	100	NA
Carbon Disulfide	ND	5	ND	5	ug/kg	NA	NA
Carbon Tetrachloride	ND	5	ND	5	ug/kg	10000	NA
Chlorobenzene	ND	5	ND	5	ug/kg	1000	NA
Chloroethane	ND	5	ND	5	ug/kg	NA	NA
Chloroform	ND	5	ND	5	ug/kg	400	NA
Chloromethane	ND	5	ND	5	ug/kg	NA	NA
4-Chlorotoluene	ND	5	ND	5	ug/kg	NA	NA
2-Chlorotoluene	ND	5	ND	5	ug/kg	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	ND	5	ND	5	ug/kg	NA	NA
Dibromochloromethane	ND	5	ND	5	ug/kg	5	NA
1,2-Dibromoethane (EDB)	ND	5	ND	5	ug/kg	100	NA
Dibromomethane	ND	5	ND	5	ug/kg	NA	NA
1,2-Dichlorobenzene	ND	5	ND	5	ug/kg	9000	NA
1,3-Dichlorobenzene	ND	5	ND	5	ug/kg	3000	NA
1,4-Dichlorobenzene	ND	5	ND	5	ug/kg	700	NA
1,1-Dichloroethane	ND	5	ND	5	ug/kg	400	NA
1,2-Dichloroethane	ND	5	ND	5	ug/kg	100	NA
trans-1,2-Dichloroethene	ND	5	ND	5	ug/kg	1000	NA
cis-1,2-Dichloroethene	ND	5	ND	5	ug/kg	300	NA
1,1-Dichloroethene	ND	5	ND	5	ug/kg	3000	NA
1,2-Dichloropropane	ND	5	ND	5	ug/kg	100	NA
2,2-Dichloropropane	ND	5	ND	5	ug/kg	NA	NA
cis-1,3-Dichloropropene	ND	5	ND	5	ug/kg	see 1,3-Dichloropropene (cis + trans	NA
trans-1,3-Dichloropropene	ND	5	ND	5	ug/kg	see 1,3-Dichloropropene (cis + trans	NA
1,1-Dichloropropene	ND	5	ND	5	ug/kg	NA	NA
1,3-Dichloropropene (cis + trans)	ND	5	ND	5	ug/kg	10	NA
Diethyl ether	ND	5	ND	5	ug/kg	NA	NA
1,4-Dioxane	ND	104	ND	102	ug/kg	200	NA
Ethylbenzene	ND	5	ND	5	ug/kg	40000	NA
Hexachlorobutadiene	ND	5	ND	5	ug/kg	30000	NA
2-Hexanone	ND	21	ND	20	ug/kg	NA	NA
Isopropylbenzene	ND	5	ND	5	ug/kg	NA	NA
p-Isopropyltoluene	ND	5	ND	5	ug/kg	NA	NA
Methylene Chloride	ND	26	ND	26	ug/kg	100	NA
4-Methyl-2-pentanone	ND	5	ND	5	ug/kg	400	NA
Naphthalene	ND	5	ND	5	ug/kg	4000	NA
n-Propylbenzene	ND	5	ND	5	ug/kg	NA	NA
Styrene	ND	5	ND	5	ug/kg	3000	NA
1,1,1,2-Tetrachloroethane	ND	5	ND	5	ug/kg	100	NA
Tetrachloroethene	ND	5	ND	5	ug/kg	1000	NA
Tetrahydrofuran	ND	5	ND	5	ug/kg	NA	NA
Toluene	ND	5	ND	5	ug/kg	30000	NA
1,2,4-Trichlorobenzene	ND	5	ND	5	ug/kg	2000	NA
1,2,3-Trichlorobenzene	ND	5	ND	5	ug/kg	NA	NA
1,1,2-Trichloroethane	ND	5	ND	5	ug/kg	100	NA
1,1,1-Trichloroethane	ND	5	ND	5	ug/kg	30000	NA
Trichloroethene	ND	5	ND	5	ug/kg	300	NA
1,2,3-Trichloropropane	ND	5	ND	5	ug/kg	NA	NA
1,3,5-Trimethylbenzene	ND	5	ND	5	ug/kg	NA	NA
1,2,4-Trimethylbenzene	ND	5	ND	5	ug/kg	NA	NA
Vinyl Chloride	ND	5	ND	5	ug/kg	900	NA
o-Xylene	ND	5	ND	5	ug/kg	see Total xylenes	NA
m&p-Xylene	ND	10	ND	10	ug/kg	see Total xylenes	NA
Total xylenes	ND	5	ND	5	ug/kg	400000	NA
1,1,2,2-Tetrachloroethane	ND	5	ND	5	ug/kg	5	NA
tert-Amyl methyl ether	ND	5	ND	5	ug/kg	NA	NA
1,3-Dichloropropane	ND	5	ND	5	ug/kg	NA	NA
Ethyl tert-butyl ether	ND	5	ND	5	ug/kg	NA	NA
Diisopropyl ether	ND	5	ND	5	ug/kg	NA	NA
Trichlorofluoromethane	ND	5	ND	5	ug/kg	NA	NA
Dichlorodifluoromethane	ND	5	ND	5	ug/kg	NA	NA

Notes:
1. values in **BOLD** exceed one or more of the applicable standard(s)
2. ND - Non Detect
3. NT - Not Tested
4. NA - No applicable standard

ATTACHMENT C
LABORATORTY ANALYTICAL REPORT

New England Testing Laboratory, Inc.
(401) 353-3420

REPORT OF ANALYTICAL RESULTS

NETLAB Work Order Number: 3G07009
Client Project: 22147.02 - Mill Pond Dam Wareham

Report Date: 20-July-2023

Prepared for:

Al Hanscom
Pare Corporation
8 Blackstone Valley Place
Lincoln, RI 02865

Richard Warila, Laboratory Director
New England Testing Laboratory, Inc.
59 Greenhill Street
West Warwick, RI 02893
rich.warila@newenglandtesting.com

NETLAB Case Number: 3G07009

Samples Submitted :

The samples listed below were submitted to New England Testing Laboratory on 07/07/23. The group of samples appearing in this report was assigned an internal identification number (case number) for laboratory information management purposes. The client's designations for the individual samples, along with our case numbers, are used to identify the samples in this report. This report of analytical results pertains only to the sample(s) provided to us by the client which are indicated on the custody record. The case number for this sample submission is 3G07009. Custody records are included in this report.

Lab ID	Sample	Matrix	Date Sampled	Date Received
3G07009-01	SED-1	Soil	07/07/2023	07/07/2023
3G07009-02	SED-2	Soil	07/07/2023	07/07/2023

NETLAB Case Number: 3G07009

Request for Analysis

At the client's request, the analyses presented in the following table were performed on the samples submitted.

SED-1 (Lab Number: 3G07009-01)

Analysis	Method
Arsenic	EPA 6010C
Cadmium	EPA 6010C
Chromium	EPA 6010C
Copper	EPA 6010C
Lead	EPA 6010C
MADEP EPH	MADEP EPH
Mercury	EPA 7471B
Nickel	EPA 6010C
PCBs (Congener Specific)	EPA 8082A
Percent Total Solids	Gravimetric
Pesticides	EPA 8081B
Semivolatile Organic Compounds	EPA 8270D
Sieve/particle size analysis	By Subcontract
Total Organic Carbon	EPA 9060
Volatile Organic Compounds	EPA 8260C
Zinc	EPA 6010C

SED-2 (Lab Number: 3G07009-02)

Analysis	Method
Arsenic	EPA 6010C
Cadmium	EPA 6010C
Chromium	EPA 6010C
Copper	EPA 6010C
Lead	EPA 6010C
MADEP EPH	MADEP EPH
Mercury	EPA 7471B
Nickel	EPA 6010C
PCBs (Congener Specific)	EPA 8082A
Percent Total Solids	Gravimetric
Pesticides	EPA 8081B
Semivolatile Organic Compounds	EPA 8270D
Sieve/particle size analysis	By Subcontract
Total Organic Carbon	EPA 9060
Volatile Organic Compounds	EPA 8260C
Zinc	EPA 6010C

Method References

Method for the Determination of Extractable Petroleum Hydrocarbons, Rev. 2.1, Massachusetts Department of Environmental Protection, 2004

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, USEPA

NETLAB Case Number: 3G07009

Case Narrative

Sample Receipt:

The samples associated with this work order were received in appropriately cooled and preserved containers. The chain of custody was adequately completed and corresponded to the samples submitted.

Exceptions: None

Analysis:

All samples were prepared and analyzed within method specified holding times and according to NETLAB's documented standard operating procedures. The results for the associated calibration, method blank and laboratory control sample (LCS) were within method specified quality control requirements and allowances. Results for all soil samples, unless otherwise indicated, are reported on a dry weight basis.

Exceptions:

8270: The sample "Sed-2" has one surrogate outside quailty control limits due to matrix interference.

NETLAB Case Number: 3G07009

Results: General Chemistry

Sample: SED-1

Lab Number: 3G07009-01 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Solids, Percent	**80.7**		0.05	Percent	07/07/23	07/08/23
Total Organic Carbon	**10**		0	Percent	07/10/23	07/10/23

NETLAB Case Number: 3G07009

Results: General Chemistry

Sample: SED-2

Lab Number: 3G07009-02 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Solids, Percent	**78.3**		0.05	Percent	07/07/23	07/08/23
Total Organic Carbon	**8**		0	Percent	07/10/23	07/10/23

NETLAB Case Number: 3G07009

Results: Total Metals

Sample: SED-1

Lab Number: 3G07009-01 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Arsenic	**8.38**		1.38	mg/kg	07/10/23	07/13/23
Cadmium	ND		0.69	mg/kg	07/10/23	07/13/23
Chromium	**41.3**		0.69	mg/kg	07/10/23	07/13/23
Copper	**16.3**		2.77	mg/kg	07/10/23	07/13/23
Lead	**86.3**		0.69	mg/kg	07/10/23	07/13/23
Mercury	ND		0.150	mg/kg	07/07/23	07/07/23
Nickel	**10.5**		0.69	mg/kg	07/10/23	07/13/23
Zinc	**42.2**		2.8	mg/kg	07/10/23	07/13/23

NETLAB Case Number: 3G07009

Results: Total Metals

Sample: SED-2

Lab Number: 3G07009-02 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Arsenic	**28.6**		1.39	mg/kg	07/10/23	07/13/23
Cadmium	ND		0.70	mg/kg	07/10/23	07/13/23
Chromium	**72.3**		0.70	mg/kg	07/10/23	07/13/23
Copper	ND		2.78	mg/kg	07/10/23	07/13/23
Lead	**38.8**		0.70	mg/kg	07/10/23	07/13/23
Mercury	ND		0.157	mg/kg	07/07/23	07/07/23
Nickel	**3.36**		0.70	mg/kg	07/10/23	07/13/23
Zinc	**32.9**		2.8	mg/kg	07/10/23	07/13/23

NETLAB Case Number: 3G07009

Results: Volatile Organic Compounds 8260C (5035-LL)

Sample: SED-1

Lab Number: 3G07009-01 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Acetone	**109**		36	ug/kg	07/07/23	07/07/23
Benzene	ND		5	ug/kg	07/07/23	07/07/23
Bromobenzene	ND		5	ug/kg	07/07/23	07/07/23
Bromochloromethane	ND		5	ug/kg	07/07/23	07/07/23
Bromodichloromethane	ND		5	ug/kg	07/07/23	07/07/23
Bromoform	ND		5	ug/kg	07/07/23	07/07/23
Bromomethane	ND		5	ug/kg	07/07/23	07/07/23
2-Butanone	ND		21	ug/kg	07/07/23	07/07/23
tert-Butyl alcohol	ND		5	ug/kg	07/07/23	07/07/23
sec-Butylbenzene	ND		5	ug/kg	07/07/23	07/07/23
n-Butylbenzene	ND		5	ug/kg	07/07/23	07/07/23
tert-Butylbenzene	ND		5	ug/kg	07/07/23	07/07/23
Methyl t-butyl ether (MTBE)	ND		5	ug/kg	07/07/23	07/07/23
Carbon Disulfide	ND		5	ug/kg	07/07/23	07/07/23
Carbon Tetrachloride	ND		5	ug/kg	07/07/23	07/07/23
Chlorobenzene	ND		5	ug/kg	07/07/23	07/07/23
Chloroethane	ND		5	ug/kg	07/07/23	07/07/23
Chloroform	ND		5	ug/kg	07/07/23	07/07/23
Chloromethane	ND		5	ug/kg	07/07/23	07/07/23
4-Chlorotoluene	ND		5	ug/kg	07/07/23	07/07/23
2-Chlorotoluene	ND		5	ug/kg	07/07/23	07/07/23
1,2-Dibromo-3-chloropropane (DBCP)	ND		5	ug/kg	07/07/23	07/07/23
Dibromochloromethane	ND		5	ug/kg	07/07/23	07/07/23
1,2-Dibromoethane (EDB)	ND		5	ug/kg	07/07/23	07/07/23
Dibromomethane	ND		5	ug/kg	07/07/23	07/07/23
1,2-Dichlorobenzene	ND		5	ug/kg	07/07/23	07/07/23
1,3-Dichlorobenzene	ND		5	ug/kg	07/07/23	07/07/23
1,4-Dichlorobenzene	ND		5	ug/kg	07/07/23	07/07/23
1,1-Dichloroethane	ND		5	ug/kg	07/07/23	07/07/23
1,2-Dichloroethane	ND		5	ug/kg	07/07/23	07/07/23
trans-1,2-Dichloroethene	ND		5	ug/kg	07/07/23	07/07/23
cis-1,2-Dichloroethene	ND		5	ug/kg	07/07/23	07/07/23
1,1-Dichloroethene	ND		5	ug/kg	07/07/23	07/07/23
1,2-Dichloropropane	ND		5	ug/kg	07/07/23	07/07/23
2,2-Dichloropropane	ND		5	ug/kg	07/07/23	07/07/23
cis-1,3-Dichloropropene	ND		5	ug/kg	07/07/23	07/07/23
trans-1,3-Dichloropropene	ND		5	ug/kg	07/07/23	07/07/23
1,1-Dichloropropene	ND		5	ug/kg	07/07/23	07/07/23
1,3-Dichloropropene (cis + trans)	ND		5	ug/kg	07/07/23	07/07/23
Diethyl ether	ND		5	ug/kg	07/07/23	07/07/23
1,4-Dioxane	ND		104	ug/kg	07/07/23	07/07/23
Ethylbenzene	ND		5	ug/kg	07/07/23	07/07/23
Hexachlorobutadiene	ND		5	ug/kg	07/07/23	07/07/23
2-Hexanone	ND		21	ug/kg	07/07/23	07/07/23
Isopropylbenzene	ND		5	ug/kg	07/07/23	07/07/23
p-Isopropyltoluene	ND		5	ug/kg	07/07/23	07/07/23
Methylene Chloride	ND		26	ug/kg	07/07/23	07/07/23
4-Methyl-2-pentanone	ND		5	ug/kg	07/07/23	07/07/23

Results: Volatile Organic Compounds 8260C (5035-LL) (Continued)

Sample: SED-1 (Continued)

Lab Number: 3G07009-01 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Naphthalene	ND		5	ug/kg	07/07/23	07/07/23
n-Propylbenzene	ND		5	ug/kg	07/07/23	07/07/23
Styrene	ND		5	ug/kg	07/07/23	07/07/23
1,1,1,2-Tetrachloroethane	ND		5	ug/kg	07/07/23	07/07/23
Tetrachloroethene	ND		5	ug/kg	07/07/23	07/07/23
Tetrahydrofuran	ND		5	ug/kg	07/07/23	07/07/23
Toluene	ND		5	ug/kg	07/07/23	07/07/23
1,2,4-Trichlorobenzene	ND		5	ug/kg	07/07/23	07/07/23
1,2,3-Trichlorobenzene	ND		5	ug/kg	07/07/23	07/07/23
1,1,2-Trichloroethane	ND		5	ug/kg	07/07/23	07/07/23
1,1,1-Trichloroethane	ND		5	ug/kg	07/07/23	07/07/23
Trichloroethene	ND		5	ug/kg	07/07/23	07/07/23
1,2,3-Trichloropropane	ND		5	ug/kg	07/07/23	07/07/23
1,3,5-Trimethylbenzene	ND		5	ug/kg	07/07/23	07/07/23
1,2,4-Trimethylbenzene	ND		5	ug/kg	07/07/23	07/07/23
Vinyl Chloride	ND		5	ug/kg	07/07/23	07/07/23
o-Xylene	ND		5	ug/kg	07/07/23	07/07/23
m&p-Xylene	ND		10	ug/kg	07/07/23	07/07/23
Total xylenes	ND		5	ug/kg	07/07/23	07/07/23
1,1,2,2-Tetrachloroethane	ND		5	ug/kg	07/07/23	07/07/23
tert-Amyl methyl ether	ND		5	ug/kg	07/07/23	07/07/23
1,3-Dichloropropane	ND		5	ug/kg	07/07/23	07/07/23
Ethyl tert-butyl ether	ND		5	ug/kg	07/07/23	07/07/23
Diisopropyl ether	ND		5	ug/kg	07/07/23	07/07/23
Trichlorofluoromethane	ND		5	ug/kg	07/07/23	07/07/23
Dichlorodifluoromethane	ND		5	ug/kg	07/07/23	07/07/23

Surrogate(s)	Recovery%	Limits		
4-Bromofluorobenzene	*94.5%*	*70-130*	07/07/23	07/07/23
1,2-Dichloroethane-d4	*121%*	*70-130*	07/07/23	07/07/23
Toluene-d8	*93.9%*	*70-130*	07/07/23	07/07/23

NETLAB Case Number: 3G07009

Results: Volatile Organic Compounds 8260C (5035-LL)

Sample: SED-2

Lab Number: 3G07009-02 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Acetone	ND		36	ug/kg	07/07/23	07/07/23
Benzene	ND		5	ug/kg	07/07/23	07/07/23
Bromobenzene	ND		5	ug/kg	07/07/23	07/07/23
Bromochloromethane	ND		5	ug/kg	07/07/23	07/07/23
Bromodichloromethane	ND		5	ug/kg	07/07/23	07/07/23
Bromoform	ND		5	ug/kg	07/07/23	07/07/23
Bromomethane	ND		5	ug/kg	07/07/23	07/07/23
2-Butanone	ND		20	ug/kg	07/07/23	07/07/23
tert-Butyl alcohol	ND		5	ug/kg	07/07/23	07/07/23
sec-Butylbenzene	ND		5	ug/kg	07/07/23	07/07/23
n-Butylbenzene	ND		5	ug/kg	07/07/23	07/07/23
tert-Butylbenzene	ND		5	ug/kg	07/07/23	07/07/23
Methyl t-butyl ether (MTBE)	ND		5	ug/kg	07/07/23	07/07/23
Carbon Disulfide	ND		5	ug/kg	07/07/23	07/07/23
Carbon Tetrachloride	ND		5	ug/kg	07/07/23	07/07/23
Chlorobenzene	ND		5	ug/kg	07/07/23	07/07/23
Chloroethane	ND		5	ug/kg	07/07/23	07/07/23
Chloroform	ND		5	ug/kg	07/07/23	07/07/23
Chloromethane	ND		5	ug/kg	07/07/23	07/07/23
4-Chlorotoluene	ND		5	ug/kg	07/07/23	07/07/23
2-Chlorotoluene	ND		5	ug/kg	07/07/23	07/07/23
1,2-Dibromo-3-chloropropane (DBCP)	ND		5	ug/kg	07/07/23	07/07/23
Dibromochloromethane	ND		5	ug/kg	07/07/23	07/07/23
1,2-Dibromoethane (EDB)	ND		5	ug/kg	07/07/23	07/07/23
Dibromomethane	ND		5	ug/kg	07/07/23	07/07/23
1,2-Dichlorobenzene	ND		5	ug/kg	07/07/23	07/07/23
1,3-Dichlorobenzene	ND		5	ug/kg	07/07/23	07/07/23
1,4-Dichlorobenzene	ND		5	ug/kg	07/07/23	07/07/23
1,1-Dichloroethane	ND		5	ug/kg	07/07/23	07/07/23
1,2-Dichloroethane	ND		5	ug/kg	07/07/23	07/07/23
trans-1,2-Dichloroethene	ND		5	ug/kg	07/07/23	07/07/23
cis-1,2-Dichloroethene	ND		5	ug/kg	07/07/23	07/07/23
1,1-Dichloroethene	ND		5	ug/kg	07/07/23	07/07/23
1,2-Dichloropropane	ND		5	ug/kg	07/07/23	07/07/23
2,2-Dichloropropane	ND		5	ug/kg	07/07/23	07/07/23
cis-1,3-Dichloropropene	ND		5	ug/kg	07/07/23	07/07/23
trans-1,3-Dichloropropene	ND		5	ug/kg	07/07/23	07/07/23
1,1-Dichloropropene	ND		5	ug/kg	07/07/23	07/07/23
1,3-Dichloropropene (cis + trans)	ND		5	ug/kg	07/07/23	07/07/23
Diethyl ether	ND		5	ug/kg	07/07/23	07/07/23
1,4-Dioxane	ND		102	ug/kg	07/07/23	07/07/23
Ethylbenzene	ND		5	ug/kg	07/07/23	07/07/23
Hexachlorobutadiene	ND		5	ug/kg	07/07/23	07/07/23
2-Hexanone	ND		20	ug/kg	07/07/23	07/07/23
Isopropylbenzene	ND		5	ug/kg	07/07/23	07/07/23
p-Isopropyltoluene	ND		5	ug/kg	07/07/23	07/07/23
Methylene Chloride	ND		26	ug/kg	07/07/23	07/07/23
4-Methyl-2-pentanone	ND		5	ug/kg	07/07/23	07/07/23

Results: Volatile Organic Compounds 8260C (5035-LL) (Continued)

Sample: SED-2 (Continued)

Lab Number: 3G07009-02 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Naphthalene	ND		5	ug/kg	07/07/23	07/07/23
n-Propylbenzene	ND		5	ug/kg	07/07/23	07/07/23
Styrene	ND		5	ug/kg	07/07/23	07/07/23
1,1,1,2-Tetrachloroethane	ND		5	ug/kg	07/07/23	07/07/23
Tetrachloroethene	ND		5	ug/kg	07/07/23	07/07/23
Tetrahydrofuran	ND		5	ug/kg	07/07/23	07/07/23
Toluene	ND		5	ug/kg	07/07/23	07/07/23
1,2,4-Trichlorobenzene	ND		5	ug/kg	07/07/23	07/07/23
1,2,3-Trichlorobenzene	ND		5	ug/kg	07/07/23	07/07/23
1,1,2-Trichloroethane	ND		5	ug/kg	07/07/23	07/07/23
1,1,1-Trichloroethane	ND		5	ug/kg	07/07/23	07/07/23
Trichloroethene	ND		5	ug/kg	07/07/23	07/07/23
1,2,3-Trichloropropane	ND		5	ug/kg	07/07/23	07/07/23
1,3,5-Trimethylbenzene	ND		5	ug/kg	07/07/23	07/07/23
1,2,4-Trimethylbenzene	ND		5	ug/kg	07/07/23	07/07/23
Vinyl Chloride	ND		5	ug/kg	07/07/23	07/07/23
o-Xylene	ND		5	ug/kg	07/07/23	07/07/23
m&p-Xylene	ND		10	ug/kg	07/07/23	07/07/23
Total xylenes	ND		5	ug/kg	07/07/23	07/07/23
1,1,2,2-Tetrachloroethane	ND		5	ug/kg	07/07/23	07/07/23
tert-Amyl methyl ether	ND		5	ug/kg	07/07/23	07/07/23
1,3-Dichloropropane	ND		5	ug/kg	07/07/23	07/07/23
Ethyl tert-butyl ether	ND		5	ug/kg	07/07/23	07/07/23
Diisopropyl ether	ND		5	ug/kg	07/07/23	07/07/23
Trichlorofluoromethane	ND		5	ug/kg	07/07/23	07/07/23
Dichlorodifluoromethane	ND		5	ug/kg	07/07/23	07/07/23

Surrogate(s)	Recovery%	Limits		
4-Bromofluorobenzene	*96.7%*	*70-130*	07/07/23	07/07/23
1,2-Dichloroethane-d4	*107%*	*70-130*	07/07/23	07/07/23
Toluene-d8	*96.6%*	*70-130*	07/07/23	07/07/23

Results: Semivolatile organic compounds

Sample: SED-1

Lab Number: 3G07009-01 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
1,2,4-Trichlorobenzene	ND		160	ug/kg	07/07/23	07/10/23
1,2-Dichlorobenzene	ND		160	ug/kg	07/07/23	07/10/23
1,3-Dichlorobenzene	ND		160	ug/kg	07/07/23	07/10/23
1,4-Dichlorobenzene	ND		160	ug/kg	07/07/23	07/10/23
Phenol	ND		160	ug/kg	07/07/23	07/10/23
2,4,5-Trichlorophenol	ND		160	ug/kg	07/07/23	07/10/23
2,4,6-Trichlorophenol	ND		160	ug/kg	07/07/23	07/10/23
2,4-Dichlorophenol	ND		160	ug/kg	07/07/23	07/10/23
2,4-Dimethylphenol	ND		406	ug/kg	07/07/23	07/10/23
2,4-Dinitrophenol	ND		406	ug/kg	07/07/23	07/10/23
2,4-Dinitrotoluene	ND		160	ug/kg	07/07/23	07/10/23
2,6-Dinitrotoluene	ND		160	ug/kg	07/07/23	07/10/23
2-Chloronaphthalene	ND		160	ug/kg	07/07/23	07/10/23
2-Chlorophenol	ND		160	ug/kg	07/07/23	07/10/23
2-Methylnaphthalene	ND		160	ug/kg	07/07/23	07/10/23
Nitrobenzene	ND		160	ug/kg	07/07/23	07/10/23
2-Methylphenol	ND		160	ug/kg	07/07/23	07/10/23
2-Nitroaniline	ND		160	ug/kg	07/07/23	07/10/23
2-Nitrophenol	ND		406	ug/kg	07/07/23	07/10/23
3,3'-Dichlorobenzidine	ND		406	ug/kg	07/07/23	07/10/23
3-Nitroaniline	ND		160	ug/kg	07/07/23	07/10/23
4,6-Dinitro-2-methylphenol	ND		406	ug/kg	07/07/23	07/10/23
4-Bromophenyl phenyl ether	ND		160	ug/kg	07/07/23	07/10/23
4-Chloro-3-methylphenol	ND		160	ug/kg	07/07/23	07/10/23
4-Chloroaniline	ND		160	ug/kg	07/07/23	07/10/23
4-Chlorophenyl phenyl ether	ND		160	ug/kg	07/07/23	07/10/23
4-Nitroaniline	ND		160	ug/kg	07/07/23	07/10/23
4-Nitrophenol	ND		406	ug/kg	07/07/23	07/10/23
Acenaphthene	ND		160	ug/kg	07/07/23	07/10/23
Acenaphthylene	ND		160	ug/kg	07/07/23	07/10/23
Aniline	ND		160	ug/kg	07/07/23	07/10/23
Anthracene	ND		160	ug/kg	07/07/23	07/10/23
Benzo(a)anthracene	ND		160	ug/kg	07/07/23	07/10/23
Benzo(a)pyrene	ND		160	ug/kg	07/07/23	07/10/23
Benzo(b)fluoranthene	ND		160	ug/kg	07/07/23	07/10/23
Benzo(g,h,i)perylene	ND		160	ug/kg	07/07/23	07/10/23
Benzo(k)fluoranthene	ND		160	ug/kg	07/07/23	07/10/23
Benzoic acid	ND		1230	ug/kg	07/07/23	07/10/23
Biphenyl	ND		49	ug/kg	07/07/23	07/10/23
Bis(2-chloroethoxy)methane	ND		160	ug/kg	07/07/23	07/10/23
Bis(2-chloroethyl)ether	ND		160	ug/kg	07/07/23	07/10/23
Bis(2-chloroisopropyl)ether	ND		160	ug/kg	07/07/23	07/10/23
Bis(2-ethylhexyl)phthalate	ND		493	ug/kg	07/07/23	07/10/23
Butyl benzyl phthalate	ND		160	ug/kg	07/07/23	07/10/23
Chrysene	ND		160	ug/kg	07/07/23	07/10/23
Di-n-octyl phthalate	ND		246	ug/kg	07/07/23	07/10/23
Dibenz(a,h)anthracene	ND		160	ug/kg	07/07/23	07/10/23
Dibenzofuran	ND		160	ug/kg	07/07/23	07/10/23

Results: Semivolatile organic compounds (Continued)

Sample: SED-1 (Continued)

Lab Number: 3G07009-01 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Diethyl phthalate	ND		160	ug/kg	07/07/23	07/10/23
Dimethyl phthalate	ND		406	ug/kg	07/07/23	07/10/23
Di-n-butyl phthalate	ND		246	ug/kg	07/07/23	07/10/23
Fluoranthene	ND		160	ug/kg	07/07/23	07/10/23
Fluorene	ND		160	ug/kg	07/07/23	07/10/23
Hexachlorobenzene	ND		160	ug/kg	07/07/23	07/10/23
Hexachlorobutadiene	ND		160	ug/kg	07/07/23	07/10/23
Hexachlorocyclopentadiene	ND		406	ug/kg	07/07/23	07/10/23
Hexachloroethane	ND		160	ug/kg	07/07/23	07/10/23
Indeno(1,2,3-cd)pyrene	ND		160	ug/kg	07/07/23	07/10/23
Isophorone	ND		160	ug/kg	07/07/23	07/10/23
Naphthalene	ND		160	ug/kg	07/07/23	07/10/23
N-Nitrosodimethylamine	ND		160	ug/kg	07/07/23	07/10/23
N-Nitrosodi-n-propylamine	ND		160	ug/kg	07/07/23	07/10/23
N-Nitrosodiphenylamine	ND		160	ug/kg	07/07/23	07/10/23
Pentachlorophenol	ND		406	ug/kg	07/07/23	07/10/23
Phenanthrene	ND		160	ug/kg	07/07/23	07/10/23
Pyrene	ND		160	ug/kg	07/07/23	07/10/23
m&p-Cresol	ND		320	ug/kg	07/07/23	07/10/23
Pyridine	ND		160	ug/kg	07/07/23	07/10/23
Azobenzene	ND		160	ug/kg	07/07/23	07/10/23
Total Dichlorobenzene	ND		160	ug/kg	07/07/23	07/10/23

Surrogate(s)	Recovery%	Limits		
Nitrobenzene-d5	*92.1%*	*30-126*	07/07/23	07/10/23
p-Terphenyl-d14	*115%*	*47-130*	07/07/23	07/10/23
2-Fluorobiphenyl	*97.2%*	*34-130*	07/07/23	07/10/23
Phenol-d6	*97.3%*	*30-130*	07/07/23	07/10/23
2,4,6-Tribromophenol	*112%*	*30-130*	07/07/23	07/10/23
2-Fluorophenol	*93.9%*	*30-130*	07/07/23	07/10/23

NETLAB Case Number: 3G07009

Results: Semivolatile organic compounds

Sample: SED-2

Lab Number: 3G07009-02 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
1,2,4-Trichlorobenzene	ND		165	ug/kg	07/07/23	07/10/23
1,2-Dichlorobenzene	ND		165	ug/kg	07/07/23	07/10/23
1,3-Dichlorobenzene	ND		165	ug/kg	07/07/23	07/10/23
1,4-Dichlorobenzene	ND		165	ug/kg	07/07/23	07/10/23
Phenol	ND		165	ug/kg	07/07/23	07/10/23
2,4,5-Trichlorophenol	ND		165	ug/kg	07/07/23	07/10/23
2,4,6-Trichlorophenol	ND		165	ug/kg	07/07/23	07/10/23
2,4-Dichlorophenol	ND		165	ug/kg	07/07/23	07/10/23
2,4-Dimethylphenol	ND		419	ug/kg	07/07/23	07/10/23
2,4-Dinitrophenol	ND		419	ug/kg	07/07/23	07/10/23
2,4-Dinitrotoluene	ND		165	ug/kg	07/07/23	07/10/23
2,6-Dinitrotoluene	ND		165	ug/kg	07/07/23	07/10/23
2-Chloronaphthalene	ND		165	ug/kg	07/07/23	07/10/23
2-Chlorophenol	ND		165	ug/kg	07/07/23	07/10/23
2-Methylnaphthalene	ND		165	ug/kg	07/07/23	07/10/23
Nitrobenzene	ND		165	ug/kg	07/07/23	07/10/23
2-Methylphenol	ND		165	ug/kg	07/07/23	07/10/23
2-Nitroaniline	ND		165	ug/kg	07/07/23	07/10/23
2-Nitrophenol	ND		419	ug/kg	07/07/23	07/10/23
3,3'-Dichlorobenzidine	ND		419	ug/kg	07/07/23	07/10/23
3-Nitroaniline	ND		165	ug/kg	07/07/23	07/10/23
4,6-Dinitro-2-methylphenol	ND		419	ug/kg	07/07/23	07/10/23
4-Bromophenyl phenyl ether	ND		165	ug/kg	07/07/23	07/10/23
4-Chloro-3-methylphenol	ND		165	ug/kg	07/07/23	07/10/23
4-Chloroaniline	ND		165	ug/kg	07/07/23	07/10/23
4-Chlorophenyl phenyl ether	ND		165	ug/kg	07/07/23	07/10/23
4-Nitroaniline	ND		165	ug/kg	07/07/23	07/10/23
4-Nitrophenol	ND		419	ug/kg	07/07/23	07/10/23
Acenaphthene	ND		165	ug/kg	07/07/23	07/10/23
Acenaphthylene	ND		165	ug/kg	07/07/23	07/10/23
Aniline	ND		165	ug/kg	07/07/23	07/10/23
Anthracene	ND		165	ug/kg	07/07/23	07/10/23
Benzo(a)anthracene	ND		165	ug/kg	07/07/23	07/10/23
Benzo(a)pyrene	ND		165	ug/kg	07/07/23	07/10/23
Benzo(b)fluoranthene	ND		165	ug/kg	07/07/23	07/10/23
Benzo(g,h,i)perylene	ND		165	ug/kg	07/07/23	07/10/23
Benzo(k)fluoranthene	ND		165	ug/kg	07/07/23	07/10/23
Benzoic acid	ND		1270	ug/kg	07/07/23	07/10/23
Biphenyl	ND		51	ug/kg	07/07/23	07/10/23
Bis(2-chloroethoxy)methane	ND		165	ug/kg	07/07/23	07/10/23
Bis(2-chloroethyl)ether	ND		165	ug/kg	07/07/23	07/10/23
Bis(2-chloroisopropyl)ether	ND		165	ug/kg	07/07/23	07/10/23
Bis(2-ethylhexyl)phthalate	ND		507	ug/kg	07/07/23	07/10/23
Butyl benzyl phthalate	ND		165	ug/kg	07/07/23	07/10/23
Chrysene	ND		165	ug/kg	07/07/23	07/10/23
Di-n-octyl phthalate	ND		254	ug/kg	07/07/23	07/10/23
Dibenz(a,h)anthracene	ND		165	ug/kg	07/07/23	07/10/23
Dibenzofuran	ND		165	ug/kg	07/07/23	07/10/23

Results: Semivolatile organic compounds (Continued)

Sample: SED-2 (Continued)

Lab Number: 3G07009-02 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Diethyl phthalate	ND		165	ug/kg	07/07/23	07/10/23
Dimethyl phthalate	ND		419	ug/kg	07/07/23	07/10/23
Di-n-butyl phthalate	ND		254	ug/kg	07/07/23	07/10/23
Fluoranthene	ND		165	ug/kg	07/07/23	07/10/23
Fluorene	ND		165	ug/kg	07/07/23	07/10/23
Hexachlorobenzene	ND		165	ug/kg	07/07/23	07/10/23
Hexachlorobutadiene	ND		165	ug/kg	07/07/23	07/10/23
Hexachlorocyclopentadiene	ND		419	ug/kg	07/07/23	07/10/23
Hexachloroethane	ND		165	ug/kg	07/07/23	07/10/23
Indeno(1,2,3-cd)pyrene	ND		165	ug/kg	07/07/23	07/10/23
Isophorone	ND		165	ug/kg	07/07/23	07/10/23
Naphthalene	ND		165	ug/kg	07/07/23	07/10/23
N-Nitrosodimethylamine	ND		165	ug/kg	07/07/23	07/10/23
N-Nitrosodi-n-propylamine	ND		165	ug/kg	07/07/23	07/10/23
N-Nitrosodiphenylamine	ND		165	ug/kg	07/07/23	07/10/23
Pentachlorophenol	ND		419	ug/kg	07/07/23	07/10/23
Phenanthrene	ND		165	ug/kg	07/07/23	07/10/23
Pyrene	ND		165	ug/kg	07/07/23	07/10/23
m&p-Cresol	ND		330	ug/kg	07/07/23	07/10/23
Pyridine	ND		165	ug/kg	07/07/23	07/10/23
Azobenzene	ND		165	ug/kg	07/07/23	07/10/23
Total Dichlorobenzene	ND		165	ug/kg	07/07/23	07/10/23

Surrogate(s)	Recovery%	Limits		
Nitrobenzene-d5	*29.1%*	*30-126*	07/07/23	07/10/23
p-Terphenyl-d14	*78.1%*	*47-130*	07/07/23	07/10/23
2-Fluorobiphenyl	*61.9%*	*34-130*	07/07/23	07/10/23
Phenol-d6	*60.1%*	*30-130*	07/07/23	07/10/23
2,4,6-Tribromophenol	*78.4%*	*30-130*	07/07/23	07/10/23
2-Fluorophenol	*61.3%*	*30-130*	07/07/23	07/10/23

NETLAB Case Number: 3G07009

Results: Pesticides

Sample: SED-1

Lab Number: 3G07009-01 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
alpha-BHC	ND		1.98	ug/kg	07/11/23	07/14/23
gamma-BHC (Lindane)	ND		1.98	ug/kg	07/11/23	07/14/23
beta-BHC	ND		1.98	ug/kg	07/11/23	07/14/23
delta-BHC	ND		1.98	ug/kg	07/11/23	07/14/23
Heptachlor	ND		1.98	ug/kg	07/11/23	07/14/23
Aldrin	ND		1.98	ug/kg	07/11/23	07/14/23
Heptachlor epoxide	ND		1.98	ug/kg	07/11/23	07/14/23
gamma-Chlordane	ND		1.98	ug/kg	07/11/23	07/14/23
alpha-Chlordane	ND		1.98	ug/kg	07/11/23	07/14/23
Chlordane	ND		19.8	ug/kg	07/11/23	07/14/23
4,4'-DDE	ND		3.95	ug/kg	07/11/23	07/14/23
Endosulfan I	ND		1.98	ug/kg	07/11/23	07/14/23
Dieldrin	ND		1.98	ug/kg	07/11/23	07/14/23
Endrin	ND		1.98	ug/kg	07/11/23	07/14/23
4,4'-DDD	ND		3.95	ug/kg	07/11/23	07/14/23
Endosulfan II	ND		1.98	ug/kg	07/11/23	07/14/23
Endrin aldehyde	ND		1.98	ug/kg	07/11/23	07/14/23
4,4'-DDT	ND		3.95	ug/kg	07/11/23	07/14/23
Methoxychlor	ND		3.95	ug/kg	07/11/23	07/14/23
Endosulfan sulfate	ND		1.98	ug/kg	07/11/23	07/14/23
Endrin Ketone	ND		1.98	ug/kg	07/11/23	07/14/23
Toxaphene	ND		19.8	ug/kg	07/11/23	07/14/23

Surrogate(s)	Recovery%	Limits		
2,4,5,6-Tetrachloro-m-xylene (TCMX)	*56.0%*	*30-106*	07/11/23	07/14/23
Decachlorobiphenyl (DCBP)	*75.2%*	*32-110*	07/11/23	07/14/23

NETLAB Case Number: 3G07009

Results: Pesticides

Sample: SED-2

Lab Number: 3G07009-02 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
alpha-BHC	ND		2.07	ug/kg	07/11/23	07/14/23
gamma-BHC (Lindane)	ND		2.07	ug/kg	07/11/23	07/14/23
beta-BHC	ND		2.07	ug/kg	07/11/23	07/14/23
delta-BHC	ND		2.07	ug/kg	07/11/23	07/14/23
Heptachlor	ND		2.07	ug/kg	07/11/23	07/14/23
Aldrin	ND		2.07	ug/kg	07/11/23	07/14/23
Heptachlor epoxide	ND		2.07	ug/kg	07/11/23	07/14/23
gamma-Chlordane	ND		2.07	ug/kg	07/11/23	07/14/23
alpha-Chlordane	ND		2.07	ug/kg	07/11/23	07/14/23
Chlordane	ND		20.7	ug/kg	07/11/23	07/14/23
4,4'-DDE	ND		4.12	ug/kg	07/11/23	07/14/23
Endosulfan I	ND		2.07	ug/kg	07/11/23	07/14/23
Dieldrin	ND		2.07	ug/kg	07/11/23	07/14/23
Endrin	ND		2.07	ug/kg	07/11/23	07/14/23
4,4'-DDD	ND		4.12	ug/kg	07/11/23	07/14/23
Endosulfan II	ND		2.07	ug/kg	07/11/23	07/14/23
Endrin aldehyde	ND		2.07	ug/kg	07/11/23	07/14/23
4,4'-DDT	ND		4.12	ug/kg	07/11/23	07/14/23
Methoxychlor	ND		4.12	ug/kg	07/11/23	07/14/23
Endosulfan sulfate	ND		2.07	ug/kg	07/11/23	07/14/23
Endrin Ketone	ND		2.07	ug/kg	07/11/23	07/14/23
Toxaphene	ND		20.7	ug/kg	07/11/23	07/14/23

Surrogate(s)	Recovery%	Limits		
2,4,5,6-Tetrachloro-m-xylene (TCMX)	*54.6%*	*30-106*	07/11/23	07/14/23
Decachlorobiphenyl (DCBP)	*79.5%*	*32-110*	07/11/23	07/14/23

NETLAB Case Number: 3G07009

Results: Polychlorinated Biphenyls (PCBs)

Sample: SED-1

Lab Number: 3G07009-01 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
2,4′-Dichlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',5-Trichlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,4,4′-Trichlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,5'-Tetrachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',5,5'-Tetrachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3',4,4'-Tetrachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
3,3',4,4'-Tetrachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
3,4,4′,5-Tetrachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',4,5,5'-Pentachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3,3′,4,4'-Pentachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3,4,4′,5-Pentachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3',4,4′,5-Pentachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2′,3,4,4′,5-Pentachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
3,3',4,4′,5-Pentachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,3′,4,4'-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,4,4',5'-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',4,4′,5,5'-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3,3′,4,4',5-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3,3′,4,4',5′-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3,4′,4,5',5-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
3,3′,4,4′,5,5′-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,3',4,4',5-Heptachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,4,4′,5,5′-Heptachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,4',5,5',6-Heptachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3,3′,4,4′,5,5′-Heptachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,3',4,4',5,6-Octachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,3',4,4',5,5′,6-Nonachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
Decachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23

Surrogate(s)	Recovery%	Limits		
2,4,5,6-Tetrachloro-m-xylene (TCMX)	*63.9%*	*40-140*	07/12/23	07/13/23

NETLAB Case Number: 3G07009

Results: Polychlorinated Biphenyls (PCBs)

Sample: SED-2

Lab Number: 3G07009-02 (Soil)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
2,4′-Dichlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',5-Trichlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,4,4′-Trichlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,5'-Tetrachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',5,5'-Tetrachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3',4,4'-Tetrachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
3,3',4,4'-Tetrachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
3,4,4′,5-Tetrachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',4,5,5'-Pentachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3,3′,4,4'-Pentachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3,4,4′,5-Pentachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3',4,4′,5-Pentachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2′,3,4,4′,5-Pentachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
3,3',4,4′,5-Pentachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,3′,4,4'-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,4,4',5'-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',4,4′,5,5'-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3,3′,4,4',5-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3,3′,4,4',5′-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3,4′,4,5',5-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
3,3′,4,4′,5,5′-Hexachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,3',4,4',5-Heptachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,4,4′,5,5′-Heptachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,4',5,5',6-Heptachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,3,3′,4,4′,5,5′-Heptachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,3',4,4',5,6-Octachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
2,2',3,3',4,4',5,5′,6-Nonachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23
Decachlorobiphenyl	ND		3	ug/kg	07/12/23	07/17/23

Surrogate(s)	Recovery%	Limits		
2,4,5,6-Tetrachloro-m-xylene (TCMX)	*68.6%*	*40-140*	07/12/23	07/13/23

Extractable Petroleum Hydrocarbons
Sample: SED-1 (3G07009-01)

SAMPLE INFORMATION

Matrix	Soil
Containers	Satisfactory
Aqueous Preservatives	NA
Temperature	Received on Ice Received at: 4+/-2 C°
Extraction Method	EPA Method 3546

EPH ANALYTICAL RESULTS

Method for Ranges: MADEP EPH 4-1.1				Client ID	SED-1	
Method for Target Analytes: MADEP EPH 4-1.1				Lab ID	3G07009-01	
EPH Surrogate Standards: Aliphatic: Chlorooctadecane Aromatic: o-Terphenyl				Date Collected	07/07/23	
				Date Received	07/07/23	
				Date Thawed	NA	
				Date Extracted	07/07/23	
EPH Fractionation Surrogates: (1) 2-Fluorobiphenyl (2) 2-Bromonaphthalene				Percent Moisture	19.30	
RANGE/TARGET ANALYTE		**Dilution**	**RL**	**Units**	**Result**	**Analyzed**
Unadjusted C11-C22 Aromatic Hydrocarbons [1]		1X	8.21	mg/kg	<8.21	07/10/23 21:56
Diesel PAH Analytes	Naphthalene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	2-Methylnaphthalene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Phenanthrene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Acenaphthene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
Other Target PAH Analytes	Acenaphthylene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Fluorene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Anthracene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Fluoranthene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Pyrene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Benzo(a)anthracene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Chrysene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Benzo(b)fluoranthene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Benzo(k)fluoranthene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Benzo(a)pyrene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Indeno(1,2,3-cd)pyrene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Dibenz(a,h)anthracene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
	Benzo(g,h,i)perylene	1X	0.41	mg/kg	<0.41	07/10/23 21:56
C9-C18 Aliphatic Hydrocarbons [1]		1X	16.4	mg/kg	<16.4	07/10/23 21:14
C19-C36 Aliphatic Hydrocarbons [1]		1X	16.4	mg/kg	<16.4	07/10/23 21:14
C11-C22 Aromatic Hydrocarbons [1,2]		1X	8.21	mg/kg	<8.21	07/10/23 21:56
Chlorooctadecane (Sample Surrogate)				%	48.9	07/10/23 21:14
o-Terphenyl (Sample Surrogate)				%	47.1	07/10/23 21:56
2-Fluorobiphenyl (Fractionation Surrogate)				%	94.6	07/10/23 21:56
2-Bromonaphthalene (Fractionation Surrogate)				%	94.4	07/10/23 21:56
Surrogate Acceptance Range [3]				%	40 - 140	

[1] Hydrocarbon range data excludes area counts of any surrogate(s) and/or internal standards eluting in that range.
[2] C11-C22 Aromatic Hydrocarbons excludes the concentration of Target PAH Analytes.
[3] See the case narrative in cases where a dash (-) is entered in the surrogate recovery block.

Extractable Petroleum Hydrocarbons
Sample: SED-2 (3G07009-02)

SAMPLE INFORMATION

Matrix	Soil
Containers	Satisfactory
Aqueous Preservatives	NA
Temperature	Received on Ice Received at: 4+/-2 C°
Extraction Method	EPA Method 3546

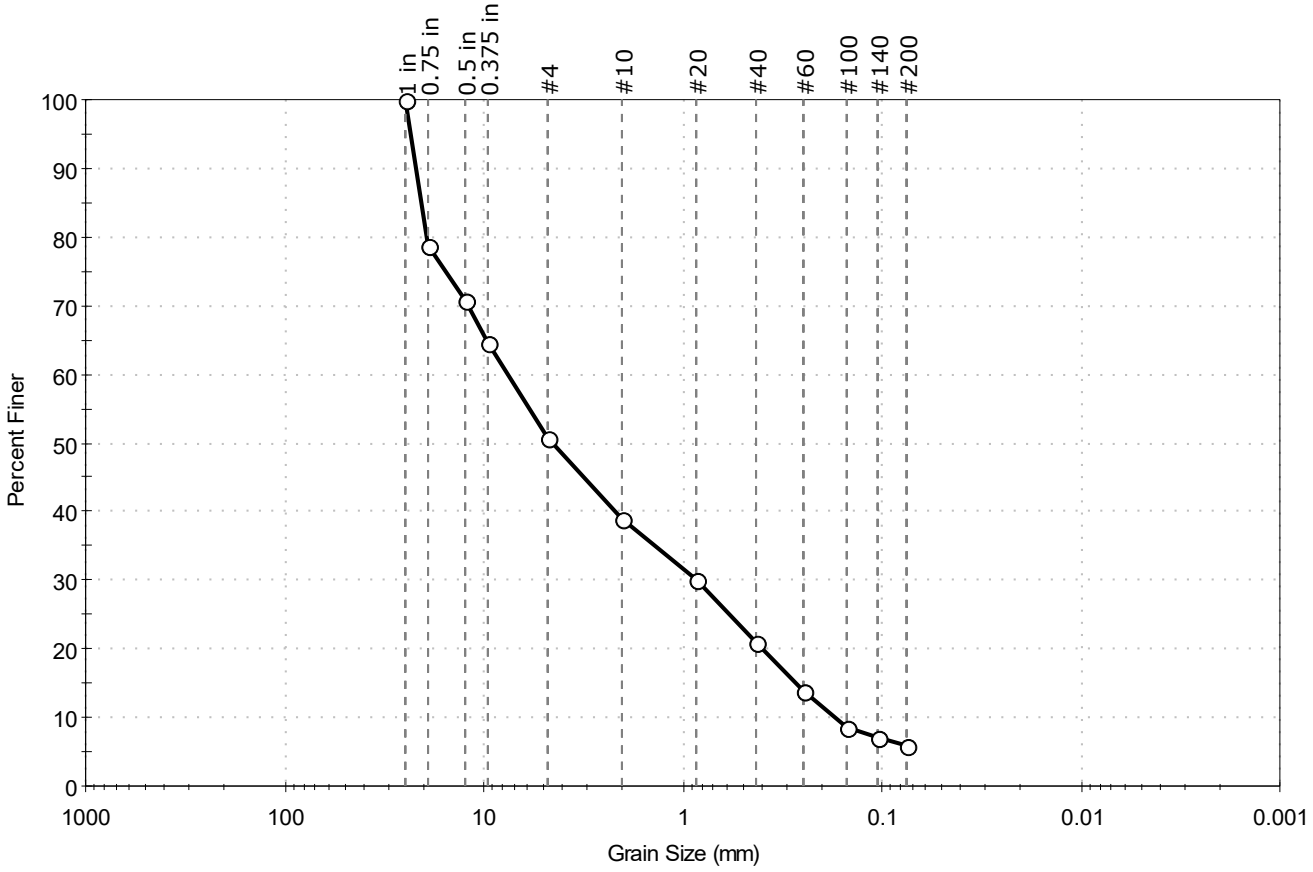
EPH ANALYTICAL RESULTS

Method for Ranges: MADEP EPH 4-1.1				Client ID	SED-2	
Method for Target Analytes: MADEP EPH 4-1.1				Lab ID	3G07009-02	
EPH Surrogate Standards: Aliphatic: Chlorooctadecane Aromatic: o-Terphenyl				Date Collected	07/07/23	
				Date Received	07/07/23	
				Date Thawed	NA	
				Date Extracted	07/07/23	
EPH Fractionation Surrogates: (1) 2-Fluorobiphenyl (2) 2-Bromonaphthalene				Percent Moisture	21.70	
RANGE/TARGET ANALYTE		**Dilution**	**RL**	**Units**	**Result**	**Analyzed**
Unadjusted C11-C22 Aromatic Hydrocarbons [1]		1X	8.46	mg/kg	<8.46	07/10/23 22:23
Diesel PAH Analytes	Naphthalene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	2-Methylnaphthalene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Phenanthrene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Acenaphthene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
Other Target PAH Analytes	Acenaphthylene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Fluorene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Anthracene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Fluoranthene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Pyrene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Benzo(a)anthracene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Chrysene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Benzo(b)fluoranthene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Benzo(k)fluoranthene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Benzo(a)pyrene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Indeno(1,2,3-cd)pyrene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Dibenz(a,h)anthracene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
	Benzo(g,h,i)perylene	1X	0.42	mg/kg	<0.42	07/10/23 22:23
C9-C18 Aliphatic Hydrocarbons [1]		1X	16.9	mg/kg	<16.9	07/10/23 21:38
C19-C36 Aliphatic Hydrocarbons [1]		1X	16.9	mg/kg	<16.9	07/10/23 21:38
C11-C22 Aromatic Hydrocarbons [1,2]		1X	8.46	mg/kg	<8.46	07/10/23 22:23
Chlorooctadecane (Sample Surrogate)				%	62.3	07/10/23 21:38
o-Terphenyl (Sample Surrogate)				%	65.1	07/10/23 22:23
2-Fluorobiphenyl (Fractionation Surrogate)				%	110	07/10/23 22:23
2-Bromonaphthalene (Fractionation Surrogate)				%	110	07/10/23 22:23
Surrogate Acceptance Range [3]				%	40 - 140	

[1] Hydrocarbon range data excludes area counts of any surrogate(s) and/or internal standards eluting in that range.
[2] C11-C22 Aromatic Hydrocarbons excludes the concentration of Target PAH Analytes.
[3] See the case narrative in cases where a dash (-) is entered in the surrogate recovery block.

Client:	New England Testing Laboratory				
Project:	3G07009				
Location:	Massachusetts			Project No:	GTX-317518
Boring ID:	---	Sample Type:	jar	Tested By:	ckg
Sample ID:	3G07009-01	Test Date:	07/19/23	Checked By:	ank
Depth :	---	Test Id:	724720		
Test Comment:	---				
Visual Description:	Moist, dark olive brown gravel with silt and sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	49.3	44.8	5.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	79		
0.5 in	12.50	71		
0.375 in	9.50	64		
#4	4.75	51		
#10	2.00	39		
#20	0.85	30		
#40	0.42	21		
#60	0.25	14		
#100	0.15	9		
#140	0.11	7		
#200	0.075	5.9		

Coefficients

D_{85} = 20.6161 mm	D_{30} = 0.8358 mm
D_{60} = 7.5824 mm	D_{15} = 0.2738 mm
D_{50} = 4.5174 mm	D_{10} = 0.1710 mm
C_u = 44.342	C_c = 0.539

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (1))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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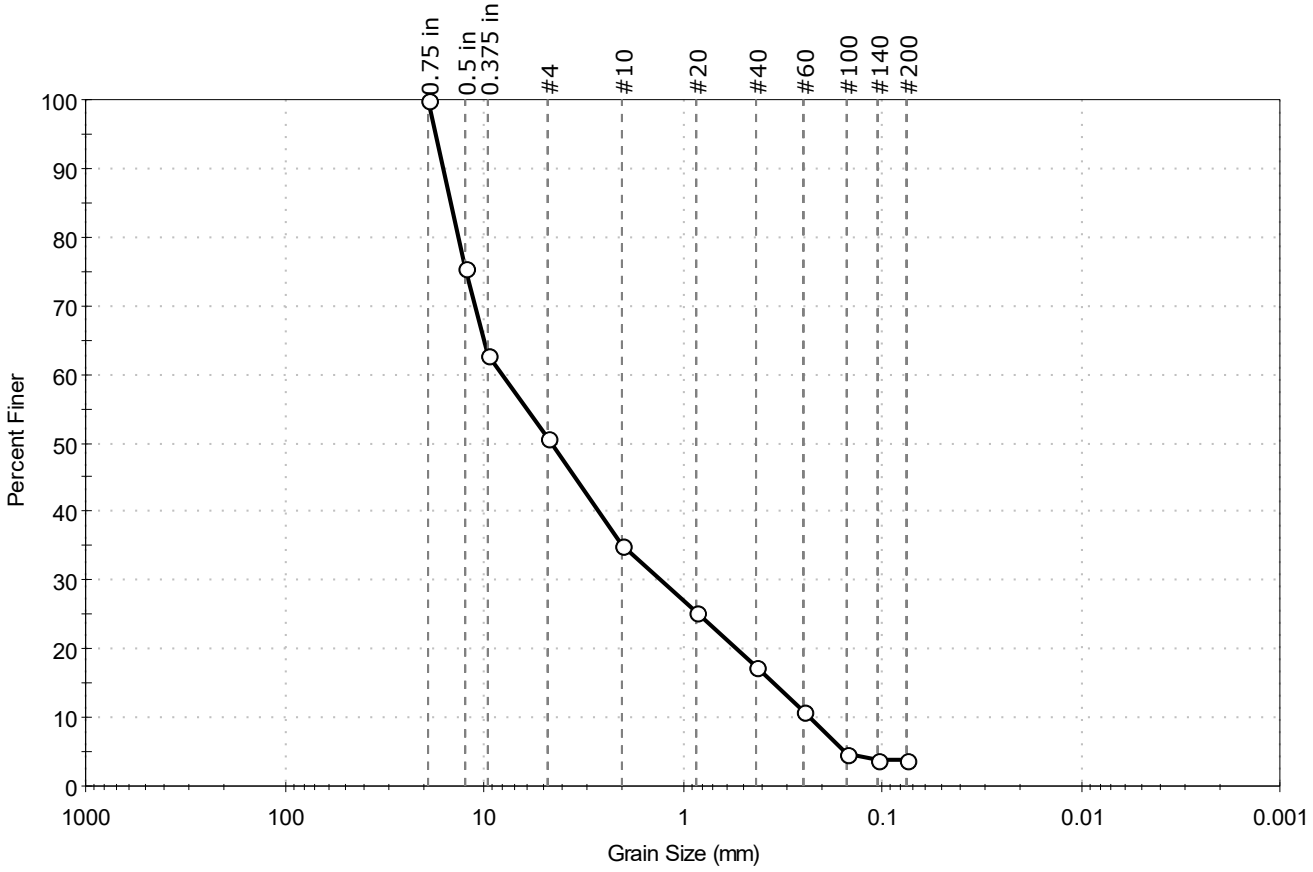
Client:	New England Testing Laboratory				
Project:	3G07009				
Location:	Massachusetts			Project No:	GTX-317518
Boring ID:	---	Sample Type:	jar	Tested By:	ckg
Sample ID:	3G07009-02	Test Date:	07/19/23	Checked By:	ank
Depth :	---	Test Id:	724721		
Test Comment:	---				
Visual Description:	Moist, dark olive brown gravel and sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	49.4	46.8	3.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	76		
0.375 in	9.50	63		
#4	4.75	51		
#10	2.00	35		
#20	0.85	25		
#40	0.42	17		
#60	0.25	11		
#100	0.15	5		
#140	0.11	4		
#200	0.075	3.8		

Coefficients

D_{85} = 14.7008 mm	D_{30} = 1.2714 mm
D_{60} = 8.0983 mm	D_{15} = 0.3516 mm
D_{50} = 4.5715 mm	D_{10} = 0.2341 mm
C_u = 34.593	C_c = 0.853

Classification

ASTM — Poorly graded GRAVEL with Sand (GP)

AASHTO — Stone Fragments, Gravel and Sand (A-1-a (1))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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Quality Control

Total Metals

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0233 - Metals Cold-Vapor Mercury										
Blank (B3G0233-BLK1)					Prepared & Analyzed: 07/07/23					
Mercury	ND		0.140	mg/kg						
LCS (B3G0233-BS1)					Prepared & Analyzed: 07/07/23					
Mercury	0.519		0.140	mg/kg	0.500		104	93-114		
LCS Dup (B3G0233-BSD1)					Prepared & Analyzed: 07/07/23					
Mercury	0.509		0.140	mg/kg	0.500		102	93-114	1.89	200
Batch: B3G0272 - Metals Digestion Soils										
Blank (B3G0272-BLK1)					Prepared: 07/10/23 Analyzed: 07/12/23					
Cadmium	ND		0.50	mg/kg						
Arsenic	ND		1.00	mg/kg						
Chromium	ND		0.50	mg/kg						
Copper	ND		2.00	mg/kg						
Nickel	ND		0.50	mg/kg						
Lead	ND		0.50	mg/kg						
Zinc	ND		2.0	mg/kg						
LCS (B3G0272-BS1)					Prepared: 07/10/23 Analyzed: 07/12/23					
Copper	90.3		2.00	mg/kg	100		90.3	85-115		
Lead	112		0.50	mg/kg	100		112	85-115		
Nickel	89.1		0.50	mg/kg	100		89.1	85-112		
Chromium	94.2		0.50	mg/kg	100		94.2	85-115		
Cadmium	90.5		0.50	mg/kg	100		90.5	85-115		
Zinc	89.7		2.0	mg/kg	100		89.7	85-115		
Arsenic	17.2		1.00	mg/kg	20.0		86.2	85-115		

Quality Control
(Continued)

Volatile Organic Compounds 8260C (5035-LL)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0264 - EPA 5035										
Blank (B3G0264-BLK1)					Prepared & Analyzed: 07/07/23					
Acetone	ND		20	ug/kg						
Benzene	ND		5	ug/kg						
Bromobenzene	ND		5	ug/kg						
Bromochloromethane	ND		5	ug/kg						
Bromodichloromethane	ND		5	ug/kg						
Bromoform	ND		5	ug/kg						
Bromomethane	ND		5	ug/kg						
2-Butanone	ND		20	ug/kg						
tert-Butyl alcohol	ND		5	ug/kg						
sec-Butylbenzene	ND		5	ug/kg						
n-Butylbenzene	ND		5	ug/kg						
tert-Butylbenzene	ND		5	ug/kg						
Methyl t-butyl ether (MTBE)	ND		5	ug/kg						
Carbon Disulfide	ND		5	ug/kg						
Carbon Tetrachloride	ND		5	ug/kg						
Chlorobenzene	ND		5	ug/kg						
Chloroethane	ND		5	ug/kg						
Chloroform	ND		5	ug/kg						
Chloromethane	ND		5	ug/kg						
4-Chlorotoluene	ND		5	ug/kg						
2-Chlorotoluene	ND		5	ug/kg						
1,2-Dibromo-3-chloropropane (DBCP)	ND		5	ug/kg						
Dibromochloromethane	ND		5	ug/kg						
1,2-Dibromoethane (EDB)	ND		5	ug/kg						
Dibromomethane	ND		5	ug/kg						
1,2-Dichlorobenzene	ND		5	ug/kg						
1,3-Dichlorobenzene	ND		5	ug/kg						
1,4-Dichlorobenzene	ND		5	ug/kg						
1,1-Dichloroethane	ND		5	ug/kg						
1,2-Dichloroethane	ND		5	ug/kg						
trans-1,2-Dichloroethene	ND		5	ug/kg						
cis-1,2-Dichloroethene	ND		5	ug/kg						
1,1-Dichloroethene	ND		5	ug/kg						
1,2-Dichloropropane	ND		5	ug/kg						
2,2-Dichloropropane	ND		5	ug/kg						
cis-1,3-Dichloropropene	ND		5	ug/kg						
trans-1,3-Dichloropropene	ND		5	ug/kg						
1,1-Dichloropropene	ND		5	ug/kg						
1,3-Dichloropropene (cis + trans)	ND		5	ug/kg						
Diethyl ether	ND		5	ug/kg						
1,4-Dioxane	ND		100	ug/kg						
Ethylbenzene	ND		5	ug/kg						
Hexachlorobutadiene	ND		5	ug/kg						
2-Hexanone	ND		20	ug/kg						
Isopropylbenzene	ND		5	ug/kg						
p-Isopropyltoluene	ND		5	ug/kg						
Methylene Chloride	ND		5	ug/kg						
4-Methyl-2-pentanone	ND		5	ug/kg						
Naphthalene	ND		5	ug/kg						
n-Propylbenzene	ND		5	ug/kg						
Styrene	ND		5	ug/kg						
1,1,1,2-Tetrachloroethane	ND		5	ug/kg						
Tetrachloroethene	ND		5	ug/kg						
Tetrahydrofuran	ND		5	ug/kg						
Toluene	ND		5	ug/kg						
1,2,4-Trichlorobenzene	ND		5	ug/kg						
1,2,3-Trichlorobenzene	ND		5	ug/kg						

Quality Control
(Continued)

Volatile Organic Compounds 8260C (5035-LL) (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0264 - EPA 5035 (Continued)										
Blank (B3G0264-BLK1)					Prepared & Analyzed: 07/07/23					
1,1,2-Trichloroethane	ND		5	ug/kg						
1,1,1-Trichloroethane	ND		5	ug/kg						
Trichloroethene	ND		5	ug/kg						
1,2,3-Trichloropropane	ND		5	ug/kg						
1,3,5-Trimethylbenzene	ND		5	ug/kg						
1,2,4-Trimethylbenzene	ND		5	ug/kg						
Vinyl Chloride	ND		5	ug/kg						
o-Xylene	ND		5	ug/kg						
m&p-Xylene	ND		10	ug/kg						
Total xylenes	ND		5	ug/kg						
1,1,2,2-Tetrachloroethane	ND		5	ug/kg						
tert-Amyl methyl ether	ND		5	ug/kg						
1,3-Dichloropropane	ND		5	ug/kg						
Ethyl tert-butyl ether	ND		5	ug/kg						
Diisopropyl ether	ND		5	ug/kg						
Trichlorofluoromethane	ND		5	ug/kg						
Dichlorodifluoromethane	ND		5	ug/kg						
Surrogate: 4-Bromofluorobenzene			*50.6*	ug/kg	*50.0*		*101*	*70-130*		
Surrogate: 1,2-Dichloroethane-d4			*51.8*	ug/kg	*50.0*		*104*	*70-130*		
Surrogate: Toluene-d8			*48.0*	ug/kg	*50.0*		*96.0*	*70-130*		
LCS (B3G0264-BS1)					Prepared & Analyzed: 07/07/23					
Acetone	58		20	ug/kg	50.0		115	50-150		
Benzene	42		5	ug/kg	50.0		83.9	70-130		
Bromobenzene	42		5	ug/kg	50.0		84.1	70-130		
Bromochloromethane	41		5	ug/kg	50.0		81.7	70-130		
Bromodichloromethane	41		5	ug/kg	50.0		81.7	70-130		
Bromoform	38		5	ug/kg	50.0		75.9	70-130		
Bromomethane	75		5	ug/kg	50.0		151	50-150		
2-Butanone	53		20	ug/kg	50.0		106	50-150		
tert-Butyl alcohol	59		5	ug/kg	50.0		117	70-130		
sec-Butylbenzene	43		5	ug/kg	50.0		85.2	70-130		
n-Butylbenzene	45		5	ug/kg	50.0		90.6	70-130		
tert-Butylbenzene	42		5	ug/kg	50.0		83.2	70-130		
Methyl t-butyl ether (MTBE)	45		5	ug/kg	50.0		89.3	70-130		
Carbon Disulfide	43		5	ug/kg	50.0		85.6	50-150		
Carbon Tetrachloride	36		5	ug/kg	50.0		71.5	70-130		
Chlorobenzene	43		5	ug/kg	50.0		85.5	70-130		
Chloroethane	80		5	ug/kg	50.0		160	50-150		
Chloroform	43		5	ug/kg	50.0		85.0	70-130		
Chloromethane	50		5	ug/kg	50.0		99.2	50-150		
4-Chlorotoluene	45		5	ug/kg	50.0		90.3	70-130		
2-Chlorotoluene	45		5	ug/kg	50.0		90.1	70-130		
1,2-Dibromo-3-chloropropane (DBCP)	42		5	ug/kg	50.0		83.1	70-130		
Dibromochloromethane	38		5	ug/kg	50.0		75.0	70-130		
1,2-Dibromoethane (EDB)	40		5	ug/kg	50.0		79.7	70-130		
Dibromomethane	42		5	ug/kg	50.0		85.0	60-140		
1,2-Dichlorobenzene	44		5	ug/kg	50.0		88.6	70-130		
1,3-Dichlorobenzene	44		5	ug/kg	50.0		87.1	70-130		
1,4-Dichlorobenzene	44		5	ug/kg	50.0		87.4	70-130		
1,1-Dichloroethane	44		5	ug/kg	50.0		87.6	70-130		
1,2-Dichloroethane	46		5	ug/kg	50.0		91.1	70-130		
trans-1,2-Dichloroethene	41		5	ug/kg	50.0		81.3	70-130		
cis-1,2-Dichloroethene	42		5	ug/kg	50.0		83.0	70-130		
1,1-Dichloroethene	44		5	ug/kg	50.0		87.2	70-130		
1,2-Dichloropropane	44		5	ug/kg	50.0		87.1	70-130		
2,2-Dichloropropane	38		5	ug/kg	50.0		76.8	70-130		

Quality Control
(Continued)

Volatile Organic Compounds 8260C (5035-LL) (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0264 - EPA 5035 (Continued)										
LCS (B3G0264-BS1)					Prepared & Analyzed: 07/07/23					
cis-1,3-Dichloropropene	40		5	ug/kg	50.0		80.1	70-130		
trans-1,3-Dichloropropene	40		5	ug/kg	50.0		80.8	70-130		
1,1-Dichloropropene	36		5	ug/kg	50.0		71.9	70-130		
Diethyl ether	56		5	ug/kg	50.0		112	60-140		
1,4-Dioxane	208		100	ug/kg	250		83.2	0-200		
Ethylbenzene	43		5	ug/kg	50.0		86.8	70-130		
Hexachlorobutadiene	36		5	ug/kg	50.0		71.3	70-130		
2-Hexanone	46		20	ug/kg	50.0		91.9	50-150		
Isopropylbenzene	42		5	ug/kg	50.0		84.4	70-130		
p-Isopropyltoluene	44		5	ug/kg	50.0		87.9	70-130		
Methylene Chloride	47		5	ug/kg	50.0		94.4	60-140		
4-Methyl-2-pentanone	43		5	ug/kg	50.0		85.3	50-150		
Naphthalene	41		5	ug/kg	50.0		82.4	70-130		
n-Propylbenzene	44		5	ug/kg	50.0		87.9	70-130		
Styrene	44		5	ug/kg	50.0		88.5	70-130		
1,1,1,2-Tetrachloroethane	42		5	ug/kg	50.0		83.7	70-130		
Tetrachloroethene	34		5	ug/kg	50.0		68.5	70-130		
Tetrahydrofuran	46		5	ug/kg	50.0		91.9	50-150		
Toluene	40		5	ug/kg	50.0		80.3	70-130		
1,2,4-Trichlorobenzene	40		5	ug/kg	50.0		80.2	70-130		
1,2,3-Trichlorobenzene	41		5	ug/kg	50.0		82.3	70-130		
1,1,2-Trichloroethane	41		5	ug/kg	50.0		81.4	70-130		
1,1,1-Trichloroethane	38		5	ug/kg	50.0		76.6	70-130		
Trichloroethene	40		5	ug/kg	50.0		80.3	70-130		
1,2,3-Trichloropropane	48		5	ug/kg	50.0		95.0	70-130		
1,3,5-Trimethylbenzene	47		5	ug/kg	50.0		93.0	70-130		
1,2,4-Trimethylbenzene	46		5	ug/kg	50.0		91.1	70-130		
Vinyl Chloride	46		5	ug/kg	50.0		91.1	50-150		
o-Xylene	44		5	ug/kg	50.0		87.4	70-130		
m&p-Xylene	86		10	ug/kg	100		86.5	70-130		
1,1,2,2-Tetrachloroethane	46		5	ug/kg	50.0		92.3	70-130		
tert-Amyl methyl ether	40		5	ug/kg	50.0		79.3	70-130		
1,3-Dichloropropane	41		5	ug/kg	50.0		82.8	70-130		
Ethyl tert-butyl ether	44		5	ug/kg	50.0		88.4	70-130		
Trichlorofluoromethane	51		5	ug/kg	50.0		102	50-150		
Dichlorodifluoromethane	54		5	ug/kg	50.0		109	50-150		
Surrogate: 4-Bromofluorobenzene			*50.6*	ug/kg	*50.0*		*101*	*70-130*		
Surrogate: 1,2-Dichloroethane-d4			*49.7*	ug/kg	*50.0*		*99.4*	*70-130*		
Surrogate: Toluene-d8			*48.5*	ug/kg	*50.0*		*97.0*	*70-130*		

Quality Control
(Continued)

Volatile Organic Compounds 8260C (5035-LL) (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0264 - EPA 5035 (Continued)										
LCS Dup (B3G0264-BSD1)					Prepared & Analyzed: 07/07/23					
Acetone	60		20	ug/kg	50.0		119	50-150	3.31	30
Benzene	44		5	ug/kg	50.0		88.7	70-130	5.56	20
Bromobenzene	39		5	ug/kg	50.0		78.0	70-130	7.48	20
Bromochloromethane	42		5	ug/kg	50.0		83.5	70-130	2.23	20
Bromodichloromethane	43		5	ug/kg	50.0		86.3	70-130	5.52	20
Bromoform	35		5	ug/kg	50.0		70.9	70-130	6.76	20
Bromomethane	70		5	ug/kg	50.0		141	50-150	6.88	30
2-Butanone	56		20	ug/kg	50.0		112	50-150	5.83	30
tert-Butyl alcohol	59		5	ug/kg	50.0		119	70-130	1.07	20
sec-Butylbenzene	41		5	ug/kg	50.0		81.1	70-130	4.93	20
n-Butylbenzene	44		5	ug/kg	50.0		87.2	70-130	3.80	20
tert-Butylbenzene	39		5	ug/kg	50.0		78.2	70-130	6.29	20
Methyl t-butyl ether (MTBE)	47		5	ug/kg	50.0		94.0	70-130	5.11	20
Carbon Disulfide	45		5	ug/kg	50.0		90.4	50-150	5.41	40
Carbon Tetrachloride	37		5	ug/kg	50.0		73.0	70-130	2.07	20
Chlorobenzene	41		5	ug/kg	50.0		81.4	70-130	4.82	20
Chloroethane	76		5	ug/kg	50.0		152	50-150	5.18	30
Chloroform	44		5	ug/kg	50.0		87.5	70-130	2.81	20
Chloromethane	52		5	ug/kg	50.0		105	50-150	5.30	30
4-Chlorotoluene	42		5	ug/kg	50.0		84.1	70-130	7.08	20
2-Chlorotoluene	42		5	ug/kg	50.0		83.9	70-130	7.08	20
1,2-Dibromo-3-chloropropane (DBCP)	44		5	ug/kg	50.0		87.7	70-130	5.46	20
Dibromochloromethane	39		5	ug/kg	50.0		78.0	70-130	3.92	20
1,2-Dibromoethane (EDB)	43		5	ug/kg	50.0		86.7	70-130	8.39	20
Dibromomethane	45		5	ug/kg	50.0		89.8	60-140	5.51	30
1,2-Dichlorobenzene	43		5	ug/kg	50.0		85.0	70-130	4.17	20
1,3-Dichlorobenzene	41		5	ug/kg	50.0		81.4	70-130	6.77	20
1,4-Dichlorobenzene	42		5	ug/kg	50.0		83.7	70-130	4.33	20
1,1-Dichloroethane	46		5	ug/kg	50.0		92.2	70-130	5.21	20
1,2-Dichloroethane	48		5	ug/kg	50.0		95.0	70-130	4.19	20
trans-1,2-Dichloroethene	43		5	ug/kg	50.0		86.4	70-130	5.99	20
cis-1,2-Dichloroethene	44		5	ug/kg	50.0		87.4	70-130	5.14	20
1,1-Dichloroethene	47		5	ug/kg	50.0		93.6	70-130	7.08	20
1,2-Dichloropropane	45		5	ug/kg	50.0		90.5	70-130	3.87	20
2,2-Dichloropropane	39		5	ug/kg	50.0		78.0	70-130	1.50	20
cis-1,3-Dichloropropene	42		5	ug/kg	50.0		83.3	70-130	3.89	20
trans-1,3-Dichloropropene	42		5	ug/kg	50.0		84.2	70-130	4.12	20
1,1-Dichloropropene	37		5	ug/kg	50.0		74.2	70-130	3.15	20
Diethyl ether	58		5	ug/kg	50.0		115	60-140	2.68	30
1,4-Dioxane	237		100	ug/kg	250		94.7	0-200	12.9	50
Ethylbenzene	41		5	ug/kg	50.0		82.2	70-130	5.40	20
Hexachlorobutadiene	34		5	ug/kg	50.0		68.4	70-130	4.12	20
2-Hexanone	50		20	ug/kg	50.0		101	50-150	9.36	20
Isopropylbenzene	40		5	ug/kg	50.0		79.3	70-130	6.16	20
p-Isopropyltoluene	41		5	ug/kg	50.0		82.3	70-130	6.56	20
Methylene Chloride	51		5	ug/kg	50.0		102	60-140	7.59	30
4-Methyl-2-pentanone	47		5	ug/kg	50.0		94.0	50-150	9.72	20
Naphthalene	43		5	ug/kg	50.0		85.8	70-130	4.04	20
n-Propylbenzene	42		5	ug/kg	50.0		83.3	70-130	5.40	20
Styrene	41		5	ug/kg	50.0		82.5	70-130	7.06	20
1,1,1,2-Tetrachloroethane	38		5	ug/kg	50.0		77.0	70-130	8.41	20
Tetrachloroethene	35		5	ug/kg	50.0		69.6	70-130	1.65	20
Tetrahydrofuran	51		5	ug/kg	50.0		102	50-150	9.92	40
Toluene	42		5	ug/kg	50.0		83.8	70-130	4.22	20
1,2,4-Trichlorobenzene	39		5	ug/kg	50.0		78.5	70-130	2.04	20
1,2,3-Trichlorobenzene	40		5	ug/kg	50.0		80.0	70-130	2.84	20
1,1,2-Trichloroethane	44		5	ug/kg	50.0		87.9	70-130	7.66	20

Quality Control
(Continued)

Volatile Organic Compounds 8260C (5035-LL) (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0264 - EPA 5035 (Continued)										
LCS Dup (B3G0264-BSD1)					Prepared & Analyzed: 07/07/23					
1,1,1-Trichloroethane	39		5	ug/kg	50.0		78.8	70-130	2.81	20
Trichloroethene	42		5	ug/kg	50.0		83.2	70-130	3.50	20
1,2,3-Trichloropropane	46		5	ug/kg	50.0		92.8	70-130	2.39	20
1,3,5-Trimethylbenzene	43		5	ug/kg	50.0		86.9	70-130	6.80	20
1,2,4-Trimethylbenzene	42		5	ug/kg	50.0		84.3	70-130	7.71	20
Vinyl Chloride	47		5	ug/kg	50.0		94.4	50-150	3.60	30
o-Xylene	40		5	ug/kg	50.0		81.0	70-130	7.65	20
m&p-Xylene	79		10	ug/kg	100		79.3	70-130	8.60	20
1,1,2,2-Tetrachloroethane	44		5	ug/kg	50.0		88.1	70-130	4.70	20
tert-Amyl methyl ether	42		5	ug/kg	50.0		84.3	70-130	6.21	20
1,3-Dichloropropane	44		5	ug/kg	50.0		87.8	70-130	5.84	20
Ethyl tert-butyl ether	46		5	ug/kg	50.0		91.7	70-130	3.69	20
Trichlorofluoromethane	52		5	ug/kg	50.0		104	50-150	1.77	20
Dichlorodifluoromethane	57		5	ug/kg	50.0		114	50-150	4.58	30
Surrogate: 4-Bromofluorobenzene			*50.4*	ug/kg	*50.0*		*101*	*70-130*		
Surrogate: 1,2-Dichloroethane-d4			*54.4*	ug/kg	*50.0*		*109*	*70-130*		
Surrogate: Toluene-d8			*54.1*	ug/kg	*50.0*		*108*	*70-130*		

Quality Control
(Continued)

Semivolatile organic compounds

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0245 - 1_Semivolatiles Extractions										
Blank (B3G0245-BLK1)					Prepared: 07/07/23 Analyzed: 07/11/23					
1,2,4-Trichlorobenzene	ND		129	ug/kg						
1,2-Dichlorobenzene	ND		129	ug/kg						
1,3-Dichlorobenzene	ND		129	ug/kg						
1,4-Dichlorobenzene	ND		129	ug/kg						
Phenol	ND		129	ug/kg						
2,4,5-Trichlorophenol	ND		129	ug/kg						
2,4,6-Trichlorophenol	ND		129	ug/kg						
2,4-Dichlorophenol	ND		129	ug/kg						
2,4-Dimethylphenol	ND		328	ug/kg						
2,4-Dinitrophenol	ND		328	ug/kg						
2,4-Dinitrotoluene	ND		129	ug/kg						
2,6-Dinitrotoluene	ND		129	ug/kg						
2-Chloronaphthalene	ND		129	ug/kg						
2-Chlorophenol	ND		129	ug/kg						
2-Methylnaphthalene	ND		129	ug/kg						
Nitrobenzene	ND		129	ug/kg						
2-Methylphenol	ND		129	ug/kg						
2-Nitroaniline	ND		129	ug/kg						
2-Nitrophenol	ND		328	ug/kg						
3,3'-Dichlorobenzidine	ND		328	ug/kg						
3-Nitroaniline	ND		129	ug/kg						
4,6-Dinitro-2-methylphenol	ND		328	ug/kg						
4-Bromophenyl phenyl ether	ND		129	ug/kg						
4-Chloro-3-methylphenol	ND		129	ug/kg						
4-Chloroaniline	ND		129	ug/kg						
4-Chlorophenyl phenyl ether	ND		129	ug/kg						
4-Nitroaniline	ND		129	ug/kg						
4-Nitrophenol	ND		328	ug/kg						
Acenaphthene	ND		129	ug/kg						
Acenaphthylene	ND		129	ug/kg						
Aniline	ND		129	ug/kg						
Anthracene	ND		129	ug/kg						
Benzo(a)anthracene	ND		129	ug/kg						
Benzo(a)pyrene	ND		129	ug/kg						
Benzo(b)fluoranthene	ND		129	ug/kg						
Benzo(g,h,i)perylene	ND		129	ug/kg						
Benzo(k)fluoranthene	ND		129	ug/kg						
Benzoic acid	ND		993	ug/kg						
Biphenyl	ND		40	ug/kg						
Bis(2-chloroethoxy)methane	ND		129	ug/kg						
Bis(2-chloroethyl)ether	ND		129	ug/kg						
Bis(2-chloroisopropyl)ether	ND		129	ug/kg						
Bis(2-ethylhexyl)phthalate	ND		397	ug/kg						
Butyl benzyl phthalate	ND		129	ug/kg						
Chrysene	ND		129	ug/kg						
Di-n-octyl phthalate	ND		199	ug/kg						
Dibenz(a,h)anthracene	ND		129	ug/kg						
Dibenzofuran	ND		129	ug/kg						
Diethyl phthalate	ND		129	ug/kg						
Dimethyl phthalate	ND		328	ug/kg						
Di-n-butyl phthalate	ND		199	ug/kg						
Fluoranthene	ND		129	ug/kg						
Fluorene	ND		129	ug/kg						
Hexachlorobenzene	ND		129	ug/kg						
Hexachlorobutadiene	ND		129	ug/kg						
Hexachlorocyclopentadiene	ND		328	ug/kg						
Hexachloroethane	ND		129	ug/kg						

Quality Control
(Continued)

Semivolatile organic compounds (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0245 - 1_Semivolatiles Extractions (Continued)										
Blank (B3G0245-BLK1)					Prepared: 07/07/23 Analyzed: 07/11/23					
Indeno(1,2,3-cd)pyrene	ND		129	ug/kg						
Isophorone	ND		129	ug/kg						
Naphthalene	ND		129	ug/kg						
N-Nitrosodimethylamine	ND		129	ug/kg						
N-Nitrosodi-n-propylamine	ND		129	ug/kg						
N-Nitrosodiphenylamine	ND		129	ug/kg						
Pentachlorophenol	ND		328	ug/kg						
Phenanthrene	ND		129	ug/kg						
Pyrene	ND		129	ug/kg						
m&p-Cresol	ND		258	ug/kg						
Pyridine	ND		129	ug/kg						
Azobenzene	ND		129	ug/kg						
Total Dichlorobenzene	ND		129	ug/kg						
Surrogate: Nitrobenzene-d5			*1720*	ug/kg	*3310*		*51.9*	*30-126*		
Surrogate: p-Terphenyl-d14			*2380*	ug/kg	*3310*		*71.7*	*47-130*		
Surrogate: 2-Fluorobiphenyl			*1930*	ug/kg	*3310*		*58.3*	*34-130*		
Surrogate: Phenol-d6			*1800*	ug/kg	*3310*		*54.4*	*30-130*		
Surrogate: 2,4,6-Tribromophenol			*2070*	ug/kg	*3310*		*62.4*	*30-130*		
Surrogate: 2-Fluorophenol			*1790*	ug/kg	*3310*		*54.1*	*30-130*		
LCS (B3G0245-BS1)					Prepared: 07/07/23 Analyzed: 07/11/23					
1,2,4-Trichlorobenzene	1540		129	ug/kg	3310		46.4	30-130		
1,2-Dichlorobenzene	1410		129	ug/kg	3310		42.7	30-130		
1,3-Dichlorobenzene	1320		129	ug/kg	3310		39.8	30-130		
1,4-Dichlorobenzene	1290		129	ug/kg	3310		39.1	30-130		
Phenol	1520		129	ug/kg	3310		45.8	30-130		
2,4,5-Trichlorophenol	1650		129	ug/kg	3310		49.9	30-130		
2,4,6-Trichlorophenol	1680		129	ug/kg	3310		50.8	30-130		
2,4-Dichlorophenol	1630		129	ug/kg	3310		49.3	30-130		
2,4-Dimethylphenol	1620		328	ug/kg	3310		48.9	30-130		
2,4-Dinitrophenol	1010		328	ug/kg	3310		30.6	15-140		
2,4-Dinitrotoluene	1840		129	ug/kg	3310		55.5	30-130		
2,6-Dinitrotoluene	1760		129	ug/kg	3310		53.2	30-130		
2-Chloronaphthalene	1620		129	ug/kg	3310		48.8	30-130		
2-Chlorophenol	1530		129	ug/kg	3310		46.1	30-130		
2-Methylnaphthalene	1610		129	ug/kg	3310		48.6	30-130		
Nitrobenzene	1410		129	ug/kg	3310		42.5	30-130		
2-Methylphenol	1620		129	ug/kg	3310		48.8	30-130		
2-Nitroaniline	1620		129	ug/kg	3310		49.0	30-130		
2-Nitrophenol	1520		328	ug/kg	3310		46.0	30-130		
3-Nitroaniline	1800		129	ug/kg	3310		54.4	30-130		
4,6-Dinitro-2-methylphenol	1500		328	ug/kg	3310		45.3	30-130		
4-Bromophenyl phenyl ether	1780		129	ug/kg	3310		53.7	30-130		
4-Chloro-3-methylphenol	1700		129	ug/kg	3310		51.4	30-130		
4-Chlorophenyl phenyl ether	1790		129	ug/kg	3310		54.0	30-130		
4-Nitroaniline	1940		129	ug/kg	3310		58.6	30-130		
4-Nitrophenol	1670		328	ug/kg	3310		50.6	30-130		
Acenaphthene	1680		129	ug/kg	3310		50.8	30-130		
Acenaphthylene	1750		129	ug/kg	3310		53.0	30-130		
Anthracene	1880		129	ug/kg	3310		56.8	30-130		
Benzo(a)anthracene	1960		129	ug/kg	3310		59.1	30-130		
Benzo(a)pyrene	1980		129	ug/kg	3310		59.9	30-130		
Benzo(b)fluoranthene	1980		129	ug/kg	3310		59.9	30-130		
Benzo(g,h,i)perylene	2030		129	ug/kg	3310		61.2	30-130		
Benzo(k)fluoranthene	2080		129	ug/kg	3310		62.8	30-130		
Biphenyl	473		40	ug/kg	828		57.1	30-130		
Bis(2-chloroethoxy)methane	1590		129	ug/kg	3310		48.1	30-130		

Quality Control
(Continued)

Semivolatile organic compounds (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0245 - 1_Semivolatiles Extractions (Continued)										
LCS (B3G0245-BS1)					Prepared: 07/07/23 Analyzed: 07/11/23					
Bis(2-chloroethyl)ether	1480		129	ug/kg	3310		44.7	30-130		
Bis(2-chloroisopropyl)ether	1640		129	ug/kg	3310		49.5	30-130		
Bis(2-ethylhexyl)phthalate	1860		397	ug/kg	3310		56.2	30-130		
Butyl benzyl phthalate	1850		129	ug/kg	3310		56.0	30-130		
Chrysene	1910		129	ug/kg	3310		57.7	30-130		
Di-n-octyl phthalate	1900		199	ug/kg	3310		57.4	30-130		
Dibenz(a,h)anthracene	2040		129	ug/kg	3310		61.5	30-130		
Dibenzofuran	1820		129	ug/kg	3310		54.9	30-130		
Diethyl phthalate	1760		129	ug/kg	3310		53.2	30-130		
Dimethyl phthalate	1780		328	ug/kg	3310		53.8	30-130		
Di-n-butyl phthalate	1960		199	ug/kg	3310		59.3	30-130		
Fluoranthene	2050		129	ug/kg	3310		61.9	30-130		
Fluorene	1830		129	ug/kg	3310		55.3	30-130		
Hexachlorobenzene	1750		129	ug/kg	3310		52.9	30-130		
Hexachlorobutadiene	1570		129	ug/kg	3310		47.4	30-130		
Hexachlorocyclopentadiene	1460		328	ug/kg	3310		44.0	30-130		
Hexachloroethane	1320		129	ug/kg	3310		39.7	30-130		
Indeno(1,2,3-cd)pyrene	1950		129	ug/kg	3310		58.9	30-130		
Isophorone	1580		129	ug/kg	3310		47.7	30-130		
Naphthalene	1600		129	ug/kg	3310		48.3	30-130		
N-Nitrosodimethylamine	1260		129	ug/kg	3310		38.2	30-130		
N-Nitrosodi-n-propylamine	1470		129	ug/kg	3310		44.4	30-130		
N-Nitrosodiphenylamine	2090		129	ug/kg	3310		63.1	30-130		
Pentachlorophenol	1660		328	ug/kg	3310		50.1	30-140		
Phenanthrene	1880		129	ug/kg	3310		56.9	30-130		
Pyrene	1840		129	ug/kg	3310		55.6	30-130		
m&p-Cresol	1620		258	ug/kg	3310		48.9	30-130		
Surrogate: Nitrobenzene-d5			*1890*	ug/kg	*3310*		*57.2*	*30-126*		
Surrogate: p-Terphenyl-d14			*2540*	ug/kg	*3310*		*76.6*	*47-130*		
Surrogate: 2-Fluorobiphenyl			*2140*	ug/kg	*3310*		*64.5*	*34-130*		
Surrogate: Phenol-d6			*1980*	ug/kg	*3310*		*59.9*	*30-130*		
Surrogate: 2,4,6-Tribromophenol			*2540*	ug/kg	*3310*		*76.6*	*30-130*		
Surrogate: 2-Fluorophenol			*1900*	ug/kg	*3310*		*57.2*	*30-130*		

Quality Control
(Continued)

Semivolatile organic compounds (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0245 - 1_Semivolatiles Extractions (Continued)										
LCS Dup (B3G0245-BSD1)					Prepared: 07/07/23 Analyzed: 07/11/23					
1,2,4-Trichlorobenzene	1610		129	ug/kg	3310		48.5	30-130	4.55	30
1,2-Dichlorobenzene	1590		129	ug/kg	3310		47.9	30-130	11.5	30
1,3-Dichlorobenzene	1510		129	ug/kg	3310		45.6	30-130	13.5	30
1,4-Dichlorobenzene	1460		129	ug/kg	3310		44.1	30-130	12.1	30
Phenol	1710		129	ug/kg	3310		51.7	30-130	12.1	30
2,4,5-Trichlorophenol	1770		129	ug/kg	3310		53.5	30-130	7.04	30
2,4,6-Trichlorophenol	1780		129	ug/kg	3310		53.6	30-130	5.48	30
2,4-Dichlorophenol	1750		129	ug/kg	3310		52.8	30-130	6.86	30
2,4-Dimethylphenol	1720		328	ug/kg	3310		51.9	30-130	5.87	30
2,4-Dinitrophenol	987		328	ug/kg	3310		29.8	15-140	2.65	30
2,4-Dinitrotoluene	1960		129	ug/kg	3310		59.1	30-130	6.39	30
2,6-Dinitrotoluene	1890		129	ug/kg	3310		57.1	30-130	7.07	30
2-Chloronaphthalene	1750		129	ug/kg	3310		52.9	30-130	8.10	30
2-Chlorophenol	1680		129	ug/kg	3310		50.7	30-130	9.58	30
2-Methylnaphthalene	1710		129	ug/kg	3310		51.8	30-130	6.29	30
Nitrobenzene	1510		129	ug/kg	3310		45.7	30-130	7.35	30
2-Methylphenol	1870		129	ug/kg	3310		56.3	30-130	14.3	30
2-Nitroaniline	1740		129	ug/kg	3310		52.4	30-130	6.86	30
2-Nitrophenol	1580		328	ug/kg	3310		47.8	30-130	4.01	30
3-Nitroaniline	1910		129	ug/kg	3310		57.7	30-130	5.89	30
4,6-Dinitro-2-methylphenol	1510		328	ug/kg	3310		45.5	30-130	0.484	30
4-Bromophenyl phenyl ether	1880		129	ug/kg	3310		56.9	30-130	5.82	30
4-Chloro-3-methylphenol	1800		129	ug/kg	3310		54.2	30-130	5.38	30
4-Chlorophenyl phenyl ether	1960		129	ug/kg	3310		59.1	30-130	8.95	30
4-Nitroaniline	2080		129	ug/kg	3310		62.9	30-130	7.05	30
4-Nitrophenol	1820		328	ug/kg	3310		54.9	30-130	8.26	30
Acenaphthene	1850		129	ug/kg	3310		55.7	30-130	9.23	30
Acenaphthylene	1880		129	ug/kg	3310		56.8	30-130	7.03	30
Anthracene	2000		129	ug/kg	3310		60.5	30-130	6.24	30
Benzo(a)anthracene	2130		129	ug/kg	3310		64.2	30-130	8.24	30
Benzo(a)pyrene	2120		129	ug/kg	3310		64.1	30-130	6.71	30
Benzo(b)fluoranthene	2140		129	ug/kg	3310		64.6	30-130	7.48	30
Benzo(g,h,i)perylene	2240		129	ug/kg	3310		67.7	30-130	10.1	30
Benzo(k)fluoranthene	2210		129	ug/kg	3310		66.7	30-130	6.02	30
Biphenyl	492		40	ug/kg	828		59.4	30-130	3.98	30
Bis(2-chloroethoxy)methane	1720		129	ug/kg	3310		51.9	30-130	7.44	30
Bis(2-chloroethyl)ether	1550		129	ug/kg	3310		46.9	30-130	4.80	30
Bis(2-chloroisopropyl)ether	1870		129	ug/kg	3310		56.6	30-130	13.3	30
Bis(2-ethylhexyl)phthalate	1980		397	ug/kg	3310		59.9	30-130	6.37	30
Butyl benzyl phthalate	2010		129	ug/kg	3310		60.7	30-130	8.19	30
Chrysene	2070		129	ug/kg	3310		62.6	30-130	8.21	30
Di-n-octyl phthalate	1970		199	ug/kg	3310		59.4	30-130	3.42	30
Dibenz(a,h)anthracene	2230		129	ug/kg	3310		67.3	30-130	8.98	30
Dibenzofuran	1970		129	ug/kg	3310		59.4	30-130	7.87	30
Diethyl phthalate	1910		129	ug/kg	3310		57.7	30-130	8.01	30
Dimethyl phthalate	1900		328	ug/kg	3310		57.2	30-130	6.20	30
Di-n-butyl phthalate	2090		199	ug/kg	3310		63.2	30-130	6.27	30
Fluoranthene	2220		129	ug/kg	3310		67.0	30-130	7.95	30
Fluorene	1990		129	ug/kg	3310		60.0	30-130	8.26	30
Hexachlorobenzene	1900		129	ug/kg	3310		57.4	30-130	8.05	30
Hexachlorobutadiene	1670		129	ug/kg	3310		50.4	30-130	6.22	30
Hexachlorocyclopentadiene	1530		328	ug/kg	3310		46.1	30-130	4.62	30
Hexachloroethane	1490		129	ug/kg	3310		45.0	30-130	12.5	30
Indeno(1,2,3-cd)pyrene	2110		129	ug/kg	3310		63.8	30-130	8.09	30
Isophorone	1700		129	ug/kg	3310		51.5	30-130	7.54	30
Naphthalene	1700		129	ug/kg	3310		51.2	30-130	5.83	30
N-Nitrosodimethylamine	1400		129	ug/kg	3310		42.3	30-130	10.2	30

Quality Control
(Continued)

Semivolatile organic compounds (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0245 - 1_Semivolatiles Extractions (Continued)										
LCS Dup (B3G0245-BSD1)					Prepared: 07/07/23 Analyzed: 07/11/23					
N-Nitrosodi-n-propylamine	1670		129	ug/kg	3310		50.4	30-130	12.6	30
N-Nitrosodiphenylamine	2210		129	ug/kg	3310		66.8	30-130	5.69	30
Pentachlorophenol	1710		328	ug/kg	3310		51.5	30-140	2.87	30
Phenanthrene	2020		129	ug/kg	3310		60.9	30-130	6.86	30
Pyrene	2070		129	ug/kg	3310		62.5	30-130	11.7	30
m&p-Cresol	1790		258	ug/kg	3310		54.0	30-130	9.95	30
Surrogate: Nitrobenzene-d5			*2040*	ug/kg	*3310*		*61.6*	*30-126*		
Surrogate: p-Terphenyl-d14			*2820*	ug/kg	*3310*		*85.2*	*47-130*		
Surrogate: 2-Fluorobiphenyl			*2330*	ug/kg	*3310*		*70.5*	*34-130*		
Surrogate: Phenol-d6			*2270*	ug/kg	*3310*		*68.6*	*30-130*		
Surrogate: 2,4,6-Tribromophenol			*2720*	ug/kg	*3310*		*82.2*	*30-130*		
Surrogate: 2-Fluorophenol			*2130*	ug/kg	*3310*		*64.3*	*30-130*		

Quality Control
(Continued)

Pesticides

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0315 - 1_Semivolatiles Extractions										
Blank (B3G0315-BLK1)					Prepared & Analyzed: 07/11/23					
alpha-BHC	ND		1.67	ug/kg						
gamma-BHC (Lindane)	ND		1.67	ug/kg						
beta-BHC	ND		1.67	ug/kg						
delta-BHC	ND		1.67	ug/kg						
Heptachlor	ND		1.67	ug/kg						
Aldrin	ND		1.67	ug/kg						
Heptachlor epoxide	ND		1.67	ug/kg						
gamma-Chlordane	ND		1.67	ug/kg						
alpha-Chlordane	ND		1.67	ug/kg						
Chlordane	ND		16.7	ug/kg						
4,4'-DDE	ND		3.33	ug/kg						
Endosulfan I	ND		1.67	ug/kg						
Dieldrin	ND		1.67	ug/kg						
Endrin	ND		1.67	ug/kg						
4,4'-DDD	ND		3.33	ug/kg						
Endrin aldehyde	ND		1.67	ug/kg						
Endosulfan II	ND		1.67	ug/kg						
4,4'-DDT	ND		3.33	ug/kg						
Methoxychlor	ND		3.33	ug/kg						
Endosulfan sulfate	ND		1.67	ug/kg						
Endrin Ketone	ND		1.67	ug/kg						
Toxaphene	ND		16.7	ug/kg						
Surrogate: 2,4,5,6-Tetrachloro-m-xylene (TCMX)			*9.23*	ug/kg	*13.3*		*69.3*	*30-106*		
Surrogate: Decachlorobiphenyl (DCBP)			*10.4*	ug/kg	*13.3*		*77.7*	*32-110*		
LCS (B3G0315-BS1)					Prepared & Analyzed: 07/11/23					
alpha-BHC	11.2		1.67	ug/kg	13.3		83.9	50-132		
gamma-BHC (Lindane)	11.7		1.67	ug/kg	13.3		87.5	54-128		
beta-BHC	11.8		1.67	ug/kg	13.3		88.2	69-126		
delta-BHC	14.9		1.67	ug/kg	13.3		112	40-126		
Heptachlor	11.8		1.67	ug/kg	13.3		88.6	55-125		
Aldrin	10.8		1.67	ug/kg	13.3		80.7	45-135		
Heptachlor epoxide	11.2		1.67	ug/kg	13.3		84.0	54-127		
gamma-Chlordane	11.3		1.67	ug/kg	13.3		84.7	55-124		
alpha-Chlordane	11.4		1.67	ug/kg	13.3		85.2	54-126		
4,4'-DDE	12.4		3.33	ug/kg	13.3		93.0	63-130		
Endosulfan I	10.3		1.67	ug/kg	13.3		77.5	53-128		
Dieldrin	11.6		1.67	ug/kg	13.3		87.0	57-124		
Endrin	12.4		1.67	ug/kg	13.3		92.7	40-140		
4,4'-DDD	11.7		3.33	ug/kg	13.3		87.8	74-140		
Endrin aldehyde	10.9		1.67	ug/kg	13.3		81.8	40-140		
Endosulfan II	11.7		1.67	ug/kg	13.3		87.7	45-125		
4,4'-DDT	18.3		3.33	ug/kg	13.3		137	60-140		
Methoxychlor	18.5		3.33	ug/kg	13.3		138	71-140		
Endosulfan sulfate	12.4		1.67	ug/kg	13.3		92.7	43-131		
Endrin Ketone	12.3		1.67	ug/kg	13.3		92.6	56-131		
Surrogate: 2,4,5,6-Tetrachloro-m-xylene (TCMX)			*10.8*	ug/kg	*13.3*		*81.3*	*38-106*		
Surrogate: Decachlorobiphenyl (DCBP)			*11.7*	ug/kg	*13.3*		*87.5*	*32-110*		

Quality Control
(Continued)

Pesticides (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0315 - 1_Semivolatiles Extractions (Continued)										
LCS Dup (B3G0315-BSD1)					Prepared & Analyzed: 07/11/23					
alpha-BHC	11.3		1.67	ug/kg	13.3		84.9	50-132	1.13	30
gamma-BHC (Lindane)	11.6		1.67	ug/kg	13.3		87.2	54-128	0.372	30
beta-BHC	11.7		1.67	ug/kg	13.3		87.6	69-126	0.654	30
delta-BHC	14.7		1.67	ug/kg	13.3		110	40-126	1.56	30
Heptachlor	11.8		1.67	ug/kg	13.3		88.4	55-125	0.226	30
Aldrin	10.7		1.67	ug/kg	13.3		80.5	45-135	0.310	30
Heptachlor epoxide	11.2		1.67	ug/kg	13.3		83.7	54-127	0.358	30
gamma-Chlordane	11.3		1.67	ug/kg	13.3		84.8	55-124	0.236	30
alpha-Chlordane	11.3		1.67	ug/kg	13.3		84.5	54-126	0.825	30
4,4'-DDE	11.3		3.33	ug/kg	13.3		84.7	63-130	9.40	30
Endosulfan I	10.4		1.67	ug/kg	13.3		78.0	53-128	0.611	30
Dieldrin	11.5		1.67	ug/kg	13.3		86.5	57-124	0.519	30
Endrin	12.3		1.67	ug/kg	13.3		92.3	40-140	0.514	30
4,4'-DDD	11.9		3.33	ug/kg	13.3		89.2	74-140	1.53	30
Endrin aldehyde	11.4		1.67	ug/kg	13.3		85.9	40-140	4.83	30
Endosulfan II	11.9		1.67	ug/kg	13.3		89.4	45-125	1.98	30
4,4'-DDT	18.4		3.33	ug/kg	13.3		138	60-140	0.650	30
Methoxychlor	14.5		3.33	ug/kg	13.3		109	71-140	24.1	30
Endosulfan sulfate	12.8		1.67	ug/kg	13.3		95.8	43-131	3.29	30
Endrin Ketone	11.8		1.67	ug/kg	13.3		88.5	56-131	4.50	30
Surrogate: 2,4,5,6-Tetrachloro-m-xylene (TCMX)			*9.97*	ug/kg	*13.3*		*74.8*	*38-106*		
Surrogate: Decachlorobiphenyl (DCBP)			*10.9*	ug/kg	*13.3*		*82.0*	*32-110*		

Quality Control
(Continued)

Polychlorinated Biphenyls (PCBs)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0238 - 1_Semivolatiles Extractions										
Blank (B3G0238-BLK1)					Prepared: 07/12/23 Analyzed: 07/13/23					
2,4'-Dichlorobiphenyl	ND		3	ug/kg						
2,2',5-Trichlorobiphenyl	ND		3	ug/kg						
2,4,4'-Trichlorobiphenyl	ND		3	ug/kg						
2,2',3,5'-Tetrachlorobiphenyl	ND		3	ug/kg						
2,2',5,5'-Tetrachlorobiphenyl	ND		3	ug/kg						
2,3',4,4'-Tetrachlorobiphenyl	ND		3	ug/kg						
3,3',4,4'-Tetrachlorobiphenyl	ND		3	ug/kg						
3,4,4',5-Tetrachlorobiphenyl	ND		3	ug/kg						
2,2',4,5,5'-Pentachlorobiphenyl	ND		3	ug/kg						
2,3,3',4,4'-Pentachlorobiphenyl	ND		3	ug/kg						
2,3,4,4',5-Pentachlorobiphenyl	ND		3	ug/kg						
2,3',4,4',5-Pentachlorobiphenyl	ND		3	ug/kg						
2',3,4,4',5-Pentachlorobiphenyl	ND		3	ug/kg						
3,3',4,4',5-Pentachlorobiphenyl	ND		3	ug/kg						
2,2',3,3',4,4'-Hexachlorobiphenyl	ND		3	ug/kg						
2,2',3,4,4',5'-Hexachlorobiphenyl	ND		3	ug/kg						
2,2',4,4',5,5'-Hexachlorobiphenyl	ND		3	ug/kg						
2,3,3',4,4',5-Hexachlorobiphenyl	ND		3	ug/kg						
2,3,3',4,4',5'-Hexachlorobiphenyl	ND		3	ug/kg						
2,3,4',4,5',5-Hexachlorobiphenyl	ND		3	ug/kg						
3,3',4,4',5,5'-Hexachlorobiphenyl	ND		3	ug/kg						
2,2',3,3',4,4',5-Heptachlorobiphenyl	ND		3	ug/kg						
2,2',3,4,4',5,5'-Heptachlorobiphenyl	ND		3	ug/kg						
2,2',3,4',5,5',6-Heptachlorobiphenyl	ND		3	ug/kg						
2,3,3',4,4',5,5'-Heptachlorobiphenyl	ND		3	ug/kg						
2,2',3,3',4,4',5,6-Octachlorobiphenyl	ND		3	ug/kg						
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	ND		3	ug/kg						
Decachlorobiphenyl	ND		3	ug/kg						
Surrogate: 2,4,5,6-Tetrachloro-m-xylene (TCMX)			*9.01*	ug/kg	*8.00*		*113*	*40-140*		

Quality Control
(Continued)

Polychlorinated Biphenyls (PCBs) (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0238 - 1_Semivolatiles Extractions (Continued)										
LCS (B3G0238-BS1)					Prepared: 07/12/23 Analyzed: 07/18/23					
2,4′-Dichlorobiphenyl	18		3	ug/kg	26.7		68.3	40-140		
2,2',5-Trichlorobiphenyl	20		3	ug/kg	26.7		74.9	40-140		
2,4,4′-Trichlorobiphenyl	19		3	ug/kg	26.7		72.3	40-140		
2,2',3,5'-Tetrachlorobiphenyl	22		3	ug/kg	26.7		82.5	40-140		
2,2',5,5'-Tetrachlorobiphenyl	21		3	ug/kg	26.7		77.3	40-140		
2,3',4,4'-Tetrachlorobiphenyl	24		3	ug/kg	26.7		89.1	40-140		
3,3',4,4'-Tetrachlorobiphenyl	20		3	ug/kg	26.7		75.0	40-140		
3,4,4′,5-Tetrachlorobiphenyl	24		3	ug/kg	26.7		90.4	40-140		
2,2',4,5,5'-Pentachlorobiphenyl	29		3	ug/kg	26.7		110	40-140		
2,3,3′,4,4'-Pentachlorobiphenyl	18		3	ug/kg	26.7		68.3	40-140		
2,3,4,4′,5-Pentachlorobiphenyl	31		3	ug/kg	26.7		115	40-140		
2,3',4,4′,5-Pentachlorobiphenyl	30		3	ug/kg	26.7		112	40-140		
2′,3,4,4′,5-Pentachlorobiphenyl	28		3	ug/kg	26.7		104	40-140		
3,3',4,4′,5-Pentachlorobiphenyl	32		3	ug/kg	26.7		120	40-140		
2,2',3,3′,4,4'-Hexachlorobiphenyl	13		3	ug/kg	26.7		49.4	40-140		
2,2',3,4,4',5'-Hexachlorobiphenyl	24		3	ug/kg	26.7		89.2	40-140		
2,2',4,4′,5,5'-Hexachlorobiphenyl	44		3	ug/kg	26.7		164	40-140		
2,3,3′,4,4',5-Hexachlorobiphenyl	41		3	ug/kg	26.7		153	40-140		
2,3,3′,4,4',5′-Hexachlorobiphenyl	32		3	ug/kg	26.7		121	40-140		
2,3,4′,4,5',5-Hexachlorobiphenyl	14		3	ug/kg	26.7		50.7	40-140		
3,3′,4,4′,5,5′-Hexachlorobiphenyl	15		3	ug/kg	26.7		55.7	40-140		
2,2',3,3',4,4',5-Heptachlorobiphenyl	16		3	ug/kg	26.7		61.6	40-140		
2,2',3,4,4′,5,5′-Heptachlorobiphenyl	14		3	ug/kg	26.7		53.9	40-140		
2,2',3,4',5,5',6-Heptachlorobiphenyl	15		3	ug/kg	26.7		55.2	40-140		
2,3,3′,4,4′,5,5′-Heptachlorobiphenyl	18		3	ug/kg	26.7		67.9	40-140		
2,2',3,3',4,4',5,6-Octachlorobiphenyl	17		3	ug/kg	26.7		62.4	40-140		
2,2',3,3',4,4',5,5′,6-Nonachlorobiphenyl	37		3	ug/kg	26.7		138	40-140		
Decachlorobiphenyl	30		3	ug/kg	26.7		111	40-140		
Surrogate: 2,4,5,6-Tetrachloro-m-xylene (TCMX)			*3.41*	ug/kg	*5.33*		*64.0*	*40-140*		

Quality Control
(Continued)

Polychlorinated Biphenyls (PCBs) (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0238 - 1_Semivolatiles Extractions (Continued)										
LCS Dup (B3G0238-BSD1)					Prepared: 07/12/23 Analyzed: 07/18/23					
2,4'-Dichlorobiphenyl	20		3	ug/kg	26.7		73.1	40-140	6.76	200
2,2',5-Trichlorobiphenyl	21		3	ug/kg	26.7		77.9	40-140	3.91	200
2,4,4'-Trichlorobiphenyl	18		3	ug/kg	26.7		66.9	40-140	7.79	200
2,2',3,5'-Tetrachlorobiphenyl	22		3	ug/kg	26.7		83.9	40-140	1.68	200
2,2',5,5'-Tetrachlorobiphenyl	21		3	ug/kg	26.7		78.3	40-140	1.34	200
2,3',4,4'-Tetrachlorobiphenyl	24		3	ug/kg	26.7		89.8	40-140	0.822	200
3,3',4,4'-Tetrachlorobiphenyl	20		3	ug/kg	26.7		73.7	40-140	1.77	200
3,4,4',5-Tetrachlorobiphenyl	24		3	ug/kg	26.7		91.8	40-140	1.49	200
2,2',4,5,5'-Pentachlorobiphenyl	33		3	ug/kg	26.7		125	40-140	12.7	200
2,3,3',4,4'-Pentachlorobiphenyl	18		3	ug/kg	26.7		68.5	40-140	0.263	200
2,3,4,4',5-Pentachlorobiphenyl	31		3	ug/kg	26.7		117	40-140	1.92	200
2,3',4,4',5-Pentachlorobiphenyl	31		3	ug/kg	26.7		116	40-140	3.50	200
2',3,4,4',5-Pentachlorobiphenyl	28		3	ug/kg	26.7		106	40-140	1.89	200
3,3',4,4',5-Pentachlorobiphenyl	34		3	ug/kg	26.7		128	40-140	6.57	200
2,2',3,3',4,4'-Hexachlorobiphenyl	16		3	ug/kg	26.7		59.8	40-140	19.2	200
2,2',3,4,4',5'-Hexachlorobiphenyl	24		3	ug/kg	26.7		90.4	40-140	1.36	200
2,2',4,4',5,5'-Hexachlorobiphenyl	45		3	ug/kg	26.7		168	40-140	1.91	200
2,3,3',4,4',5-Hexachlorobiphenyl	40		3	ug/kg	26.7		150	40-140	1.43	200
2,3,3',4,4',5'-Hexachlorobiphenyl	33		3	ug/kg	26.7		125	40-140	3.60	200
2,3,4',4,5',5-Hexachlorobiphenyl	14		3	ug/kg	26.7		52.6	40-140	3.63	200
3,3',4,4',5,5'-Hexachlorobiphenyl	16		3	ug/kg	26.7		59.4	40-140	6.30	200
2,2',3,3',4,4',5-Heptachlorobiphenyl	18		3	ug/kg	26.7		68.2	40-140	10.2	200
2,2',3,4,4',5,5'-Heptachlorobiphenyl	15		3	ug/kg	26.7		55.1	40-140	2.07	200
2,2',3,4',5,5',6-Heptachlorobiphenyl	15		3	ug/kg	26.7		56.5	40-140	2.33	200
2,3,3',4,4',5,5'-Heptachlorobiphenyl	18		3	ug/kg	26.7		68.6	40-140	0.967	200
2,2',3,3',4,4',5,6-Octachlorobiphenyl	17		3	ug/kg	26.7		65.2	40-140	4.37	200
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	37		3	ug/kg	26.7		140	40-140	1.33	200
Decachlorobiphenyl	30		3	ug/kg	26.7		112	40-140	0.462	200
Surrogate: 2,4,5,6-Tetrachloro-m-xylene (TCMX)			*3.29*	ug/kg	*5.33*		*61.7*	*40-140*		

Quality Control
(Continued)

Extractable Petroleum Hydrocarbons (MADEP-EPH)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0240 - 1_Semivolatiles Extractions										
Blank (B3G0240-BLK1)					Prepared: 07/07/23 Analyzed: 07/10/23					
Unadjusted C11-C22 Aromatic Hydrocarbons	ND		6.63	mg/kg						
Naphthalene	ND		0.33	mg/kg						
2-Methylnaphthalene	ND		0.33	mg/kg						
Phenanthrene	ND		0.33	mg/kg						
Acenaphthene	ND		0.33	mg/kg						
Acenaphthylene	ND		0.33	mg/kg						
Fluorene	ND		0.33	mg/kg						
Anthracene	ND		0.33	mg/kg						
Fluoranthene	ND		0.33	mg/kg						
Pyrene	ND		0.33	mg/kg						
Benzo(a)anthracene	ND		0.33	mg/kg						
Chrysene	ND		0.33	mg/kg						
Benzo(b)fluoranthene	ND		0.33	mg/kg						
Benzo(k)fluoranthene	ND		0.33	mg/kg						
Benzo(a)pyrene	ND		0.33	mg/kg						
Indeno(1,2,3-cd)pyrene	ND		0.33	mg/kg						
Dibenz(a,h)anthracene	ND		0.33	mg/kg						
Benzo(g,h,i)perylene	ND		0.33	mg/kg						
C9-C18 Aliphatic Hydrocarbons	ND		13.2	mg/kg						
C19-C36 Aliphatic Hydrocarbons	ND		13.2	mg/kg						
C11-C22 Aromatic Hydrocarbons	ND		6.63	mg/kg						
Surrogate: Chlorooctadecane			*5.31*	mg/kg	*8.28*		*64.1*	*40-140*		
Surrogate: o-Terphenyl			*3.92*	mg/kg	*8.28*		*47.4*	*40-140*		
Surrogate: 2-Fluorobiphenyl			*2.24*	mg/kg	*3.31*		*67.6*	*40-140*		
Surrogate: 2-Bromonaphthalene			*2.28*	mg/kg	*3.31*		*68.8*	*40-140*		
LCS (B3G0240-BS1)					Prepared: 07/07/23 Analyzed: 07/10/23					
Naphthalene	1.30		0.33	mg/kg	2.65		49.0	40-140		
2-Methylnaphthalene	1.36		0.33	mg/kg	2.65		51.4	40-140		
Phenanthrene	1.40		0.33	mg/kg	2.65		52.7	40-140		
Acenaphthene	1.34		0.33	mg/kg	2.65		50.7	40-140		
Acenaphthylene	1.35		0.33	mg/kg	2.65		51.1	40-140		
Fluorene	1.33		0.33	mg/kg	2.65		50.2	40-140		
Anthracene	1.45		0.33	mg/kg	2.65		54.6	40-140		
Fluoranthene	1.47		0.33	mg/kg	2.65		55.6	40-140		
Pyrene	1.48		0.33	mg/kg	2.65		55.9	40-140		
Benzo(a)anthracene	1.60		0.33	mg/kg	2.65		60.4	40-140		
Chrysene	1.61		0.33	mg/kg	2.65		60.6	40-140		
Benzo(b)fluoranthene	1.60		0.33	mg/kg	2.65		60.4	40-140		
Benzo(k)fluoranthene	1.56		0.33	mg/kg	2.65		58.8	40-140		
Benzo(a)pyrene	1.55		0.33	mg/kg	2.65		58.3	40-140		
Indeno(1,2,3-cd)pyrene	1.51		0.33	mg/kg	2.65		56.8	40-140		
Dibenz(a,h)anthracene	1.50		0.33	mg/kg	2.65		56.6	40-140		
Benzo(g,h,i)perylene	1.54		0.33	mg/kg	2.65		58.1	40-140		
EPH_LCS_Aliphatic_C19-C36	18.1		0.00	mg/kg	21.2		85.5	40-140		
EPH_LCS_Aliphatic_C9-C18	10.6		0.00	mg/kg	15.9		66.9	40-140		
EPH_LCS_Aromatic_C11-C22	24.9		0.00	mg/kg	45.0		55.4	40-140		
Nonane	1.40		0.33	mg/kg	2.65		52.7	30-140		
Decane	1.66		0.33	mg/kg	2.65		62.8	40-140		
Dodecane	1.87		0.33	mg/kg	2.65		70.5	40-140		
Tetradecane	1.82		0.33	mg/kg	2.65		68.6	40-140		
Hexadecane	1.86		0.33	mg/kg	2.65		70.4	40-140		
Octadecane	2.02		0.33	mg/kg	2.65		76.1	40-140		
Nonadecane	2.10		0.33	mg/kg	2.65		79.3	40-140		
Eicosane	2.19		0.33	mg/kg	2.65		82.8	40-140		
Docosane	2.33		0.33	mg/kg	2.65		87.9	40-140		
Tetracosane	2.36		0.33	mg/kg	2.65		89.2	40-140		

Quality Control
(Continued)

Extractable Petroleum Hydrocarbons (MADEP-EPH) (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B3G0240 - 1_Semivolatiles Extractions (Continued)										
LCS (B3G0240-BS1)					Prepared: 07/07/23 Analyzed: 07/11/23					
Hexacosane	2.37		0.33	mg/kg	2.65		89.6	40-140		
Octacosane	2.36		0.33	mg/kg	2.65		89.2	40-140		
Triacontane	2.30		0.33	mg/kg	2.65		87.0	40-140		
Hexatriacontane	2.09		0.33	mg/kg	2.65		79.0	40-140		
Surrogate: Chlorooctadecane			*7.44*	mg/kg	*8.28*		*89.8*	*40-140*		
Surrogate: o-Terphenyl			*4.74*	mg/kg	*8.28*		*57.3*	*40-140*		
Surrogate: 2-Fluorobiphenyl			*2.66*	mg/kg	*3.31*		*80.5*	*40-140*		
Surrogate: 2-Bromonaphthalene			*2.71*	mg/kg	*3.31*		*81.7*	*40-140*		
LCS Dup (B3G0240-BSD1)					Prepared: 07/07/23 Analyzed: 07/10/23					
Naphthalene	1.25		0.33	mg/kg	2.65		47.2	40-140	3.95	25
2-Methylnaphthalene	1.31		0.33	mg/kg	2.65		49.6	40-140	3.76	25
Phenanthrene	1.40		0.33	mg/kg	2.65		53.0	40-140	0.568	25
Acenaphthene	1.32		0.33	mg/kg	2.65		49.7	40-140	1.89	25
Acenaphthylene	1.32		0.33	mg/kg	2.65		49.7	40-140	2.78	25
Fluorene	1.31		0.33	mg/kg	2.65		49.6	40-140	1.25	25
Anthracene	1.43		0.33	mg/kg	2.65		53.9	40-140	1.29	25
Fluoranthene	1.53		0.33	mg/kg	2.65		57.8	40-140	3.75	25
Pyrene	1.54		0.33	mg/kg	2.65		58.2	40-140	4.03	25
Benzo(a)anthracene	1.68		0.33	mg/kg	2.65		63.2	40-140	4.65	25
Chrysene	1.68		0.33	mg/kg	2.65		63.4	40-140	4.51	25
Benzo(b)fluoranthene	1.69		0.33	mg/kg	2.65		63.7	40-140	5.28	25
Benzo(k)fluoranthene	1.63		0.33	mg/kg	2.65		61.5	40-140	4.41	25
Benzo(a)pyrene	1.60		0.33	mg/kg	2.65		60.6	40-140	3.74	25
Indeno(1,2,3-cd)pyrene	1.56		0.33	mg/kg	2.65		58.9	40-140	3.58	25
Dibenz(a,h)anthracene	1.54		0.33	mg/kg	2.65		58.2	40-140	2.70	25
Benzo(g,h,i)perylene	1.59		0.33	mg/kg	2.65		60.1	40-140	3.26	25
EPH_LCS_Aliphatic_C19-C36	18.2		0.00	mg/kg	21.2		86.0	40-140	0.623	25
EPH_LCS_Aliphatic_C9-C18	10.7		0.00	mg/kg	15.9		67.4	40-140	0.733	25
EPH_LCS_Aromatic_C11-C22	25.4		0.00	mg/kg	45.0		56.4	40-140	1.75	25
Nonane	1.42		0.33	mg/kg	2.65		53.7	30-140	1.83	25
Decane	1.69		0.33	mg/kg	2.65		63.8	40-140	1.58	25
Dodecane	1.88		0.33	mg/kg	2.65		70.9	40-140	0.565	25
Tetradecane	1.82		0.33	mg/kg	2.65		68.6	40-140	0.00	25
Hexadecane	1.85		0.33	mg/kg	2.65		69.9	40-140	0.713	25
Octadecane	2.04		0.33	mg/kg	2.65		77.2	40-140	1.40	25
Nonadecane	2.14		0.33	mg/kg	2.65		80.9	40-140	1.94	25
Eicosane	2.24		0.33	mg/kg	2.65		84.4	40-140	1.91	25
Docosane	2.36		0.33	mg/kg	2.65		89.0	40-140	1.27	25
Tetracosane	2.40		0.33	mg/kg	2.65		90.5	40-140	1.45	25
Hexacosane	2.41		0.33	mg/kg	2.65		91.0	40-140	1.49	25
Octacosane	2.37		0.33	mg/kg	2.65		89.6	40-140	0.475	25
Triacontane	2.30		0.33	mg/kg	2.65		86.7	40-140	0.259	25
Hexatriacontane	2.02		0.33	mg/kg	2.65		76.1	40-140	3.68	25
Surrogate: Chlorooctadecane			*7.33*	mg/kg	*8.28*		*88.6*	*40-140*		
Surrogate: o-Terphenyl			*4.76*	mg/kg	*8.28*		*57.5*	*40-140*		
Surrogate: 2-Fluorobiphenyl			*2.59*	mg/kg	*3.31*		*78.1*	*40-140*		
Surrogate: 2-Bromonaphthalene			*2.61*	mg/kg	*3.31*		*78.9*	*40-140*		

Notes and Definitions

Item	Definition
Wet	Sample results reported on a wet weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.

NEW ENGLAND TESTING LABORATORY, INC.
59 Greenhill Street
West Warwick, RI 02893
1-888-863-8522

CHAI

3 G 0 70093

PROJ. NO. 22147.02 | PROJECT NAME/LOCATION: Mill Pond Dam Wareham

CLIENT: Pare

REPORT TO: esilva; eklinkhammer; jgulfayle

INVOICE TO: sgravel

DATE	TIME	COMP	GRAB	SAMPLE I.D.	AQUEOUS	SOIL	OTHER * SEDIMENT	NO. OF CONTAINERS	PRESERVATIVE	TESTS** PCBs	EPH	JMG	As, cd, cr, Cu, Ni, Hg, Zn, Pb	Pesticides	Total organic compounds	Percent water	grain size	VOCs	REMARKS
7/7/23	0930	X		SED-1			X	3	ICE	X	X	X	X	X	X	X	X		
	0954	X		SED-2				3	ICE	X	X	X	X	X	X	X	X		
	0930		X	SED-1				3	1 MeOH 2 ICE									X	
	0954		X	SED-2				3	1 MeOH 2 ICE									X	
			J																

	Date/Time		Date/Time
Sampled by: (Signature)	7/7/23 JMG 11:30	Received by: (Signature)	
Relinquished by: (Signature)		Received by: (Signature)	
Relinquished by: (Signature)	7/7/23 11:30	Received for Laboratory by: (Signature)	7/7/23 1130

Laboratory Remarks:
Temp. received: 3
Cooled ☐

Special Instructions:
List Specific Detection Limit Requirements:
- Please compare to MassDEP water quality cert
- Please analyze

Turnaround (Business Days)_____

**Netlab subcontracts the following tests: Radiologicals, Radon, Asbestos, UCMRs, Perchlorate, Bromate, Bromide, Sieve, Salmonella, Carbamates, CT ETPH

Proposal No. 606532-136278
A00840 - 158

MassDEP Analytical Protocol Certification Form

Laboratory Name: New England Testing Laboratory, Inc. Project #: 22147.02

Project Location: Wareham, MA RTN:

This Form provides certifications for the following data set: list Laboratory Sample ID Number(s): 3G07009

Matrices: ☐ Groundwater/Surface Water ☒ Soil/Sediment ☐ Drinking Water ☐ Air ☐ Other:

CAM Protocol (check all that apply below):

8260 VOC CAM II A ☒	7470/7471 Hg CAM III B ☒	MassDEP VPH (GC/PID/FID) CAM IV A ☐	8082 PCB CAM V A ☒	9014 Total Cyanide/PAC CAM VI A ☐	6860 Perchlorate CAM VIII B ☐
8270 SVOC CAM II B ☒	7010 Metals CAM III C ☐	MassDEP VPH (GC/MS) CAM IV C ☐	8081 Pesticides CAM V B ☒	7196 Hex Cr CAM VI B ☐	MassDEP APH CAM IX A ☐
6010 Metals CAM III A ☒	6020 Metals CAM III D ☐	MassDEP EPH CAM IV B ☒	8151 Herbicides CAM V C ☐	8330 Explosives CAM VIII A ☐	TO-15 VOC CAM IX B ☐

Affirmative Responses to Questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	☒ Yes ☐ No
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	☒ Yes ☐ No
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	☒ Yes ☐ No
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	☒ Yes ☐ No
E	VPH, EPH, APH, and TO-15 only a. VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications). b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	☐ Yes ☐ No ☐ Yes ☐ No
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	☒ Yes ☐ No

Responses to Questions G, H and I below are required for "Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	☒ Yes ☐ No[1]

***Data User Note*: Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.**

H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	☒ Yes ☐ No[1]
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	☒ Yes ☐ No[1]

[1]*All negative responses must be addressed in an attached laboratory narrative.*

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, is accurate and complete.

Signature: _____ **Position:** Laboratory Director

Printed Name: Richard Warila **Date**: 7/20/2023

Massachusetts Department of Transportation

MILL POND DAM

SECTION 7

WILDLIFE PASSAGE REPORT & PASSAGE DESIGN MEMO

WILDLIFE PASSAGE DESIGN REPORT

PROJECT No. 606352

Reconstruction of Mill Pond Dam MA00027
Route 6WB/28NB (Cranberry Highway)
Wareham, MA

Pare Project No. 22147.02

Prepared for:

Massachusetts Department of Transportation
10 Park Plaza
Boston, MA 02116

Prepared by:

PARE CORPORATION
8 Blackstone Valley Place
Lincoln, RI 02865

December 2024

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1.0 Project Purpose

As part of the reconstruction of Wareham Mill Pond Dam, Pare Corporation has been tasked with designing a replacement fish ladder that would improve the migration of several target anadromous species of marine life. During preliminary design, Pare coordinated with the Division of Marine Fisheries to determine a suitable fish ladder type to replace the existing fish ladder which is inefficient due to the limited flow range and areas susceptible to predation. The design was based on the latest guidelines available from the National Oceanic and Atmospheric Administration (NOAA), the United States Geological Service (USGS), the U.S. Fish and Wildlife Service (USFWS), and the Massachusetts Division of Marine Fisheries (MADMF), along with coordination with Massachusetts Department of Transportation (MassDOT) – Highway Division Environmental Section, and MADMF for site specific information and requirements.

This report provides information on the alternative analysis of the fish ladder performed during conceptual design, the parameters assumed based on the target species identified by MADMF, and summarizes the output data from the hydraulic analysis of the proposed passage. Based on the analysis, the geometry of the passage was designed to accommodate a range of flows and velocities so that the various target species can effectively journey from the Agawam River and into Mill Pond upstream.

2.0 DESCRIPTION OF EXISTING SITE CONDITIONS

2.1 Description of Existing Structure

Mill Pond Dam is located in Wareham, Massachusetts where the Cranberry Highway (Route 6/28) crosses the Agawam River. The resulting impoundment to the north of the dam is Agawam Mill Pond. Mill Pond Dam is a 16.5' high, 285' long earth fill embankment structure carrying U.S. Route 6 westbound and State Route 28 northbound, over the Agawam River. The dam consists of five major elements: a fish way, a primary spillway, secondary spillway, an outlet pipe, and the earth embankment. This 285' long, 16.5' high dam with a reported maximum storage capacity of 1,768 acre-feet is a Large size, Class I (High) hazard potential structure as classified by 302CMR10. An approximately 6' wide by 300' long earthen dike containing a natural bottom fish way extends Northward from the east side of the dam along the length of the dike.

Migrating fish travel upstream from the Agawam River to the fish way upstream through a fish ladder located at the base of the dam's primary spillway. The existing fish ladder is an Alaskan Steeppass type; a baffle fish ladder that is prefabricated and modular. This type of ladder is typically used in retrofits, where the lift elevation must fit within the space available which causes these type of fish ladders to be narrower and steeper. Due to its slope, the operating flow range is limited. At this location there are a combination of issues that further limit the capacity of the ladder. The configuration of the underground weir and pool fishway and transition from the steeppass make it difficult for fish to pass between the two sections. Secondly, flows from the main and auxiliary spillways can be a significant false attraction leading fish away from the fishway entrance, tiring them enough to be unable to make the rest of the journey, and making them more susceptible to predation.

2.2 Description of Cultural Resource Areas Affecting the Site

2.2.1 Historic and Archaeological Considerations

The primary cultural resource concern is the herring run along the Agawam River. The run is a popular tourist attraction and has been in operation since 1632. This must be maintained during the construction periods that coincide with migration activity. The proposed fish ladder will likely need to be operational before the existing fish ladder can be decommissioned. A concrete pad will be included in the design of the proposed fish ladder to allow harvesting of the herring by the Town. The flow would be diverted from the fish ladder onto the harvesting pad by using adjustable weirs and/or stoplogs. The harvesting pad design will also allow fish that are not chosen for harvesting to enter back into the fish ladder stream.

According to the April 2015 archaeological reconnaissance and site assessment report prepared by Archaeological and historical Services, Inc., the upstream fishway and fish ladder should be considered historically significant, in the opinion of the report authors. Care should be taken to preserve any possible historic elements and to closely match the aesthetics of the existing structures. Based on coordination with environmental and historical agencies during design several solutions were discussed to preserve the historical elements and provide a context sensitive design that suits the nature of the project area. It was agreed that by repairing the stone walls, although labor intensive, the open portion of the dike would be the most appropriate way to preserve the cultural resource. The portion under the roadway and in the downstream area will be preserved to the maximum extent practicable with repair and rehabilitation likely for certain areas, mostly anticipated under the roadway. Some portions in the downstream area will

have to be removed to accommodate the proposed fish ladder, but the materials could be repurposed elsewhere on the site.

3.0 ALTERNATIVES ANALYSIS

The proposed fish ladder will be located in the downstream area between what are now the existing auxiliary and primary spillways. The fish ladder entrance would be located downstream of the proposed bridge and will turn back to fit the steps in elevation required to transport marine species from the river to the pond. The final portion of the fish ladder would travel under the bridge along the east abutment before exiting into the impoundment, east of the proposed spillway.

The following provides a brief summary of the design options explored for the proposed fish ladder. The Pool and Weir fish ladder was selected after close coordination with MADMF to choose the most beneficial fish ladder for the marine life in the Agawam River and Mill Pond.

Alternative 1 – Denil Ladder

This type of fish ladder is a rectangular chute with baffles extending from the bottom and sides. It is most commonly used in small streams, especially in the Northeast. Due to the highly turbulent nature of Denil Fish Ladders, they provide good attraction flows, but resting pools are usually required. MADMF believes this design would suit the migratory patterns of the marine wildlife that travel in the Agawam River.

Alternative 2 – Alaskan Steeppass

This type of baffle fish ladder is a prefabricated, modular version of the Denil Ladder. It is narrower, steeper, and has a more complex baffle configuration than the Denil Ladder. Due to its slope, the operating flow range is limited. This type of ladder is typically used in retrofits, where the lift elevation must fit within the space available. This type is currently in use at Mill Pond Dam and due to the transitions for the different sections of the fish way and significant false attractions from the spillways, this type of spillway is inefficient for the types of anadromous species in the Agawam River.

Alternative 3 – Pool and Weir

This type of fish ladder includes pools separated by weirs that step up at each pool to achieve the elevation required form the entrance to the exit of the fish ladder. The ladder is designed by creating flow conditions that allow each pool to be used by the fish to recover from the energy demand required to swim through the weirs. These ladders can be designed to have a more natural appearance by designing them into the landscape using the existing stone masonry walls that will be removed as part of the spillway replacement. Due to the popularity of the herring run at this location, this option would be the most aesthetically pleasing option. This type of fish ladder has been used effectively in other communities around New England for fish passage.

Alternative 4 – Rehabilitation of the Existing Fish Ladder

This option involves complete rehabilitation and reconstruction of the existing stone masonry fish ladder, including the open and underground segments of the fishway. According to MADMF population counts of the fish ladder, this ladder is not as efficient as other alternatives. It would also be the most

expensive alternative, as repairing the stone masonry walls, the constraints within the underground portions of the fish ladder, impacts to vegetated wetlands, and the length of the open portions on the upstream side of the dam are all labor intensive.

The recommended alternative based on coordination with MADMF is the Pool and Weir fish ladder due to its effectiveness at other locations in New England for similar species and the aesthetics of this type of fish ladder. The herring run is a popular destination during the spring months and this fish ladder will provide a better viewing experience for visitors and will more closely match the natural aesthetics of the location.

4.0 TARGET SPECIES & DESIGN PARAMETERS

Based on coordination with MADMF, the species that are targeted for the design of the fish ladder are river herring (alewife and blueback herring), American shad, American eel, and white perch. Pare primarily used the design parameters in the "Nature-like Fishway Passage Design Guidelines for Atlantic Coast Diadromous Fishes" from May 2016, released jointly by NOAA, USGS, and USFWS. Pare reviewed the parameters of each species and determined the target flow velocities and pool geometry that would satisfy the requirements of all species, providing the greatest chance of survival for each species. Below is a summary of the design parameters used for each target species from the guidelines.

4.1 River Herring

4.1.1 Blueback Herring

Min. Total Length (cm)	20
Max. Total Length (cm)	31
Body Depth/Total Length Ratio	0.252
Max. Body Depth (cm)	7.8
Min. Pool Width (ft)	5
Min. Pool Depth (ft)	2
Min. Pool Length (ft)	10
Min. Weir Width (ft)	2.25
Min. Weir Depth (ft)	1
Max. Weir Velocity (ft/s)	6
Max. Fishway Slope	1:20

4.1.2 Alewife

Min. Total Length (cm)	22
Max. Total Length (cm)	38
Body Depth/Total Length Ratio	0.223
Max. Body Depth (cm)	8.9
Min. Pool Width (ft)	5
Min. Pool Depth (ft)	2.25
Min. Pool Length (ft)	10
Min. Weir Width (ft)	2.5
Min. Weir Depth (ft)	1
Max. Weir Velocity (ft/s)	6
Max. Fishway Slope	1:20

In addition to the tables above, Pare used guidance for river herring from the MADMF Diadromous Fish Passage Guidelines from September 2020. This guidance generally closely matched the NOAA, USGS, and USFWS data with some more specific information related to low flow situations on the target weir velocities and geometry of the pools and weirs. Below is a summary of that data:

Min. Pool Depth (ft)	2
Min. Weir Width (ft)	0.5
Min. Weir Depth (ft)	0.5
Max. Weir Velocity (ft/s)	6.56
Fishway Elevation Change (ft)	0.5
Max. Fishway Slope	3%

4.2 American Shad

Min. Total Length (cm)	36
Max. Total Length (cm)	76
Body Depth/Total Length Ratio	0.292
Max. Body Depth (cm)	22.2
Min. Pool Width (ft)	20
Min. Pool Depth (ft)	4
Min. Pool Length (ft)	30
Min. Weir Width (ft)	5
Min. Weir Depth (ft)	2.25
Max. Weir Velocity (ft/s)	8.25
Max. Fishway Slope	1:30

The pool geometry recommendations for shad are significantly larger than that of river herring. The pool and weir geometry proposed is under the recommended minimums for shad due to site constraints but fall between the recommendations of river herring and shad to accommodate migration of both species as much as practicable. Based on coordination with MADMF during design, meeting the requirements of this species is not as high a priority for the agency than of herring and eel. Further

coordination with MADMF will continue through final design to determine if shad can be accommodated based on site constraints of the geometry.

4.3 American Eel

4.3.1 Length Less than 15 cm

Min. Total Length (cm)	5
Max. Total Length (cm)	15
Body Depth/Total Length Ratio	0.068
Max. Body Depth (cm)	1
Min. Pool Width (ft)	3
Min. Pool Depth (ft)	1.25
Min. Pool Length (ft)	5
Min. Weir Width (ft)	0.25
Min. Weir Depth (ft)	0.25
Max. Weir Velocity (ft/s)	0.75
Max. Fishway Slope	1:20

4.3.2 Length Greater than 15 cm

Min. Total Length (cm)	15
Max. Total Length (cm)	116
Body Depth/Total Length Ratio	0.068
Max. Body Depth (cm)	7.9
Min. Pool Width (ft)	6
Min. Pool Depth (ft)	2
Min. Pool Length (ft)	10
Min. Weir Width (ft)	0.75
Min. Weir Depth (ft)	1
Max. Weir Velocity (ft/s)	1
Max. Fishway Slope	1:20

4.4 White Perch

The guidelines used to find the parameters for the other species did not include White Perch. The same guidelines provide guidance for determining the design parameters for fish species where data is not available. Based on information found on the Maine Department of Inland Fisheries and Wildlife website, it was determined that the minimum total length to be used for the calculations would be 6" long and a maximum of 12" long. Where guidance did not give specific information on how to calculate the geometry Blueback Herring parameters were used due to the similar size of the species.

Min. Total Length (in)	6
Max. Total Length (in)	12
Body Depth/Total Length Ratio	0.25
Max. Body Depth (in)	3
Min. Pool Width (ft)	5
Min. Pool Depth (ft)	2
Min. Pool Length (ft)	10
Min. Weir Width (ft)	2
Min. Weir Depth (ft)	0.75
Max. Weir Velocity (ft/s)	5.0
Max. Fishway Slope	1:20

5.0 FISH LADDER DESIGN

Pare used HEC-RAS 6.3.1 to model the fish ladder and determine the velocities at each weir and water surface elevations in each pool for a given upstream pond elevation. Each pool and weir were entered into the program to accurately depict the locations and elevations shown in the plans. To promote migration over a range of flow conditions, the elevation of the fish ladder exit was adjusted to ensure an optimal weir velocity for the target species for the normal pool elevation as well as pond elevations slightly above or below normal pool.

5.1 Pool and Weir Geometry

Available fish ladder design guidance was used to determine the length, width, and depth of each pool and associated weir dimension. The chosen dimensions are within the minimum and maximum space recommendations ranges for each target species and were optimized based on the results of the hydraulic analysis.

The downstream portion of the fish ladder consists of rectangular concrete pools separated by rectangular weirs. The concrete will be faced with a stone veneer made from reused stone from the existing downstream masonry walls being demolished for the proposed bridge, spillway, and fish ladder construction. The fish ladder entrance will match into the existing downstream walls and will create the required attraction flow for the target fish species. Due to the tidal fluctuations in the river, the entrance was evaluated for the maximum and minimum tides to ensure that the entrance to the fish ladder will not have a significant head differential during either event. At higher tides, the first few weirs will be submerged, but the pools at the entrance were aligned so that the flow through he weirs will generally pass unimpeded to keep the attraction as high as possible. Although this will have an impact on migration, this condition is temporary, a few hours at most during the higher astronomical tides.

The fish ladder then continues under the bridge, along the front of the East Abutment and daylights on the upstream side of the bridge and exits to the pond east of the proposed spillway. This upper portion consists of rectangular concrete pools and weirs that will be cast against the other bridge, spillway, and low-level outlet components. At the fish ladder exit, an adjustable gate will be configured to allow adjustment to the invert elevation of the exit and control the flow based on variations in pond surface elevations.

In addition to pools and weirs to accommodate fish migration, a harvesting pad is proposed at the first turn in the fish ladder that allows water to flow into a separate pool area of shallower depth. Access is provided by walkways around the pool for users to reach into the pad and remove the fish. The harvesting pad pool will utilize stop logs which can be manually removed to open the area and replaced to close it.

6.0 EEL PASSAGE DESIGN

Due to the low velocities required for eel passage, Pare is proposing a separate eel passage built adjacent to the fish ladder to create a better environment to accommodate eel. Pare is proposing to utilize a laterally sloped eel ramp to allow eel to pass from the downstream channel to the pond upstream. This option provides a simple design that does not require adjustment of the upstream weir to control the velocity of the flow through the ramp or additional components such as pumps to wet the ramp and baskets to capture eel to be released into the pond.

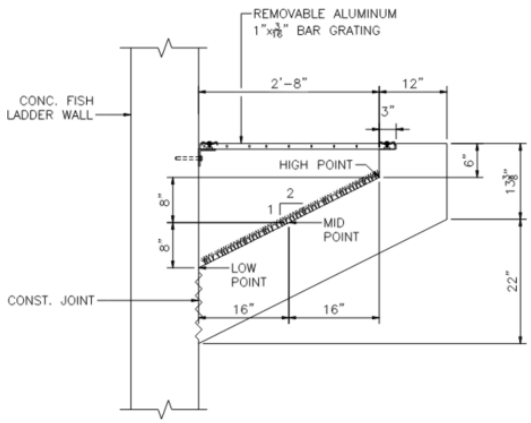


Figure 1- Eel Ramp Cross-Section

The ramp is lined with synthetic material to imitate grass that the eel can utilize to migrate up the ladder. The sloped channel allows the top few inches of the ramp, where the water velocity is lowest, to be utilized by the eel even as the pond level changes. This type of eel ramp is ideal for environments where the head water has minimal fluctuations, such as the case with Mill Pond which only fluctuates a few inches above or below normal pool. The ramp will be covered by an aluminum grate which will prevent predation and can be removed for maintenance of the ramp.

The ramp will be sloped at approximately 2:1 across the channel with the midpoint of the ramp exit set at the normal pool elevation of 14.3. The upper portion of the ramp will be level which will lower the velocity in the channel for the latter part of the journey up the fish way, then slope down the wall of the fish ladder approximately 6% to the top of the spillway slab apron on the downstream side of the dam where the eel will enter the ramp. The flow from the eel ramp will enter the river close to the entrance of the fish ladder to prevent a false attraction to another part of the downstream channel.

To direct eel to the ramp entrance, the end of the spillway apron will be covered with the synthetic grass along its vertical face across the whole channel. At the top of the vertical wall a 12-inch wide horizontal will overhang the vertical face to prevent eel from crawling up on top of the spillway slab and will continue towards the entrance of the eel ramp.

7.0 DOWNSTREAM PASSAGE

It is anticipated that downstream migration will be accommodated through the proposed spillway during normal and higher flow conditions, with the proposed fish ladder to be used during lower flow conditions. The proposed spillway has been designed with a fixed weir notch that directs flow on to a series of steps down to the spillway slab floor. The fish will enter through the main spillway notch into the top step of the spillway which will have a wall built on the edge to create a pool for downstream migrating fish to drop into and direct them to an opening in the wall of the fish ladder to allow them to travel downstream. The opening into the fish ladder will be 12-inches wide by 6" high and will be perched to allow the fish to drop into the fish ladder pool while preventing fish migrating upstream to enter the spillway pool.

The channel in the top step has been designed with a pool that will allow 48-inches of depth to prevent injuries to the fish. Likewise, the opening from the top spillway pool to the fish ladder pool will drop into a minimum 36-inch-deep pool. This arrangement should allow most fish to safely travel downstream without creating a secondary outlet in the downstream area which could act as a false attraction to fish migrating upstream in the Agawam River.

8.0 DESIGN SUMMARY

Utilizing the latest fish passage design guidance and coordination with MADMF, Pare is proposing to replace the existing Alaskan Steeppass fish ladder with a Pool and Weir fish ladder in combination with an eel ramp along an adjacent alignment. The new fish ladder has been designed to accommodate weir velocities and resting pools that will allow all target species of fish to effectively ascend the fish ladder for a range of pond water surface elevations. The proposed adjacent eel passage will utilize a laterally sloped channel to allow eel to migrate into Mill Pond by providing flow conditions more suitable for that species over the range of normal pond elevations. By providing separate passages with differing flow and geometric conditions, it is anticipated that this passage will allow the migration of the target species to grow into the future and continue the historic tradition of this herring run.

Further information on the hydraulic conditions is provided in a separate design memorandum with this design submission and will be incorporated into this report when the fish ladder design is finalized.

APPENDICES

APPENDIX A – Locus Map

December 20, 2024

Mr. Harry Adolphe
Project Manager
Massachusetts Department of Transportation – Highway Division
10 Park Plaza
Boston, MA 02116

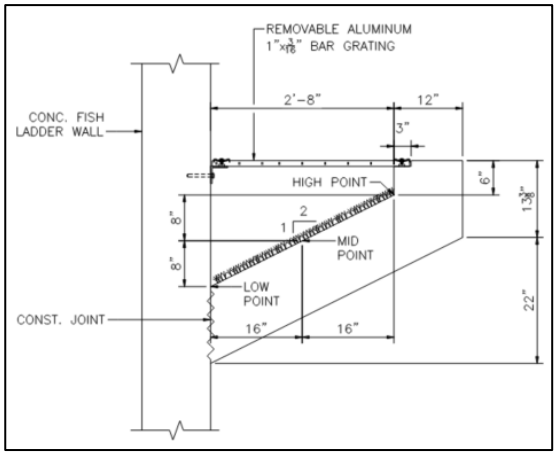
RE: **Passage Design Memorandum – Revisions Per USFWS Review Comments**
Rehabilitation of Mill Pond Dam
Route 6W/Route28N (Cranberry Highway); Wareham, MA
Contract No. 115785, Assignment No. 2
MassDOT Project No. 606352
Pare Project No. 22147.02

Dear Mr. Adolphe:

Upon the review meeting with MassDOT and USFWS on September 27, 2024, Pare has completed additional data collection and revisions to certain components of the passage systems in response to additional review comments received from USFWS during the meeting. Provided herein is each review comment / discussion point that was discussed at that meeting followed by an explanation of how that comment has been addressed.

1. *Pare will evaluate a detail that would create and overhang at the edge of the apron to help prevent eels from travelling up onto the spillway apron.*

Such an overhang has been added. Additionally, the eel passage system itself has been revised for the previously designed 12" square conduit with a buoyant control section to the following:



The proposed eel passage will be built adjacent to the fish ladder to create a better environment to accommodate eel. The eel passage will be a laterally sloped eel ramp to allow eel to pass from the downstream channel to the pond upstream. The sloped channel allows the top few inches of the ramp, where the water velocity is lowest, to be utilized by the eel even as the pond level changes. This type of eel ramp is ideal for environments where the head water has minimal fluctuations, such as the case with Mill Pond which only fluctuates a few inches above or below normal pool.

This option of eel passage provides a simple design that does not require adjustment of the upstream weir to control the velocity of the flow through the ramp or additional components such as pumps to wet the ramp and baskets to capture eel to be released into the pond.

These revisions to the eel passage system do result in the system passing higher flows than the original system that only passed a trickle flow. As such, this system was incorporated within the hydraulic model. The table below provides the updated hydraulic data for the passage systems (eel remap and fishway) as well as the spillway.

Table 1: Flow Conditions within the Mill Pond Dam Fish Ladder

Hydrological Condition		*CFSM*	*Outflow* *CFS*	*Pond Elev* *WSEL*	*Eel Passage* *CFS*	*Spwy Flow* *CFS*	*Spwy Velocity* *FPS*	*FL Flow* *CFS*	*FL Depth*[1] *FT*	*FL Width*[2] *FT*	*FL Velocity*[3] *FPS*	Qt	EDF	Pool Depth *FT*
Targeted Parameters for Optimal Performance of Fish Passage								-	>1.0	>2.5	<6.0	>0.3	2.1[4]	>2.25
	Drought[6]	0.5	8	13.5	0.0	0	0.0	8.0	1.0	3.3	2.5	0.3	1.5	3.2
Operating Range of Baseflows	**95%**[5]	1.7	29	14.0	0.1	14	2.1	**14.8**	**1.5**	**3.3**	**3.0**	**0.5**	**2.4**	**3.8**
	50%[5]	2.6	44	14.3	0.4	26	2.7	**17.5**	**1.8**	**3.3**	**3.1**	**0.6**	**2.7**	**4.0**
	5%[6]	3.5	60	14.5	0.8	39	3.1	**19.8**	**2.0**	**3.3**	**3.1**	**0.7**	**2.9**	**4.2**
1yr	2.9" Rain Event	-	71	14.7	1.2	48	3.2	22.0	2.2	3.3	3.2	0.8	3.1	4.4
2yr	3.4" Rain Event	-	79	14.7	1.5	55	3.2	22.9	2.2	3.3	3.2	0.8	3.2	4.5
5yr	4.3" Rain Event	-	98	14.9	2.2	71	3.5	25.0	2.4	3.3	3.2	0.9	3.3	4.7
10yr	5.0" Rain Event	-	116	15.1	3.0	87	3.9	27.0	2.6	3.3	3.2	0.9	3.5	4.8
25yr	6.0" Rain Event	-	146	15.3	4.4	111	4.3	29.9	2.8	3.3	3.3	1.0	3.7	5.1
50yr	6.8" Rain Event	-	171	15.5	5.7	133	4.6	32.5	3.0	3.3	3.3	1.1	3.8	5.3
100yr	7.6" Rain Event	-	204	15.8	7.4	161	4.8	35.5	3.3	3.3	3.4	1.2	4.0	5.5

1) Depth of flow over each weir; depth of each pool is 2.25 feet greater than this depth.

2) Width of flow over each weir at pool level

3) Velocity of flow over each weir

4) Optimal EDF is 2.09 for River Herring. USFWS indicated it should be clost to but less than 3.0 for the full operating range

5) Obtained from Table 6: Estimated stream discharge per square mile at selected flow durations for low-flow partial-record station and discontinued streamflow-gaging station in Buzzards Bay Basin, southeastern Massachusetts, water years 1967-91 of the "Streamflow, Ground-Water Recharge and discharge, and Characteristics of Surficial Deposits in Buzzards Bay Basin, Southeastern Massachusetts . U.S. Geological Survey Water-Resources Investigations Report 95-4234", prepared in corporation with Massachusetts Department of Environmental Management, Division of Resource Conservation, Office of Water Resources.

6) Not provided within USGS reference document; cfsm values are presumed conservative assumptions

Fish ladder performance for storms greater than the 10-year storm is above the presumed optimal EDF range. The dam has additional operational capacity through the operation of the downward operating gate located within outlet chamber that could allow for that edam to accommodate these storm events at a lower peak pool elevation that in turn would result in the ability for optimal flow conditions to be maintained through the fish ladder system

2. *Provide further assessment of several issues, including that the depth of the plunge pool be a minimum of four feet and the flow added to the fish ladder will not create any issues with the upstream passage through the ladder.*

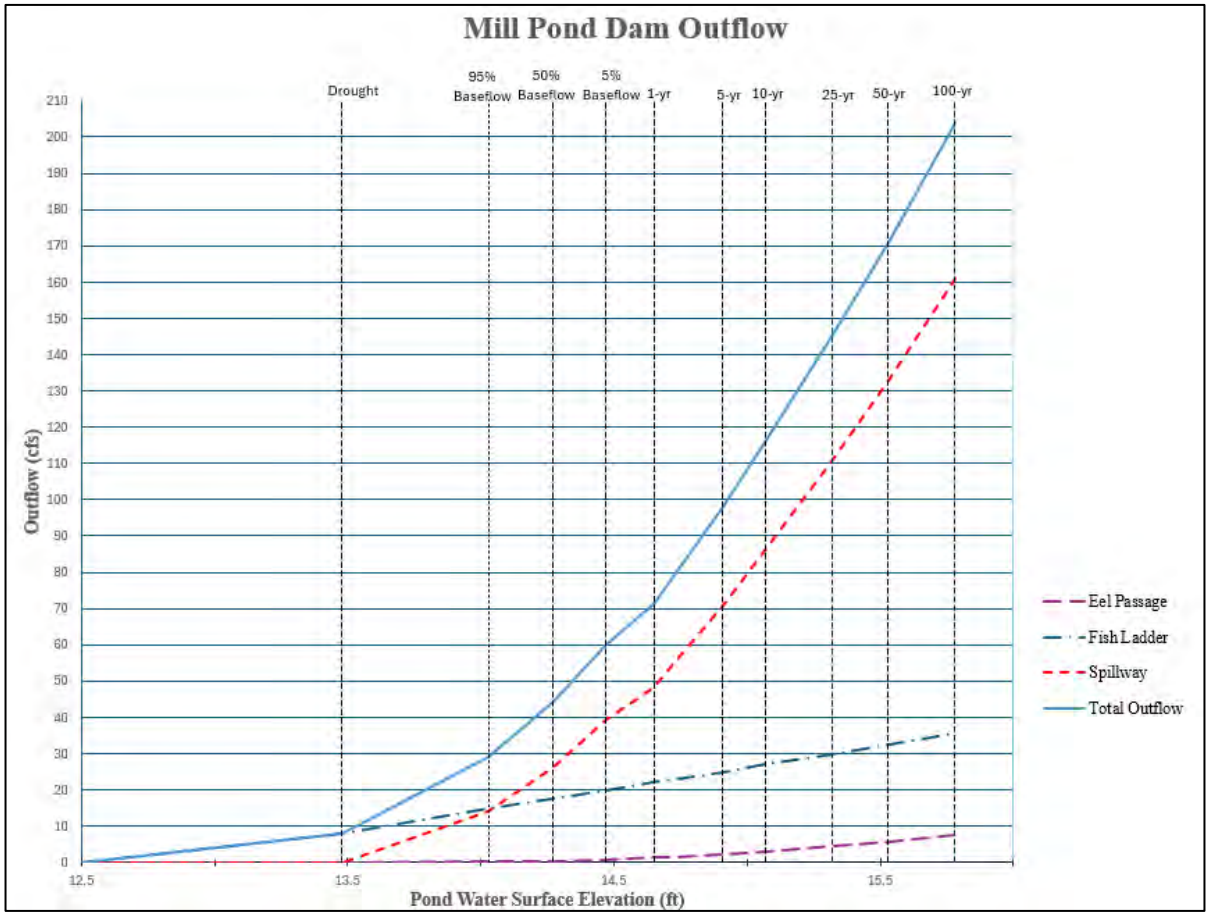
The proposed spillway has been designed with a fixed weir notch that directs flow on to a series of steps down to the spillway slab floor. A plunge pool is proposed to be incorporated within the top step. The bottom of the pool is proposed at El. 8.5 while the top of the step will be set at El. 12.5, which will provide a minimum pool depth of 4 feet. The total weir length of the step is 118 feet. At the left end of the pool, a 12”W x 12”H notch in the fish ladder wall is proposed (Invert El. 12.3) for one way passage of fish that inadvertently get carried over the spillway and into the plunge pool. The impact of this notch and the introduction of supplemental flow to the fish ladder system at this location was evaluated utilizing the hydraulic model of the system. It was determined that the supplemental flow from this notch was insignificant (generally less than 5% of the total flow within the ladder) and its corresponding impact on the performance/hydraulics of the fish ladder negligible. The table below provides the specifics of the supplemental flow at varying flow conditions.

Table 2: Fish Ladder Weir #20 WSEL due to Additional Spillway Flow

Hydrological Condition	Pond El. (ft)	Total Flow (cfs)	Spillway Flow (cfs)	WSEL at DS Step Weir #1 (ft)	Flow to Fish Ladder (cfs)	Peak WSEL at Weir #20 without Weir Flow (ft)	Peak WSEL at Weir #20 with Weir Flow (ft)	Differential in WSEL at Weir #20 (ft)
95% Baseflow	14.0	29	14	12.63	0.5	11.55	11.59	0.04
50% Baseflow	14.3	44	26	12.69	0.6	11.78	11.83	0.05
5% Baseflow	14.5	60	39	12.75	0.8	11.99	12.06	0.07
1-year	14.7	71	48	12.78	0.8	12.17	12.24	0.07
2-year	14.7	79	55	12.82	0.9	12.26	12.33	0.07
5-year	14.9	98	71	12.87	1.0	12.43	12.51	0.08
10-year	15.1	116	87	12.93	1.2	12.6	12.67	0.07
25-year	15.3	146	111	13.00	1.3	12.84	12.89	0.05
50-year	15.5	171	133	13.07	1.4	13.05	13.07	0.02
100-year	15.8	204	161	13.15	1.5	13.3	13.3	0.00

3. *Provide a graph showing the flow range relative to the pond water surface elevations to give the reviewers a better idea of the anticipated flows at the spillway and the fish ladder.*

The graph below details the four stage-discharge rating curves for this structure. The four being total outflow, spillway outflow, fishway outflow, and eel ramp outflow at varying pond elevations. The y axis is outflow (cfs), the bottom x axis is the water surface elevation (WSEL) within the pond (NAVD88-ft), while the top x axis identifies specific WSEL that are tied to the varying baseflow and storm event conditions.



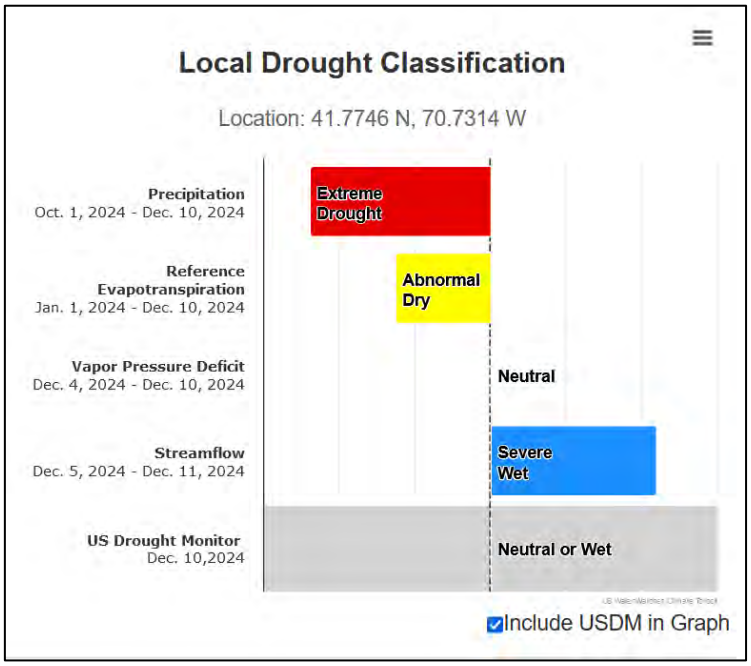
4. *USFWS discussed their concerns with the flow and tide assumptions used for the fish ladder design.*

a. **Baseflow assumption:**

To confirm the baseflows utilized within the analysis, Pare visited the site on November 15th, 2024, to measure the WSEL (El. 14.39) and collect supplemental data of the existing fishway system in order to better approximate the flow rate occurring through this system. Pare then incorporated the fishway system data collection into the hydraulic model to determine the flow rate through each of the three dam components at the measured WSEL of El. 14.39. The total flow rate through the dam at a pond elevation of El. 14.39 as determined to be 27 CFS, 19 cfs of which was through the primary spillway, 3 cfs through the auxiliary spillway, and 5 cfs through the fishway. This area had been and was in an extreme drought[1] condition (see figure below) at the time of this data collection and flow assessment; as such, the measured 27 CFS is likely a good representation of a lower drought type condition baseflow. This 27 cfs is slightly less than the 95% low flow baseflow value determined initially and used in this analysis, 29 cfs. As such, the base flow values used within this analysis appear to be generally representative of the baseflow conditions at this site.

Note, the WSEL for the pond (El. 14.39) that was measured during this lower baseflow condition is near (and actually slightly above) than pool level under normal baseflow conditions (El. 14.3). The reason for this is likely due to certain conditions that were present within the existing fishway system that limited the capacity of that system. Stop logs were present within the existing fishway channel just upstream of the culvert of the fishway that extends under Route 28; these stop logs as well as several areas of debris within the channel section between the control section at the pond and these stop logs appeared to be creating a tailwater condition within the system that limited its discharge capacity. If the existing fishway system were operating at its optimal hydraulic performance, it would be capable of passing higher flows and this lower baseflow conditions would have translated to a lower WSEL within the pond.

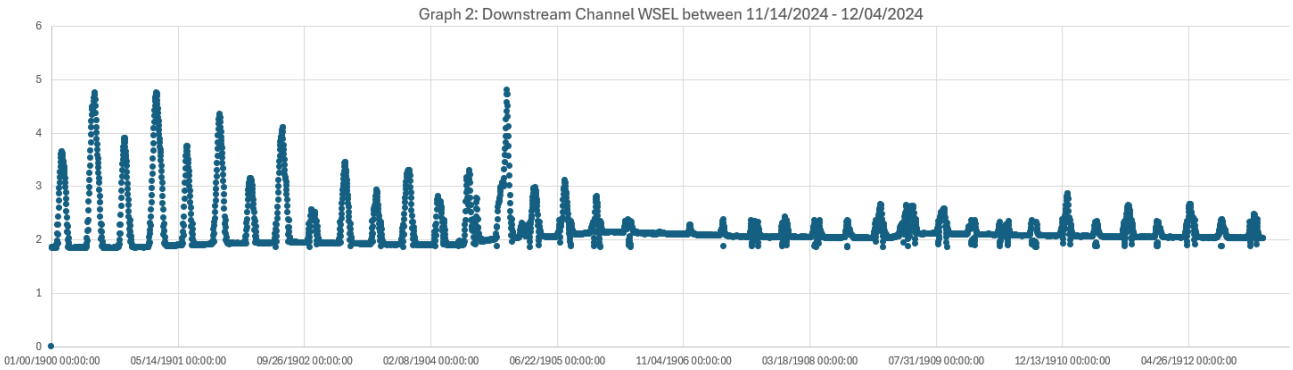
The following image shows the drought data for Wareham:



[1] https://climatetoolbox.org/tool/Historical-Water-Watcher

b. **Tidal assumption:**

To confirm the downstream channel elevation utilized within the analysis, Pare visited the site multiple times between November 10th and December 4th, 2024, to install a data logger and perform site survey to assess the tidal influence on the downstream channel. The data logger was installed on November 14th and has been in use since the date of installation. In addition to the data logger, Pare visited the site on November 10th, during a low tide cycle and determined the WSEL's within the downstream channel in the area of the fishway entrance to be El. 1.0. Pare visited the site again on November 15th and was present for both the high tide and low tide curves and determined the max and min WSEL's to be El. 4.8 and El. 1.2 respectively. The curve below provides the data from the logger. Note, the logger as installed is not capable of recording the WSEL when it dips below El. 1.8, which appeared above to be the minimum WSEL that occurs at this location; El. 1.0 to El. 1.2. The graph below shows the WSEL of the downstream channel that was collected between November 14th and December 4th, 2024.



5. Impact assessment of tidally influenced fluctuation in tailwater.

As indicated within 4b; the WSEL within the downstream channel at the location for the proposed fishway entrance fluctuates 3.8 feet from El. 4.8 to El. 1.0, based upon the 25-day window in which the data logger was in place and the data pulled. This range is slightly wider than what has previously been assumed and reported. As such, a similar impact assessment to that completed and referenced within the previous passage design memorandum (August 21st, 2024) was also completed incorporating this updated fluctuation range. The assessment includes evaluating the impact that specific tail water elevations had on the hydraulic performance and conditions of the fish. The table below provides a tabulated summary of the assessment.

Table 3: Tidal Effect on Fish Ladder Performance

Location	Max WSEL				Optimal WSEL			Min WSEL
	NAVD88 -ft	NAVD88 -ft	NAVD88 -ft	NAVD88 -ft	NAVD88 -ft	NAVD88 -ft	NAVD88 -ft	NAVD88 -ft
DS Channel at Entrance Weir	4.80	4.00	3.00	2.05	2.00	1.50	1.00	0.90
Head Drop	**0.05**	**0.09**	**0.21**	**0.50**	**0.52**	**0.79**	**1.14**	**1.22**
Weir #1 (El. 0.5)	4.85	4.09	3.21	2.55	2.52	2.29	2.14	2.12
Head Drop	**0.07**	**0.13**	**0.27**		**0.51**	**0.62**	**0.70**	**0.71**
Weir #2 (El. 1.0)	4.92	4.22	3.48		3.03	2.91	2.84	2.83
Head Drop	**0.10**	**0.17**	**0.34**		**0.51**	**0.57**	**0.60**	**0.61**
Weir #3 (El. 1.5)	5.02	4.39	3.82		3.54	3.48	3.44	3.44
Head Drop	**0.13**	**0.23**	**0.39**		**0.50**	**0.53**	**0.55**	**0.55**
Weir #4 (El. 2.0)	5.15	4.62	4.21		4.04	4.01	3.99	3.99
Head Drop	**0.19**	**0.30**	**0.44**		**0.51**	**0.52**	**0.53**	**0.53**
Weir #5 (El. 2.5)	5.34	4.92	4.65		4.55	4.53	4.52	4.52
Head Drop	**0.24**	**0.36**	**0.45**		**0.50**	**0.51**	**0.51**	**0.51**
Weir #6 (El. 3.0)	5.58	5.28	5.10		5.05	5.04	5.03	5.03
Head Drop	**0.31**	**0.41**	**0.48**			**0.50**	**0.51**	**0.51**
Weir #7 (El. 3.5)	5.89	5.69	5.58			5.54	5.54	5.54
Head Drop	**0.37**	**0.44**	**0.49**				**0.50**	**0.50**
Weir #8 (El. 4.0)	6.26	6.13	6.07				6.04	6.04
Head Drop	**0.41**	**0.46**	**0.49**					
Weir #9 (El. 4.5)	6.67	6.59	6.56					
Head Drop	**0.45**	**0.49**	**0.50**					
Weir #10 (El. 5.0)	7.12	7.08	7.06					
Head Drop	**0.47**	**0.48**						
Weir #11 (El. 5.5)	7.59	7.56						
Head Drop	**0.48**	**0.50**						
Weir #12 (El. 6.0)	8.07	8.06						
Head Drop	**0.49**							
Weir #13 (El. 6.5)	8.56							
Head Drop	**0.50**							
Weir #14 (El. 7.0)	9.06							
Head Drop								

Legend

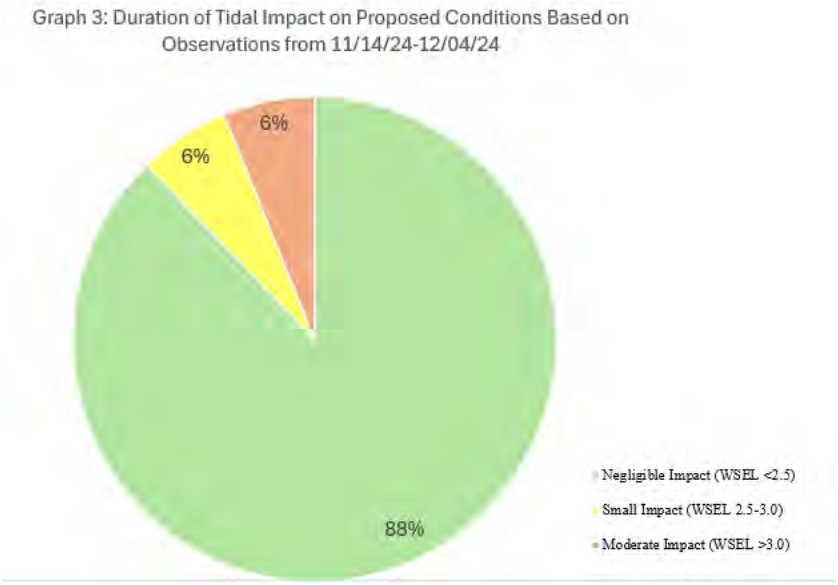
- Moderate Impact anythign outside
- Small Impact- Negligible impact on performance metrics
- Negligible Impact - No impact on performance metrics
- No Impact

The following conclusions can be drawn from this assessment:

- For tailwater elevations less than El. 2.5, the fishway's performance is near optimal and is largely unimpacted by the tailwater elevation itself. During the lower tailwater elevation, the head drops at the downstream most weirs are higher than the rest of the system (0.5 feet). However, these larger head drops are not expected to impact the performance of the fishway; all weirs remain submerged and therefore not plunging flow conditions will develop.
- For tailwater elevations above El. 2.5, the performance of the fishway is impacted slightly in the form of a reduction in the head drop from weir to weir. This impact does not extend very far upstream along the system; although, the activities of the fishway entrance may be impacted. However, as noted below, the percentage of time that this elevated tailwater conditions exists, is fairly insignificant.

The data logger was utilized to determine the percentage of time the tailwater elevation was within certain categories; < El. 2.5 (No/Negligible Impact), El. 2.5 to El. 3.0 (Small Impact), >El. 3.0 (Moderate Impact). The following was determined, which is demonstrated within the pie chart provided below:

a. 88% of the observed time the WSEL was < El. 2.5
b. 6% of the observed time the WSEL was between El. 2.5 and El. 3.0
c. 6% of the time the WSEL was > El. 3.5



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We look forward to continued collaboration with MassDOT and the Project Team as we continue to work towards the goal of advancing the passage components along with the dam and bridge project. Should you have any questions or comments, please do not hesitate to contact us.

Eric Silva, P.E.
Senior Project Engineer

Matthew Dunn, P.E., CFM
Managing Engineer

ES/MD/GB

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Massachusetts Department of Transportation

MILL POND DAM

SECTION 8

STORMWATER REPORT

STORMWATER MANAGEMENT REPORT

Pare Project No. 22147.02

Mill Pond Dam
Bridge No. W-06-020
US 6 WB & ST 28 NB
Wareham, MA

MassDOT Project No. 606352

Applicant:

Massachusetts Department of Transportation
Highway Division, Project Management Section
10 Park Plaza
Boston, MA 02116

FEBRUARY 2025

PARE CORPORATION
ENGINEERS SCIENTISTS PLANNERS

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Template Version: November 2023

To: MassDOT

Date: *February 10, 2025*

Project #: *606352*

From: *Pare Corporation*

Re: *US 6 WB & ST 28 NB (BRIDGE NO. W-06-020)*

This Stormwater Management Memorandum has been prepared to show compliance with the Massachusetts Stormwater Management Standards in accordance with the Massachusetts Water Quality Certification Regulations (314 CMR 9.00) to support the Project's Section 401 Water Quality Certificate Application.

Project Description

The Applicant, MassDOT, is proposing Project 606352 to construct a bridge replacement (the Project) located in Wareham, MA. As proposed, the Project consists of the reconstruction of the Mill Pond Dam, which connects the Cranberry Highway (Route 6 and Route 28). Work includes replacing the existing spillway and culvert with a new arch crested weir and steel beam superstructure with reinforced concrete abutments. Work also includes construction of training walls to route flow downstream. The existing historic fish ladder will be replaced with a step and pool fish ladder. Reconstruction of the roadway on either side of bridge superstructure is proposed to match existing roadway conditions. Stormwater improvements are proposed including the installation of a bioretention basin for water quality. Existing overhead utilities, gas and water main lines to the north and south of the road will be temporarily and permanently relocated.

Existing and Proposed Drainage Conditions

The project is located in the Buzzards Bay Watershed and comprises 1.18 +/- Acres of land on the previously developed roadway. Approximately 92% (1.09 Acres) of the existing site cover has been identified as impervious cover and 8% (.09 Acres) is made up of grassed and wooded pervious ground cover. No existing SCMs were identified at the discharge points in the existing condition.

Under current drainage conditions, stormwater is collected in two existing drainage systems identified in the project area: one east of the existing Bridge No. W-06-020 and one west of the existing Bridge No. W-06-020. The eastern drainage system consists of a series of catch basins receiving runoff from Route 6 (Cranberry Highway) and discharges flow offsite to the southeast. The western drainage system consists of a 12" drainage trunkline and series of drainage structures receiving runoff from the shoulders of Route 6 (Sandwich Road) and Route 28 (Cranberry Highway) and discharging flow to a grassed area uphill of the Agawam River located southwest of the existing Bridge No. W-06-020.

The Site was assessed as two analysis areas based on existing drainage patterns. Offsite flows were included within the hydrologic analysis as they contribute to the proposed SCM. The hydrologic model is prepared to present the changes within the project area, and illustrate the changes in peak flow generated by the roadway improvements. The Existing Hydrology Plan (Appendix A) delineates the Existing Drainage Areas (EDA), described below:

- **EDA-1**: EDA-1 is bound by Route 6 and Route 28 high points to the west and the high point dividing runoff from Bridge No. W-06-020 along the Route 6/28 corridor to the east. Stormwater runoff from Route 6, Route 28, and adjacent properties discharges to the Agawam River via closed drainage.
- **EDA-2**: EDA-2 is bound by the proposed limit of disturbance for the Site to the east and the high point dividing runoff from Bridge No. W-06-020 along the Route 6/28 corridor to the west. Stormwater runoff from Route 6 and adjacent properties discharges offsite to the southeast.

Existing peak runoff rates from the study area were generated for the rainfall events having a return rate of 2-year, 10-years, and 100-years using the SCS TR-20 Method (refer to Appendix A for existing hydrology calculations). Note that rainfall data was taken from NOAA Atlas 14.

Table 1: Existing Condition - Peak Stormwater Runoff Rate

Analysis Area	2-Year Event 3.44 inches (cfs)	10-Year Event 5.04 inches (cfs)	100-year Event 7.58 inches (cfs)
DP-1 Agawam River	3.83	6.60	11.01
DP-2 Offsite	2.06	3.22	5.03

The Project will include the replacement of the existing bridge over the Agawam River, roadway reconstruction, a stormwater control measure, and other associated site improvements.

The proposed stormwater control measure for the site is designed within the guidelines of the Massachusetts Stormwater Handbook. The stormwater control measure is designed to incorporate features that address flowrate, quantity of runoff, and quality of runoff from the redeveloped Site. The proposed drainage system for the Site consists of a bioretention basin discharging to the Agawam River.

The Proposed Hydrology Plan (Appendix B) delineates the Proposed Drainage Areas (PDA), described below:

- **PDA-1**: PDA-1 is bound by the Route 6 and Route 28 high points to the west high point dividing runoff from Bridge No. W-06-020 along the Route 6/28 corridor to the east. Stormwater runoff from Route 6, Route 28, and adjacent properties discharges via closed drainage to the proposed bioretention basin before discharging to the Agawam River.
- **PDA-2**: PDA-2 is bound by the proposed limit of disturbance for the Site to the east and the high point dividing runoff from Bridge No. W-06-020 along the Route 6/28 corridor to the west. Stormwater runoff from Route 6 and adjacent properties discharges offsite to the southeast.

Proposed peak runoff rates from the study area were generated for the rainfall events having a return rate of 2-years, 10-years, and 100-years using the SCS TR-20 Method (refer to Appendix B for proposed hydrology calculations). Note that rainfall data was taken from NOAA Atlas 14. Runoff hydrographs were developed for the proposed condition of the subcatchment-area of the Site and the results for each storm event are shown in Table 2 below.

Table 2: Proposed Condition - Peak Stormwater Runoff Rate

Analysis Area	2-Year Event 3.44 inches (cfs)	10-Year Event 5.04 inches (cfs)	100-year Event 7.58 inches (cfs)
DP-1 Agawam River	3.93	6.63	10.99
DP-2 Offsite	2.31	3.43	5.20

Massachusetts Department of Environmental Protection (MassDEP) – Stormwater Management Standards

As demonstrated below, the proposed Project complies with the MassDEP Stormwater Management Standards (the Standards). Under the Stormwater Management Standards, the Project is considered a redevelopment project because it involves maintenance and improvement of an existing roadway. The Agawam Mill Pond Dam consists of five major elements including a fish way, a primary spillway, a secondary spillway, an outlet pipe and an earth embankment. The resulting impoundment to the north of the dam is the Agawam Mill Pond. It is anticipated that phased construction will be needed in order to facilitate the replacement of the structure. In conjunction with the structural work, roadway related construction will also occur and includes, but is not limited to: reconstruction of the approaches to the bridge via roadway reconstruction and pavement micro milling and overlay; remove, handle, haul, reset and replace granite curbing as needed; replacement of bituminous sidewalk on both sides of the roadway with sectional widening on the south side of the roadway at the structure; installation of a 5-foot wide buffered westbound bike facility within the project limits; pavement striping; installation of new signage; and all other incidentals needed to complete the work.

The Project has been designed to meet the Stormwater Management Standards to the maximum extent practicable and to improve upon existing conditions.

Standard 1: No New Untreated Discharges

The Project has been designed to comply with Standard 1.

Per Massachusetts Stormwater Handbook Volume 1 Chapter 1, this standard allows for the direct discharge of stormwater to waters and wetlands provided the discharge is adequately treated. No new outfalls are proposed. An existing outfall is proposed to be upgraded with a headwall, riprap level spreader, and will now discharge to the proposed bioretention basin.

See Standard 4 for the water quality treatment provided by the Project.

Standard 2: Peak Rate Attenuation

The Project has been designed to comply with Standard 2 to the maximum extent practicable. Table 1 includes a summary of impervious cover impacts, which can be used as a metric to understand impacts to peak discharge rates following development.

A minimal increase in impervious cover is proposed for sectional widening of the roadway. This increase in impervious cover and peak discharge rate will be mitigated to the maximum extent practicable by the proposed bioretention basin which will receive runoff from the western portion of the project site and off site impervious area. The proposed bioretention basin will be located off of the southwestern corner of the Mill Pond Dam where an existing outfall currently discharges directly to the Agawam River. Additional rainfall that lands on the increased impervious surface will drain to the same waterbody after being treated. Increases in peak rates are experienced to both design points due to the increase of impervious area associated with the sectional widening. Due to the limited right-of-way, these flows cannot be captured and mitigated. The increase in flows are minimal and are anticipated to have a negligible impact to the downstream receiving systems.

Table 1: Existing and proposed impervious cover

Existing Impervious Area (sq. ft)	Proposed Impervious Area (sq. ft)	Change In Impervious Area (sq. ft)	Percent Increase in Impervious Area (%)
84,276	87,649	3,373	3.8%

Standard 3: Stormwater Recharge

The Project has been designed to comply with Standard 3 to the maximum extent practicable. The purpose of this standard is to replenish groundwater by ensuring that the infiltration volume of precipitation into the ground under post-development conditions is at least as much as the infiltration volume under pre-development conditions.

Per Massachusetts Stormwater Handbook Volume 1 Chapter 1, for sites comprised solely of C and D soils and bedrock at the land surface, proponents are required to infiltrate the required recharge volume only to the maximum extent practicable. Soils have been identified as type D on site, limiting the opportunity to infiltrate. Additionally, the proposed SCM will not meet the required separation from groundwater. The bioretention basin is proposed to be lined with a perforated underdrain to dewater entirely within 72 hours.

Calculations documenting compliance to the maximum extent practicable with this requirement are provided in Appendix D.

Standard 4: Water Quality

The Project has been designed to comply with Standard 4 to the maximum extent practicable.

Stormwater Standard # 4 requires that stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). The required water quality volume treated is to be 0.5 inches over the total post-construction impervious area. Water quality control for the site is described below, and supporting calculations are provided in Appendix D. 80% TSS treatment is achieved using a treatment system consisting of a sediment forebay sized to store 0.1 inches over the contributing impervious area and a bioretention basin sized to store 90% of the WQv. The bioretention basin is proposed with two (2) feet of bioretention soil and will be lined at the bottom of the practice with an underdrain. Riprap slopes are proposed at the outlet, sediment forebay check dam, and spillway of the drainage system to dissipate flow. The Agawam River has an identified TMDL for total nitrogen. The proposed bioretention basin SCM provides 50% treatment credit for total nitrogen from the proposed 36 inches of bioretention soil at the bottom of the basin.

A Long-Term Pollution Prevention Plan (LTPPP) has been developed for the project in compliance with Standard 4. The Standard 9 section of this document includes this LTPPP.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

Standard 5 does not apply to the Project. There are no Land Uses with Higher Potential Pollutant Loads within the project area.

Standard 6: Critical Areas

Standard 6 does not apply to the Project. There are no Critical Areas within the project area.

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the Maximum Extent Practicable

The project proposes improvements to an existing roadway with widening less than a single lane, and meets the requirements of a redevelopment in accordance with the handbook. The project is required by the Handbook to meet the Stormwater Standards to the full extent for the net increase in impervious area, and required to meet Standards 1, 2, 3, 4, 5, and 6 only to the maximum extent practicable.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls

The implementation of erosion and sediment (E&S) controls during construction is considered a standard practice for all MassDOT projects. E&S controls will be installed before any land disturbance begins for the Project and will remain in place for the duration of the Project. The E&S controls for the Project are shown on the project plans and include perimeter silt fencing, filter socks, and inlet protection

The Project disturbs one or more acres of land; therefore, the project contractor will request coverage under the NPDES Construction General Permit (CGP) and develop a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP follows the requirements of this standard and complies with the NPDES CGP.

Standard 9: Operation and Maintenance Plan

MassDOT O&M plans are implemented on a programmatic level by each MassDOT district. Each MassDOT district office is responsible for providing operation and maintenance for the MassDOT stormwater management systems within their respective jurisdictions. Appendix F includes the O&M Plan for this project.

Long-term pollution prevention for the Project includes litter pick-up, inspection and maintenance of stormwater assets, maintenance of landscaped areas, snow and ice management, street sweeping, prohibition of illicit discharges, and spill prevention and response.

Standard 10: Prohibition of Illicit Discharges

All illicit discharges to the stormwater management system are prohibited.

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.

Attachments:

Figures
Appendix A – Existing Hydrologic Reports and Watershed
Appendix B – Proposed Hydrologic Reports and Watersheds
Appendix C – Soil Data
Appendix D – Water Quality Calculations
Appendix E – Stormwater Checklist
Appendix F – O&M Plan

Mill Pond Dam Bridge No. W-06-020
US 6 WB & ST 28 NB Wareham, MA

FIGURES

SITE LOCATION MAP

SCALE: 1"= 2,000'

8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
(401) 334-4100

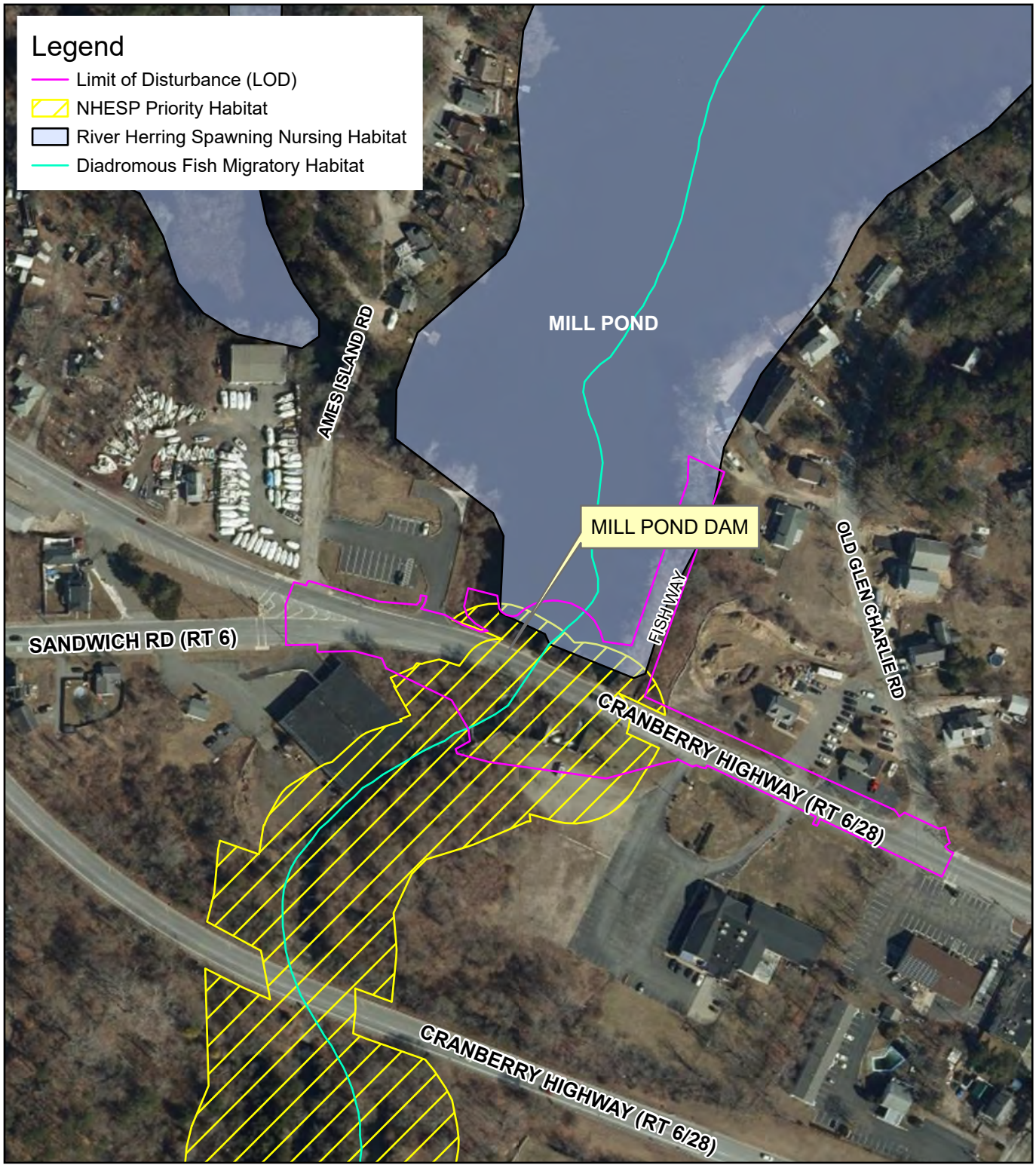
10 LINCOLN ROAD, SUITE 210
FOXBORO, MA 02035
(508) 543-1755

PARE PROJECT No. 22147.02 DECEMBER 2023

FIGURE 1

MILL POND DAM/BRIDGE REPLACEMENT
WAREHAM, MA

MassDOT Project No. 606352



MASS GIS

ANNOTATED AERIAL PHOTOGRAPH

SCALE: 1" = 200'

8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
(401) 334-4100

10 LINCOLN ROAD, SUITE 210
FOXBORO, MA 02035
(508) 543-1755

PARE PROJECT No. 22147.02 DECEMBER 2023

FIGURE 2

MILL POND DAM/BRIDGE REPLACEMENT
WAREHAM, MA

MassDOT Project No. 606352

Mill Pond Dam Bridge No. W-06-020
US 6 WB & ST 28 NB Wareham, MA

APPENDIX A

EXISTING HYDROLOGIC REPORTS AND WATERSHED

WAREHAM
US 6 WB & ST 28 NB

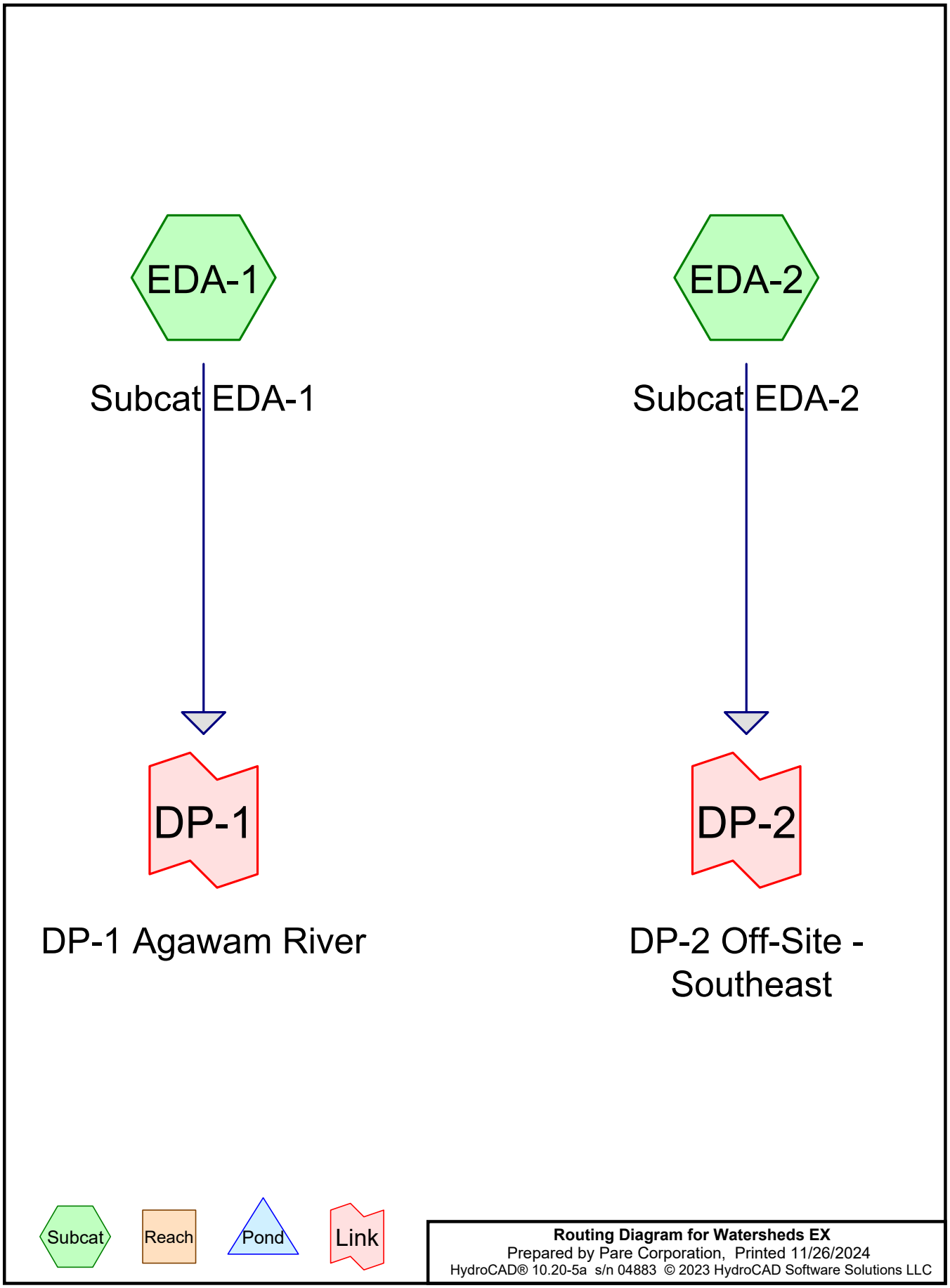
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	2
PROJECT FILE NO.	606352		

EX HYDROLOGY PLAN

0 50 100 150 200

SCALE: 1" = 50'

Proposal No. 606352-136278
EX HYDROLOGY PLAN.DWG Plotted on 26-Nov-2024 11:38 AM
A008840 - 194


EDA-1
EDA-2
Subcat EDA-1
Subcat EDA-2
DP-1
DP-2
DP-1 Agawam River
DP-2 Off-Site - Southeast
Subcat
Reach
Pond
Link
Routing Diagram for Watersheds EX
Prepared by Pare Corporation, Printed 11/26/2024
HydroCAD® 10.20-5a s/n 04883 © 2023 HydroCAD Software Solutions LLC

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EDA-1: Subcat EDA-1 Runoff Area=72,392 sf 78.60% Impervious Runoff Depth=1.96"
Tc=5.0 min CN=85 Runoff=3.83 cfs 11,849 cf

Subcatchment EDA-2: Subcat EDA-2 Runoff Area=30,332 sf 90.57% Impervious Runoff Depth=2.58"
Tc=5.0 min CN=92 Runoff=2.06 cfs 6,520 cf

Link DP-1: DP-1 Agawam River Inflow=3.83 cfs 11,849 cf
Primary=3.83 cfs 11,849 cf

Link DP-2: DP-2 Off-Site - Southeast Inflow=2.06 cfs 6,520 cf
Primary=2.06 cfs 6,520 cf

Total Runoff Area = 102,724 sf Runoff Volume = 18,369 cf Average Runoff Depth = 2.15"
17.87% Pervious = 18,353 sf 82.13% Impervious = 84,371 sf

Summary for Subcatchment EDA-1: Subcat EDA-1

Runoff = 3.83 cfs @ 12.08 hrs, Volume= 11,849 cf, Depth= 1.96"
Routed to Link DP-1 : DP-1 Agawam River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.44"

Area (sf)	CN	Description
56,804	98	Paved roads w/curbs & sewers, HSG A
239	36	Woods, Fair, HSG A
95	98	Water Surface, HSG A
15,254	39	>75% Grass cover, Good, HSG A
72,392	85	Weighted Average
15,493	39	21.40% Pervious Area
56,899	98	78.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment EDA-2: Subcat EDA-2

Runoff = 2.06 cfs @ 12.07 hrs, Volume= 6,520 cf, Depth= 2.58"
Routed to Link DP-2 : DP-2 Off-Site - Southeast

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.44"

Area (sf)	CN	Description
27,472	98	Paved roads w/curbs & sewers, HSG A
437	36	Woods, Fair, HSG A
2,423	39	>75% Grass cover, Good, HSG A
30,332	92	Weighted Average
2,860	39	9.43% Pervious Area
27,472	98	90.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Link DP-1: DP-1 Agawam River

Inflow Area = 72,392 sf, 78.60% Impervious, Inflow Depth = 1.96" for 2yr event
Inflow = 3.83 cfs @ 12.08 hrs, Volume= 11,849 cf
Primary = 3.83 cfs @ 12.08 hrs, Volume= 11,849 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: DP-2 Off-Site - Southeast

Inflow Area = 30,332 sf, 90.57% Impervious, Inflow Depth = 2.58" for 2yr event
Inflow = 2.06 cfs @ 12.07 hrs, Volume= 6,520 cf
Primary = 2.06 cfs @ 12.07 hrs, Volume= 6,520 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EDA-1: Subcat EDA-1 Runoff Area=72,392 sf 78.60% Impervious Runoff Depth=3.41"
Tc=5.0 min CN=85 Runoff=6.60 cfs 20,541 cf

Subcatchment EDA-2: Subcat EDA-2 Runoff Area=30,332 sf 90.57% Impervious Runoff Depth=4.13"
Tc=5.0 min CN=92 Runoff=3.22 cfs 10,435 cf

Link DP-1: DP-1 Agawam River Inflow=6.60 cfs 20,541 cf
Primary=6.60 cfs 20,541 cf

Link DP-2: DP-2 Off-Site - Southeast Inflow=3.22 cfs 10,435 cf
Primary=3.22 cfs 10,435 cf

Total Runoff Area = 102,724 sf Runoff Volume = 30,977 cf Average Runoff Depth = 3.62"
17.87% Pervious = 18,353 sf 82.13% Impervious = 84,371 sf

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EDA-1: Subcat EDA-1 Runoff Area=72,392 sf 78.60% Impervious Runoff Depth=5.81"
Tc=5.0 min CN=85 Runoff=11.01 cfs 35,042 cf

Subcatchment EDA-2: Subcat EDA-2 Runoff Area=30,332 sf 90.57% Impervious Runoff Depth=6.63"
Tc=5.0 min CN=92 Runoff=5.03 cfs 16,753 cf

Link DP-1: DP-1 Agawam River Inflow=11.01 cfs 35,042 cf
Primary=11.01 cfs 35,042 cf

Link DP-2: DP-2 Off-Site - Southeast Inflow=5.03 cfs 16,753 cf
Primary=5.03 cfs 16,753 cf

Total Runoff Area = 102,724 sf Runoff Volume = 51,795 cf Average Runoff Depth = 6.05"
17.87% Pervious = 18,353 sf 82.13% Impervious = 84,371 sf

Mill Pond Dam Bridge No. W-06-020
US 6 WB & ST 28 NB Wareham, MA

APPENDIX B

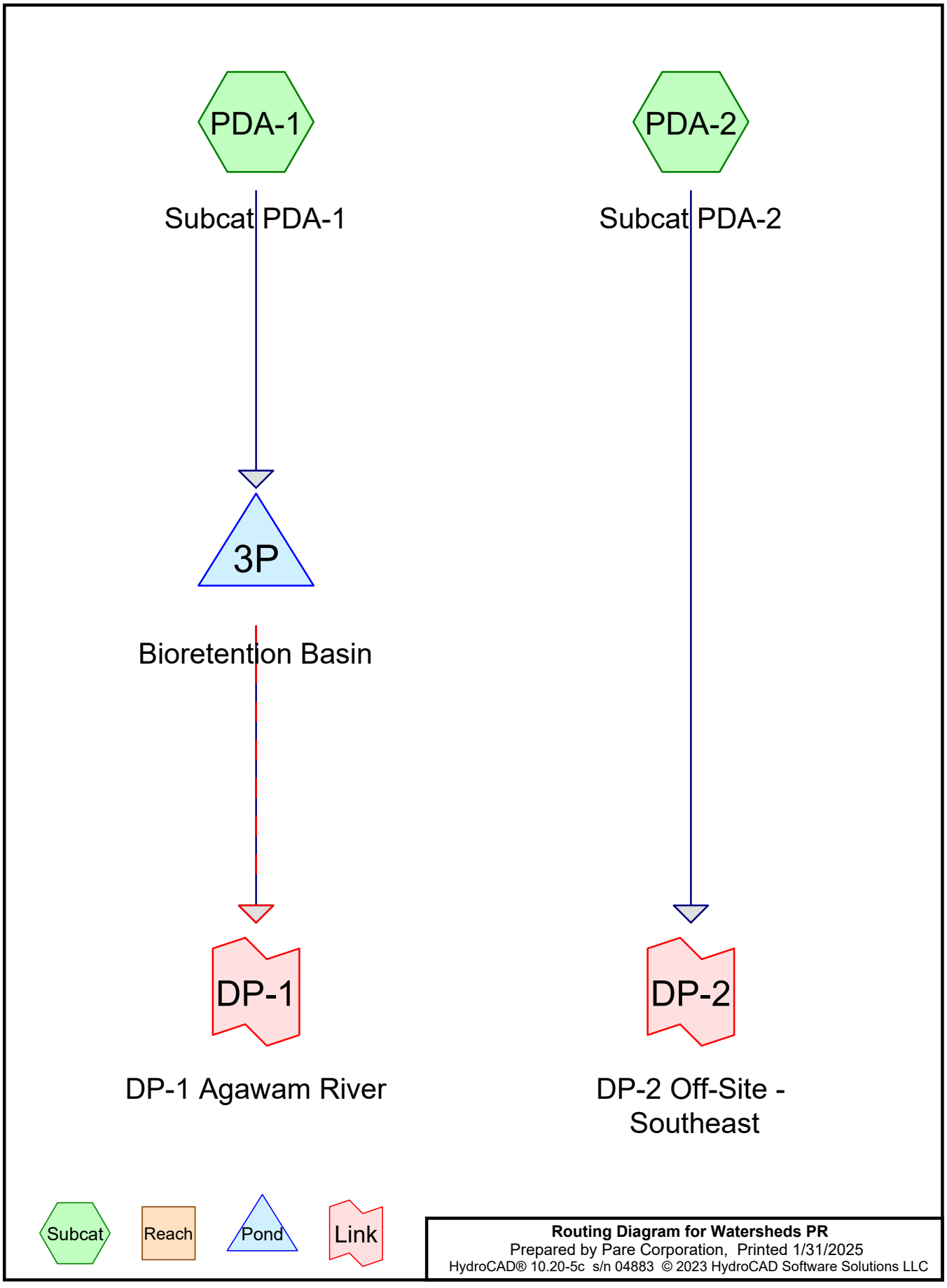
PROPOSED HYDROLOGIC REPORTS AND WATERSHED

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	2
PROJECT FILE NO.	606352		

PR HYDROLOGY PLAN

0 50 100 150 200
SCALE: 1" = 50'


PDA-1
PDA-2
Subcat PDA-1
Subcat PDA-2
3P
Bioretention Basin
DP-1
DP-2
DP-1 Agawam River
DP-2 Off-Site - Southeast
Subcat
Reach
Pond
Link
Routing Diagram for Watersheds PR
Prepared by Pare Corporation, Printed 1/31/2025
HydroCAD® 10.20-5c s/n 04883 © 2023 HydroCAD Software Solutions LLC

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PDA-1: Subcat PDA-1 Runoff Area=72,392 sf 79.63% Impervious Runoff Depth=2.05"
Tc=5.0 min CN=86 Runoff=3.98 cfs 12,339 cf

Subcatchment PDA-2: Subcat PDA-2 Runoff Area=30,332 sf 98.92% Impervious Runoff Depth=3.09"
Tc=5.0 min CN=97 Runoff=2.31 cfs 7,823 cf

Pond 3P: Bioretention Basin Peak Elev=9.94' Storage=2,392 cf Inflow=3.98 cfs 12,339 cf
Primary=3.71 cfs 4,549 cf Secondary=0.22 cfs 7,790 cf Outflow=3.93 cfs 12,339 cf

Link DP-1: DP-1 Agawam River Inflow=3.93 cfs 12,339 cf
Primary=3.93 cfs 12,339 cf

Link DP-2: DP-2 Off-Site - Southeast Inflow=2.31 cfs 7,823 cf
Primary=2.31 cfs 7,823 cf

Total Runoff Area = 102,724 sf Runoff Volume = 20,161 cf Average Runoff Depth = 2.36"
14.68% Pervious = 15,075 sf 85.32% Impervious = 87,649 sf

Summary for Subcatchment PDA-1: Subcat PDA-1

Runoff = 3.98 cfs @ 12.08 hrs, Volume= 12,339 cf, Depth= 2.05"
Routed to Pond 3P : Bioretention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.44"

Area (sf)	CN	Description
14,748	39	>75% Grass cover, Good, HSG A
57,644	98	Paved roads w/curbs & sewers, HSG A
72,392	86	Weighted Average
14,748	39	20.37% Pervious Area
57,644	98	79.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment PDA-2: Subcat PDA-2

Runoff = 2.31 cfs @ 12.07 hrs, Volume= 7,823 cf, Depth= 3.09"
Routed to Link DP-2 : DP-2 Off-Site - Southeast

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.44"

Area (sf)	CN	Description
327	39	>75% Grass cover, Good, HSG A
30,005	98	Paved roads w/curbs & sewers, HSG A
30,332	97	Weighted Average
327	39	1.08% Pervious Area
30,005	98	98.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Pond 3P: Bioretention Basin

Inflow Area = 72,392 sf, 79.63% Impervious, Inflow Depth = 2.05" for 2yr event
Inflow = 3.98 cfs @ 12.08 hrs, Volume= 12,339 cf
Outflow = 3.93 cfs @ 12.11 hrs, Volume= 12,339 cf, Atten= 1%, Lag= 1.8 min
Primary = 3.71 cfs @ 12.11 hrs, Volume= 4,549 cf
Routed to Link DP-1 : DP-1 Agawam River
Secondary = 0.22 cfs @ 12.11 hrs, Volume= 7,790 cf
Routed to Link DP-1 : DP-1 Agawam River

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 9.94' @ 12.11 hrs Surf.Area= 1,777 sf Storage= 2,392 cf

Plug-Flow detention time= 78.7 min calculated for 12,330 cf (100% of inflow)
Center-of-Mass det. time= 78.8 min (897.3 - 818.5)

Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	6,062 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6.00	1,060	0.0	0	0
6.01	1,060	33.0	3	3
7.00	1,060	33.0	346	350
8.00	1,060	33.0	350	700
9.00	1,060	33.0	350	1,049
9.01	1,060	100.0	11	1,060
9.50	1,482	100.0	623	1,683
10.50	2,161	100.0	1,822	3,504
11.50	2,954	100.0	2,558	6,062

Device	Routing	Invert	Outlet Devices
#1	Primary	9.70'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Secondary	6.00'	**6.0" Vert. Subdrain Outlet** C= 0.600 Limited to weir flow at low heads
#3	Device 2	6.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 4.00'

Primary OutFlow Max=3.63 cfs @ 12.11 hrs HW=9.93' TW=0.00' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 3.63 cfs @ 1.57 fps)

Secondary OutFlow Max=0.22 cfs @ 12.11 hrs HW=9.93' TW=0.00' (Dynamic Tailwater)
└**2=Subdrain Outlet** (Passes 0.22 cfs of 1.81 cfs potential flow)
└**3=Exfiltration** (Controls 0.22 cfs)

Stage-Discharge for Pond 3P: Bioretention Basin

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
6.00	0.00	0.00	0.00
6.10	0.03	0.00	0.03
6.20	0.07	0.00	0.07
6.30	0.07	0.00	0.07
6.40	0.07	0.00	0.07
6.50	0.07	0.00	0.07
6.60	0.08	0.00	0.08
6.70	0.08	0.00	0.08
6.80	0.08	0.00	0.08
6.90	0.09	0.00	0.09
7.00	0.09	0.00	0.09
7.10	0.09	0.00	0.09
7.20	0.09	0.00	0.09
7.30	0.10	0.00	0.10
7.40	0.10	0.00	0.10
7.50	0.10	0.00	0.10
7.60	0.11	0.00	0.11
7.70	0.11	0.00	0.11
7.80	0.11	0.00	0.11
7.90	0.12	0.00	0.12
8.00	0.12	0.00	0.12
8.10	0.12	0.00	0.12
8.20	0.12	0.00	0.12
8.30	0.13	0.00	0.13
8.40	0.13	0.00	0.13
8.50	0.13	0.00	0.13
8.60	0.14	0.00	0.14
8.70	0.14	0.00	0.14
8.80	0.14	0.00	0.14
8.90	0.14	0.00	0.14
9.00	0.15	0.00	0.15
9.10	0.16	0.00	0.16
9.20	0.16	0.00	0.16
9.30	0.17	0.00	0.17
9.40	0.18	0.00	0.18
9.50	0.19	0.00	0.19
9.60	0.19	0.00	0.19
9.70	0.20	0.00	0.20
9.80	1.24	1.03	0.21
9.90	3.13	2.91	0.22
10.00	5.56	5.34	0.22
10.10	8.44	8.21	0.23
10.20	11.68	11.45	0.24
10.30	15.26	15.02	0.25
10.40	19.14	18.88	0.25
10.50	23.29	23.02	0.26
10.60	27.69	27.42	0.27
10.70	32.33	32.05	0.28
10.80	37.18	36.90	0.29
10.90	42.25	41.95	0.30
11.00	47.51	47.21	0.31
11.10	52.96	52.65	0.31
11.20	58.59	58.27	0.32
11.30	64.39	64.06	0.33
11.40	70.36	70.02	0.34
11.50	**76.48**	**76.13**	**0.35**

Stage-Area-Storage for Pond 3P: Bioretention Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
6.00	1,060	0
6.10	1,060	35
6.20	1,060	70
6.30	1,060	105
6.40	1,060	140
6.50	1,060	175
6.60	1,060	210
6.70	1,060	245
6.80	1,060	280
6.90	1,060	315
7.00	1,060	350
7.10	1,060	385
7.20	1,060	420
7.30	1,060	455
7.40	1,060	490
7.50	1,060	525
7.60	1,060	560
7.70	1,060	595
7.80	1,060	630
7.90	1,060	665
8.00	1,060	700
8.10	1,060	735
8.20	1,060	770
8.30	1,060	805
8.40	1,060	840
8.50	1,060	875
8.60	1,060	909
8.70	1,060	944
8.80	1,060	979
8.90	1,060	1,014
9.00	1,060	1,049
9.10	1,138	1,159
9.20	1,224	1,277
9.30	1,310	1,404
9.40	1,396	1,539
9.50	1,482	1,683
9.60	1,550	1,834
9.70	1,618	1,993
9.80	1,686	2,158
9.90	1,754	2,330
10.00	1,822	2,509
10.10	1,889	2,694
10.20	1,957	2,887
10.30	2,025	3,086
10.40	2,093	3,292
10.50	2,161	3,504
10.60	2,240	3,724
10.70	2,320	3,952
10.80	2,399	4,188
10.90	2,478	4,432
11.00	2,558	4,684
11.10	2,637	4,944
11.20	2,716	5,211
11.30	2,795	5,487
11.40	2,875	5,770
11.50	**2,954**	**6,062**

Summary for Link DP-1: DP-1 Agawam River

Inflow Area = 72,392 sf, 79.63% Impervious, Inflow Depth = 2.05" for 2yr event
Inflow = 3.93 cfs @ 12.11 hrs, Volume= 12,339 cf
Primary = 3.93 cfs @ 12.11 hrs, Volume= 12,339 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: DP-2 Off-Site - Southeast

Inflow Area = 30,332 sf, 98.92% Impervious, Inflow Depth = 3.09" for 2yr event
Inflow = 2.31 cfs @ 12.07 hrs, Volume= 7,823 cf
Primary = 2.31 cfs @ 12.07 hrs, Volume= 7,823 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PDA-1: Subcat PDA-1 Runoff Area=72,392 sf 79.63% Impervious Runoff Depth=3.50"
Tc=5.0 min CN=86 Runoff=6.77 cfs 21,141 cf

Subcatchment PDA-2: Subcat PDA-2 Runoff Area=30,332 sf 98.92% Impervious Runoff Depth=4.69"
Tc=5.0 min CN=97 Runoff=3.43 cfs 11,847 cf

Pond 3P: Bioretention Basin Peak Elev=10.04' Storage=2,580 cf Inflow=6.77 cfs 21,141 cf
Primary=6.41 cfs 11,230 cf Secondary=0.23 cfs 9,911 cf Outflow=6.63 cfs 21,140 cf

Link DP-1: DP-1 Agawam River Inflow=6.63 cfs 21,140 cf
Primary=6.63 cfs 21,140 cf

Link DP-2: DP-2 Off-Site - Southeast Inflow=3.43 cfs 11,847 cf
Primary=3.43 cfs 11,847 cf

Total Runoff Area = 102,724 sf Runoff Volume = 32,988 cf Average Runoff Depth = 3.85"
14.68% Pervious = 15,075 sf 85.32% Impervious = 87,649 sf

Watersheds PR

Type III 24-hr 100yr Rainfall=7.58"

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PDA-1: Subcat PDA-1 Runoff Area=72,392 sf 79.63% Impervious Runoff Depth=5.92"
Tc=5.0 min CN=86 Runoff=11.18 cfs 35,743 cf

Subcatchment PDA-2: Subcat PDA-2 Runoff Area=30,332 sf 98.92% Impervious Runoff Depth=7.22"
Tc=5.0 min CN=97 Runoff=5.20 cfs 18,252 cf

Pond 3P: Bioretention Basin Peak Elev=10.18' Storage=2,847 cf Inflow=11.18 cfs 35,743 cf
Primary=10.76 cfs 23,265 cf Secondary=0.24 cfs 12,477 cf Outflow=10.99 cfs 35,743 cf

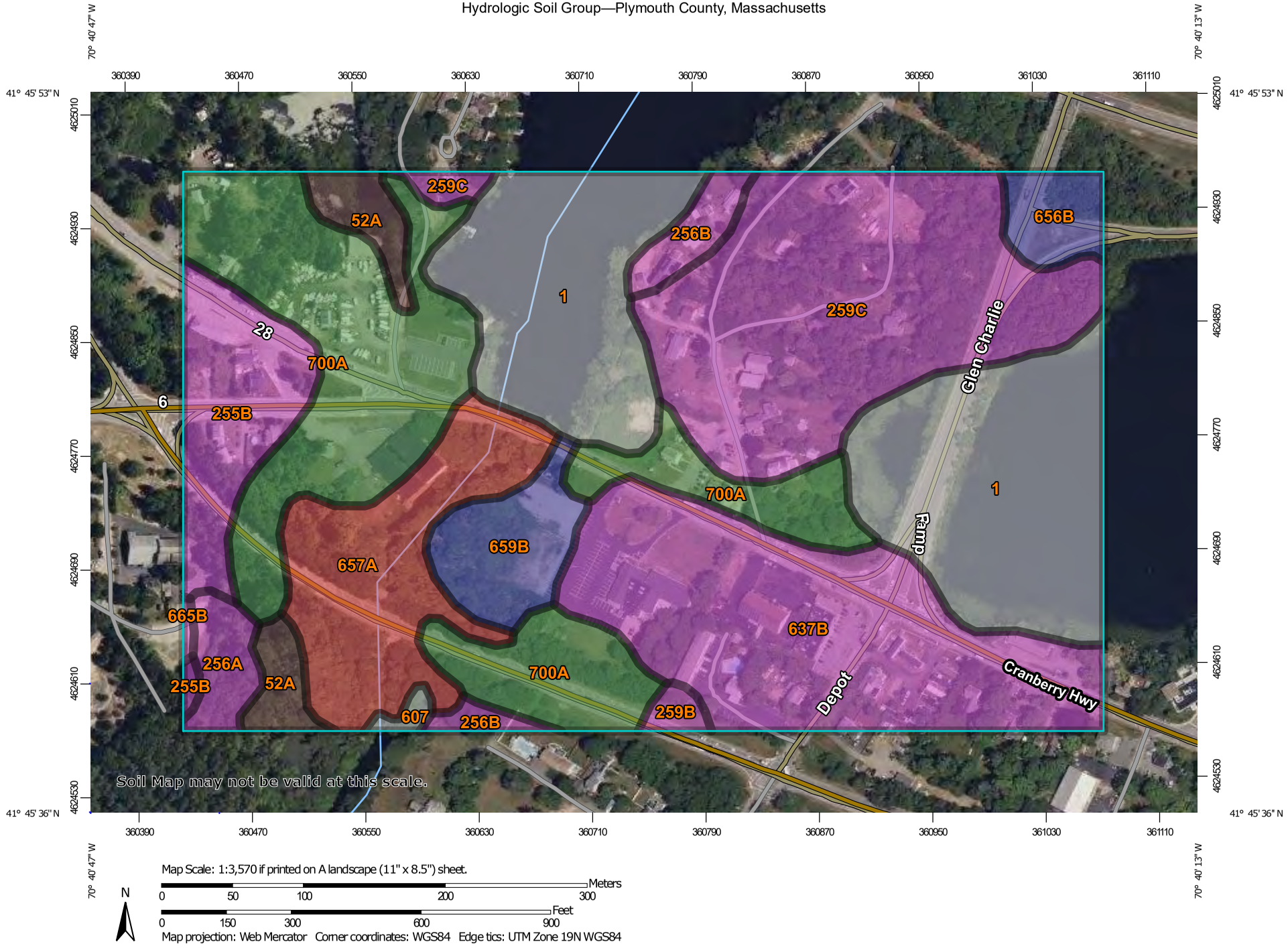
Link DP-1: DP-1 Agawam River Inflow=10.99 cfs 35,743 cf
Primary=10.99 cfs 35,743 cf

Link DP-2: DP-2 Off-Site - Southeast Inflow=5.20 cfs 18,252 cf
Primary=5.20 cfs 18,252 cf

Total Runoff Area = 102,724 sf Runoff Volume = 53,995 cf Average Runoff Depth = 6.31"
14.68% Pervious = 15,075 sf 85.32% Impervious = 87,649 sf

Mill Pond Dam Bridge No. W-06-020
US 6 WB & ST 28 NB Wareham, MA

APPENDIX C
SOIL DATA



Map Scale: 1:3,570 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

Proposal No. 606532-136278

A00840 - 217

Proposal No. 606532-136278

A00840 - 218

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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: Plymouth County, Massachusetts
Survey Area Data: Version 16, 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: Jun 10, 2022—Jun 30, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		13.5	21.3%
52A	Freetown muck, 0 to 1 percent slopes	B/D	1.6	2.5%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	3.4	5.4%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	A	1.0	1.5%
256B	Deerfield loamy fine sand, 3 to 8 percent slopes	A	1.1	1.8%
259B	Carver loamy coarse sand, 3 to 8 percent slopes	A	0.3	0.5%
259C	Carver loamy coarse sand, 8 to 15 percent slopes	A	11.4	18.0%
607	Water, saline		0.2	0.3%
637B	Carver - Urban land complex, 0 to 8 percent slopes	A	10.2	16.1%
656B	Udorthents - Urban land complex, 0 to 8 percent slopes	B	1.1	1.7%
657A	Aquepts, 0 to 3 percent slopes	D	5.3	8.4%
659B	Udorthents, 0 to 8 percent slopes, gravelly	B	2.1	3.4%
665B	Udipsamments, 0 to 8 percent slopes	A	0.1	0.1%
700A	Udipsamments, wet substratum, 0 to 3 percent slopes	A/D	12.1	19.0%
Totals for Area of Interest			**63.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

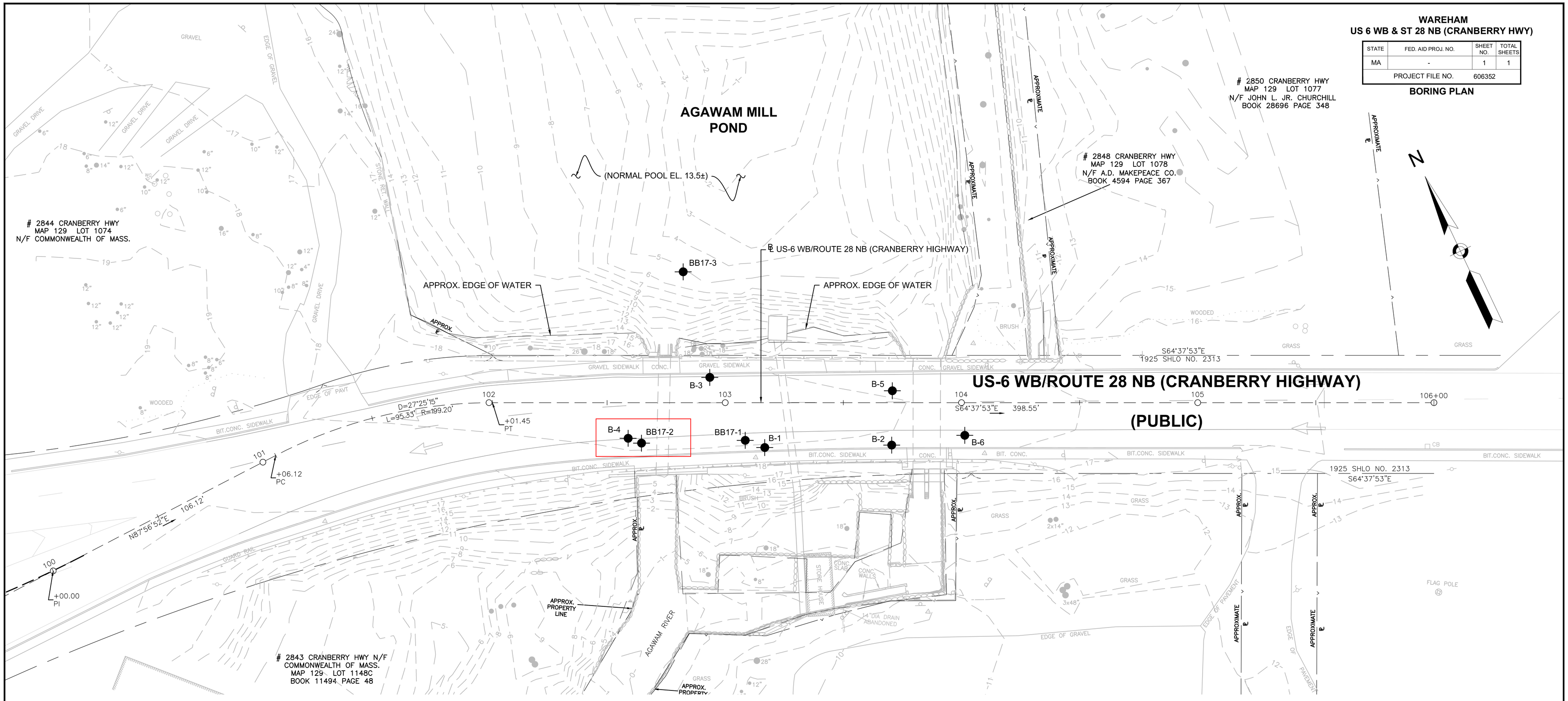
Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WAREHAM
US 6 WB & ST 28 NB (CRANBERRY HWY)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	1
PROJECT FILE NO.	606352		

BORING PLAN



BORING LOCATIONS (FEET)							
BORING NO.	NORTHING	EASTING	STATION	OFFSET	SURFACE EL	DEPTH	YEAR
B-1	2739594.0	880949.2	103+17	19' RT	17.9±	27'	2008
B-2	2739571.9	880998.2	103+70	18' RT	17.7±	27'	2008
B-3	2739630.8	880940.9	102+93	11' LT	18.2±	27'	2008
B-4	2739622.3	880898.7	102+59	15' RT	18.1±	32'	2010
B-5	2739592.6	881008.3	103+71	5' LT	17.9±	32'	2010
B-6	2739562.4	881028.0	104+01	14' RT	17.5±	32'	2010
BB17-1	2739600.3	880943.1	103+08	16' RT	18.1±	85' AND 10' BEDROCK CORE	2017
BB17-2	2739618.0	880902.9	102+65	17' RT	18.1±	84' AND 10' BEDROCK CORE	2017
BB17-3	2739676.0	880949.9	102+82	55' LT	5.1±	53'	2017

NOTES:

1. LOCATION OF DRIVE SAMPLE BORINGS ARE SHOWN THUS: ✛

   BORINGS COMPLETED BY NEW ENGLAND BORING CONTRACTORS. BORINGS WERE OBSERVED BY PARE CORPORATION PERSONNEL.
2. SEE THE BORING LOCATIONS TABLE FOR THE SPECIFIED DEPTH OF EACH BORING.
3. BENCH MARK: GPS PNT #1, N2740804.864, E879795.245, ELEV.=26.91
4. BORINGS ARE LOCATED FROM THE US-6 WB/ROUTE 28 NB BASELINE.

0 20 50 100
SCALE: 1" = 20'

PROJECT FILE NO. 606352

MassDOT Massachusetts Department of Transportation Highway Division

BORING PLAN OF PROPOSED BRIDGE

WAREHAM

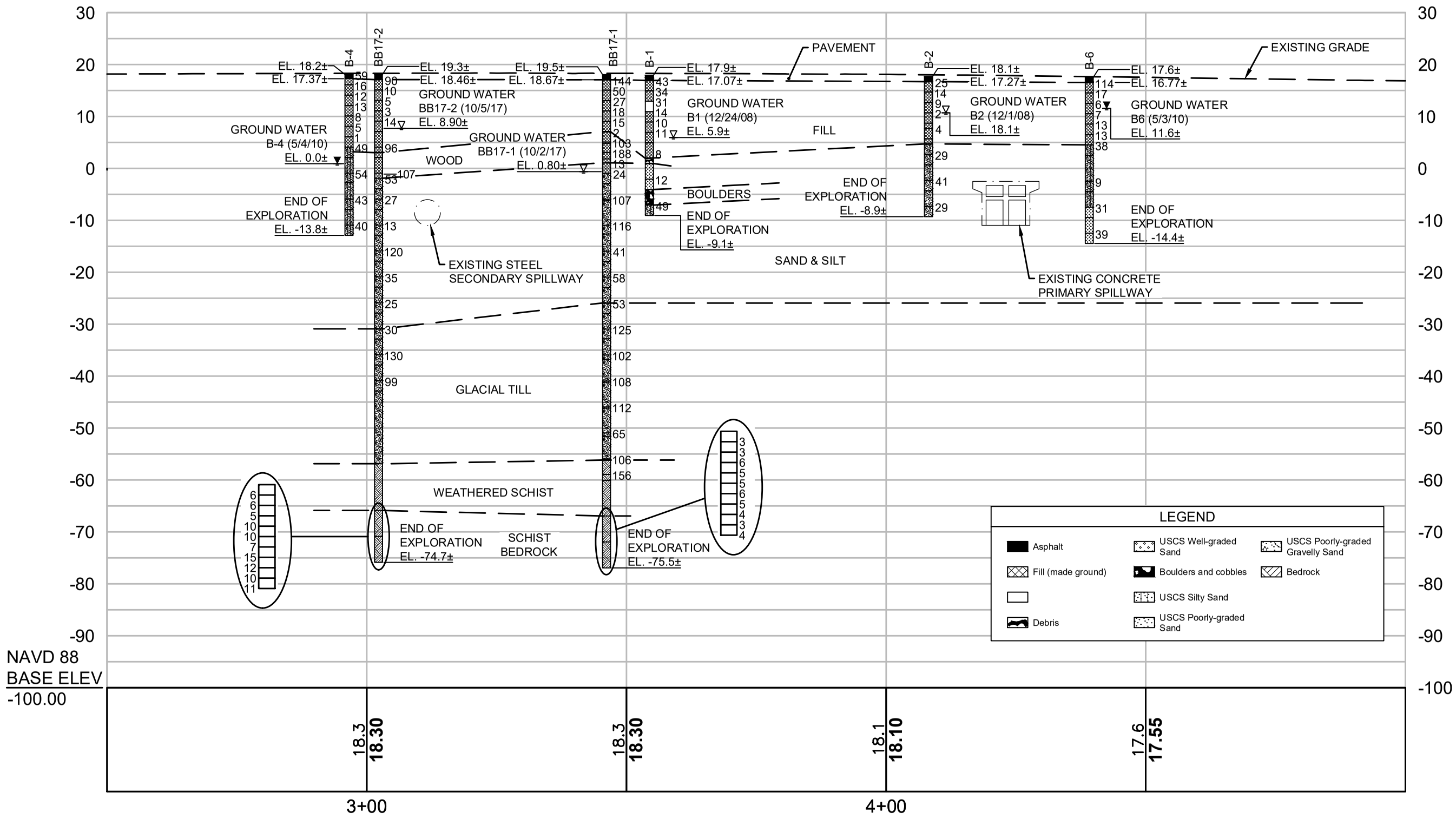
US 6 WB/ST 28 NB (CRANBERRY HWY) OVER AGAWAM RIVER

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

SCALE: 1" = 20'-0" *SEPTEMBER 20, 2018*

BRIDGE NO. W-06-020 (8M1)

Proposal No. 606532-136278



SUBSURFACE PROFILE

SCALE: 1"=20'

A00840 - 222

Pare Corporation
10 Lincoln Road, Suite 210
Foxboro, MA 02035
T: 508-543-1755
F: 508-543-1881

BORING NUMBER B-4

CLIENT MassDOT
PROJECT NAME Mill Pond Dam
PROJECT NUMBER 14199.14
PROJECT LOCATION Wareham, MA
DATE STARTED 5/4/10 **COMPLETED** 5/5/10
GROUND ELEVATION 18.2 ft **HOLE SIZE** inches
DRILLING CONTRACTOR New Hampshire Boring, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Wash and Drive/Automatic Hammer
AT TIME OF DRILLING ---
LOGGED BY Shane Souza **CHECKED BY**
AT END OF DRILLING 18.20 ft / Elev 0.00 ft
BORING LOCATION 2739622.3°N / 880898.7°E

DEPTH (ft)	CASING (bl/ft)	SAMPLE TYPE NUMBER	RECOVERY/PEN. (in)	DEPTH (FT)	BLOW COUNTS/6"	MIN/FT	GRAPHIC LOG	SAMPLE DESCRIPTION	STRATUM DESCRIPTION
0									
		S-1	9 / 24	1 - 3	51-39-20-12 (59)			Dry, very dense, brown, fine SAND, some coarse sand, trace inorganic silt.	
		S-2	14 / 24	3 - 5	7-8-8-6 (16)			Dry, medium dense, brown, fine SAND, trace coarse sand, trace inorganic silt.	
5									
		S-3	6 / 24	5 - 7	8-6-6-7 (12)			Dry, medum dense, brown, fine SAND, trace coarse sand, trace inorganic silt.	
		S-4	7 / 24	7 - 9	6-7-6-6 (13)			Moist, medium dense, brown, fine SAND, trace coarse sand, trace inorganic silt.	FILL
10									
		S-5	6 / 24	9 - 11	7-5-3-1 (8)			Wet, loose, brown, fine SAND, some coarse sand, trace inorganic silt.	
		S-6	10 / 24	11 - 13	2-3-2-2 (5)			Wet, loose, brown, coarse SAND and fine SAND, trace inorganic silt.	
		S-7	12 / 24	13 - 15	3-1-0-1 (1)			Wet, very loose, black, coarse SAND and fine SAND, trace coarse sand.	
15									
		S-8	10 / 24	15 - 17	8-16-33-27 (49)			Wet, hard, light brown, inorganic SILT and fine SAND, trace coarse sand.	
20									
		S-9	16 / 22	20 - 21.8	11-22-32-120/4"			Wet, veyr dense, light brown, fine SAND and inorganic SILT, trace coarse sand.	
25									SAND WITH SILT
		S-10	15 / 24	25 - 27	19-21-22-28 (43)			Wet, dense, light brown, fine SAND, some inorganic silt, trace coarse sand.	
30									
		S-11	3 / 24	30 - 32	10-14-26-33 (40)			Wet, dense, light brown, fine SAND, some inorganic silt, trace coarse sand.	
								Bottom of borehole at 32.0 feet.	
35									

GRANULAR SOILS

BLOWS/FT	DENSITY
0 - 4	V. LOOSE
4 -10	LOOSE
10 - 30	M. DENSE
30 - 50	DENSE
>50	V. DENSE

COHESIVE SOILS

BLOWS/FT	DENSITY
<2	V. SOFT
2 - 4	SOFT
4 - 8	M. STIFF
8 - 15	STIFF
15 - 30	V. STIFF
>30	HARD

REMARKS:
1.Changed location: boring moved from N2739619.6, E880897.4 to N2739622.3, E880898.7 because of gas line.

BURMISTER CLASSIFICATION

TRACE	0 -10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

PERCENT BY WEIGHT

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

PARE BORING LOG - GINT STD US LAB.GDT - 8/16/18 15:21 - Y:\JOBS\14 JOBS\14199.14 MASSDOT MILL POND DAM\BORING LOG\14199.14 BORING LOGS.GPJ

Pare Corporation
10 Lincoln Road, Suite 210
Foxboro, MA 02035
508-543-1755

BORING NUMBER BB17-2

CLIENT MassDOT
PROJECT NAME Mill Pond Dam
PROJECT NUMBER 14199.14
PROJECT LOCATION Wareham, MA
DATE STARTED 10/3/17 **COMPLETED** 10/5/17
GROUND ELEVATION 19.3 ft NAVD88 **HOLE SIZE** 4 in.
DRILLING CONTRACTOR New England Boring Contractors, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Wash and Drive
▽ **AT TIME OF DRILLING** 10.40 ft / Elev 8.90 ft
AT END OF DRILLING ---
LOGGED BY M. Pham **CHECKED BY** SJM
BORING LOCATION 2739618.04°N / 880902.9°E

DEPTH (ft)	CASING (bl/ft)	SAMPLE TYPE NUMBER	RECOVERY/PEN. (in)	DEPTH (FT)	BLOW COUNTS/6"	MIN/FT	GRAPHIC LOG	SAMPLE DESCRIPTION	STRATUM DESCRIPTION
0									8-10" PAVEMENT
		S-1	14 / 24	1 - 3	100-73-17-9 (90)			Wet, very dense, brown, fine to coarse GRAVEL, some fine to coarse sand, trace silt.	FILL
		S-2	3 / 24	3 - 5	6-6-4-3 (10)			Wet, loose, brown, fine to coarse SAND, little silt, trace coal.	
5		S-3	6 / 24	5 - 7	5-2-3-2 (5)			Wet, loose, brown, fine to coarse SAND, some silt, trace fine gravel.	
		S-4	7 / 24	7 - 9	3-1-2-3 (3)			Wet, very loose, brown, fine to coarse SAND and coarse GRAVEL, some silt.	
10		S-5	10 / 24	9 - 11	17-9-5-4 (14)			Wet, medium dense, dark brown, fine to coarse SAND, little silt, trace fine gravel, trace coal, trace fish scale.	
15		S-6	9 / 24	14 - 16	25-37-59-60 (96)			Wet, very dense, dark brown, fine to coarse SAND, trace fine gravel, trace silt, trace wood.	
									WOOD
20		S-7	24 / 0	19 - 19	107/0"			Split Spoon Refusal.	GLACIAL DEPOSITS
		S-8	9 / 24	20 - 22	26-24-29-24 (53)			Wet, very dense, light brown, fine to coarse SAND, trace fine gravel, trace silt.	
25								Wet, medium dense, light brown, fine to coarse SAND and fine to coarse GRAVEL, little silt.	

GRANULAR SOILS

BLOWS/FT	DENSITY
0 - 4	V. LOOSE
4 -10	LOOSE
10 - 30	M. DENSE
30 - 50	DENSE
>50	V. DENSE

COHESIVE SOILS

BLOWS/FT	CONSIST.
<2	V. SOFT
2 - 4	SOFT
4 - 8	M. STIFF
8 - 15	STIFF
15 - 30	V. STIFF
>30	HARD

REMARKS:
1.S-6: Black wash 12'-15'.
2.S-7: Obstruction at 19'. 1' boulder.

BURMISTER CLASSIFICATION

TRACE	0 -10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

PERCENT BY WEIGHT

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

(Continued Next Page)

PARE BORING LOG - GINT STD US LAB.GDT - 12/7/21 16:10 - Y:\JOBS\14 JOBS\14199.14 MASSDOT MILL POND DAM\BORING LOG\14199.14A BORING LOGS.GPJ

Pare Corporation
10 Lincoln Road, Suite 210
Foxboro, MA 02035
508-543-1755

BORING NUMBER BB17-2

CLIENT MassDOT **PROJECT NAME** Mill Pond Dam

PROJECT NUMBER 14199.14 **PROJECT LOCATION** Wareham, MA

DEPTH (ft)	CASING (bl/ft)	SAMPLE TYPE NUMBER	RECOVERY/PEN. (in)	DEPTH (FT)	BLOW COUNTS/6"	MIN/FT	GRAPHIC LOG	SAMPLE DESCRIPTION	STRATUM DESCRIPTION
25		S-9	6 / 24	24 - 26	31-15-12-19 (27)				
30		S-10	0 / 24	29 - 31	9-7-6-19 (13)			No Recovery	
35		S-11	5 / 24	34 - 36	13-78-42-14 (120)			Wet, very dense, light brown, fine to coarse SAND, little fine to coarse gravel, trace silt.	
40		S-12	5 / 24	39 - 41	24-18-17-17 (35)			Wet, dense, light brown, coarse GRAVEL and fine to coarse SAND, little silt.	GLACIAL DEPOSITS
45		S-13	8 / 24	44 - 46	22-14-11-19 (25)			Wet, medium dense, light brown, fine to coarse SAND, little fine to coarse gravel, trace silt.	
50		S-14	0 / 24	49 - 51	21-17-13-20 (30)			No Recovery.	
55		S-15	5 / 24	54 - 56	19-76-54-34 (130)			Wet, very dense, light brown, fine to coarse SAND, some coarse gravel, trace silt.	

3.S-11: Obstruction at 35'.
4.S-14 & S-15: Rock in tip.

(Continued Next Page)

PARE BORING LOG - GINT STD US LAB.GDT - 12/7/21 16:10 - Y:\JOBS\14 JOBS\14199.14 MASSDOT MILL POND DAM\BORING LOG\14199.14A BORING LOGS.GPJ

Pare Corporation
10 Lincoln Road, Suite 210
Foxboro, MA 02035
508-543-1755

BORING NUMBER BB17-2

CLIENT MassDOT **PROJECT NAME** Mill Pond Dam

PROJECT NUMBER 14199.14 **PROJECT LOCATION** Wareham, MA

DEPTH (ft)	CASING (bl/ft)	SAMPLE TYPE NUMBER	RECOVERY/PEN. (in)	DEPTH (FT)	BLOW COUNTS/6"	MIN/FT	GRAPHIC LOG	SAMPLE DESCRIPTION	STRATUM DESCRIPTION
60		S-16	9 / 24	59 - 61	30-65-34-25 (99)			Wet, very dense, light brown, fine to coarse SAND, little silt, trace fine gravel.	GLACIAL DEPOSITS
								Roller bit down to bedrock.	
65									
70									
75									
80									WEATHERED SCHIST
85		C1	30 / 60	84 - 89		6 6 5 10		Very poor, moderately weathered, hard, extremely fractured SCHIST. REC = 50% RQD = 0%	SCHIST

PARE BORING LOG - GINT STD US LAB.GDT - 12/7/21 16:10 - Y:\JOBS\14 JOBS\14199.14 MASSDOT MILL POND DAM\BORING LOG\14199.14A BORING LOGS.GPJ

(Continued Next Page)

Pare Corporation
10 Lincoln Road, Suite 210
Foxboro, MA 02035
508-543-1755

BORING NUMBER BB17-2

CLIENT MassDOT **PROJECT NAME** Mill Pond Dam

PROJECT NUMBER 14199.14 **PROJECT LOCATION** Wareham, MA

DEPTH (ft)	CASING (bl/ft)	SAMPLE TYPE NUMBER	RECOVERY/PEN. (in)	DEPTH (FT)	BLOW COUNTS/6"	MIN/FT	GRAPHIC LOG	SAMPLE DESCRIPTION	STRATUM DESCRIPTION
						10			
90		C2	16 / 60	89 - 94		7 15 12 10 11		Very poor, moderately weathered, hard, extremely fractured SCHIST. REC = 26.7% RQD = 0%	SCHIST
								Bottom of borehole at 94.0 feet.	
95									
100									
105									
110									
115									

PARE BORING LOG - GINT STD US LAB.GDT - 12/7/21 16:10 - Y:\JOBS\14 JOBS\14199.14 MASSDOT MILL POND DAM\BORING LOG\14199.14A BORING LOGS.GPJ

Mill Pond Dam Bridge No. W-06-020
US 6 WB & ST 28 NB Wareham, MA

APPENDIX D

WATER QUALITY CALCULATIONS

PAGE 1 OF 1

PROJECT NAME: Mill Pond Dam PROJECT NUMBER: 22147.02

SUBJECT: Bioretention Area Calculations

COMPUTATIONS BY: MC DATE: 1/31/2025

CHECK BY: DATE:

Bioretention Area Calculations

Refer to the RI Stormwater & Installation Standards Manual

Basin Area : BIO-1

REQUIRED WQv (AREA) =	52,123	SF
TOTAL CONTRIBUTING AREA TO BMP =	57,644	SF

Cell Volume shall be larger of Recharge Volume and Water Quality Volume

Recharge Volume (Re_V)

Hydrologic Soil Group (HSG) =	D	
Impervious Area within HSG =	52,123	SF
Recharge Factor (From Table 3-4) =	0.10	Inches
Required Re_V Volume =	**434**	**CF**

REQUIREMENT NOT MET - LINED BIORETENTION AREA

Water Quality Volume (WQ_V)

WQ_V = Impervious Area x 0.5 inches =	2,172	CF
Required WQ_V Volume =	**2,172**	**CF**
Volume provided in Bioretention Media =	781	CF in filter media with a 0.33 Void Ratio
Volume provided in Bioretention (above filter media) =	894	CF in storage above filter media
Volume provided in Sediment Forebay =	567	CF
Total WQ_V Volume Provided =	**2,242**	**CF**

Pretreatment (Sediment Forebay)

Should also treat 25% TSS

Required Pretreatment Volume MassDOT SDG(>0.1 inch x Acre (SF)) =	434	CF
Volume Provided =	**567**	**CF**

TOTAL SUSPENDED SOLIDS (TSS) REMOVAL - PROPOSED CONDITION

DATE: 11/26/2024

22147.02 - MassDOT Wareham Mill Pond Dam

BMP	TSS Removal Rate	Starting TSS Load	TSS Removed	Remaining Load
PDA				
Sediment Forebay	25%	1.00	0.25	0.75
Bioretention Basin	90%	0.75	0.68	0.08
	total TSS removal:		**92.5%**	

Drainage Area	Impervious Area (SF)	% of Total Impervious Area	TSS Removed	Weighted % TSS Removal
PDA-1	57,644	0.66	92.5%	60.8%
PDA-2	30,005	0.34	0.0%	0.0%
Remaining untreated impervious area	30,005	0.34	0.0%	0.0%
Total Proposed Impervious Area =	87,649	1.00		**60.8%**

Total Annual TSS Removal Rate = **60.8%**

Total Annual TSS Removal Square Feet = **35067**

Notes:

* TSS removal efficiency provided by Mass DEP

**** Mass STEP TSS removal efficiency

Mill Pond Dam Bridge No. W-06-020
US 6 WB & ST 28 NB Wareham, MA

APPENDIX E

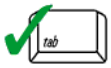
STORMWATER CHECKLIST

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.

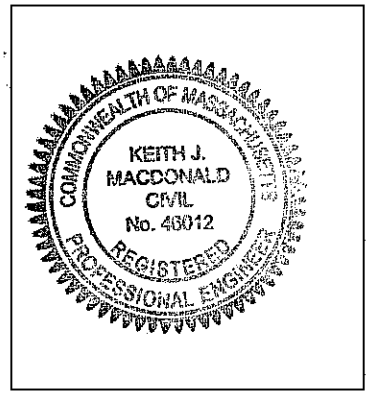
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the 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



Keith MacDonald 2/21/2025

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
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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.

Mill Pond Dam Bridge No. W-06-020
US 6 WB & ST 28 NB Wareham, MA

APPENDIX F

OPERATION AND MAINTENANCE PLAN

BRIDGE REPLACEMENT - US 6 WB & ST 28 NB (BRIDGE NO. W-06-020)

Stormwater Management System Operation and Maintenance Plan and Long-Term Pollution Prevention Plan

Wareham

PREPARED FOR

massDOT

10 Park Plaza
Boston, MA 02116

PREPARED BY

Pare Corporation
8 Blackstone Valley Place
Lincoln, RI, 02865

February 10, 2025

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1

Stormwater Management System Operation and Maintenance (O&M) Plan

This Stormwater Management System Operation and Maintenance (O&M) Plan describes the approach for inspection and maintenance of drainage infrastructure and structural stormwater control measures (SCMs) to minimize contaminant loading for the Mill Pond Dam Birdge Replacement in Wareham, MA. In general, inspection and maintenance activities will be conducted consistent with the National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer System (MS4) and MassDOT's anticipated NPDES Transportation Separate Storm Sewer System (TS4) Permit.

This document has been prepared per the requirements of Massachusetts Department of Environmental Protection (MassDEP) Regulations 310 CMR 10.05 (6)(k)(9) and satisfies the requirements of Massachusetts Stormwater Standard 9.

1.1 Responsible Party

In accordance with MassDOT procedures, the MassDOT District #5 office located in Taunton, MA, is responsible for the maintenance of all stormwater management systems on MassDOT roads within the project area.

Questions or concerns regarding activities associated with this O&M Plan should be addressed to MassDOT's District #5 office located at 1000 County Street, Taunton, MA 02780, phone (857) 368-5000, during regular weekday hours, or to MassDOT's Highway Operations Center located in South Boston, MA at (800) 227-0608 during all other times and days, including weekends and holidays.

1.2 Inspection and Maintenance Measures and Record-Keeping

See Appendix B of the Stormwater Management Report for the proposed stormwater system within the project limits. The stormwater management system covered by this O&M Plan consists of the following measures:

- Hard Bottomed Sediment Forebay
- Bioretention Basin

MassDOT uses a performance-based inspection and maintenance program for SCMs and catch basins. For SCMs, MassDOT's overall approach is to inspect SCMs, and based on the

results of the inspections, perform maintenance to preserve functionality. For catch basins, MassDOT's overall approach is to perform maintenance at an interval that maintains the functionality of the catch basin (e.g., sump is less than 50% full of sediment). Catch basin inspections, including documentation of sediment accumulation, and maintenance will generally occur simultaneously.

MassDOT's O&M program is data driven. Inspections and maintenance are recorded by personnel using hand-held tablets in the field to document sediment accumulation, maintenance action performed, and follow-up actions needed. Data are recorded in MassDOT's asset management system which is accessible in the field (mobile) or the office (desktop).

The table below summarizes data that is generally collected for each asset type. For all assets, the inspector and inspection date are recorded. Photo documentation of structure condition is taken and attached to the inspection record.

Inspection Form	Applicable Stormwater Assets	Information Collected
Inlets	› Catch basins › Outlet control structures	› Sediment accumulation › Trash/Debris accumulation › Signs of contamination › Frame and grate condition › Overall structure condition
SCMs	Consistent with the MassDOT Stormwater Design Guide (SDG), SCM categories include: › Infiltration SCMs › Stormwater wetland SCMs › Bioretention SCMs › Other SCMs	› SCM accessibility › Presence of standing water › Level of erosion › Sediment accumulation › Trash/Debris accumulation › Vegetation condition › Overall SCM condition
Storm Discharge Points	› Outlets to SCMs	› Presence of flow › Signs of contaminated flow › Sediment accumulation › Level of erosion › Pipe condition › Scour protection condition › Overall structure condition

Inspection and maintenance records can be made available using the asset management system through request with the MassDOT District 5 Environmental Engineer. Records will be kept for at least three years. Representatives of the Town's Conservation Commission(s), MassDEP, and US EPA may obtain access to these records, upon request. Additionally, MassDOT will allow members and agents of MassDEP and the Conservation Commission(s) to enter and inspect the premises, upon request, to evaluate and ensure that the Operation and Maintenance Plan requirements for each SCM are being followed.

Maintenance actions will not occur at any set frequency, but rather will be based on condition and impact to functionality. Maintenance to be performed on the stormwater system includes:

Stormwater Feature	*Potential Maintenance Actions*	
Surface SCMs	• *Remove and properly dispose of accumulated material (e.g., sediment, trash, leaf litter, debris)* • *Mow vegetated areas and remove and dispose of grass clippings* • *Regrade areas that show signs of unwanted ponding and channelization* • *Stabilize or reconstruct eroded areas and reseed* • *Replace stones/soil and/or replant vegetation*	• *Remove woody growth* • *Treat invasive plants according to MassDOT Landscape Design Section* • *Infiltration and bioretention SCMs only:* o *Address issues of standing water* o *Drain and reconstruct SCM* o *If rehabilitation is not possible, then retrofit to be a wet SCM while considering safety implications*
Inlets and Outlets to SCMs	• *Clear inlet and remove and properly dispose of sediment, trash, leaf litter, debris, and vegetation* • *Regrade areas that show signs of ponding and channelization* • *Repair or replace structural components* • *Repair damaged or eroded areas*	• *Provide or rehabilitate erosion control at the outlet* • *Regrade and replace the channel materials* • *Remove woody growth* • *Stabilize or reconstruct eroded areas* • *Treat invasive plants according to MassDOT Vegetation Management Plan*

Based on the results of the inspection, repairs will be made in accordance with MassDOT standard practices. Maintenance will be prioritized given the urgency of the required maintenance and availability of staff, contracts, etc. Maintenance may require contracting if existing contracts are unavailable to perform the work. More intensive remedial activities may require permitting and/or an engineering solution.

1.3 Erosion and Sediment Control Measures during Maintenance Activities

For maintenance activities that could result in discharges of sediments or other contaminants into wetlands, waterways, or other resource areas regulated under 310 CMR 10.00, the responsible maintenance personnel will employ measures to prevent migration of these sediments/contaminants. Such temporary measures may include, but are not necessarily limited to, the use of siltation barriers, catch basin silt sacks/filter bags, pipe plugs, cofferdams deployed within the stormwater structure, turbidity curtains, or other practices designed to prevent such discharges.

Where maintenance occurs in areas that are confined, with no risk of discharge to adjacent water bodies, no special measures may be needed. Examples include, but are not limited to: (1) cleaning of a forebay under dry conditions when the work can be completed and exposed surfaces stabilized prior to placing it back into service; and (2) catch basin cleaning where the activity is limited to removing material from a sump below the elevation of the outlet pipe.

1.4 O&M Budget

MassDOT performs maintenance for stormwater management systems as part of their routine operation and maintenance budget for roadways and bridges. Budgets are managed at the district level and vary by fiscal year, depending on funding sources.

2

Long-Term Pollution Prevention Plan

This Long-Term Pollution Prevention Plan (LTPPP) describes the approach for pollution prevention and related maintenance activities for the Mill Pond Dam Bridge Replacement in Wareham, MA. In general, long-term pollution prevention and related maintenance activities will be conducted consistent with:

- The National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer System (MS4),
- MassDOT's anticipated NPDES Transportation Separate Storm Sewer System (TS4) Permit, and
- Measures outlined in MassDOT's Stormwater Management Plan (SWMP).

This LTPPP satisfies the requirements related to pollution prevention under Massachusetts Stormwater Standards 4, 5, 6, and 10.

2.1 Practices for Long-Term Pollution Prevention

For the facilities covered, long-term pollution prevention includes the following measures.

- *good housekeeping;*
- *storing materials and waste products inside or under cover;*
- *vehicle washing;*
- *routine inspections and maintenance of SCMs;*
- *spill prevention and response;*
- *maintenance of lawns, gardens, and other landscaped areas;*
- *storage and use of fertilizers, herbicides, and pesticides;*
- *pet waste management;*
- *operation and management of septic systems; and*
- *proper management of deicing chemicals and snow.*

2.1.1 Litter Pick-up

MassDOT will conduct litter pick-up from the stormwater management facilities in conjunction with routine road maintenance activities.

2.1.2 Inspection and Maintenance of Stormwater Assets

MassDOT will conduct inspection and maintenance of drainage infrastructure and the stormwater control measures (SCMs) in accordance with the O&M Plan, as described in Section 1.

2.1.3 Maintenance of Landscaped Areas

Routine mowing will be conducted according to standard MassDOT practices. SCM basin bottoms and embankments designed to impound water should be mowed as required to prevent establishment of woody vegetation.

Except in rare circumstances, MassDOT does not use fertilizers, herbicides, and pesticides for the maintenance of facilities. Exceptions include using fertilizer to ensure the survival of new plantings and herbicides to control invasive plants. Use of fertilizers and herbicides is reviewed and approved by the MassDOT Landscape Design Section and District 5 Environmental Engineer prior to application. Local Conservation Commission review may also be required.

2.1.4 Snow and Ice Management

Snow and Ice Management will be conducted consistent with the practices outlined in the MassDOT Snow and Ice Control Program Environmental Status and Planning Report (ESPR), formerly known as the Snow and Ice Control Generic Environmental Impact Report (GEIR).

In accordance with the Snow and Ice Control ESPR, no sand is used on MassDOT properties for snow and ice control. The exception to this rule is within reduced salt areas where high sodium levels have been found in drinking water sources.

2.1.5 Street Sweeping

Routine highway cleaning, with a brush-type street sweeper, will be conducted in accordance with standard MassDOT practices. Sweeping will occur annually in the Spring.

2.1.6 Prohibition of Illicit Discharges

The MassDEP Stormwater Management Standard 10 prohibits illicit discharges to the stormwater management system. Illicit discharges are discharges that do not consist entirely of stormwater, except for certain specified non-stormwater discharges.

In accordance with the existing MS4 permit and anticipated TS4 permit requirements, examples of discharges from the following sources are not considered illicit discharges:

- Firefighting activities*
- Foundation drains
- Water line flushing
- Footing drains
- Flows from riparian habitats/wetlands
- Potable water sources
- Dechlorinated swimming pool water
- Street wash waters

- Landscape irrigation
- Individual residential car washing
- Uncontaminated groundwater
- Rising groundwater
- Diverted stream flows
- Wash water from residential buildings (no detergents)
- Condensation from air conditioning units
- Run-on from private driveways caused by precipitation
- Lawn watering
- Water from crawl space pumps

*Water from firefighting activities is allowed and need only be addressed where they are identified as significant sources of pollutants to waters of the United States.

Based on plan review and confirmation in the field, there are no known or proposed illicit connections associated with the Mill Pond Dam Bridge Replacement. Should an interconnection to the stormwater management system be identified, the MassDOT PM will coordinate with the District Permits Engineer to confirm if the connections are authorized. For unauthorized connections, the MassDOT PM and/or MassDOT Environmental Services Section will investigate the connections and if they are determined to be illicit, the connections will be managed through MassDOT's Illicit Discharge Detection and Elimination (IDDE) program and/or through other agencies.

Massachusetts Department of Transportation

MILL POND DAM

SECTION 9
COPIES OF ENVIRONMENTAL AND CULTURAL COORDINATION CORRESPONDENCE

MA NHESP Correspondence
USFWS Section 7 Documentation
MADMF Letter, dated 01/11/2022
Section 106 Correspondence (THPO/SHPO/BUAR)

From:	Burns, Trevor B. (DOT)
To:	Saniuk, Matthew J. (DOT)
Subject:	FW: MassDOT 606352 - WAREHAM- BRIDGE REPLACEMENT MILL POND ON ROUTE 28- Rare Plants
Attachments:	image001.png image002.jpg

From: Hoogeboom, Julia A. (DOT) <Julia.A.Hoogeboom@dot.state.ma.us>
Sent: Thursday, September 21, 2023 9:02 AM
To: McGuire, Timothy (FWE) <Timothy.McGuire2@mass.gov>
Cc: Paulson, David J. (DOT) <David.J.Paulson@dot.state.ma.us>; Burns, Trevor B. (DOT) <Trevor.B.Burns@dot.state.ma.us>
Subject: RE: MassDOT 606352 - WAREHAM- BRIDGE REPLACEMENT MILL POND ON ROUTE 28- Rare Plants

Hi Tim,

Thanks for providing this input! We won't schedule a plant survey here and will reach out once if the project footprint expands (though unlikely).

A sedimentation and erosion control plan will be implemented during construction; however, I realize that details are sparse on these 25% plans. To give you a rough idea, erosion controls are proposed along the upland limit-of-work. To control water, the pond will be drawdown to 2 feet below normal pool elevation and steel sheet cofferdams will be installed along the limit of work in the channel. While not shown on the plan, there will likely be a bypass pipe but I'd like to provide you more information once the plans are further along. I'll plan to submit a complete narrative regarding sedimentation and water control methods as more information becomes available and as part of our complete MESA checklist.

Let me know if you have any questions in the meantime!
Thanks,
Julia

Julia Hoogeboom
Wildlife and Endangered Species Coordinator
Environmental Services
MassDOT Highway Division
857-445-2880

From: McGuire, Timothy (FWE) <Timothy.McGuire2@mass.gov>
Sent: Friday, September 15, 2023 12:38 PM
To: Hoogeboom, Julia A. (DOT) <Julia.A.Hoogeboom@dot.state.ma.us>
Cc: Paulson, David J. (DOT) <David.J.Paulson@dot.state.ma.us>; Burns, Trevor B. (DOT) <Trevor.B.Burns@dot.state.ma.us>
Subject: RE: MassDOT 606352 - WAREHAM- BRIDGE REPLACEMENT MILL POND ON ROUTE 28- Rare Plants

Hi Julia,

I don't think there is any chance that either of the listed species would be within the proposed area of work. Should that area expand downstream, or if something goes wrong (sedimentation) that would be a concern, as there are plants downstream. One more question, how do you propose to handle sedimentation and preventing sediment and other material from going downstream? Will there be a bypass pipe? I may have missed that on the plans.

Thanks,

Tim McGuire
Endangered Species Review Biologist
Massachusetts Division of Fisheries & Wildlife
1 Rabbit Hill Road, Westborough, MA 01581
Phone: (508) 389-6366 | Email: timothy.mcguire2@mass.gov
mass.gov/masswildlife | facebook.com/masswildlife

From: Hoogeboom, Julia A. (DOT) <Julia.A.Hoogeboom@dot.state.ma.us>
Sent: Thursday, September 14, 2023 11:45 AM
To: McGuire, Timothy (FWE) <Timothy.McGuire2@mass.gov>

Cc: Paulson, David J. (DOT) <David.J.Paulson@dot.state.ma.us>; Burns, Trevor B. (DOT) <Trevor.B.Burns@dot.state.ma.us>
Subject: RE: MassDOT 606352 - WAREHAM- BRIDGE REPLACEMENT MILL POND ON ROUTE 28- Rare Plants

Yes, see attached 25% sketch plans and Right-of-way plans. While the design may change, I don't anticipate the project footprint to. If it does, we will keep you posted.

Thanks for reviewing.
-Julia

Julia Hoogeboom
Wildlife and Endangered Species Coordinator
Environmental Services
MassDOT Highway Division
857-445-2880

From: McGuire, Timothy (FWE) <Timothy.McGuire2@mass.gov>
Sent: Thursday, September 14, 2023 11:36 AM
To: Hoogeboom, Julia A. (DOT) <Julia.A.Hoogeboom@dot.state.ma.us>
Cc: Paulson, David J. (DOT) <David.J.Paulson@dot.state.ma.us>; Burns, Trevor B. (DOT) <Trevor.B.Burns@dot.state.ma.us>
Subject: RE: MassDOT 606352 - WAREHAM- BRIDGE REPLACEMENT MILL POND ON ROUTE 28- Rare Plants

Hi Julia, do you have a draft plan that I can take a look at? I want to look at how far downstream impacts go.

Thanks,

Tim McGuire
Endangered Species Review Biologist
Massachusetts Division of Fisheries & Wildlife
1 Rabbit Hill Road, Westborough, MA 01581
Phone: (508) 389-6366 | Email: timothy.mcguire2@mass.gov
mass.gov/masswildlife | facebook.com/masswildlife

From: McGuire, Timothy (FWE)
Sent: Wednesday, September 13, 2023 12:06 PM
To: Hoogeboom, Julia A. (DOT) <Julia.A.Hoogeboom@dot.state.ma.us>
Cc: Paulson, David J. (DOT) <David.J.Paulson@dot.state.ma.us>; Burns, Trevor B. (DOT) <Trevor.B.Burns@dot.state.ma.us>
Subject: RE: MassDOT 606352 - WAREHAM- BRIDGE REPLACEMENT MILL POND ON ROUTE 28- Rare Plants

Hi Julia,

I am going to touch base with the botanists on this one and will get back to you shortly.

Thanks,

Tim McGuire
Endangered Species Review Biologist
Massachusetts Division of Fisheries & Wildlife
1 Rabbit Hill Road, Westborough, MA 01581
Phone: (508) 389-6366 | Email: timothy.mcguire2@mass.gov
mass.gov/masswildlife | facebook.com/masswildlife

From: Hoogeboom, Julia A. (DOT) <Julia.A.Hoogeboom@dot.state.ma.us>
Sent: Tuesday, September 12, 2023 4:21 PM
To: McGuire, Timothy (FWE) <Timothy.McGuire2@mass.gov>
Cc: Paulson, David J. (DOT) <David.J.Paulson@dot.state.ma.us>; Burns, Trevor B. (DOT) <Trevor.B.Burns@dot.state.ma.us>
Subject: MassDOT 606352 - WAREHAM- BRIDGE REPLACEMENT MILL POND ON ROUTE 28- Rare Plants

Hi Tim,

We wanted to reach out regarding MassDOT project 606352 in Wareham on Route 32 over the Agawam River at the southern terminus

of Mill Pond. The proposed project is a bridge replacement project and upgrade to the existing fishway to improve fish passage. DMF is involved with the fish passage design. The current design is still being finalized so we need to wait to share plans, however I have included an aerial image (below) showing the approximate limit of work. Most of the work is occurring within the previously disturbed park or on the human-altered streambank (e.g. concrete or stone wall retaining walls). The surrounding land also contains a large population of invasives including multiflora rose and Japanese knotweed. Based on previous correspondence between Dave when he was a NHESP and MassDOT, the area is mapped for Shore Pygmy Weed and Long's Bittercress. Based on site conditions, it my understanding that a plant survey may not be needed, however could you please let us know if plant records extend into the limit of work and if NHESP thinks a plant survey is warranted?

I've also included photos of the work area.

Thanks!
-Julia

Julia Hoogeboom
Wildlife and Endangered Species Coordinator
Environmental Services
MassDOT Highway Division
857-445-2880

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: 02/14/2025 20:18:16 UTC
Project code: 2024-0031145
Project Name: 606352 WAREHAM- CULVERT AND DAM REPLACEMENT ON CRANBERRY HIGHWAY AT ROUTE 28 AND ROUTE 6, MILL POND

Federal Nexus: yes
Federal Action Agency (if applicable): Federal Highway Administration

Subject: Federal agency coordination under the Endangered Species Act, Section 7 for '606352 WAREHAM- CULVERT AND DAM REPLACEMENT ON CRANBERRY HIGHWAY AT ROUTE 28 AND ROUTE 6, MILL POND'

Dear Trevor Burns:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on February 14, 2025, for '606352 WAREHAM- CULVERT AND DAM REPLACEMENT ON CRANBERRY HIGHWAY AT ROUTE 28 AND ROUTE 6, MILL POND' (here forward, Project). This project has been assigned Project Code 2024-0031145 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements may not be complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project.

Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat and Tricolored Bat Range-wide Determination Key (DKey), invalidates this letter. ***Answers to certain questions in the DKey commit the project proponent to implementation of conservation measures that must be followed for the ESA determination to remain valid. Note that conservation measures for northern long-eared bat and tricolored bat may differ. If both bat species are present in the action area and the key suggests more conservative measures for one of the species for your Project, the Project may need to apply***

the most conservative measures in order to avoid adverse effects. If unsure which conservation measures should be applied, please contact the appropriate Ecological Services Field Office.

Determination for the Northern Long-Eared Bat and Tricolored Bat

Based on your IPaC submission and a standing analysis completed by the Service, you determined the proposed Project will have the following effect determinations:

Species	**Listing Status**	**Determination**
Northern Long-eared Bat (*Myotis septentrionalis*)	Endangered	NLAA
Tricolored Bat (*Perimyotis subflavus*)	Proposed Endangered	NLAA

Federal agencies must consult with U.S. Fish and Wildlife Service under section 7(a)(2) of the Endangered Species Act (ESA) when an action *may affect* a listed species. Tricolored bat is proposed for listing as endangered under the ESA, but not yet listed. For actions that may affect a proposed species, agencies cannot consult, but they can *confer* under the authority of section 7(a)(4) of the ESA. Such conferences can follow the procedures for a consultation and be adopted as such if and when the proposed species is listed. Should the tricolored bat be listed, agencies must review projects that are not yet complete, or projects with ongoing effects within the tricolored bat range that previously received a NE or NLAA determination from the key to confirm that the determination is still accurate.

Unless the Service advises you within 15 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that consultation on the Action is complete for northern long-eared bat and/or tricolored bat and no further action is necessary unless either of the following occurs:

- new information reveals effects of the action that may affect the northern long-eared bat or tricolored bat in a manner or to an extent not previously considered; or,
- the identified action is subsequently modified in a manner that causes an effect to the northern long-eared bat or tricolored bat that was not considered when completing the determination key.

15-Day Review Period

As indicated above, the Service will notify you within 15 calendar days if we determine that this proposed Action does not meet the criteria for a “may affect, not likely to adversely affect” (NLAA) determination for the northern long-eared bat and/or tricolored bat. If we do not notify you within that timeframe, you may proceed with the Action under the terms of the NLAA concurrence provided here. This verification period allows the identified Ecological Services Field Office to apply local knowledge to evaluation of the Action, as we may identify a small subset of actions having impacts that we did not anticipate when developing the key. In such cases, the identified Ecological Services Field Office may request additional information to verify the effects determination reached through the Northern Long-eared Bat and Tricolored Bat DKey.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination key for the northern long-eared bat and tricolored bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Monarch Butterfly *Danaus plexippus* Proposed Threatened
- Plymouth Redbelly Turtle = Plymouth Redbelly Cooter *Pseudemys rubriventris bangsi* Endangered

You may coordinate with our Office to determine whether the Action may affect the species and/or critical habitat listed above. Note that reinitiation of consultation would be necessary if a new species is listed or critical habitat designated that may be affected by the identified action before it is complete.

If you have any questions regarding this letter or need further assistance, please contact the New England Ecological Services Field Office and reference Project Code 2024-0031145 associated with this Project.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

606352 WAREHAM- CULVERT AND DAM REPLACEMENT ON CRANBERRY HIGHWAY AT ROUTE 28 AND ROUTE 6, MILL POND

2. Description

The following description was provided for the project '606352 WAREHAM- CULVERT AND DAM REPLACEMENT ON CRANBERRY HIGHWAY AT ROUTE 28 AND ROUTE 6, MILL POND':

> 606352 WAREHAM- CULVERT AND DAM REPLACEMENT ON CRANBERRY HIGHWAY AT ROUTE 28 AND ROUTE 6, MILL POND
> Work on this project consists of replacing the Route 28 culverts at Mill Pond and dam with a single span bridge structure, new dam and spill way.
> This project is funded by FHWA. The USFWS has given us permission to consult under the Northern long-eared bat and Tricolored bat Range-wide Determination Key
> Plymouth Redbelly Cooter : After consulting with the Massachusetts Natural Heritage and Endangered Species Program (NHESP), it was determined that there is no data to suggest the presence of habitat and/or individuals at this project location.
> *Proposed species: MassDOT determined the project action will not jeopardize the continued existence of the proposed species listed within the projects action area (Monarch butterfly and Tricolored bat).

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@41.762651,-70.67620554916364,14z

DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of “may affect, but not likely to adversely affect” for a least one species covered by this determination key.

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of listed bats or any other listed species?

   Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

   No

2. Is the action area wholly within Zone 2 of the year-round active area for northern long-eared bat and/or tricolored bat?

   Automatically answered
   No

3. Does the action area intersect Zone 1 of the year-round active area for northern long-eared bat and/or tricolored bat?

   Automatically answered
   No

4. Does any component of the action involve leasing, construction or operation of wind turbines? Answer 'yes' if the activities considered are conducted with the intention of gathering survey information to inform the leasing, construction, or operation of wind turbines.

   Note: For federal actions, answer ‘yes’ if the construction or operation of wind power facilities is either (1) part of the federal action or (2) would not occur but for a federal agency action (federal permit, funding, etc.).

   No

5. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

   Yes

6. Is the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), or Federal Transit Administration (FTA) funding or authorizing the proposed action, in whole or in part?

   Yes

7. FHWA, FRA, and FTA have completed a range-wide programmatic consultation for transportation- related actions within the range of the Indiana bat, northern long-eared bat and tricolored bat.

   Does your proposed action fall within the scope of this programmatic consultation?

   Note: If you are unsure, but your action is transportation related, please select "Yes" and use the FHWA, FRA, FTA Assisted Determination Key (FHWA DKey) in IPaC to determine if the programmatic consultation is applicable to your action. Return to this key and answer ‘no’ to this question if it is not.

   No

8. Are you an employee of the federal action agency or have you been officially designated in writing by the agency as its designated non-federal representative for the purposes of Endangered Species Act Section 7 informal consultation per 50 CFR § 402.08?

   Note: This key may be used for federal actions and for non-federal actions to facilitate section 7 consultation and to help determine whether an incidental take permit may be needed, respectively. This question is for information purposes only.

   Yes

9. Is the lead federal action agency the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC)? Is the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC) funding or authorizing the proposed action, in whole or in part?

   No

10. Is the lead federal action agency the Federal Energy Regulatory Commission (FERC)?

    No

11. [Semantic] Is the action area located within 0.5 miles of a known bat hibernaculum?

    Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered
    No

12. Does the action area contain any winter roosts or caves (or associated sinkholes, fissures, or other karst features), mines, rocky outcroppings, or tunnels that could provide habitat for hibernating bats?

    No

13. Does the action area contain (1) talus or (2) anthropogenic or naturally formed rock shelters or crevices in rocky outcrops, rock faces or cliffs?

    No

14. Will the action cause effects to a bridge?

    Note: Covered bridges should be considered as bridges in this question.

    Yes

15. Has a site-specific bridge assessment following USFWS guidelines been completed?

    Note: For information on conducting a bridge/structure assessment, please see Appendix K in the USFWS' Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines at:https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines Additional resources can be found at: https://www.fws.gov/media/bats-and-transportation-structures-references-and-additional-resources and a training video is located at: https://www.youtube.com/watch?v=iuFwkT7q8Ws.

    Yes

16. Was evidence of bat use found during the bridge assessment?

    No

    SUBMITTED DOCUMENTS

    - *606352_Wareham_Bridge_W-06-020_assessment_form.pdf https://ipac.ecosphere.fws.gov/project/QNSNQX3QTJFDDOGOJAH3YEP3KU/projectDocuments/157351056*
    - *MillPond_Bat_Bridge_Inspection_Letter.docx https://ipac.ecosphere.fws.gov/project/QNSNQX3QTJFDDOGOJAH3YEP3KU/projectDocuments/157351057*
    - *606352_wareham2_nleb_survey_20231103.pdf https://ipac.ecosphere.fws.gov/project/QNSNQX3QTJFDDOGOJAH3YEP3KU/projectDocuments/157353655*
    - *606352_wareham2_nleb_survey_20231103.pdf https://ipac.ecosphere.fws.gov/project/QNSNQX3QTJFDDOGOJAH3YEP3KU/projectDocuments/157353656*

17. Did you coordinate with your local Ecological Services Field Office (ESFO) and receive approval of the bridge assessment results? If NO, please contact the appropriate local ESFO before completing this determination key.

    Yes

18. Will the action result in effects to a culvert or tunnel at any time of year?

    Yes

19. Does the culvert or tunnel equal or exceed 23 feet (7.0 meters) in length?

    Yes

20. Do the interior dimensions of the culvert or tunnel **equal or exceed 3.0 feet (0.9 meters) in height (minimum height for tricolored bat)**?

    Yes

21. Has a site-specific culvert assessment following USFWS guidelines been completed?

    Note: For information on conducting a bridge/structure assessment, please see Appendix K in the USFWS' Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines at:https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines Additional resources can be found at: https://www.fws.gov/media/bats-and-transportation-structures-references-and-additional-resources and a training video is located at: https://www.youtube.com/watch?v=iuFwkT7q8Ws.

    Yes

    SUBMITTED DOCUMENTS

    - *606352_Wareham_Bridge_W-06-020_assessment_form.pdf https://ipac.ecosphere.fws.gov/project/QNSNQX3QTJFDDOGOJAH3YEP3KU/projectDocuments/157351056*
    - *MillPond_Bat_Bridge_Inspection_Letter.docx https://ipac.ecosphere.fws.gov/project/QNSNQX3QTJFDDOGOJAH3YEP3KU/projectDocuments/157351057*

22. Was evidence of bat use found during the bridge/structure (e.g., culvert) assessment?

    No

23. Did you coordinate with your local Ecological Services Field Office (ESFO) and receive approval of culvert assessment results? If NO, please contact the appropriate local ESFO before completing this determination key.

    Yes

24. Are trees present within 1000 feet of the action area?

    Note: If there are trees within the action area that are of a sufficient size to be potential roosts for bats answer "Yes". If unsure, additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    Yes

25. Does the action include the intentional exclusion of bats from a building or structure?

    Note: Exclusion is conducted to deny bats' entry or reentry into a building. To be effective and to avoid harming bats, it should be done according to established standards. If your action includes bat exclusion and you are unsure whether northern long-eared bats or tricolored bats are present, answer "Yes." Answer "No" if there are no signs of bat use in the building/structure. If unsure, contact your local Ecological Services Field Office to help assess whether northern long-eared bats or tricolored bats may be present. Contact a Nuisance Wildlife Control Operator (NWCO) for help in how to exclude bats from a structure safely without causing harm to the bats (to find a NWCO certified in bat standards, search the Internet using the search term "National Wildlife Control Operators Association bats"). Also see the White-Nose Syndrome Response Team's guide for bat control in structures.

    No

26. Does the action involve removal, modification, or maintenance of a human-made structure (barn, house, or other building) **known or suspected to contain roosting bats?**

    No

27. Will the action cause construction of one or more new roads open to the public?

    For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

    No

28. Will the action include or cause any construction or other activity that is reasonably certain to increase average daily traffic permanently or temporarily on one or more existing roads?

    Note: For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.). .

    No

29. Will the action include or cause any construction or other activity that is reasonably certain to increase the number of travel lanes on an existing thoroughfare?

    For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

    No

30. Will the proposed Action involve the creation of a new water-borne contaminant source (e.g., leachate pond, pits containing chemicals that are not NSF/ANSI 60 compliant)?

    Note: For information regarding NSF/ANSI 60 please visit https://www.nsf.org/knowledge-library/nsf-ansi-standard-60-drinking-water-treatment-chemicals-health-effects

    No

31. Will the proposed action involve the creation of a new point source discharge from a facility other than a water treatment plant or storm water system?

    No

32. Will the action include drilling or blasting?

    No

33. Will the action involve military training (e.g., smoke operations, obscurant operations, exploding munitions, artillery fire, range use, helicopter or fixed wing aircraft use)?

    No

34. Will the proposed action involve the use of herbicides or other pesticides other than herbicides (e.g., fungicides, insecticides, or rodenticides)?

    No

35. Will the action include or cause activities that are reasonably certain to cause chronic or intense nighttime noise (above current levels of ambient noise in the area) in suitable summer habitat for the northern long-eared bat or tricolored bat during the active season?

    Chronic noise is noise that is continuous or occurs repeatedly again and again for a long time. Sources of chronic or intense noise that could cause adverse effects to bats may include, but are not limited to: road traffic; trains; aircraft; industrial activities; gas compressor stations; loud music; crowds; oil and gas extraction; construction; and mining.

    Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    No

36. Does the action include, or is it reasonably certain to cause, the use of permanent or temporary artificial lighting within 1000 feet of suitable northern long-eared bat or tricolored bat roosting habitat?

    Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    Yes

37. Will the action cause an increase in the extent of suitable forested habitat exposed to artificial lighting?

    No

38. Will the action include tree cutting or other means of knocking down or bringing down trees, tree topping, or tree trimming?

    Yes

39. Will the proposed action occur exclusively in an already established and currently maintained utility right-of-way?

    No

40. Does the action include emergency cutting or trimming of hazard trees in order to remove an imminent threat to human safety or property? See hazard tree note at the bottom of the key for text that will be added to response letters

    Note: A "hazard tree" is a tree that is an immediate threat to lives, public health and safety, or improved property.

    No

41. Does the project intersect with the 0- 9.9% forest density category?

    Automatically answered
    No

42. Does the project intersect with the 10.0- 19.9% forest density category map?

    Automatically answered
    No

43. Does the project intersect with the 20.0- 29.9% forest density category map?

    Automatically answered
    No

44. Does the project intersect with the 30.0- 100% forest density category map?

    Automatically answered
    Yes

45. Will the action cause trees to be cut, knocked down, or otherwise brought down across an area greater than 100 acres in total extent?

    No

46. Will the proposed action result in the use of prescribed fire?

    Note: If the prescribed fire action includes other activities than application of fire (e.g., tree cutting, fire line preparation) please consider impacts from those activities within the previous representative questions in the key. This set of questions only considers impacts from flame and smoke.

    No

47. Does the action area intersect the northern long-eared bat species list area?

    Automatically answered
    Yes

48. [Semantic] Is the action area located within 0.25 miles of a culvert that is known to be occupied by northern long-eared or tricolored bats?

    Automatically answered
    No

49. [Semantic] Is the action area located within 150 feet of a documented northern long-eared bat roost site?

    Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered
    No

50. Is suitable summer habitat for the northern long-eared bat present within 1000 feet of project activities?
    If unsure, answer "Yes."

    Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    Yes

51. Are any of the trees proposed for cutting or other means of knocking down, bringing down, topping, or trimming suitable for northern long-eared bat roosting (i.e., live trees and/or snags ≥3 inches dbh that have exfoliating bark, cracks, crevices, and/or cavities)?

    Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    Yes

52. Will any tree cutting/trimming or other knocking or bringing down of trees occur during the **Summer Occupancy season** for northern long-eared bats in the action area?

    Note: Bat activity periods for your state can be found in Appendix L of the Service's Range-wide Indiana Bat and Northern long-eared Bat Survey Guidelines.

    No

53. Does the action area intersect the tricolored bat species list area?

    Automatically answered
    Yes

54. [Semantic] Is the action area located within 0.25 miles of a culvert that is known to be occupied by northern long-eared or tricolored bats?

    Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered
    No

55. Has a presence/probable absence bat survey targeting the tricolored bat and following the Service's Range-wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines been conducted within the project area?

    Yes

56. Was the presence/probable absence survey conducted within the last 5 years?

    Yes

57. Did you coordinate with your Ecological Services Field Office (ESFO) and receive approval of the results? If NO, please contact the appropriate local ESFO before completing this determination key - you may change your answer to 'yes' only after coordinating with the ESFO and uploading survey results.

    Yes

58. Did survey results demonstrate the probable absence of tricolored bats?

    Yes

59. Do you have any documents that you want to include with this submission?

    No

PROJECT QUESTIONNAIRE

Enter the extent of the action area (in acres) from which trees will be removed - round up to the nearest tenth of an acre. For this question, include the entire area where tree removal will take place, even if some live or dead trees will be left standing.

0.6

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: 8573010759

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Highway Administration

The Commonwealth of Massachusetts
Division of Marine Fisheries
251 Causeway Street, Suite 400, Boston, MA 02114
p: (617) 626-1520 | f: (617) 626-1509
www.mass.gov/marinefisheries

CHARLES D. BAKER, Governor | KARYN E. POLITO, Lt. Governor | KATHLEEN A. THEOHARIDES, Secretary | RONALD S. AMIDON, Commissioner | DANIEL J. MCKIERNAN, Director

January 11, 2022

Eric Silva, P.E.
Pare Corporation
8 Blackstone Valley Place,
Lincoln, RI 02865

Dear Mr. Silva:

The Division of Marine Fisheries (MA DMF) has reviewed the request for fisheries information by MassDOT – Highway Division to reconstruct Mill Pond Dam at the confluence of Agawam Mill Pond and Agawam River in the Town of Wareham. Work involves replacing the existing primary and secondary spillways, construction of a new single span steel and concrete slab bridge over the new primary spillway, construction of a new fish ladder designed by MA DMF and decommissioning of the existing fishway, demolition and replacement of the existing storage shed, installation of rip-rap protection along embankments, and road and sidewalk reconstruction along Route 6/28 between the intersection of Sandwich Road and Old Glen Charlie Road. The project was reviewed with respect to potential impacts to marine fisheries resources and habitat.

The Agawam River/Mill Pond complex provides migratory habitat for a variety of diadromous fish species, including alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), American shad (*Alosa sapidissima*), rainbow smelt (*Osmerus mordax*), American eel (*Anguilla rostrata*), Atlantic tomcod (*Microgadus tomcod*), and white perch (*Morone americana*) [1]. The site also acts as an important spawning area for blueback herring.

MA DMF is actively involved with the fishway design component of this project. In addition to this collaborative role, we offer the following comments for your consideration:

- In order to protect diadromous fish passage, spawning, and juvenile development for the above listed species, a Spring time-of-year (TOY) restriction should be observed. All in-water, silt-producing activities should be prohibited from **March 15 – July 15** of any year [1];
- A Fall TOY restriction should also be observed during juvenile alewife emigration from **September 1 – November 15** of any year. However, if a temporary gravity-fed bypass

channel and silt-containment measures (i.e., cofferdams, hay bales) are installed prior to the TOY restriction to allow uninterrupted flow around the work site, then work may be permitted during the fall TOY restriction; and

- The project site is in a productive river herring run and will require a MA DMF Fishway Construction Permit. Final design approval will occur during the DMF Fishway Construction Permit review.

Questions regarding this review may be directed to Simonetta Harrison in our New Bedford office at simonetta.harrison@mass.gov.

Sincerely,

Simonetta Harrison
Fisheries Habitat Specialist

cc: Erika Klinkhammer, Pare Corporation
John Logan, Brad Chase, John Sheppard, Keri Anne Goncalves, Emma Gallagher, MA DMF

References

[1] Evans, N.T., K.H. Ford, B.C. Chase, and J. Sheppard. 2011. *Recommended Time of Year Restrictions (TOYs) for Coastal Alteration Projects to Protect Marine Fisheries Resources in Massachusetts*. Massachusetts Division of Marine Fisheries Technical Report, TR-47. https://www.mass.gov/doc/time-of-year-recommendations-tr-47/download.

SH/BC/JS

MassDOT - Cultural Resources Unit (Project #606352 – Wareham: Mill Pond Dam - Cranberry Highway)

Section 106 Notification Checklist for USACOE Section 404 Permit - Project Notification Forms (PNF)

1. State Historic Preservation Office (SHPO)

- ☒ Archaeological survey correspondence attached
- ☐ SHPO stamped PNF received (attached)
- ☐ No comments received within 30-day review period
- ☐ No PNF submitted in accordance with 2013 letter from USACOE, MassDOT in-house Section 106 clearance attached
- ☒ Section 106 No Adverse Effect attached MHC concurrence on NAE 1/16/2025

2. Board of Underwater Archaeological Resources (BUAR)

- ☒ PNF submitted by e-mail with delivery receipt (attached)
- ☐ Comments received within 30-day review period (attached)
- ☒ No comments received within 30-day review period

3. Mashpee Wampanoag Tribe (MTHPO)

- ☒ PNF submitted by e-mail with delivery receipt (attached) (2016 MTHPO "no adverse effect" comment letter attached)
- ☐ Comments received within 30-day review period (attached)
- ☒ No comments received within 30-day review period (No comments received on 2023 PNF submittal)

4. Wampanoag Tribe of Gay Head Aquinnah (ATHPO)

- ☒ PNF submitted by e-mail with delivery receipt (attached)
- ☐ Comments received within 30-day review period (attached)
- ☒ No comments received within 30-day review period

5. Stockbridge-Munsee Community (SMTHPO)

- ☐ PNF submitted by e-mail with delivery receipt (attached)
- ☐ Comments received within 30-day review period (attached)
- ☐ No comments received within 30-day review period
- ☒ N/A (Project not within tribe's area of interest)

6. Narragansett Indian Tribe (NTHPO)

- ☒ PNF submitted by e-mail with delivery receipt (attached)
- ☐ Comments received within 30-day review period (attached)
- ☒ No comments received within 30-day review period

Also attached is 2024 Public Information Meeting correspondence, 2023 PNFs, 2021 letters, 2014-2016 Archaeological survey correspondence, and 2010 project notifications.

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

massDOT
Massachusetts Department of Transportation
Highway Division

CONCURRENCE. Brona Simon
1/16/25
BRONA SIMON
STATE HISTORIC
PRESERVATION OFFICER
MASSACHUSETTS
HISTORICAL COMMISSION

December 19, 2024

RECEIVED
DEC 23 2024
MASS. HIST. COMM
RC. 48506

Ms. Brona Simon
State Historic Preservation Officer
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125

RE: WAREHAM: Mill Pond Dam (Bridge W-06-020)
Cranberry Highway (Route 6/28 WB) over Agawam River
MassDOT Project #606352 / MHC #RC.48506
Section 106 Review: No Adverse Effect
Section 4(f) Evaluation: Fee Takings - *de minimis*
Section 4(f) Evaluation: Temporary Occupancies – No 4(f) Use

Dear Ms. Simon,

The Massachusetts Department of Transportation (MassDOT) proposes to expend federal funds to replace the section of the Mill Pond dam and spillway system (Bridge W-06-020) which carries Cranberry Highway (Route 6/28 WB) over the Agawam River in Wareham. The Mill Pond dam and spillway system impounds water along the Agawam River, creating the 145-acre Mill Pond which is currently used for recreational purposes and as a water supply for cranberry growing operations. The ell-shaped dam system consists of a 285' long stone-faced earthen fill dam with primary and secondary spillways that carries the Route 6/28 WB roadway over the river, and a 330' long earthen dike extending northerly (perpendicular) from the roadway. The project will correct the structural, operational, maintenance, and capacity deficiencies of the dam and spillway system, while restoring the traditional cultural use of the site as an anadromous fish run. The project will replace the existing fish ladder system with a functionally upgraded herring run infrastructure, and will also provide multimodal improvements for vehicular, bicycle, and pedestrian users of the bridge. The total length of the project area on Cranberry Highway is 0.17 miles.

The dam and fish ladder system are included in the Inventory of Historic and Archaeological Assets of the Commonwealth as the Agawam Herring Run/Dam (WRH.924), which is within the Agawam Village Area (WRH.H). In a letter dated February 11, 2016, the Massachusetts Historical Commission (MHC) staff concurred with MassDOT's recommendation that the ca. 1836 open stone-lined fishway channel (historic fishway) located north of Cranberry Highway is eligible for listing in the National Register of Historic Places (NRHP) as a Traditional Cultural Property (TCP). MassDOT agrees with the MHC's recommendation that the boundaries of the TCP include not only the historic fishway but also other elements of the dam system and fish ladder system including the stone-faced earthen fill dam, concrete control gate and primary and secondary spillways, concrete pool and weir fishway, wood frame store house and wood stairs leading to the concrete harvesting platform, aluminum "Alaskan steep pass fishway" fish ladder, underground fishway, and earthen dike.

MassDOT has reviewed the project under the Massachusetts Statewide Programmatic Agreement for Section 106 of the National Historic Preservation Act of 1966, as amended [36 CFR 800], and has determined that the proposed work will have **No Adverse Effect** on any properties that are listed or are eligible for listing in the National Register of Historic Places.

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

More research is necessary to determine if the Agawam Village Area is eligible for listing in the NRHP, however, the current project work will be confined to the NR-eligible Agawam Herring Run/Dam properties and also adjacent properties that would not contribute to any potential historic district.

Agawam Herring Run/Dam

While the Agawam Herring Run/Dam location has been utilized by Native Americans since time immemorial, a herring run infrastructure developed when the Agawam River was impounded for industrial purposes in the 19th century. The ca. 1836 Agawam Nail Factory accommodated the passage of the herring with the construction of the underground fishway and historic fishway to channel fish from the river south of the roadway to Mill Pond to the north. Most of the current fish ladder system was constructed and reconstructed throughout the 20th and early 21st century.

The Mill Pond dam system consists of a primary spillway, a secondary (auxiliary) spillway, an abandoned 18" diameter outlet pipe, and a 16.5' high, 285' long stone-faced earthen fill dam embankment. Flow through the dam is accomplished through the primary spillway and secondary (auxiliary) spillway, both of which travel under Cranberry Highway and outlet downstream of the dam. The primary spillway consists of a 11.5' wide by 6.5' high concrete sluiceway. Discharges are controlled by a two-bay concrete box culvert fitted with wooden stop logs (controls) on the downstream end. The stop log structure has a total weir length of 9.8'. The downstream side of the main spillway consists of stone and mortar training walls, some with concrete caps. The secondary spillway consists of a 5' diameter steel pipe culvert. Discharges are controlled by a concrete structure filled with timber stop logs on the upstream side with a weir length of 5'.

The dam system operates concurrently with the fish ladder system. In 2000, the Town of Wareham and the Massachusetts Division of Marine Fisheries reconstructed the concrete pool and weir fishway on the downstream side of the dam and installed the prefabricated 25' long aluminum ladder. The herring pass through this fish ladder system into the 90' long underground fishway. The underground fishway is carried under Cranberry Highway through a buried granite box culvert. The fishway daylights from the culvert into the open historic fishway upstream of the dam and finally exits into Mill Pond approximately 325' north of the dam. The historic fishway extends along the east side of the earthen dike and is lined with dry laid, cut granite blocks. The dike is an approximate 330-long earthen embankment running upstream and perpendicular to the dam. The upstream side of the dike is a steep (approximately 2:1) earthen slope.

The dam system is currently in substandard condition and the fishway system does not function. In 2008, the Department of Conservation and Recreation (DCR) declared that the dam does not meet accepted safety standards and that a threat to life and/or property exists. In 2022, the DCR rated the overall physical condition of the dam as poor. The current fish ladder system was determined to be in poor condition based on a DCR evaluation report in April 2009. The concrete spillways and fish ladder system do not properly allow for herring, eels, and other aquatic wildlife to pass upriver around the dam.

The National Park Service Bulletin #38 notes that TCPs are typically significant for their integrity of relationship and integrity of condition. Integrity of relationship reflects the connection between the

property and the beliefs or practices that give it significance. Integrity of condition reflects the physical condition of the design, materials, and setting within the property. While the dam system and fish ladder system evoke a sense of the past and inspire some interest, the TCP is significant for the continuity of the traditional cultural practice (herring harvesting) at this location, rather than the integrity of its individual components. The current non-functioning infrastructure within the TCP disrupts the relationship between the property and the traditional cultural practice of herring harvesting by the Wampanoag tribes and the Town of Wareham. The goal of the project is to construct a functioning herring run system and restore the integrity of relationship and condition at this location.

The proposed project work within the Agawam Herring Run/Dam will remove the existing primary and secondary concrete spillways and replace them with a single sharp-crested arched weir which will outlet under a new 53' long single span bridge. A proposed pool and weir fish ladder will be constructed in the downstream area where the current primary spillway, store house, and aluminum fish ladder are located (see plans). The construction in the downstream area will require the removal of portions of the stone masonry walls and the 20th century fish ladder system. The large stones will be incorporated into the proposed fish ladder system design and also the stormwater infiltration basin proposed southwesterly of the bridge. The proposed fish ladder system will be constructed to provide better connectivity between the river and pond compared to the highly inefficient existing fish ladder which has a high mortality rate and a limited capacity to pass fish, eels, and other aquatic wildlife through the dam. The proposed fish ladder system will have an ADA-accessible harvesting pad for individuals with limited mobility. The current harvesting pad is only accessible by ladder through a hatch in the store house.

Both the underground fishway (south of roadway) and the historic fishway (north of roadway) will remain in place but will need to be reconstructed and rehabilitated to prevent structural failure and future issues for the dam and earthen dike. The underground fishway may need the culvert roofs replaced, especially under the roadway. Instead of granite clapper slabs, concrete panels would be used to replace the roof where required. The western stone wall of the historic fishway also serves to retain the earthen dike along the east side of Mill Pond. This wall is in fair to poor condition due to tree root disturbance and lack of maintenance. The historic fishway will be cleared of vegetation and will require repairs to the stone channel walls which have been damaged due to the tree root growth.

The store house is a single-story, approximately 250 square-foot, wood framed structure with cedar shake siding, painted wood trim, and a composite asphalt shingled roof. The building currently serves as storage for lawn equipment as the Town of Wareham no longer supports a Herring Warden. The wooden store house and stairs are dilapidated and will be removed as part of the project work. Based on a 2018 assessment, the wood framing and siding exhibit rot and insect damage. The asphalt shingle roof is in general disrepair with missing and crumbled shingle tabs. The building is precariously supported on timber posts and stone columns (see photos). The building will be replaced in kind to the southeast of the bridge. The design will match the aesthetics of the existing store house by using cedar shake shingles for the siding, wood trim, and asphalt shingles for the roof (see plans).

Additional project work includes roadway reconstruction and roadway repaving, constructing a temporary bridge, drainage and utility work, and ADA-compliant sidewalk reconstruction.

Section 4(f) Evaluation – Fee Takings – de minimis impact

Fee takings are required from parcels within the NR-eligible Agawam Herring Run / Dam to complete the project work on the dam system and fishway system. Fee takings are highlighted in yellow on the attached ROW plans. The parcels include: Parcel 27-1 (owner unknown); Parcel 27-3 and 27-7 (Wareham Land Trust); Parcel 27-4 (Erin Maclure); Parcel 27-5 (John Churchill); Parcel 27-6 (Commonwealth of Massachusetts); Parcel 27-8 (Wareham B.P.O. Elks).

Any fee taking or easement that result in the permanent incorporation of land from a public or private historic site into a transportation facility is regarded as a "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 your concurrence 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

This project also requires temporary occupancies, also known as temporary construction easements, on the NR-eligible Agawam Herring Run / Dam. The temporary occupancies are necessary to facilitate the temporary sidewalk construction. The parcels highlighted in orange on the enclosed ROW plan sheets show the proposed temporary occupancies.

It is MassDOT's opinion that the temporary occupancies located within the NR-listed Agawam Herring Run / Dam 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 a historic site for the purposes of Section 4(f), pursuant to 23 CFR 774.17. Your concurrence with this No Adverse Effect finding will signify that your office agrees with MassDOT's assessment that the proposed temporary occupancy does not constitute a "use" of the NR-listed historic property under Section 4(f) and that the conditions listed above have been satisfied, pursuant to Condition 5.

No Adverse Effect Finding and Section 106 Consultation

MassDOT recommends that the proposed project will have No Adverse Effect on the Agawam Herring Run/Dam, which is NR-eligible as a TCP. A TCP is a place or location that is eligible for inclusion in the NRHP because of its association with cultural practices and beliefs that are rooted in the history of a community and are important to maintaining the continuity of that community's traditional beliefs and practices. Although the NRHP itself consists of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering, and culture, the term "property" in TCP can refer to an important or sacred location rather than a bounded collection of architectural or archaeological resources. A TCP can be a functional property type that is not based on aesthetics, stylistic types, or the potential to provide information about the past. The Agawam Herring Run/Dam is significant as a location for the cultural practice of herring harvesting rather than as a collection of non-functioning fish ladder components. In addition to replacing the structurally deficient dam system, this project will reestablish the continuity of herring harvesting at this TCP by replacing the non-functioning fish ladder system. The project will also preserve and rehabilitate the historic fishway north of the roadway and the underground fishway south of the roadway. The dilapidated, 20th century store house will be removed and a new building constructed to match its aesthetics. The project will reuse the existing stones associated with the dam system, the fish ladder system, and the former nail factory.

In evaluating the effect of an undertaking on a TCP, the input of the traditional communities is essential. The Agawam Herring Run/Dam is significant for the Mashpee Wampanoag Tribe and the Town of Wareham as a location for the traditional cultural practice of herring harvesting. As part of the 2015 archaeological survey, Archaeological and Historical Services, Inc. (AHS) conducted on-site interviews with the Wareham Herring Warden and Assistant Herring Warden, and with representatives of the Mashpee Wampanoag Tribe, to obtain specific information regarding the herring run and river-herring fishing traditions on the TCP and in nearby Wareham and Mashpee. The interviews were included in the AHS report submitted to the MHC in 2016. The Town Herring Wardens discussed the process of herring harvesting at this location and the difficulty of accessing and maintaining the underground fishway. The representatives of the Mashpee Wampanoag Tribe discussed the cultural significance of herring harvesting to the tribe but made no mention of the Agawam Herring Run/Dam fish ladder system. The THPO of the Mashpee Wampanoag Tribe (MTHPO) responded in a letter dated January 21, 2016 that the tribe has no concerns related to the proposed project and anticipates no adverse effects to sites of cultural significance.

Project notification letters were initially submitted to the Wareham Historical Commission (WHC) and the MTHPO on April 20, 2010. The WHC submitted an informational letter to the MHC on July 20, 2010.

Notification letters were submitted to the MTHPO, the THPO of the Wampanoag Tribe of Gay Head (Aquinnah) (ATHPO), the MA Commission on Indian Affairs (MCIA), and the WHC on November 17, 2014 in advance of the AHS survey. No comments were received from the ATHPO or MCIA. As the MTHPO and the WHC responded to the survey notice, MassDOT submitted a copy of AHS's report to their offices on January 14, 2016.

Notification letters with project updates were sent to the WHC, MTHPO, ATHPO, and the Board of Underwater Archaeological Resources (BUAR) on December 17, 2021. No comments were received.

As the project requires a Section 404 permit from the US Army Corps of Engineers, notifications with up-to-date plans were submitted by MassDOT to the ATHPO, MTHPO, the BUAR, and the THPO of the Narragansett Indian Tribe on November 27, 2023. No comments were received.

MassDOT submitted notifications to the WHC, ATHPO, and MTHPO on September 27, 2024 in advance of the virtual project information meeting held on November 13, 2024. No comments have been received.

MassDOT solicits your concurrence with our finding of No Adverse Effect for this project under Section 106 of the National Historic Preservation Act of 1966, as amended. Please feel free to contact me at jameson.harwood@dot.state.ma.us if you have any questions.

Sincerely,

Jameson Harwood

Jameson Harwood
Cultural Resources Supervisor
Environmental Services

ENC: Locus/Aerials
Project plans
ROW plans - marked
MHC correspondence
Mashpee THPO no adverse effect letter
Project notification correspondence
Photos

7020 2450 0001 6271 4591

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City, State, ZIP+4®

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: Bettina Washington
Sent: Friday, September 27, 2024 9:24 AM
Subject: Relayed: MassDOT Project #606352-Wareham: Cranberry Highway (Rte. 28/Rte. 6) Mill Pond Dam over Agawam River - VPIM

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

Bettina Washington (thpo@wampanoagtribe-nsn.gov)

Subject: MassDOT Project #606352-Wareham: Cranberry Highway (Rte. 28/Rte. 6) Mill Pond Dam over Agawam River - VPIM

Harwood, Jameson (DOT)

From: Harwood, Jameson (DOT)
Sent: Friday, September 27, 2024 9:23 AM
To: Bettina Washington
Subject: MassDOT Project #606352-Wareham: Cranberry Highway (Rte. 28/Rte. 6) Mill Pond Dam over Agawam River - VPIM
Attachments: 606352-Wareham_Flyer_Template_Virtual_V2.0-Project Management.pdf; 606352-Wareham-VPIM Notice.pdf

Ms. Washington,

The Virtual Project Information Meeting for the above-mentioned project has been scheduled for Wednesday November 13, 2024 at 6:30 PM. Please refer to attachment for meeting details.

Thanks!

Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza – Rm 7130
Boston, MA 02116
508-542-6967 (cell)

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: David Weeden (David.Weeden@mwtribe-nsn.gov)
Sent: Friday, September 27, 2024 9:23 AM
Subject: Relayed: MassDOT Project #606352-Wareham: Cranberry Highway (Rte. 28/Rte. 6) Mill Pond Dam over Agawam River - VPIM

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

David Weeden (David.Weeden@mwtribe-nsn.gov) (David.Weeden@mwtribe-nsn.gov)

Subject: MassDOT Project #606352-Wareham: Cranberry Highway (Rte. 28/Rte. 6) Mill Pond Dam over Agawam River - VPIM

Harwood, Jameson (DOT)

From: Harwood, Jameson (DOT)
Sent: Friday, September 27, 2024 9:23 AM
To: David Weeden (David.Weeden@mwtribe-nsn.gov)
Subject: MassDOT Project #606352-Wareham: Cranberry Highway (Rte. 28/Rte. 6) Mill Pond Dam over Agawam River - VPIM
Attachments: 606352-Wareham_Flyer_Template_Virtual_V2.0-Project Management.pdf; 606352-Wareham-VPIM Notice.pdf

Mr. Weeden,

The Virtual Project Information Meeting for the above-mentioned project has been scheduled for Wednesday November 13, 2024 at 6:30 PM. Please refer to attachment for meeting details.

Thanks!

Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza – Rm 7130
Boston, MA 02116
508-542-6967 (cell)

Harwood, Jameson (DOT)

From: ron2angeladunham@verizon.net
Sent: Friday, September 27, 2024 9:40 AM
To: Harwood, Jameson (DOT)
Cc: ron2angeladunham@verizon.net
Subject: Re: MassDOT Project #606352-Wareham: Cranberry Highway (Rte. 28/Rte. 6) Mill Pond Dam over Agawam River - VPIM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Thank you for the information regarding the Rte. 28/Rte. 6 Mill Pond Dam project virtual meeting. I have it on my calendar.

Angela

Angela M. Dunham, Chair
Wareham Historical Commission
Home: 508-295-8578
Mobile: 508-317-0813
Ron2AngelaDunham@verizon.net

From: Harwood, Jameson (DOT) <Jameson.Harwood@dot.state.ma.us>
Sent: Friday, September 27, 2024 9:24:46 AM
To: Angela Dunham <ron2angeladunham@verizon.net>
Subject: MassDOT Project #606352-Wareham: Cranberry Highway (Rte. 28/Rte. 6) Mill Pond Dam over Agawam River - VPIM

Ms. Dunham,

The Virtual Project Information Meeting for the above-mentioned project has been scheduled for Wednesday November 13, 2024 at 6:30 PM. Please refer to attachment for meeting details.

Thanks!

Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza – Rm 7130
Boston, MA 02116
508-542-6967 (cell)

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: Angela Dunham
Sent: Friday, September 27, 2024 9:25 AM
Subject: Relayed: MassDOT Project #606352-Wareham: Cranberry Highway (Rte. 28/Rte. 6) Mill Pond Dam over Agawam River - VPIM

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

Angela Dunham (ron2angeladunham@verizon.net)

Subject: MassDOT Project #606352-Wareham: Cranberry Highway (Rte. 28/Rte. 6) Mill Pond Dam over Agawam River - VPIM

MassDOT Project #606352-Wareh...

Harwood, Jameson (DOT)

From: Harwood, Jameson (DOT)
Sent: Friday, September 27, 2024 9:25 AM
To: Angela Dunham
Subject: MassDOT Project #606352-Wareham: Cranberry Highway (Rte. 28/Rte. 6) Mill Pond Dam over Agawam River - VPIM
Attachments: 606352-Wareham_Flyer_Template_Virtual_V2.0-Project Management.pdf; 606352-Wareham-VPIM Notice.pdf

Ms. Dunham,

The Virtual Project Information Meeting for the above-mentioned project has been scheduled for Wednesday November 13, 2024 at 6:30 PM. Please refer to attachment for meeting details.

Thanks!

Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza – Rm 7130
Boston, MA 02116
508-542-6967 (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: Bridge W-06-020 Replacement (MassDOT Project #606352)
Location /Address: Cranberry Highway (Route 6/28) at Mill Pond Dam over Agawam River
City/Town: Wareham

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 (lead federal agency)
USACOE	Section 404 Permit

Project Description (narrative):

The Massachusetts Department of Transportation proposes to replace Mill Pond Dam (Bridge No. W-06-020) which carries Cranberry Highway (Route 6/28) over the Agawam River in Wareham. The total length of the project area on Cranberry Highway is 0.17 miles. The Mill Pond Dam is a 16.5-foot high, 285-foot-long earthen gravity fill embankment structure which impounds the Agawam River to form Mill Pond.

There are five major components to the dam/bridge: a historic stone herring run/fishway; a primary spillway; a secondary or auxiliary spillway; an unused concrete culvert or pipe; and the earthen embankment. The Agawam Mill Pond outlets through the main or primary spillway structure on the east, consisting of a concrete culvert leading to a concrete spillway structure with timber stop logs on the downstream end. Downstream of the stop-log structure, a cement-capped fieldstone retaining wall makes a 90-degree turn and flows parallel to the toe of the dam until joining the outlet channel from the secondary spillway. The secondary spillway, west of the main spillway, is a five-foot-diameter steel pipe. Discharge is controlled by a concrete structure fitted with wooden stop logs on the upstream side. The river herring run/fishway is the third outlet from the dam, and consists of mixed stone and cement elements, including a raceway and three sections of fishway which date to its various periods and vary in structural integrity. The intake of the six-foot-wide fishway is approximately 325 feet upstream of the roadway. North of the roadway the fishway is an open channel, but it runs underground as it passes beneath the road to the south side of the dam, where it outlets into the primary spillway channel. An aluminum fish ladder within a concrete channel is at the southern end of the fishway. An elevated wooden building serves to store fishing equipment and provides

controlled access through a trapdoor stairway to a concrete slab platform, which is used to create a catching pool to harvest herring.

The project also proposes to reconstruct the existing herring run facility associated with the dam. The herring run structure is currently not functioning. The central concrete structures will be removed and replaced. The existing storage building is currently in poor condition and will be replaced with a similar structure in a new location. The current herring platform is accessed by a set of stairs extending downward from the existing storage building. The stone lined channel to the north of the roadway is in poor condition and will be reconstructed in kind. Invasive vegetation will be cleared from around the channel and dam. Components of the existing herring run facility, such as retaining wall stones, will be reused in the proposed facility. Other components, such as the underground herring run tunnels, will be left in place if possible.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

The herring run facility reconstruction includes the demolition of the existing storage building. A similar storage building will be constructed in a new location.

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).

See plans

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.

The dam and associated fishway are recorded in MACRIS as the Agawam Herring Run/Dam (WRH.924), which are elements within the Agawam Village (WRH.H). On February 11, 2016, the MHC concurred with MassDOT's recommendation that the herring run/fishway portion of the Agawam Herring Run and Dam complex (WRH.924) is eligible for listing in the National Register of Historic Places as a Traditional Cultural Property (TCP).

The dam and the herring run site have been maintained since the 17th century by the towns of Wareham and Plymouth, the latter retaining rights to the fish because the river herring spawning ponds are in Plymouth. The two main species of river herring that pass through the fishway are the alewife (*Alosa pseudoharengus*) and the blueback herring (*Alosa aestivalis*). Wareham has officially maintained the Agawam River herring run since the 18th century, ensuring that it has continuous adequate water flow, and that migrating fish can pass through. The fish were so important that water-powered mills on rivers with herring populations, including those on the Agawam River in and near the Area of Potential Effect (APE), were required by the Commonwealth of Massachusetts to create fish passages at any dam impoundments. To this day, Wareham and Plymouth maintain an annual agreement and auction the fishing rights when fish populations are high enough for them to be harvested. The Agawam Herring Run/fishway was excavated and lined with a combination of cut granite and fieldstone which form a channel to funnel fish around the millworks for their migrations and to facilitate their harvesting.

On behalf of MassDOT, AHS documented the herring run complex in 2015 under Permit #3509 issued by the State Archaeologist. The AHS survey consisted of the following activities: documentary research of the historic and environmental contexts of the project area; a project walkover; selective vegetative clearing and soil coring within the proposed wetland replacement area; and mapping and photo-documentation of the earthen dam embankment (including the concrete culverts, pipe and primary and auxiliary spillways), herring run complex (including the historic fish run/fishway and modem ladder and fish house) and visible fieldstone and cut granite walls likely associated with the former Agawam Nail Company.

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?

Route 6/28 / Mill Pond Dam crossing over the Agawam River.

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: _____ **Date:** 11/27/2023

Name: Jameson Harwood, Cultural Resources Supervisor

Address: 10 Park Plaza

City/Town/Zip: Boston, MA 02717

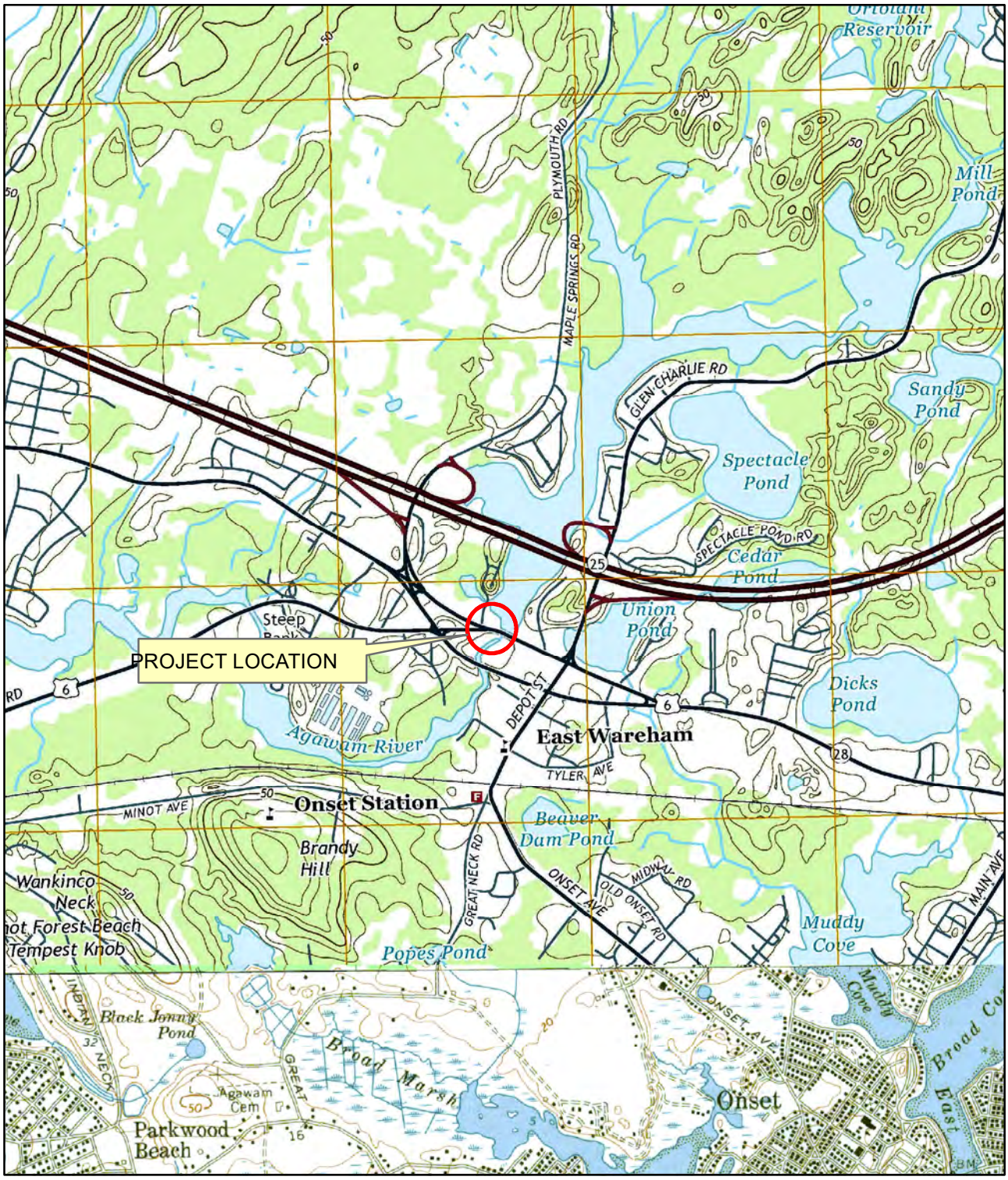
Telephone: Email: jameson.harwood@state.ma.us

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

CC

CC:



MASS GIS

SITE LOCATION MAP

SCALE:1"=2,000'

N W E S

8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
(401) 334-4100

10 LINCOLN ROAD, SUITE 210
FOXBORO, MA 02035
(508) 543-1755

PARE PROJECT NO.14199.14 DECEMBER 2021

FIGURE 1

MILL POND DAM/BRIDGE REPLACEMENT
WAREHAM, MA

MassDOT Project No. 606352

MASS GIS

ANNOTATED AERIAL PHOTOGRAPH

SCALE:1"=200'

N
W E
S

8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
(401) 334-4100

10 LINCOLN ROAD, SUITE 210
FOXBORO, MA 02035
(508) 543-1755

PARE PROJECT NO.14199.14 DECEMBER 2021

FIGURE 2

MILL POND DAM/BRIDGE REPLACEMENT
WAREHAM, MA

MassDOT Project No. 606352

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: Bettina Washington
Sent: Monday, November 27, 2023 11:44 AM
Subject: Relayed: MassDOT Project #606352 - Wareham: Rt 6/28 and Mill Pond Dam

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

Bettina Washington (thpo@wampanoagtribe-nsn.gov)

Subject: MassDOT Project #606352 - Wareham: Rt 6/28 and Mill Pond Dam

Harwood, Jameson (DOT)

From: Harwood, Jameson (DOT)
Sent: Monday, November 27, 2023 11:44 AM
To: Bettina Washington
Subject: MassDOT Project #606352 - Wareham: Rt 6/28 and Mill Pond Dam
Attachments: MassDOT Project 606352 - Wareham, Mill Pond Dam PNF.pdf; MassDOT Project 606352 - Wareham, Mill Pond Dam Plans.pdf

Ms. Washington,

MassDOT is submitting information for the above-referenced project to the THPO to meet the Section 106 consultation requirements of FHWA (lead federal agency) and the US Army Corps of Engineers. Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@state.ma.us

Thank you,
Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza
Boston, MA 02116

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: Robinson, David S (EEA)
Sent: Monday, November 27, 2023 11:35 AM
Subject: Delivered: MassDOT Project #606352 - Wareham: Rt 6/28 and Mill Pond Dam

Your message has been delivered to the following recipients:

Robinson, David S (EEA) (David.S.Robinson@mass.gov)

Subject: MassDOT Project #606352 - Wareham: Rt 6/28 and Mill Pond Dam

Harwood, Jameson (DOT)

From:	Harwood, Jameson (DOT)
Sent:	Monday, November 27, 2023 11:35 AM
To:	Robinson, David S (EEA)
Subject:	MassDOT Project #606352 - Wareham: Rt 6/28 and Mill Pond Dam
Attachments:	MassDOT Project 606352 - Wareham, Mill Pond Dam PNF.pdf; MassDOT Project 606352 - Wareham, Mill Pond Dam Plans.pdf

Tracking:	**Recipient**	**Delivery**
	Robinson, David S (EEA)	Delivered: 11/27/2023 11:35 AM

David,

MassDOT is submitting information for the above-referenced project to the BUAR to meet the Section 106 consultation requirements of FHWA (lead federal agency) and the US Army Corps of Engineers. Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@state.ma.us

Thank you,
Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza
Boston, MA 02116

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: David Weeden (David.Weeden@mwtribe-nsn.gov); 106Review
Sent: Monday, November 27, 2023 11:43 AM
Subject: Relayed: MassDOT Project #606352 - Wareham: Rt 6/28 and Mill Pond Dam

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

David Weeden (David.Weeden@mwtribe-nsn.gov) (David.Weeden@mwtribe-nsn.gov)

106Review (106Review@mwtribe-nsn.gov)

Subject: MassDOT Project #606352 - Wareham: Rt 6/28 and Mill Pond Dam

Harwood, Jameson (DOT)

From: Harwood, Jameson (DOT)
Sent: Monday, November 27, 2023 11:43 AM
To: David Weeden (David.Weeden@mwtribe-nsn.gov); 106Review
Subject: MassDOT Project #606352 - Wareham: Rt 6/28 and Mill Pond Dam
Attachments: MassDOT Project 606352 - Wareham, Mill Pond Dam PNF.pdf; MassDOT Project 606352 - Wareham, Mill Pond Dam Plans.pdf

David,

This project has been updated since our last correspondence in 2016. The project still proposes to reconstruct the existing, non-functioning herring run complex. Please let me know if you have any questions or concerns about the attached project plans. If the project is still acceptable, I would respectfully request an updated memo of support from your office to include with my submittal to the Massachusetts Historical Commission (the 2016 memo is attached).

MassDOT is submitting information for the above-referenced project to the THPO to meet the Section 106 consultation requirements of FHWA (lead federal agency) and the US Army Corps of Engineers. Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@state.ma.us

Thank you,
Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza
Boston, MA 02116

Harwood, Jameson (DOT)

From: Microsoft Outlook
To: Tashtesook@aol.com
Sent: Monday, November 27, 2023 11:46 AM
Subject: Relayed: MassDOT Project #606352 - Wareham: Rt 6/28 and Mill Pond Dam

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

Tashtesook@aol.com (Tashtesook@aol.com)

Subject: MassDOT Project #606352 - Wareham: Rt 6/28 and Mill Pond Dam

Harwood, Jameson (DOT)

From: Harwood, Jameson (DOT)
Sent: Monday, November 27, 2023 11:45 AM
To: Tashtesook@aol.com
Subject: MassDOT Project #606352 - Wareham: Rt 6/28 and Mill Pond Dam
Attachments: MassDOT Project 606352 - Wareham, Mill Pond Dam PNF.pdf; MassDOT Project 606352 - Wareham, Mill Pond Dam Plans.pdf

Mr. Brown,

MassDOT is submitting information for the above-referenced project to the THPO to meet the Section 106 consultation requirements of FHWA (lead federal agency) and the US Army Corps of Engineers. Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@state.ma.us

Thank you,
Jamie

Jameson M. Harwood, Cultural Resources Supervisor
Environmental Services Section
***MassDOT* – Highway Division**
10 Park Plaza
Boston, MA 02116

Massachusetts Department of Transportation
MILL POND DAM

SECTION 10
PROJECT-RELATED SPECIAL PROVISIONS

ITEM 102.3 HERBICIDE TREATMENT OF INVASIVE PLANTS HOUR

REV. 2023.03.01 *(REV. DATE TO BE REMOVED BY CONTRACTS)*

CONTRACTS:

- INCLUDE HERBICIDE REPORT FORM IN THE BOOK – SEE PROPOSAL DOCS FOLDER DOCUMENT A00810

This work must be performed by people who meet the qualifications below and are approved by the Landscape Design Section.

Work under this item consists of herbicide treatment of invasive plants currently existing within the project limits and as directed. An Invasive Plant Management Strategy (IPMS) shall be submitted to the Engineer for review and approval and the IPMS shall be implemented on-site. The IPMS shall be measured and paid for under Item 102.33 Invasive Plant Management Strategy.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation items.

Payment is per hour on-site and shall be compensation for a minimum crew of 2 licensed applicators, 2 backpack sprayers and mist-blowers, a properly equipped spray truck with spray hoses, and a tank with sufficient capacity for a full day of work. If there is only one applicator,

ITEM 102.3 (Continued)

hourly payment shall be adjusted to 50 percent of the unit price. This item is not intended for manual removal of plants.

Management of plants determined to have been introduced to the site via imported loam, compost, mulch, plants, equipment, or other construction activities will be the Contractor's responsibility and at the Contractor's expense.

Herbicide shall be applied during daytime hours only.

Measures to prevent the introduction of invasive plant species to the site and to address introduction due to construction-related activities shall be covered under the Standard Specifications, Division I - Subsections 7.01(D) Plant Pest Control and 7.13 Protection and Restoration of Property as amended in these Special Provisions.

Plant species targeted for management under this item shall be as determined in the field per the site walk and as specified in the IPMS.

The definition of invasive plant species shall be as described by Massachusetts Invasive Plant Advisory Group (MIPAG): "non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems."

Control of invasive plants shall begin immediately with the initiation of construction activities and prior to any clearing or site disturbance. Treatment areas shall include stockpile locations and may, upon approval of the Engineer, extend outside the project limit. Treatment shall be done each consecutive year for the duration of the contract unless specified otherwise in the IMPS or unless directed otherwise by the MassDOT invasive species contact. Work shall be done during the growing season from May – October unless otherwise specified in the IPMS.

Areas identified for vegetation control measures shall be as shown on the plans and as determined in the field by the Engineer and a MassDOT Landscape Architect. Contact at MassDOT Landscape Design Section may be contacted at: XXXXX.XXXX@dot.state.ma.us. (DESIGNER: Insert LD Project Reviewer email.)

QUALIFICATIONS

The applicators shall submit and meet the qualifications outlined below. A list of contractors specializing in invasive management and approved by MassDOT Landscape Design Section is available on the following website: https://www.mass.gov/lists/landscape-design-and-roadside-maintenance under Invasive Plant Management.

QUALIFICATIONS (Continued)

Requirements

1. Company must provide proof of qualifications by providing the following:
   a. Narrative describing company, its expertise and experience with invasive plant control.
   b. Demonstrate experience with herbicide treatment as part of restorations and in sensitive areas.
   c. Describe company's technical qualifications and past performance.

2. Company must meet licensing requirements:
   a. All crew applicators must have a Massachusetts Commercial Applicator License (CORE).
   b. At least one or more applicators must have a ROW certification, if required for work.
   c. Company must provide name(s) of applicator(s) and Applicator License/Certification number for all contractor crew leaders working on the project.
   d. The company must provide documentation of any warnings, penalties or fines received in the last three (3) years.

3. Company must provide proof of experience with invasive plant control and include following:

a. At least five (5) references from prior invasive plant control work completed in last five (5) years. Provide contact information including address, phone number and email.
b. Provide a summary of each of these projects including nature of the problem, specific invasive vegetation treated, dates and period of treatment, methodologies used, and summary of success or not in terms of meeting performance objectives. Include summary of equipment used.
c. Photo documentation of these projects.
d. GPS coordinates of project locations, if available.

4. Crew leader must have expertise with invasive plant control and provide the following:
   a. Have held Core license for at least five (5) years.
   b. Resume listing five (5) or more years of experience applying pesticides with the company or with another company specializing in vegetation management.

SUBMITTALS

No work shall begin without approval of the submittals.

Submittals include the following items:

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to proposed treatment the IPMS shall be submitted for approval by the Engineer and MassDOT Landscape Architect. All chemicals, methods and work done under this item shall be consistent with the IPMS. The IPMS shall be as described under Item 102.33.

SUBMITTALS (Continued)

Herbicide Use Report

Within two (2) weeks after each application, the Contractor shall provide the Engineer a completed and signed MassDOT Herbicide Use Report.

Photo Documentation

Digital photos with date and time of herbicide application work may be required and shall be submitted upon request.

MATERIALS

All proposed herbicides shall be as approved in the IPMS. Herbicides shall be labeled for the method of treatment and shall meet all federal, state and local regulation requirements. Application rates will depend on the herbicide proposed and shall be per the manufacturer's label for specific application.

METHODS

All methods used shall be as approved in the IPMS which shall be determined during the Initial Site Walk as described under Item 102.33 Invasive Plant Management Strategy.

The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

The Contractor shall notify the Engineer a minimum of 3 days prior to the date of expected herbicide application. Applicators shall notify the Engineer upon arriving on-site and upon leaving the site.

Herbicide Applications

All herbicide applications shall conform to Massachusetts Pesticide Laws and Regulations per the Massachusetts Department of Agricultural Resources (MDAR) Pesticide Bureau.

Mixing, applying and/or disposing of herbicides shall always be in accordance with instructions on their labels and all applicable federal, state, and local regulations. Mixing shall not occur within sensitive areas, wetlands, or buffer zones.

METHODS (Continued)

The contractor shall not spray 2 hours prior to precipitation, during rain, or during windy conditions. The Contractor shall be responsible for monitoring weather conditions and adjusting the work schedule as appropriate for the herbicide and application method to be used.

Targeted vegetation shall be identified and marked prior to treatment. Plants treated by foliar spray, injection or glove application or other methods that leave standing vegetation, as opposed to cut-stump application, shall remain clearly marked for identification through the contract period.

Desirable vegetation shall be protected from both spray and other physical damage.

The contractor is responsible for any damage to vegetation not designated for removal or treatment. Vegetation damaged shall be restored. The cost of replacement plants and/or restoration shall be borne by the Contractor.

The contractor shall ensure that the public does not enter a work area while herbicide application or spraying is underway.

Disposal Of Invasive Plant Material

All material to be cleared shall become the property of the Contractor. The satisfactory disposal of all cleared plant material (seeds, roots, woody vegetation, associated soils, etc.) shall be the Contractor's responsibility.

The Contractor shall take measures to prevent viable plant material from leading to further infestations (seeds, roots, woody material, etc.) while stockpiled, in transit, or at final disposal locations. All precautions shall be taken to avoid contamination of natural landscapes with invasive plants or invasive plant material.

Chipping, shredding, or on-site burning of plant material must be approved by the Engineer and included in the IMPS.

For plant material taken to an incinerating facility per the IPMS, a receipt from that facility shall be submitted to the Engineer as proof of disposal.

Where feasible, it is preferable to dispose of plants on-site or to bury them on-site with on-going monitoring for re-sprouting. Disposal locations and methods must be approved and included in the IPMS. Site work such as grading and seeding to stabilize and restore disposal area shall be incidental to this item.

The Contractor shall be responsible for treating or otherwise managing areas of re-growth due to improper disposal. Treatment shall be at the Contractor's expense.

METHODS (Continued)

Follow-Up Treatment

Plants and areas shall be re-treated as necessary and as appropriate to the time of year. Treatment shall be for the duration of the contract and per the IPMS.

MEASURE OF SUCCESS

The expectation is a minimum of 85-95 percent control achieved after the first treatment, depending on plants targeted and extent of population, and based on the expectations laid out in the IPMS. The expectation for the contract duration is 95-100% eradication by the end of the treatment period, unless otherwise specified in the IPMS.

METHOD OF MEASUREMENT

Item 102.3 will be measured for payment by the Hour of crew time spent on the project doing actual herbicide application work. A crew shall be defined as a minimum of two licensed

applicators each equipped with (at minimum) back-pack sprayer and mist blower. The crew shall also have a properly equipped spray truck with hoses and a tank with sufficient capacity for a full day of work.

BASIS OF PAYMENT

Item 102.3 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work.

Payment will be based upon time spent on the project doing actual work and shall not include travel time to and from the Contractor's place of business and shall also not include time for investigative field trips.

If there is only one applicator, hourly payment shall be adjusted to 50 percent of the unit price.

The Invasive Plant Management Strategy will be paid for under Item 102.33.

ITEM 102.33 INVASIVE PLANT MANAGEMENT STRATEGY HOUR

REV. 2023.03.01 *(REV. DATE TO BE REMOVED BY CONTRACTS)*

This item consists of providing an Invasive Plant Management Strategy (IPMS) for the control of invasive plants currently existing on the project site and/or as directed and shall be coordinated with Item 102.3 Herbicide Treatment of Invasive Plants. The IPMS shall be submitted for review and approval and the IPMS shall be implemented on-site.

Herbicide treatment for invasive plants shall be as described under Item 102.3 Herbicide Treatment of Invasive Plants and shall be compensated per that Item.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation as relevant to the project.

Individual attending the site walk and determining the Invasive Plant Management Strategy must demonstrate expertise with vegetation management and invasive plant control and submit qualifications as described below.

QUALIFICATIONS

Individual shall be from the same company as that providing services for Item 102.3 Herbicide Treatment of Invasive Plants and shall submit the following, if not submitted under Item 102.3:

- Submit copy of current Core license.
- Submit a resume listing five (5) or more years of experience managing invasive plants with a company specializing in vegetation management.
- References shall be submitted if requested.

SUBMITTALS

Task Summary & Reports

For measurement of payment, the contractor shall submit the total sum and a breakdown of hours for the tasks performed. At a minimum, the tasks shall include the Initial Site Walk, the IPMS Written Report, and if necessary to accommodate project or site changes, a Follow-up Site Inspection and accompanying IPMS Amendment.

Interim Site Monitoring Reports and/or a Final Report shall be submitted if requested by the MassDOT Landscape Design contact. The MassDOT Landscape Design contact must be notified to attend the final walk-through when a Final Report has been requested.

ITEM 102.33 (Continued)

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to construction activities and/or any proposed treatment, submit a written IPMS proposal for approval by the Engineer and MassDOT Landscape Architect. All chemicals and methods proposed shall be consistent with the applicable Massachusetts Wetlands Protection Act Order of Conditions.

The IPMS shall be completed in coordination with the Roadway Contractor and the Engineer and shall include the following as appropriate to the project:

I. Project Information

a. Company writing IPMS and performing herbicide application
b. Date of site walk
c. Attendees at site walk
d. Expected end date of contract and expected last treatment (month/season)

II. Brief Description of Conditions

a. Provide a free-hand sketch on construction plans or aerial image showing species, location, and as relevant, show or note extent of population as relevant to Strategy (i.e., population extends off ROW preventing eradication, small population and eradication deemed feasible within contract schedule, etc.).

III. Coordination with Roadway Contractor regarding other work

a. Tree Work: Note coordination to be implemented with tree removal, clearing, and clearing and grubbing as applicable to the project.
b. Wetland Mitigation - Include management proposed for wetland mitigation areas in the IPMS, if and as required.
c. Planting: If there is planting in areas proposed for treatment, propose treatment and schedule to avoid herbicide damage to plants.
d. Mowing: If coordination is required with state mowers, note need in IPMS.

IV. Soil Management

a. Provide specifics on how soil with invasive plant roots (in particular) or seeds will be handled (i.e., separate stockpiles, plant material will be buried on-site, re-used on-site, disposed off site and if so, where?).
b. Show stockpile locations on plan and include treatment schedule.
c. Note measures that will be implemented to avoid spread through equipment, including how and where equipment will be cleaned.

V. Invasive Plant Treatment & Management

a. Proposed chemicals and methods of treatment for each species or area.
b. Time of treatment based on target plant species.
c. Submit product label including application methods and rates (entire MSDS information need not be submitted if available online).

ITEM 102.33 (Continued)

d. Proposed performance metrics or measure of treatment success if different from those specified under Item 102.3.
e. Method for disposing of invasive plant material. This includes material that may result in spread (i.e., seeds, roots) and material that has been treated and/or is not viable (foliage, dead wood, etc.). Methods may include grinding in place, stockpiling and treating, and incinerating offsite.
f. Expected follow-up treatment for duration of contract.

VI. Monitoring Schedule if requested by MassDOT.

Note: The IPMS is critical for identifying pre-construction conditions as well as strategies for minimizing import or spread of invasive plants. Failure to provide an approved IPMS may jeopardize this item, in which case, the contractor will be responsible for management of invasive plants found on-site at no cost to the contract.

Photo Documentation

Digital photos with date and time verification shall be provided with the IPMS and with any follow-up monitoring or reporting.

METHODS

Initial Site Walk

Prior to any construction activities and soil disturbance, the Contractor shall walk the site with the Engineer and the MassDOT Landscape Architect to determine the IPMS. During the site walk the Contractor shall identify limits of work and, as necessary, mark locations of areas designated for treatment and individual plants targeted for treatment or removal. The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

IPMS Follow-up Amendment

The IPMS may be amended to address additional concerns or adjust to conditions if required by the MassDOT Landscape Architect. The amended IPMS shall be submitted to the Engineer and MassDOT Landscape Architect for approval at least fourteen (14) days prior to any proposed treatment.

ITEM 102.33 (Continued)

Interim Site Monitoring Inspection Reports

If required by the MassDOT Landscape Architect and Engineer, Interim Site Monitoring and an accompanying report shall be conducted.

Final Inspection

A final inspection and report documenting the status of invasive control may be required for regulatory purposes or for instances where control will be continued by others. The report shall include photo documentation of pre-construction (existing) and post-treatment conditions, notations on a plan or aerial image of area treated, summary of treatment performed, and control achieved.

METHOD OF MEASUREMENT

Item 102.33 will be measured for payment by the Hour. The basis for measurement shall be per the completion of tasks as approved under the Task Summary submittal.

BASIS OF PAYMENT

Item 102.33 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work.

Payment shall not include travel time to and from the Contractor's place of business.

ITEM 115.1	**DEMOLITION OF BRIDGE NO. W-06-020 (9LH)**	**LUMP SUM**
ITEM 115.2	**DEMOLITION OF BRIDGE NO. W-06-020 (8M1)**	**LUMP SUM**
ITEM 115.3	**DEMOLITION OF BRIDGE NO. W-06-020 (XXX)**	**LUMP SUM**

The work under this Item includes the complete removal and satisfactory disposal of all of the materials comprising the existing superstructure and shall conform to the relevant provisions of Section 112 of the Standard Specifications and the following:

ITEM 115.1 (Continued)
ITEM 115.2 (Continued)
ITEM 115.3 (Continued)

GENERAL

The superstructure is defined as all bridge elements above the beam seats including but not limited to bearings, reinforced concrete deck and wearing surface, curbing, steel stringers, diaphragms, barrier railings, roadway and any other material and appurtenances connected to or considered part of the superstructure. It is presumed that the existing steel components contain lead-based paint. All work shall be in accordance with the "General Requirements for Demolition and Work Involving Painted Steel" included elsewhere in these Contract Documents.

Within 30 days of the Notice to Proceed, the Contractor shall perform the following:

a. The Contractor shall coordinate with the Engineer so that soil samples shall be taken to a depth of six inches and shall be tested for lead contamination.
b. If any of the samples test positive for lead contamination, a Massachusetts Licensed Site Professional (LSP) shall be hired by the Contractor.
c. Any detected contaminants shall be addressed by an amendment to the Contractor's Health and Safety Plan.

The Contractor's LSP shall be responsible for monitoring and handling of contaminated soil to re-used on site or disposed of off-site. Any contaminated material disposed of as surplus or unsuitable shall be additionally sampled, tested and disposed of in accordance with the disposal requirements contained elsewhere in the Special Provisions. The work associated with testing, monitoring, and disposing of contaminated soils shall be paid for under the respective items of work, as outlined in the various Items contained in the Special Provisions.

The Massachusetts Department of Transportation does not guarantee or represent that the bridge materials will actually coincide with any descriptions contained herein or represented on the plans. The Contractor shall make his own investigation of the existing bridges including the size, shape, and connections of the materials that make up the structure and the structure's stability under

demolition and construction loadings. No additional compensation, other than the lump sum price bid for this Item, shall be made if the materials or work provided is different than that inferred or described herein or shown on the plans.

ITEM 115.1 (Continued)
ITEM 115.2 (Continued)
ITEM 115.3 (Continued)

The Contractor shall submit his proposed method of demolition including equipment, tools, devices, etc. to the Engineer for approval. The demolition procedure and work shall follow the requirements given for erection in Section 960.61, D. Erection, of the Standard Specifications. The demolition procedure and any necessary calculations and drawings shall bear the stamp of a Professional Engineer registered in the Commonwealth of Massachusetts certifying that all existing structural members are suitably braced and supported throughout the demolition process. Work shall not commence until the Engineer has given written approval of the method of demolition.

Debris from construction must be carefully contained within the work zones and prevented from falling into the waterway below. No foreign material or debris resulting from the Contractor's operations shall be permitted to enter or remain in the waterway. The Contractor shall be required to remove any debris generated from construction from the site immediately and to restore portions of the site affected by the operation to their original undisturbed condition or better. Removal of debris generated by demolition and construction will be performed at the Contractor's own expense. The Contractor shall be responsible for dust control as a result of the demolition operations.

The Contractor shall provide for the protection of the waterway and adjacent areas during demolition of the existing bridge. This shall be accomplished by the utilization of adequate shielding placed beneath and adjacent to the existing structure prior to demolition. The Contractor shall not allow debris, tools, or incidental equipment of any kind to swing over areas where vehicular or pedestrian traffic exists.

The Contractor shall be responsible for adequately protecting any existing utility lines during his operations. If any utilities are damaged due to the Contractor's negligence, he shall make repairs at his own expense. The Department makes no assurances regarding the presented conditions, dimensions, and materials of the existing structure as shown on the Contract Drawings. The Contractor shall verify all existing conditions and construction features of the bridge to be demolished, as necessary, for the proper planning and completion of the work. The Contractor

shall base its bid on his/her own findings without any additional compensation for variances from the Plans or these Special Provisions regarding actual conditions for the items to be removed.

The Contractor shall prepare and submit a plan indicating its proposed demolition procedures including dust control, and methods to be used including equipment, tools, devices, crane capacity and location, schedule of operations, methods of utility protection, shielding design, disposal location, traffic management procedures, etc., to the Engineer for approval.

Work under this item may not commence until the Engineer has given written approval. The Contractor shall be responsible for dust control as a result of the demolition operations.

ITEM 115.1 (Continued)
ITEM 115.2 (Continued)
ITEM 115.3 (Continued)

The Contractor shall make adequate provisions for the protection of public or private property adjacent to and underneath the bridge due to the concrete excavation operations. The Contractor shall submit his proposed method of demolition including equipment, tools, devices, shielding, etc. to the Engineer for approval. The shielding design, temporary supports (if required), and any necessary calculations and drawings shall be stamped by a Professional Engineer registered in Massachusetts. Work under this item may not commence until the Engineer has given written approval of the method of shielding.

The protective shielding shall be installed under the bridge, extending the full length of the bridge span and extend and adequate width along the existing bridge width, and a sufficient distance beyond the bridge edge and vertically at the fasciae to an elevation above the beam seat. The shielding shall have all spaces along the perimeter and at the seams sealed to prevent any dust or debris from escaping and falling into the waterway below.

Shielding shall be designed to safely withstand all loads that it will be subjected to. The permissible design stresses shall be in accordance with the AASHTO LRFD Bridge Design Specifications, Ninth Edition with latest interims. The design shall include a complete description of equipment and construction methods proposed for the deck removal and the maximum size of deck area that will be removed (i.e., 12-inch x 12-inch jack hammered sections, or 6-foot x 2-foot saw cut sections). Shielding shall also be designed to withstand the impact imparted by the maximum sized piece of excavated concrete should it fall during excavation or removal.

All material and debris shall become the property of the Contractor and shall be recycled, reused or disposed of in accordance with all applicable local, state and federal requirements.

METHOD OF MEASUREMENT

This Item will be measured in the unit of LUMP SUM.

BASIS OF PAYMENT

Payment for work described under this Item will be paid for at the Contract LUMP SUM Price for which price shall include full compensation for all labor, tools, equipment, materials, testing, loading, transportation, disposal, approvals, and permits necessary for the completion of the work including any costs associated with special handling of the treated wood products.

ITEM 115.1 (Continued)
ITEM 115.2 (Continued)
ITEM 115.3 (Continued)

The Contractor will make his own investigation of the structure to be demolished including the materials that are part of or may be stored in the structure. No increase will be made to the bid price due to the nature of the materials involved in the demolition. All costs for permits, dump fees, taxes, special handling of hazardous materials, etcetera, shall be included in the bid price of the demolition item.

No separate payment will be made for temporary shielding but all costs in connection therewith shall be included in the Contract unit price bid.

Soil testing is not included in this item. Soil testing shall be paid for according to Item 180.03.

ITEM 120.1 UNCLASSIFIED EXCAVATION CUBIC YARD

The work under this item shall conform to the relevant provisions of Section 120 of the Standard Specifications and the following:

The work shall include the excavation of material of every description regardless of the type encountered, including the excavation of bituminous concrete pavement from within the project limits as shown on the drawings and as directed by the Engineer, except materials under the items of Bridge Excavation, Channel Excavation, Class A Trench Excavation and Concrete Excavation, and except those materials for which excavation is included with the work specified to be performed under other items of this Contract.

The work shall also include the removal of any existing pavements. Also included shall be the removal and disposal of existing cobbles, bollards, water and gas mains and all other materials not designated to be reused on the project or to be removed and stacked. The Engineer shall determine the disposition of all materials with respect to removal and disposal. Additionally, this item includes the removal and disposal of crushed stone placed for the temporary access roadway.

Edges of excavations made in existing pavements shall be squared by saw cutting with power drive tools to provide a neat, clean edge for joining new pavement as shown on the plans. Ragged, uneven edges shall not be accepted. Pavement areas, which have been broken or undermined, shall be edged neatly with minimum disturbance to the remaining pavement.

The Contractor shall perform all excavation in such a manner as to maintain slopes, longitudinally and laterally and to ensure proper and continuous drainage at all times.

ITEM 120.1 (Continued)

To avoid damage to trees which have parts of their root system in roadways or planting areas designated for excavation, such excavation shall be accomplished as carefully as possible or as directed by the Engineer.

This work shall also include all clearing and grubbing of plant material within the excavation limits.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement and payment will be in accordance with Section 120 of the Standard Specifications.

No separate payment will be made for the off-site disposal of all existing material unsuitable for reuse in the proposed work, but all costs in connection therewith shall be considered incidental to the Contract and no additional compensation shall be allowed, therefore.

The removal and disposal of bollards, removal and disposal of crushed stone placed for access roadway and removal and disposal of any an gas and water mains removed during relocation shall be included under this item.

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 **ITEMS 181.11 through 181.14** (Continued)

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:

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 soil 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.

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

ITEMS 181.11 through 181.14 (Continued)

Massachusetts Department of Environmental Protection (DEP) for accepting such material, in accordance with DEP Policy #COMM-97-001, or at a similar out-of-state facility. It should be noted that soils which exceed the levels and criteria for disposal at in-state landfills, as outlined in COMM-97-001, may be shipped to an in-state landfill, but require approval from the DEP Division of Solid Waste Management and receiving facility. An additional management alternative for this material is recycling into asphalt. Regulated Soils may also be recycled at a DEP approved recycling facility possessing a Class A recycling permit subject to acceptance by the facility and compliance with DEP Policy #BWSC-94-400. Regulated Soil removed from the site for disposal or

treatment must be removed via an LSP approved Bill of Lading, Manifest or applicable material tracking form. This type of facility shall be approved/permitted by the State in which it operates to accept the class of contaminated soil in accordance with all applicable local, state and federal regulations.

HAZARDOUS WASTE consists of materials which must be disposed of at a facility permitted and operated in full compliance with Federal Regulation 40 CFR 260-265, Massachusetts Regulation 310 CMR 30.000, Toxic Substances Control Act (TSCA) regulations, or the equivalent regulations of other states, and all other applicable local, state, and federal regulations. All excavated materials classified as hazardous waste shall be disposed of at an out-of-state permitted facility. This facility shall be a RCRA hazardous waste or TSCA facility, or RCRA hazardous waste incinerator. This type of facility shall be approved/permitted by the State in which it operates to accept hazardous waste in accordance with all applicable local, state and federal regulations and shall be permitted to accept all contamination which may be present in the soil excavate. The Contractor shall ensure that, when needed, the facility can accept TSCA waste materials i.e., polychlorinated biphenyls (PCBs). Hazardous waste must be removed from the site for disposal or treatment via an LSP approved Manifest.

MONITORING/SAMPLING/TESTING REQUIREMENTS

The Contractor shall be responsible for monitoring, sampling and testing during and following excavation of contaminated soils to determine the specific class of contaminated material. Monitoring, sampling and testing frequency and techniques should be performed in accordance with Item 180.03 – LSP Services. Additional sampling and analysis may be necessary to meet the requirements of the disposal facility license. The cost of such additional sampling and analysis shall be included in the bid cost for the applicable disposal items. The Contractor shall obtain sufficient information to demonstrate that the contaminated soil meets the disposal criteria set by the receiving facility that will accept the material.

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

ITEMS 181.11 through 181.14 (Continued)

submit to the Engineer for review all plans and documents relevant to LSP services, including but not limited to, all documents that must be submitted to the DEP.

WASTE TRACKING:

Copies of the fully executed Weight Slips/Bills of Lading/ Manifests/Material Shipping Records or other material tracking form received by the Contractor from each disposal facility and for each load disposed of at that facility, shall be submitted to Engineer and the Contractor's LSP within three days of receipt by the Contractor. The Contractor is responsible for preparing and submitting

such documents for review and signature by the LSP or other appropriate person with signatory authority, three days in advance of transporting soil off-site. The Contractor shall furnish a form attached to each manifest or other material tracking form for all material removed off-site, certifying that the material was delivered to the site approved for the class of material. If the proposed disposition of the material is for reuse within the project construction corridor, the Contractor shall cooperate with MassDOT to obtain a suitable representative sample(s) of the material to establish its structural characteristics in order to meet the applicable structural requirements as fill for the project.

All material transported off-site shall be loaded by the Contractor into properly licensed and permitted vehicles and transported directly to the selected disposal or recycling facility and be accompanied by the applicable shipping paper. At a minimum, truck bodies must be structurally sound with sealed tail gates, and trucks shall be lined, and loads covered with a liner, which shall be placed to form a continuous waterproof tarpaulin to protect the load from wind and rain.

DECONTAMINATION OF EQUIPMENT

Tools and equipment which are to be taken from and reused off site shall be decontaminated in accordance with applicable local, state, and federal regulations. This requirement shall include, but not be limited to, all tools, heavy machinery and excavating and hauling equipment used during excavation, stockpiling and handling of contaminated material. Decontamination of equipment is considered incidental to the applicable excavation item.

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

ITEMS 181.11 through 181.14 (Continued)

(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,

because 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

(a) 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 base plan to record this information.

The Sampling Results will be presented in tabular format. Each sample will be identified by appropriate identification matching the sample identification shown on the Chain of Custody Record. The sample must also be identified by location (e.g., grid number or stockpile number). For each sample, the following information must be listed: the classification (unregulated, regulated, etc.), proposed disposal option for the stockpile or unit of material represented, and all analytical results.

Each Characterization Report will include the laboratory analytical report and Chain of Custody Record for the samples included in the Report.

(b) 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.

ITEMS 181.11 through 181.14 (Continued)

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:

(a) 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.

(b) 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)

(c) 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

(d) 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.

(c) 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.

ITEMS 181.11 through 181.14 (Continued)

Demolition Debris:
Demolition debris must be tracked if the debris is stockpiled at a location other than the point of origin or if treatment or material processing is conducted. Identification of locations will be based on the station-offset of the location. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations/comments, quantity, and stockpile ID/processing operation location. For each unit of material tracked, the table will also

track reuse of the material on-site, providing reuse date, location of reuse as defined by start and end station, width of reuse location by offset, the fill elevation range, quantity, and finish grade for said location. For demolition debris, which is not reused on site, the table will also track disposal of the material as defined by disposal date, quantity and disposal facility. The table must provide a reference to any analytical data generated for the material.

Soil/Sediment:
Soil excavation will be identified based on the station-offset of the excavation location limits. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations, quantity, and stockpile number/location. For each unit of material tracked, the table will also track reuse of the material on-site and disposal of the material off-site using the same categories identified for demolition debris above.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Disposal of contaminated soil shall be measured for payment by the TON of actual and verified weight of contaminated materials removed and disposed of. The quantities will be determined only by weight slips issued by and signed by the disposal facility. The most cost-effective, legal

disposal method shall be used. The work of the LSP for disposal under all 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 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 all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEMS 181.11 through 181.14 (Continued)

ITEM 181.13 Measurement for Disposal of Regulated Soil - Out-of-State Facility shall be under the Contract Unit Price by the weight in tons of contaminated materials removed from the site and transported to and disposed of at an approved out-of-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.14 Measurement for Disposal of Hazardous Waste shall be under the Contract Unit Price by the weight in tons of hazardous waste removed from the site and transported to and disposed of at the licensed hazardous waste facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 698.4 GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL SQUARE YARD

The work performed under this Item shall consist of furnishing and installing geotextile fabric in conjunction with the details as shown on the Plans or as directed by the Engineer.

The geotextile fabric shall be listed on the MassDOT QCML and conform to the requirements of AASHTO M288 for fabric used as Permanent Erosion Control, and fabric used for separation. Woven Monofilament Geotextile shall be Class 2 and all others shall be Class 1. Construction and installation shall be in accordance with AASHTO M288 and the following:

Atmospheric exposure of the geotextile fabric to the elements following lay down shall be a maximum of 14 days. If laid under water, the covering rock fill or crushed stone shall be placed on the same day as the geotextile.

For seams that are sewn in the field, the Contractor shall provide at least a six (6) feet length of sample sewn seam for the approval by the Engineer before the geotextile 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 Contractor shall submit the seam assembly description along with the seam samples. This description shall include the seam type, stitch type, sewing thread, and stitch density.

The geotextile shall be placed in intimate contact with the soils without wrinkles or folds, and it 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 the geotextile.

The geotextile shall be placed so that the machine direction is horizontal and runs along the slope. Adjacent geotextile sheets shall be joined by either sewing or overlapping. Overlapped seams at roll ends shall be overlapped a minimum of 12 inches except if placed underwater. In such instances the overlap shall be a minimum of three (3) feet. Overlaps of adjacent rolls shall be a minimum of 12 inches in all instances.

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

The slope protection placement shall begin at the toe of the slope and proceed up the slope. Placement shall take place so as to avoid stretching and subsequent tearing of the geotextile.

Crushed stone, rock fill or riprap shall not be dropped from a height exceeding three (3) feet. All void spaces in the armor stone shall be backfilled with small stone to ensure full coverage.

ITEMS 698.4 (Continued)

Field monitoring shall be performed to verify that the crushed stone placement does not damage the geotextile. Any geotextile damaged during backfill placement shall be replaced as directed by the Engineer, at the Contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Geotextile Fabric for Permanent Erosion Control and Geotextile Fabric for Separation shall be measured by the SQUARE YARD and will be paid for at the contract unit price per SQUARE YARD, which includes full compensation for all labor, equipment and materials and all incidental work necessary to complete the work as specified. The area of geotextile folded over the top of the crushed stone will be included in the quantity measurement.

ITEM 751.765 COMPOST AND SEED OVER MODIFIED ROCK CUBIC YARD

REV. 2024.01.01 (REV. DATE TO BE REMOVED BY CONTRACTS).

GENERAL

The work under this Item shall conform to the relevant provisions of Subsection 751, 767, and 765 of the Standard Specifications and the following.

Work shall consist of furnishing and pneumatically applying compost in conjunction with the specified native seed on designated areas of modified rock and achieving satisfactory establishment of seeded species as specified herein.

QUALIFICATIONS

Compost application and seeding shall be done by a company having a minimum of five years of experience with native seed establishment. Prior to beginning work, the seeding Contractor shall furnish proof of qualifications to the Engineer for approval. Proof of qualifications shall include providing documentation (photos and contacts) to demonstrate knowledge and expertise with native seeding and establishment and proof of having completed successful native seeding projects.

MATERIAL AND SUBMITTALS
Compost

Compost shall meet the relevant provisions for Type 2 Compost, found in Section M1.06 of the Supplemental Standard Specifications.

- The Engineer shall approve the Contractor's equipment for application.

Seed Mix

Seed Mixes and Submittals shall be per the item(s) for the permanent seed mix. Mix shall be:

765.442 Roadside Riverbank Mix

Botanical Name	Common Name	% Mix By Weight (PLS)
Grass		
Elymus virginicus	Virginia Wild Rye	27.0%
Schizachyrium scoparium 'Albany Pine'	Little Bluestem 'Albany Pine'	22.5%
Andropogon gerardii NY Eco	Big Bluestem NY Eco	14.0%
Elymus riparius	Riverbank Wild Rye	14.0%
Panicum virgatum	Switch Grass	5.0%
Dichanthelium clandestinum 'Tioga'	Deertongue grass 'Tioga'	5.0%
Carex vulpinoidea	Fox Sedge	2.0%
Agrostis perennans	Upland Bentgrass	1.5%
Carex vulpinoidea	Fox Sedge	0.5%
Poa palustris	Fowl Bluegrass	0.3%
Juncus effusus	Soft Rush	0.1%
Juncus tenuis	Path Rush	0.1%
		92.0%
Herb/Forb		
Chamaecrista fasciculata	Partridge Pea	3.0%
Penstemon digitalis	Beard-tongue	1.0%
Vernonia noveboracensis	New York Ironweed	0.6%
Helenium autumnale	Common Sneezeweed	0.5%
Verbena hastata	Blue Vervain	0.4%
Aster puniceus	Aster - Swamp	0.4%
Aster cordifolius	Blue Wood Aster	0.3%
Asclepias incarnata	Swamp Milkweed	0.3%
Monarda fistulosa	Wild Bergamot	0.2%
Aster novae-angliae	New England Aster	0.2%
Solidago rigida	Rigid Goldenrod	0.2%
Desmodium canadense	Showy Tick Trefoil	0.2%
Eupatorium perfoliatum	Boneset	0.2%
Eupatorium maculatum	Spotted Joe Pye Weed	0.2%
Solidago juncea	Early Goldenrod	0.1%
Euthamia graminifolia	Grass-leaved Goldenrod	0.1%
Lobelia cardinalis	Cardinal Flower	0.1%
		8.0%
Seeding Rate: 15.0 lbs PLS/Acre		**100.0%**

765.553 Wetland Seed – Riparian Mix

Mix 765.553 Wetland – Riparian Mix

	Botanical Name	Common Name	% PLS By Weight
Grass			
	Sorghastrum nutans NY Eco	Indiangrass NY Ecotype	14.00%
	Schizachyrium scoparium	Little Blue Stem	14.00%
	Elymus riparius	Riverbank Wild Rye	10.00%
	Elymus virginicus	Virginia Wild Rye	10.00%
	Panicum clandestinum 'Tioga'	Deer Tongue 'Tioga'	9.00%
	Andropogon gerardii NY Eco	Big Bluestem NY Eco	8.00%
	Carex vulpinoidea	Fox Sedge	7.00%
	Panicum virgatum	Switchgrass	3.00%
	Juncus effusus	Soft Rush	2.00%
	Agrostis perennans	Upland Bentgrass	2.00%
	Scirpus atrovirens	Green Bulrush	1.00%
			80.00%
Herb/Forb			
	Chamaecrista fasciculata	Partridge Pea	3.00%
	Verbena hastata	Blue Vervain	3.00%
	Asclepias incarnata	Swamp Milkweed	3.00%
	Heliopsis helianthoides	Ox-Eye Sunflower	2.00%
	Eupatorium perfoliatum	Boneset	2.00%
	Aster umbellatus	Flat Topped White Aster	1.00%
	Aster prenanthoides	Zig Zag Aster	1.00%
	Aster puniceus	Aster – Swamp	1.00%
	Aster novae-angliae	New England Aster	1.00%
	Eupatorium maculatum	Joe-pye Weed	1.00%
	Monarda fistulosa	Wild Bergamot	1.00%
	Vernonia noveboracensis	New York Ironweed	1.00%
			20.00%
			100.00%

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

FOR USE WITH SLOPES: Add 30 lbs/acre of a cover crop if erosions is a concern. For a cover crop use either grain oats (1 Jan to 31 July) or grain rye (1 Aug to 31 Dec). Cover crop shall be incidental to seeding Mix.

SEEDING SEASON

The season for seeding native mixes is April 1 - May 15 and October 1 - December 1 for dormant seeding. Written approval must be obtained for seeding outside the seeding season and, if approved, the permanent seed rate shall be increased by 50%

CONSTRUCTION METHODS

Method of application and equipment to be used shall be reviewed and approved by the Engineer prior to placement of material.

Placement of Compost

Compost shall be placed as shown on the Plans and in the Detail and as required by the Engineer. Material shall be placed so that settled material is at or slightly below the surface plane of the stone. The Contractor shall ensure that there will be adequate quantity, including adjustment for settlement.

For purposes of estimation, required compost quantities should be 300 cubic yards per acre to achieve the target depth.

Seeding

For areas smaller than half an acre, unless otherwise approved by the Engineer, seeding shall be done by broadcast method. Seeding shall be done in conjunction with or immediately following Compost application. Alternative seeding methods must be submitted and approved by the Engineer 14 days in advance of compost and seed application.

Hydroseeding

Hydroseeding may be used for sites over half an acre in size or when the rock slope does not permit safe application via a broadcasting method. Hydroseed shall be per the manufacturer's directions and as follows.
Tank and hoses shall be cleaned from all previous hydroseeding and hydromulching projects. Seed shall be mixed into the slurry immediately before application and slurry applied within 30 minutes after seeds have been placed in the tank. Once seed has been placed in the tank, tank shall be agitated only enough to mix the seeds and keep slurry from separating.

When Seeding Occurs after Application of Compost or after December 1

When seeding is done more than 3 days after Compost application or when Compost is applied after December 1, seeding rate shall be increased by 50%.

Over-Seeding

- Large extents of bare area (greater than 5-6 feet and depending on modified rock slope conditions) shall be over-seeded with the specified mix during the appropriate season for seeding. Rates, methods, and submittals shall be as specified under the relevant Seed Mix Item and Materials above.
- Over-seeding, mulch, watering, and all work for over-seeding shall be incidental.

Determining Satisfactory Establishment

A reasonably well-established stand of the specified seeded species as determined by the Engineer and the MassDOT Landscape Architect or designated Specialist will be required for Final Acceptance. The expectation is that an acceptable number and variety of the desired permanent seeded species will be visible. For seeding with compost over modified rock this shall generally be:

- A minimum of 50% coverage by the specified permanent seeded species after one growing season (considered June-September 15). Of that percentage, generally, depending on the mix species:
    - At least 2 types of permanent seeded grass species shall be visible.

- At least 2 species of wildflowers shall be visible.

- There will be no more than 25% coverage by weed species.
- There will be no invasive or aggressive species within the stand at the time of acceptance.
- There shall be no evidence of seed from non-native mixes (ex., clover) due to using an incorrect or modified mix or due to failure to clean the hydroseeding tank if a hydroseeder is used.

Invasive and aggressive weeds (such as mugwort, vetch, knapweed, and chicory) must be cut, pulled with roots removed, or treated with herbicide by a licensed and approved applicator prior to going to seed for Interim Acceptance. Weed removal shall be coordinated with MassDOT Landscape Architect. No herbicides shall be used without approval and coordination with MassDOT Landscape Design Section.

Acceptance of Seeding and Establishment Work

Conditional Acceptance shall be based on approval of seed mix submittals and proper application of seed as specified herein.

Final Acceptance of Seed Establishment shall be given upon satisfactory Establishment as described above. If the seeded area fails to meet the requirements of Establishment by the end of the growing season, contractor shall propose and implement remediations and site shall be inspected during the following growing season after July 1st. Otherwise, Contractor shall forego the payment for Final Acceptance. All remediation shall be at the contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Compost and Seed for Modified Rock will be measured and paid for at the Contract unit price per Cubic Yard which price shall include all labor, materials, equipment, site preparation, and all incidental costs required to complete the work.

Native Seed Mix shall be compensated at the bid price per the specified seed mix item by pound.

Schedule of payment shall be as follows:

60% upon approval of Compost application and Conditional Acceptance of seeding as specified above

40% upon Final Acceptance of Seed Establishment

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. 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 765.635 NATIVE SEEDING AND ESTABLISHMENT SQUARE YARD

Work shall conform to the relevant provisions of Subsections 765 and 767 of the Standard Specifications and the following:

The work under this item shall consist of seeding, mowing, and other care to establish a stand of grass in the areas shown on the plans or as required by the Engineer. For the purposes of these specifications, the term "grass" shall apply to all the forbs, grasses, sedges, and rushes included in the materials.

QUALIFICATIONS

Seeding shall be done by a company having a minimum of five years of experience with a native seed establishment. Prior to beginning work, the seeding Contractor shall furnish proof of qualifications to the Engineer for approval. Proof of qualifications shall include providing documentation (photos and contacts) to demonstrate knowledge and expertise with native seeding and establishment and proof of having completed successful native seeding projects.

SEEDING SEASON

The seeding seasons for native mixes is April 1 - May 15 and October 1 - December 1 for dormant seeding. Written approval must be obtained for seeding outside the seeding season and, if approved, the permanent seed rate shall be increased by 50%.

The seeding season for cover crops shall be grain oats January 1 – July 31 and grain rye August 1 – December 1.

MATERIAL AND SUBMITTALS

Seed Mixes and Submittals shall be per the item(s) for permanent and annual (cover crop) seed mixes.

Compost Blanket, if used, shall meet the material and submittal requirements for that item.

Hydromulch shall be wood fiber or straw applied per the Standard Specifications and at the rates specified below and per the manufacturer.

A certified statement shall be furnished, prior to start of work, to the Engineer by the Contractor as to the number of pounds of hydromulch, tackifier, and seed, per 100 gallons of water and as applicable to products used. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above.

Fertilizer

No fertilizers shall be applied.

Water

Water, including hose and all other watering equipment required for the work, shall be furnished by the Contractor to the site at no additional cost. Water shall be suitable for irrigation and free from

ITEM 765.635 (Continued)

ingredients harmful to plant life. All plants injured or work damaged due to the lack of water or the use of too much water shall be the Contractor's responsibility to correct.

SEEDING

Hand broadcast method shall be used for all areas smaller than half an acre and when specified on the plans for areas over half an acre. Include note for manual broadcast on plans.

Seeding shall occur within 72 hours of placement of loam and final grading, or the Contractor shall propose a reasonable, alternative schedule that shall be approved by the Engineer.

Surface Preparation

No seeding or soil preparation shall be done if soil is muddy or dry and compacted. Bare soils shall be raked to remove large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Ruts and depressions shall be filled with additional loam or compost and the soil shall be re-graded to a relatively smooth finish corresponding to the required grades.

When seeding over existing or compacted soil or soil that has sat bare for more than 30 days, surface will be prepared by tilling or raking to a minimum depth of 2 inches prior to seeding and prior to Compost Blanket application (when applied).

Surface preparation shall be compensated for under for loam placement or topsoil rehandled and spread as appropriate to the project.

Jute or coir mesh, when specified in the contract, shall be placed after seeding and per the Standard Specifications and the manufacturer's instruction.

Surface preparation shall be approved by the Engineer prior to seeding.

Seeding over Various Substrates

Loam: Seeding shall occur within 72 hours of loam placement to prevent loss of topsoil. Seed shall be manually broadcast for areas less than half an acre (each area, not cumulative area) and when specified on the plans. Broadcasting shall be immediately followed by hydromulching as specified below. When not specified on the plans, larger areas may be hydroseeded as specified below.

Compost Blanket: Compost Blanket shall be applied as specified under that item. Seed should be hand broadcast at the same time as compost application to ensure a thin cover of compost over seed.

When seeding is done after application of Compost Blanket the rate shall be increased by 50%. If the Compost Blanket is applied after December 1, seed shall be broadcast or hydroseeding over the compost in the Spring and the rate increased by 50% specified under Seed Application.

Compost Mulch over Modified Rock: Compost Mulch and seed shall be applied as specified under that item. No hydromulch is required.

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Cover Crop

Cover crop shall be used when seeding out of season, when specified with the permanent native seed mix under that item, and as required to prevent erosion until the permanent seed establishes.

A cover crop should not be used with a steep slope mix or other permanent mix which already contains either cereal rye or oats in the composition of the mix. A cover crop is not necessary for wetland seeding and is not typically necessary for soil stabilization when seeding in conjunction with a compost blanket application.

Seed Application

All seeds shall be mulched as specified herein.

Seed application shall be by broadcast seeding or by hydroseeding as described below.

Broadcast Seeding

Seed shall be broadcast spread using a cyclone or whirlwind seeder or hand broadcast. Small or light-seeded species such as bluestem may be mixed with approved filler to achieve an even distribution. Seed shall not be broadcast when wind velocities are greater than 15 mph.

Broadcast seeding shall be undertaken in two separate passes at ninety degrees to each other. One-half the seeding rate shall be applied in each direction (horizontally and vertically). To ensure seed to soil contact with broadcasting of seed, seeding shall be followed by rolling or tracking with equipment approved by the Engineer.

Broadcast seed shall be mulched with weed-free straw mulch unless seeding is done as part of Compost Blanket in which case it shall be as specified above under seeding with Compost Blanket application. Hydromulching shall be as specified under Hydromulching.

Hydroseeding and Hydromulching

Hydroseed and mulching shall be per the manufacturer's directions and as follows.

Hydroseeding shall only be used for sites over half an acre in size or with permission of the Engineer.

Tank and hoses shall be cleaned from all previous hydroseeding and hydromulching projects. Seed shall be mixed into the slurry immediately before application and slurry applied within 30 minutes after seeds have been placed in the tank. Once seed has been placed in the tank, tank shall be agitated only enough to mix the seeds and keep slurry from separating.

A 2-step process shall be used for seeding in conjunction with hydromulch. Seed shall be applied with 500 lbs/acre of hydromulch in the first pass. A second pass with 1,000 lbs/ acre of hydromulch shall be applied in a second pass. Each pass shall be applied in a different direction.

Once the seed has been added to the tank mixture a one-hour time limit is set for spreading the mixture on the soil. Once the one hour has passed the excess mixture must be discarded.

ITEM 765.635 (Continued)

For broadcast seeding, hydromulch shall be applied immediately following seeding at a rate of 1,000 lbs/acre. Tank shall be cleaned from any previous hydroseeding.

CARE DURING GERMINATION AND ESTABLISHMENT

Contractor shall care for seeded areas as necessary for successful germination. Care will include watering and weed control as necessary to achieve establishment of the specified seeded species after one growing season as specified below.

The contractor shall maintain the stand of grasses to ensure healthy growth of the seeded species. Work shall include mowing or weed whacking for weed control, watering if necessary, and removal of invasive plants.

Watering shall be sufficient to achieve soil moisture to a depth of 2 inches or more and such moisture is uniform. Method of watering shall not erode or damage soil or grassed surfaces.

General Weed Control: Unless otherwise directed, mowing shall be as specified under Mowing for Weed Control for seed establishment. Weeds shall be mowed prior to weed setting seed (by the end of July unless otherwise approved).

Control of Invasive and Aggressive Weeds: Invasive and aggressive weeds, including but not limited to mugwort, ragweed, knapweed, foxtail, crabgrass, and chicory must be cut or treated prior to going to seed. Herbicide treatment must be coordinated with MassDOT. Undesired species (such as chicory) introduced due to use of incorrect seed mix shall be removed at the Contractor's expense.

MOWING FOR WEED CONTROL

Mowing for weed control shall be completed after weeds have sprouted and show leaf and bud growth, but prior to setting seed, generally between July 7th and August 1st, unless directed otherwise by the MassDOT Landscape Architect and the Engineer.

Mowing height shall be as needed for weed control, generally to a height of 8 inches and not below 4 inches, unless directed otherwise. Mowing shall be with a brush hog mower or string trimmer other approved equipment. Conventional lawn mowers which cannot achieve the appropriate cut shall not be used.

The contractor shall give 48-hour notice prior to mowing work. Mowing shall only occur in dry sunny weather. Litter pickup should occur prior to mowing in all areas. If required, cut grass shall be raked and removed. Litter pickup and raking and removal of grass shall be incidental to the work.

Mowing equipment shall be approved by the Engineer prior to work.

OVER-SEEDING

Areas of bare ground greater than 2-3 feet in diameter shall be over-seeded with the specified mix during the appropriate season for seeding. Where required for overseeding mowing shall be as close

ITEM 765.635 (Continued)

to the soil as much as possible. Soil that is compacted shall be raked or otherwise roughened prior to over-seeding.

Over-seeding rates and methods shall those specified above under Materials and Methods. Following over-seeding, soil shall be lightly tamped to ensure seed to soil contact and areas shall be mulched with straw mulch and watered with a fine mist to moisten soil to a depth of at least 2 inches.

Over-seeding, mulch, watering, and all work for over-seeding shall be incidental.

DETERMINING SATISFACTORY GRASS ESTABLISHMENT

A well-established stand of the specified seeded species as determined by the Engineer and the MassDOT Landscape Architect will be required for Final Acceptance. The expectation is that an acceptable number and variety of the desired permanent seeded species (not the cover crop) will be visible. Generally:

- A minimum of 75% coverage by the specified permanent seeded species after one growing season. Of that percentage, generally, depending on the mix species:
  - At least 3 types of permanent seeded grass species shall be visible.
  - At least 3 species of wildflowers shall be visible.
- There will be no significant gaps or bare soil (generally 2-3 feet in diameter or greater).
- There will be no more than 25% coverage by weed species.
- All soil shall be stabilized and there shall be no channeling or erosion.
- There will be no invasive or aggressive species within the stand at the time of acceptance.
- There shall be no evidence of seed from non-native mixes (i.e., clover) due to failure to clean the hydroseeding tank or using incorrect mix.

Invasive and aggressive weeds (such as mugwort, ragweed, knapweed, and chicory) must be cut or treated prior to going to seed for Interim Acceptance. Herbicide treatment must be coordinated with MassDOT.

A warm-season grass mix with perennials will not have uniform growth. A uniform stand of grass may indicate use of an incorrect mix.

ACCEPTANCE OF SEEDING AND ESTABLISHMENT WORK

Conditional Acceptance shall be based on proper application of seed as specified herein.

Interim Acceptance of Care. Seeding will be inspected by mid-July to assess germination and Establishment conditions as described above. When necessary for Interim Acceptance, areas shall be mowed prior to weed species producing seed and as specified above under Weed Control. ***Areas requiring weed control that are not mowed prior to weed seed dispersal will not be approved for Interim Acceptance.*** Seeding that shows good germination and is determined by the Engineer and Landscape Architect to not require weed control at time of inspection shall be accepted for Interim Acceptance payment.

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Final Acceptance of Establishment shall be given upon satisfactory Establishment as described above.

If the seeded area fails to meet the requirements of Establishment by the end of the growing season, contractor shall propose and implement remediations and site shall be inspected during the following growing season after July 1st. All remediation shall be at the contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Native Seeding and Establishment will be measured for payment by the square yard, complete in place.

Native Seeding and Establishment will be paid at the Contract unit price by the square yard upon Conditional, Interim, and Final Acceptances as described above. This price shall include all submittals, seeding, rolling to ensure seed-to-soil contact, weed control other than mowing, water, over-seeding, labor, materials, equipment, and all incidental costs required to complete the work of establishing a satisfactory stand of grass.

Native seed and cover crop mixes shall be compensated under the respective items.

Site preparation, including raking, tilling, removal of debris and stones, and other work to the prepare site for seeding shall be compensated under loam placement or topsoil rehandled and spread as relevant to the project. If used, Compost Blanket shall be compensated under the respective item.

Option1: Mowing for weed control will be paid as specified under Item 765.664.
Option2: Mowing for weed control will be incidental to this item.
Schedule of payment shall be as follows:

30% upon Conditional Acceptance

20% upon Interim Acceptance of Care, except this amount will be reduced to zero and final payment will be reduced accordingly when areas requiring weed control are not mowed as specified in the Interim Acceptance criteria.

50% upon Final Acceptance of Establishment

ITEM 765.423	**MID-HEIGHT ROADSIDE POLLINATOR MEADOW**	**POUND**
ITEM 765.442	**ROADSIDE RIVERBANK MIX**	**POUND**
ITEM 765.472	**STEEP SLOPE TALL MIX**	**POUND**
ITEM765.553	**WETLAND SEED- RIPARIAN MIX**	**POUND**

Work under this item shall consist of furnishing the mix(es) specified below in the required quantity.

SUBMITTALS

1) Pre-Verification of Seed Availability. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species in the required quantities and for the anticipated date of seeding. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. Species not expected to be available should be noted and substitutions recommended.

2) Final Verification of Seed Availability. No earlier than 21 days prior to ordering, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species and in the required quantities. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section. Substitutions or changes in the mix at this time must be approved by MassDOT Landscape Design Section.

3) Seed Worksheet provided herein shall be submitted to the Engineer prior to ordering seed to determine the number of pounds of Pure Live Seed required.

4) Seed Tags. The contractor shall submit original seed tags from each bag of seed used on the project or ensure that each tag is photo documented by the Engineer while on the unopened bag.

5) Number of tags submitted must correspond to number of bags delivered.

6) Species listed on the seed tag shall match the Final Verification of Seed Availability (Submittal #2) unless approved otherwise. Tag must include: variety and species name; lot number; purity; percentage of inert matter; percentage of weeds, noxious seeds, and other crop seeds; germination, dormant or hard seed; total viability; origin of seed; germination test date, net weight, and name and address of seller. The origin of seed must be listed on the seed tag for all species in the mix to provide verification of original (generation 0) seed source. The smallest known geographic area (township, county, ecotype region, etc.) shall be listed. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

   A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section.

7) Verification of Seed Delivery. Prior to payment, contractor shall submit the Seed Delivery Verification form contained within the contract or the Supplier's Verification on company letterhead or a bill of lading. Supplier verification must include all information requested on the Verification form within this contract. The bill of lading must include variety and species name, lot number, net weight shipped, date of sale, invoice, project or seeding location, and name and address of Supplier. All information must be filled in and complete for acceptance.

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ITEM 765.553 (Continued)

Information must match the seed tags and quantity of seed used on the job. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section.

8) Seed Sample. If requested or if seed is from a previously opened bag, the contractor may be asked to submit to the Engineer a sample of seed from the seed bag (1-2 cups) at the time of seeding.

SEEDING SEASON

The appropriate seeding seasons are:
Spring: April 1 - May 15
Fall: October 1 - December 1 for dormant seeding

PERMANENT SEED MIX(ES)

Calculating Pure Live Seed (PLS)

Quantities specified are PURE LIVE SEED. Greater quantities of ordered seed may be required to achieve actual specified seeding rates.

Pure Live Seed (PLS) is defined as a percentage calculated by multiplying the percent of pure seed by the percent of viable seed (total germination, hard seed, and dormant seed). For example:

If a seed label indicates 90% purity, 78% germination, 10% hard seed, and 2% dormancy, it is calculated to be 90% x [78 + 10 + 2]% = 81% PLS.

Therefore, each pound of PLS would need 1 pound / 0.81 = 1.2 pounds of seed with a 90% purity and 90% total germination

Seed Mix(es) shall be as specified below. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

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765.423 Mid-Height Roadside Pollinator Meadow

Botanical Name	Common Name	% Mix By Weight (PLS)
Grass		
Grass		
Schizachyrium scoparium 'Albany Pine'	Little Bluestem 'Albany Pine'	38.0%
Elymus virginicus	Virginia Wild Rye	25.0%
Panicum virgatum	Switch Grass	7.0%
Tridens flavus	Purpletop	5.0%
Panicum clandestinum 'Tioga'	Deer Tongue 'Tioga'	0.8%
Agrostis perennans	Upland Bentgrass	0.8%
		76.6%
Herb/Forb		
Echinacea purpurea	Purple Coneflower	8.0%
Coreopsis lanceolata	Lance-leaf Coreopsis	4.0%
Chamaecrista fasciculata	Partridge Pea	2.5%
Penstemon digitalis	Beard-tongue	1.3%
Desmodium canadense	Showy Tick Trefoil	1.2%
Rudbeckia triloba	Brown Eyed Susan	0.8%
Zizia aurea	Golden Alexanders	0.6%
Liatris scariosa	Northern Blazing Star	0.6%
Rudbeckia hirta-VT ecotype	Black-eyed Susan-VT ecotype	0.6%
Verbena hastata	Blue Vervain	0.5%
Monarda fistulosa	Wild Bergamot	0.5%
Aster novae-angliae	New England Aster	0.3%
Aster pilosus	Heath Aster	0.3%
Asclepias syriaca	Common Milkweed	0.3%
Aster lateriflorus	Calico Aster	0.3%
Aster laevis NY Ecotype	Smooth Aster NY Ecotype	0.3%
Achillea millefolium	Common Yarrow	0.3%
Solidago odora	Licorice Scented Goldenrod	0.2%
Solidago nemoralis	Grey Goldenrod	0.2%
Solidago juncea	Early Goldenrod	0.2%
Solidago bicolor	White Goldenrod	0.2%
Pycnanthemum muticum	Bigleaf Mountain Mint	0.1%
Pycnanthemum tenuifolium	Slender Mountain Mint	0.1%
		23.4%
Seeding Rate: 20.0 lbs PLS/Acre		**100.0%**

***Used for upland slope restoration**

ITEM 765.423
ITEM 765.442
ITEM 765.472
ITEM 765.553 (Continued)

765.442 Roadside Riverbank Mix

Botanical Name	Common Name	% Mix By Weight (PLS)
Grass		
Elymus virginicus	Virginia Wild Rye	27.0%
Schizachyrium scoparium 'Albany Pine'	Little Bluestem 'Albany Pine'	22.5%
Andropogon gerardii NY Eco	Big Bluestem NY Eco	14.0%
Elymus riparius	Riverbank Wild Rye	14.0%
Panicum virgatum	Switch Grass	5.0%
Dichanthelium clandestinum 'Tioga'	Deertongue grass 'Tioga'	5.0%
Carex vulpinoidea	Fox Sedge	2.0%
Agrostis perennans	Upland Bentgrass	1.5%
Carex vulpinoidea	Fox Sedge	0.5%
Poa palustris	Fowl Bluegrass	0.3%
Juncus effusus	Soft Rush	0.1%
Juncus tenuis	Path Rush	0.1%
		92.0%
Herb/Forb		
Chamaecrista fasciculata	Partridge Pea	3.0%
Penstemon digitalis	Beard-tongue	1.0%
Vernonia noveboracensis	New York Ironweed	0.6%
Helenium autumnale	Common Sneezeweed	0.5%
Verbena hastata	Blue Vervain	0.4%
Aster puniceus	Aster - Swamp	0.4%
Aster cordifolius	Blue Wood Aster	0.3%
Asclepias incarnata	Swamp Milkweed	0.3%
Monarda fistulosa	Wild Bergamot	0.2%
Aster novae-angliae	New England Aster	0.2%
Solidago rigida	Rigid Goldenrod	0.2%
Desmodium canadense	Showy Tick Trefoil	0.2%
Eupatorium perfoliatum	Boneset	0.2%
Eupatorium maculatum	Spotted Joe Pye Weed	0.2%
Solidago juncea	Early Goldenrod	0.1%
Euthamia graminifolia	Grass-leaved Goldenrod	0.1%
Lobelia cardinalis	Cardinal Flower	0.1%
		8.0%
Seeding Rate: 15.0 lbs PLS/Acre		**100.0%**

***Used for upland slope restoration**

ITEM 765.423
ITEM 765.442
ITEM 765.472
ITEM 765.553 (Continued)

765.472 Steep Slope Mid-Height Mix

Botanical Name	Common Name	% Mix By Weight (PLS)
Grass		
Cover Crop - Secale cereale/Avena	Cover Crop - Grain Oats/Rye	40.0%
Schizachyrium scoparium 'Albany Pine'	Little Bluestem 'Albany Pine'	30.0%
Elymus virginicus	Virginia Wild Rye	8.0%
Elymus canadensis	Canada Wild Rye	5.0%
Panicum virgatum	Switch Grass	4.5%
Agrostis perennans	Upland Bentgrass	3.0%
Dichanthelium clandestinum 'Tioga'	Deertongue grass 'Tioga'	2.3%
		92.8%
Herb/Forb		
Echinacea purpurea	Purple Coneflower	3.0%
Chamaecrista fasciculata	Partridge Pea	2.0%
Penstemon digitalis	Beard-tongue	0.7%
Monarda fistulosa	Wild Bergamot	0.3%
Asclepias syriaca	Common Milkweed	0.2%
Lespedeza capitata	Roundhead Bush Clover	0.2%
Rudbeckia hirta-VT ecotype	Black-eyed Susan-VT ecotype	0.1%
Aster prenanthoides	Zig Zag Aster	0.1%
Solidago nemoralis	Grey Goldenrod	0.1%
Aster pilosus	Heath Aster	0.1%
Aster laevis NY Ecotype	Smooth Aster NY Ecotype	0.1%
Pycnanthemum tenuifolium	Slender Mountain Mint	0.1%
Solidago juncea	Early Goldenrod	0.1%
Asclepias incarnata	Swamp Milkweed	0.1%
		7.2%
Seeding Rate: 75.0 lbs PLS/Acre		**100.0%**

***Used for upland slope restoration**

ITEM 765.423
ITEM 765.442
ITEM 765.472
ITEM 765.553 (Continued)

765.553 Wetland Seed – Riparian Mix

Mix 765.553 Wetland – Riparian Mix

	Botanical Name	Common Name	% PLS By Weight
Grass			
	Sorghastrum nutans NY Eco	Indiangrass NY Ecotype	14.00%
	Schizachyrium scoparium	Little Blue Stem	14.00%
	Elymus riparius	Riverbank Wild Rye	10.00%
	Elymus virginicus	Virginia Wild Rye	10.00%
	Panicum clandestinum 'Tioga'	Deer Tongue 'Tioga'	9.00%
	Andropogon gerardii NY Eco	Big Bluestem NY Eco	8.00%
	Carex vulpinoidea	Fox Sedge	7.00%
	Panicum virgatum	Switchgrass	3.00%
	Juncus effusus	Soft Rush	2.00%
	Agrostis perennans	Upland Bentgrass	2.00%
	Scirpus atrovirens	Green Bulrush	1.00%
			80.00%
Herb/Forb			
	Chamaecrista fasciculata	Partridge Pea	3.00%
	Verbena hastata	Blue Vervain	3.00%
	Asclepias incarnata	Swamp Milkweed	3.00%
	Heliopsis helianthoides	Ox-Eye Sunflower	2.00%
	Eupatorium perfoliatum	Boneset	2.00%
	Aster umbellatus	Flat Topped White Aster	1.00%
	Aster prenanthoides	Zig Zag Aster	1.00%
	Aster puniceus	Aster – Swamp	1.00%
	Aster novae-angliae	New England Aster	1.00%
	Eupatorium maculatum	Joe-pye Weed	1.00%
	Monarda fistulosa	Wild Bergamot	1.00%
	Vernonia noveboracensis	New York Ironweed	1.00%
			20.00%
			100.00%

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

FOR USE WITH SLOPES: Add 30 lbs/acre of a cover crop if erosions is a concern. For a cover crop use either grain oats (1 Jan to 31 July) or grain rye (1 Aug to 31 Dec). Cover crop shall be incidental to seeding Mix.

***Used for Infiltration Basin**

ITEM 765.423
ITEM 765.442
ITEM 765.472
ITEM 765.553 (Continued)

Application Rate

Mid-Height Roadside Pollinator Meadow: 20 lbs/acre PLS. Option1: In addition, apply 30 pounds of cover crop (grain oats or grain rye) as appropriate to the season. Option 2: No cover crop shall be applied.
Roadside Riverbank Mix: 15 lbs/acre PLS. Option1: In addition, apply 30 pounds of cover crop (grain oats or grain rye) as appropriate to the season. Option 2: No cover crop shall be applied.
Steep Slope Tall Mix: 75 lbs/acre PLS. Option1: In addition, apply 30 pounds of cover crop (grain oats or grain rye) as appropriate to the season. Option 2: No cover crop shall be applied.
Wetland Seed- Riparian Mix: 20 lbs/acre PLS. Option1: In addition, apply 30 pounds of cover crop (grain oats or grain rye) as appropriate to the season. Option 2: No cover crop shall be applied.

Any species substitution shall be with a species having similar characteristics and function. Substitutions must be approved by MassDOT Landscape Design Section per the documentation submittal process.

50% Increase Adjustment for Field Conditions

Seeding under the following conditions requires a 50% increase in the permanent mix at the time of construction:

- Seeding out of season
  OR
- Seeding after Compost Blanket has been applied (unless already increased for out of season).

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Roadside Pollinator Meadow Mix, Steep Slope Tall Mix and Wetland Seed- Riparia Mix, will be measured for payment by the pound of Pure Live Seed delivered and complete in place.

Roadside Pollinator Meadow Mix, Steep Slope Tall Mix and Wetland Seed- Riparia Mix will be paid at the contract unit price per pound of Pure Live Seed delivered upon approval of all Seed Submittal Documentation. Overseeding required to correct poor germination or establishment shall be incidental to the item.

Cover crop not included as part of the permanent mix composition will be paid for under Item 765.21, Annual Cover Crop. (delete sentence if no cover crop is required)

Application and care of native seed mix will be paid for separately under Item 735.635 Native Seeding and Establishment.

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ITEM 765.553 (Continued)

ITEM 765.423
ITEM 765.442
ITEM 765.472

NATIVE SEED WORKSHEET

Project Description: _____ Project No: _____

Contractor: _____Contract No: _____

Seed Mix Number & Description: _____

Contractor: Complete Prior To Ordering

Pounds of Seed Required Per Contract:

_____lbs./acre for _____Acre(s) OR _____ SY

Additional 50% increase if required (out of season or seeding over compost blanket):

_____**lbs. Total Seed Required**

Calculated Quantity for **P**ure **L**ive **S**eed (PLS[1]):

_____ **Total Pounds PLS**

Engineer: Verification at Time of Application

Number pounds delivered to site[2]: _____ Date(s): _____

Actual Seed Bag Tag/s Received or photo documented by Engineer: _____

[1] PLS=% pure seed x % viable seed (total germination, hard seed, and dormant seed).
*[2]Quantity delivered should match pounds **Total Pounds PLS** and **Verification of Seed Delivery**. Pounds should be shown on each Seed Tag.*

ITEM 765.553 (Continued)

SUPPLIER VERIFICATION OF SEED DELIVERY FOR MASSDOT PROJECTS

Date_____

We hereby certify that (*Seed Supplier*):_____

Furnished to (*Contractor*): _____

For use on: (*Project Description*) _____

Project #: _____ Contract #: _____

Pounds of Pure Live Seed: _____

Of Mix (*Description*): _____

Lot Number _____

The material was delivered on (*Date*)_____.

The labels and contents meet all State and Federal regulations. The mixture consists of the following species, including cultivars (as applicable) and ecotype region, and at the following percentages (may be attached separately):

Name (print): _____ Title: _____

Supplier: _____

Signature and Seal: _____

ITEM 983.9 STREAMBED RESTORATION LUMP SUM

DESCRIPTION

This work shall consist of removing, stockpiling, and replacing river bed material in the area downstream of the proposed bridge replacement and downstream of the proposed dam spillway in the limits of work. The streambed restoration shall replicate the existing natural channel bed outside the work area in terms of material, roughness, shape, profile, and appearance. The

ultimate product will, to the extent possible, replicate the function and appearance of the natural stream channel, as illustrated by photo-documentation herein (Figure A).

The Contractor shall coordinate with his/her subcontractors to ensure all required equipment is available on-site to complete the work in this manner. The streambed restoration is required to comply with environmental permits issued for the project. MassDOT Environmental Services will provide a Fluvial Geomorphologist (Geomorphologist) to provide a pre-construction meeting, on-site oversight during construction, and assistance during streambed restoration construction to ensure the restoration is constructed as shown on the Plans, as required by these Special Provisions and in accordance with permit requirements.

At least 30 days prior to the commencement of construction, the Contractor shall coordinate with David Paulson (MassDOT Wildlife Unit Supervisor, (508) 389-6366 / david.j.paulson@state.ma.us) to set up an initial (virtual or in person) meeting with MassDOT's Geomorphologist, Contractor, and Resident Engineer. At this meeting, the Geomorphologist will provide an overview of the restoration work. The Contractor should be prepared to discuss the anticipated means, methods, and schedule.

Process Approval:

In lieu of a mockup, the Contractor shall schedule an onsite meeting to discuss the streambed restoration with the Geomorphologist and respective parties from MassDOT. The Geomorphologist shall be onsite during initial streambed restoration. The Contractor shall provide the Geomorphologist adequate access to observe, direct, and inspect the channel restoration work throughout the duration of the removal, stockpile, and reinstallation of the existing streambed material. If material is being brought to the site for streambed restoration, the Contractor shall provide the Geomorphologist with photographs to see the material.

MATERIAL

The streambed material excavated from the existing streambed shall be removed and stockpiled to facilitate reinstallation and replication of the natural streambed. The excavated streambed material shall also be reused to provide a minimum 12" layer of native streambed material on top of the proposed riprap placed downstream of the proposed concrete spillway slab.

In the event that excavated material is not suitable or there is not enough suitable material available, additional streambed restoration material shall be locally sourced that matches the composition of the existing native river bed. Photos have been provided of the downstream channel for informational purposes. The Contractor, with MassDOT, shall evaluate material excavated from the site to determine the appropriate restoration material to be brought from off-site.

The streambed material shall be approved by the Resident Engineer and Geomorphologist prior to use.

CONSTRUCTION

Channel

The streambed material shall be reinstalled over modified rockfill as depicted on the plans, to an minimum thickness of 12 inches, with variations in thickness as necessary to replicate existing

channel conditions. The initial placement of streambed material shall fill the voids in the underlying riprap. Fill voids by shaking stone with the teeth of an excavator bucket, hand tamping with metal tamping rods, and by spraying water to settle fines between large stones. Plate compactors shall not be used. The purpose of filling the voids is to prevent subsurface flow where surface water disappears into large voids between the stone fill below the channel bed surface during low flow conditions. The final streambed shape and appearance shall be finalized in the field as directed by the Geomorphologist.

Completion

Once all material has been placed in the stream channel and approved by the Geomorphologist and Resident Engineer, the Contractor shall remove the cofferdams in such a way as 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 shall maintain the general configuration of the existing streambed bedform and there shall be minimal subsurface flow upon final inspection by the Resident Engineer and Geomorphologist. The project must be passable by fish and other aquatic organisms following construction.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The streambed restoration to be measured for payment will be the complete and accepted work for restoration of the streambed within the limits shown on the Plans as approved by the Resident Engineer and Geomorphologist.

The accepted streambed restoration will be paid for on a lump sum basis. Payment will be full compensation for excavating, stockpiling, transporting, and placing the material specified and for furnishing all labor, tools, equipment, testing, and incidentals necessary to complete the work.

The Geomorphologist will be provided by MassDOT at no cost to the Contractor.

Any required soil, gravel borrow, or modified rockfill to be installed below the streambed material shall be paid for under separate items included within Contract.

FIGURES

Figure A: Downstream of Bridge

ITEM 991.1 **CONTROL OF WATER - STRUCTURE NO. W-06-020 (CCV)** **LUMP SUM**

This Item includes all dewatering necessary to accomplish the demolition of the existing structures, construction of the proposed structures, and placement of the proposed stone

ITEM 991.1 (Continued)

armaments in the dry. The Work under this Item shall conform to the relevant provisions of Section 140 of the Standard Specifications and these Special Provisions. The selected dewatering

and maintenance of flow systems shall not significantly alter the normal water surface elevations or stream velocities.

Dewatering shall be conducted to ensure that all cement concrete masonry is placed and cured in the dry.

Anticipated locations of Control of Water are shown on the Plans, but the exact layout and location of the systems shall be determined by the Contractor to accommodate the specific site conditions encountered and the Contractor's operations. It is the responsibility of the Contractor to determine the need and extent of stream diversions, sedimentation basins and dewatering techniques and sedimentation controls needed to control water and sediment at the site. It is also the Contractor's responsibility to ensure the proposed dewatering system is in conformance with permits provided through this Contract. During the actual process of executing the excavation operations, the Contractor shall submit the methods and materials he proposes to use for the Engineer's approval.

The Contractor's methods shall consider the close proximity of right-of-way lines, wetland delineation, overhead utilities, and existing and proposed structures, all of which may require the dewatering controls to be coordinated with other work items.

The design of the water control system shall be in accordance with the Standard Specifications, Chapter 3.2.5 of the MassDOT *LRFD Bridge Manual*, and relevant provisions of the AASHTO *LRFD Bridge Design Specifications* and Guide Specifications. The system will be designed to a height of 1 foot above the design flood elevation given in the Construction Plans.

Particular attention shall be paid to Subsection 3.2.4 of the aforementioned MassDOT Bridge Manual regarding the design and installation of control of water, especially as it relates to buried portions that protrude into the soil that supports the bridge structure.

Plans and Calculations for dewatering measures shall be developed by the Contractor for this Item, prepared by a Professional Engineer Registered in the Commonwealth of Massachusetts and submitted for the review of the Engineer prior to the start of construction.

CONSTRUCTION METHODS

The Contractor is advised that the effectiveness of the water control method used will vary based on the field conditions at the time at which the work is being performed. The Engineer has the right to order the Contractor to stop all construction operations when in his judgment the Contractor's water control operations are failing to produce adequate results or are posing a threat to the environment.

The Contractor shall use such equipment and shall perform his operations in such a manner that boiling or other disturbances of the soil in the foundation area will be prevented. 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.

ITEM 991.1 (Continued)

All dewatering and related work shall be conducted in such a manner as to prevent siltation or contamination of the waterway or adjoining wetlands.

The pumping discharge shall not be allowed to enter directly into Mill Pond or the Agawam River. The water from the work areas shall be pumped to a settling tank/basin. 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. The tank can be constructed of concrete, fiberglass or any other material that will meet the following:

A. 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.
B. The outlet from the settling tank/basin 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/basin.

The settling tanks/basins shall be maintained as follows:

A. Inspect at least twice daily during dewatering operations.
B. Repair any damage immediately.
C. Clean tank/basin outlet daily. Remove any debris immediately.
D. Remove sediments when deposits reach eight (8) inches below the outlet invert.
E. Dispose sediments outside of wetland areas at a location approved by the Engineer.

The Contractor shall inspect hay bales that surround the outlet daily and shall immediately replace any that are damaged. The Contractor shall utilize dewatering stockpile basins and filter basins as shown on the plans for the purposes of dewatering excavated material.

The location of the tanks/basins will be as directed by the Engineer due to specific site conditions and staging operations of the Contractor.

Pumping shall be conducted in a manner that will not adversely affect the freshly placed cement 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 Contractor shall select the size and configuration of pumps and pipes.

When there is visible turbidity within the river caused by the construction, the polluting activity will cease until adequate controls can be installed to protect the river.

Sufficient operating and stand-by pumps and equipment shall be available to dewater and keep the work areas dry during the construction period. Utility costs, and connections shall be arranged and paid for by the Contractor.

ITEM 991.1 (Continued)

The Contractor is advised that the work to be performed under this item shall be in conformance with the applicable provisions of the MassDOT Standard Specifications as well as the following environmental permitting sections as referenced in these Special Provisions:

- DEP - WATER QUALITY CERTIFICATE
- ARMY CORPS OF ENGINEERS PERMIT

All work (including all labor, tools, equipment, materials, maintenance and fees) required in order to conform to the MassDOT Standard Specifications and the above environmental permitting sections, if not included separately under other items, shall be considered incidental to Item 991.1, and no additional compensation shall be made to the Contractor. Also included shall be all necessary additional permits that may be required in performing the work under this item.

The Contractor shall provide any necessary temporary filtering fabrics, silt fencing, sedimentation/retention basins and/or other effective procedures or structures together with all labor, materials, and equipment necessary for controlling water in the Temporary Support System. Such work shall be subject to the approval of the Engineer, but such approval will not relieve the Contractor of the responsibility for the adequacy of construction, maintenance, operation and safety of the water control system.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

This Item will be measured in the unit of LUMP SUM for all water control systems required on the project. Each system location will not be measured and paid for separately. This Item is one payment for all systems required on the project.

This Work will be paid for at the contract LUMP SUM price, which price shall include full compensation for all necessary design, labor, equipment, materials, installation, piping, pumping, maintenance, removal of the water control systems and all other incidentals necessary to satisfactorily complete the work.

If partial payment is desired by the Contractor, the Contractor shall submit a schedule of payment to the Engineer for approval.

Massachusetts Department of Transportation

MILL POND DAM

SECTION 11

HYDRAULIC STUDY REPORT

(Attached Separately)

Massachusetts Department of Transportation

MILL POND DAM

SECTION 12

DESIGN PLANS

Entitled "Massachusetts Department of Transportation
Highway Division, (US 6 WB & ST 28 NB Bridge No. W-06-020),
Water Quality Certification Permit Submission"
prepared by Pare Corporation

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	47
PROJECT FILE NO.	606352		

TITLE SHEET & INDEX

PLAN AND PROFILE OF

US 6 WB & ST 28 NB

(BRIDGE NO. W-06-020)

IN THE TOWN OF

WAREHAM

PLYMOUTH COUNTY

FEDERAL AID PROJECT NO. ######

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 LATEST MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS WITH MASSACHUSETTS AMENDMENTS, 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, WILL GOVERN.

WATER QUALITY CERTIFICATION PERMIT SUBMISSION

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7 , 8	PROFILE NO. 1 & NO. 2
9 , 10	DRAINAGE & UTILITY PLAN NO. 1 & NO. 2
11	WETLAND IMPACT PLAN
12	SPILLWAY SECTION
13 , 14	LANDSCAPE PLAN NO. 1 & NO. 2
15 , 16	CONSTRUCTION DETAILS NO. 1 & NO. 2
17	KEY PLAN & INDEX
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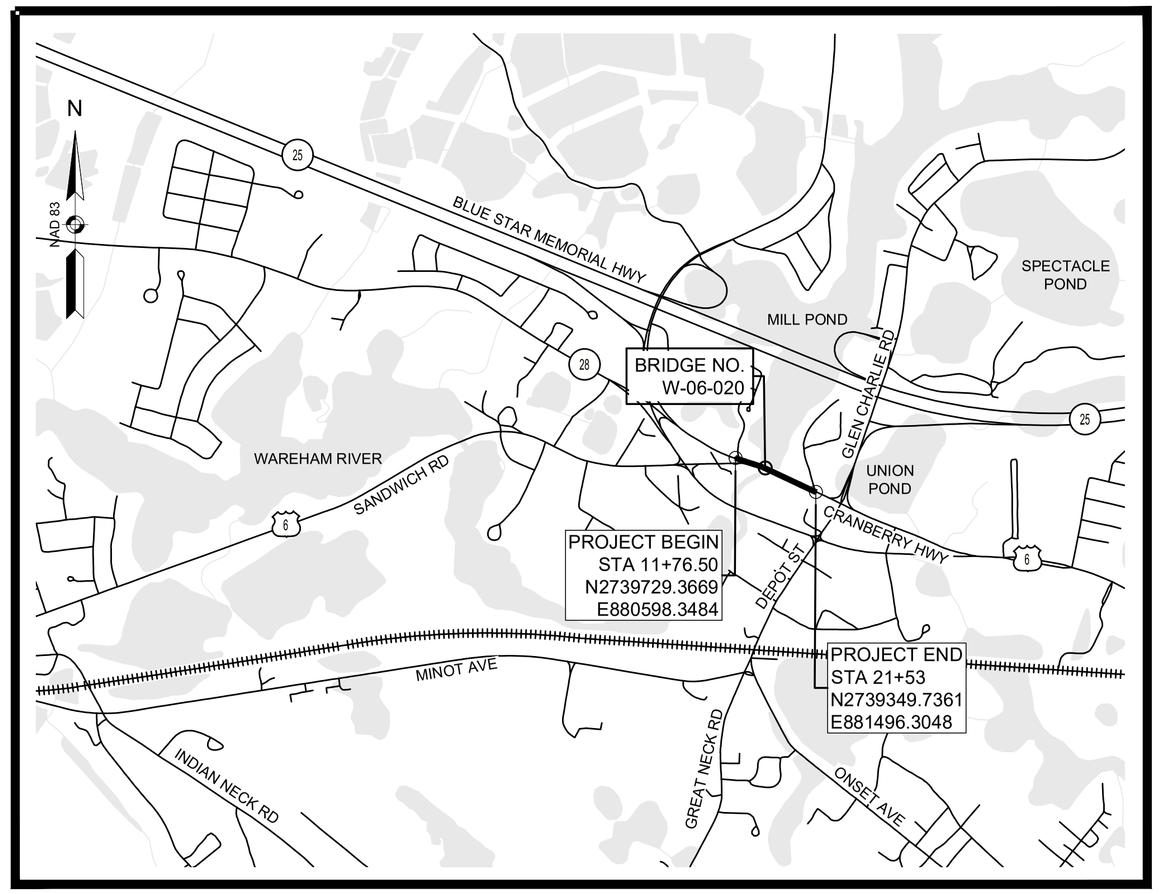


0 1200 2400 3600

SCALE: 1" = 1200'

LENGTH OF PROJECT = 976.5 FEET = 0.185 MILES

DESIGN DESIGNATION (US 6 WB & ST 28 NB)

DESIGN SPEED	40 MPH
ADT (2023)	14,255
ADT (2043)	16,260
K	9%
D	N/A
T (PEAK HOUR)	9%
T (AVERAGE DAY)	9%
DHV	1,464
DDHV	N/A
FUNCTIONAL CLASSIFICATION	URBAN MINOR ARTERIAL

DATE	DESCRIPTION	REV #
02-21-2025	REVISED - 100% DESIGN	
01-15-2025	100% DESIGN	
12-17-2024	100% DESIGN	
01-31-2024	75% DESIGN	
12-17-2021	25% DESIGN	

massDOT Massachusetts Department of Transportation Highway Division

APPROVED

CHIEF ENGINEER **DATE**

PARE
PARE CORPORATION
ENGINEERS • SCIENTISTS • PLANNERS
8 BLACKSTONE VALLEY PLACE, LINCOLN, RI 02865, 401-334-4100
10 LINCOLN ROAD, SUITE 210, FOXBORO, MA 02035, 508-543-2700
31 ROBBIA ROAD, SUITE 301, HOLYOKE, MA 01040, 413-267-2446

Shadley Associates
Landscape Architects and Site Planning Consultants

606352_HD(TITLE SHEET).DWG Plotted on 27-Feb-2025 10:33 AM
Proposal No. 606532-136278
A00840 - 357

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
		CATCH BASIN CURB INLET
FP	FP	FLAG POLE
GP	GP	GAS PUMP
MB	MB	MAIL BOX
		POST SQUARE
		POST CIRCULAR
WELL	WELL	WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GATE POST
GG	GG	GAS GATE
BHL #	BHL #	BORING HOLE
MW #	MW #	MONITORING WELL
TP #	TP #	TEST PIT
		HYDRANT
		LIGHT POLE
CO.BD.		COUNTY BOUND
		GPS POINT
C	C	CABLE MANHOLE
D	D	DRAINAGE MANHOLE
E	E	ELECTRIC MANHOLE
G	G	GAS MANHOLE
M	M	MISC MANHOLE
S	S	SEWER MANHOLE
T	T	TELEPHONE MANHOLE
W	W	WATER MANHOLE
MHB	MHB	MASSACHUSETTS HIGHWAY BOUND
MON		MONUMENT
SB		STONE BOUND
TB		TOWN OR CITY BOUND
△		TRAVERSE OR TRIANGULATION STATION
TPL or GUY	TPL or GUY	TROLLEY POLE OR GUY POLE
HTP		TRANSMISSION POLE
UFB	UFB	UTILITY POLE W/ FIREBOX
UPDL	UPDL	UTILITY POLE WITH DOUBLE LIGHT
ULT	ULT	UTILITY POLE W / 1 LIGHT
UPL	UPL	UTILITY POLE
		BUSH
SIZE & TYPE		TREE
		STUMP
		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
		GUARD RAIL - DOUBLE FACE - STEEL POSTS
		GUARD RAIL - DOUBLE FACE - WOOD POSTS
		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		EROSION AND SEDIMENT CONTROL BARRIER
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDERING VEGETATED WETLANDS
		100 FT ZONE BUFFER
		200 FT RIVERFRONT AREA
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT
		COMPOST FILTER SOCK

TRAFFIC SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
1	1	CONTROLLER PHASE ACTUATED
		TRAFFIC SIGNAL HEAD (SIZE AS NOTED)
		WIRE LOOP DETECTOR (6' x 6' TYP UNLESS OTHERWISE SPECIFIED)
		VIDEO DETECTION CAMERA
		MICROWAVE DETECTOR
		PEDESTRIAN PUSH BUTTON, SIGN (DIRECTIONAL ARROW AS SHOWN) AND SADDLE
	*	EMERGENCY PREEMPTION CONFIRMATION STROBE LIGHT
		VEHICULAR SIGNAL HEAD
		VEHICULAR SIGNAL HEAD, OPTICALLY PROGRAMMED
		FLASHING BEACON
		PEDESTRIAN SIGNAL HEAD, (TYPE AS NOTED OR AS SPECIFIED)
RRSG	RRSG	RAILROAD SIGNAL
OR		SIGNAL POST AND BASE (ALPHA-NUMERIC DESIGNATION NOTED)
	20'	MAST ARM, SHAFT AND BASE (ARM LENGTH AS NOTED)
		HIGH MAST POLE OR TOWER
		SIGN AND POST
		SIGN AND POST (2 POSTS)
	20'	MAST ARM WITH LUMINAIRE
		OPTICAL PRE-EMPTION DETECTOR
		CONTROL CABINET, GROUND MOUNTED
		CONTROL CABINET, POLE MOUNTED
		FLASHING BEACON CONTROL AND METER PEDESTAL
		LOAD CENTER ASSEMBLY
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
ONLY	ONLY	LEGEND "ONLY" - WHITE
	SL	STOP LINE
	CW	CROSSWALK - SEE DETAIL (SHEET ##)
	SWL	SOLID WHITE LINE - 6" REFLECTORIZED
	SYL	SOLID YELLOW LINE
	BWL	BROKEN WHITE LINE (10' STRIPE - 30' SPACE - 10' STRIPE)
	BYL	BROKEN YELLOW LINE (3' STRIPE - 9' SPACE - 3' STRIPE)
	DGL	DOTTED GREEN LINE (3' STRIPE - 9' SPACE - 3' STRIPE)
	DWL	DOTTED WHITE LINE (3' STRIPE - 9' SPACE - 3' STRIPE)
	DYL	DOTTED YELLOW LINE
	DWLEx	DOTTED WHITE LINE EXTENSION (2' STRIPE - 6' SPACE - 2' STRIPE)
	DYLEx	DOTTED YELLOW LINE EXTENSION
	DBWL	DOUBLE WHITE LINE
	DBYL	DOUBLE YELLOW LINE - 6" REFLECTORIZED
	WGL	WHITE GORE LINE - 12" @ 20' O.C. ANGLE @ 45°
	YGL	YELLOW GORE LINE - 12" @ 20' O.C. ANGLE @ 45°
	WCGL	WHITE CHEVRON GORE LINE - 24" @ 20' O.C.

ABBREVIATIONS

GENERAL

AADT	ANNUAL AVERAGE DAILY TRAFFIC
ABAN	ABANDON
ADJ	ADJUST
APPROX.	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CB	CATCH BASIN
CBCI	CATCH BASIN WITH CURB INLET
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CIP	CAST IRON PIPE
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DHV	DESIGN HOURLY VOLUME
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DW	STEADY DON'T WALK - PORTLAND ORANGE
DWY	DRIVEWAY
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
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

ABBREVIATIONS (cont.)

GENERAL

PWW	PAVED WATER WAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDWY	ROADWAY
REM	REMOVE
RET	RETAIN
RET WALL	RETAINING WALL
ROW	RIGHT OF WAY
RR	RAILROAD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SMH	SEWER MANHOLE
ST	STREET
STA	STATION
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SW	SIDEWALK
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
PCR	PEDESTRIAN CURB RAMP

TRAFFIC SIGNAL ABBREVIATIONS

CAB	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY UPRAISED HAND
FDW	FLASHING UPRAISED HAND
FR	FLASHING CIRCULAR RED
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR YELLOW
FYL	FLASHING YELLOW LEFT ARROW
FYR	FLASHING YELLOW RIGHT ARROW
G	STEADY CIRCULAR GREEN
GL	STEADY GREEN LEFT ARROW
GR	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
GV	STEADY GREEN VERTICAL ARROW
OL	OVERLAP
PED	PEDESTRIAN
PTZ	PAN, TILT, ZOOM
R	STEADY CIRCULAR RED
RL	STEADY RED LEFT ARROW
RR	STEADY RED RIGHT ARROW
TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALKING PERSON
Y	STEADY CIRCULAR YELLOW
YL	STEADY YELLOW LEFT ARROW

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	47
PROJECT FILE NO.	606352		

LEGEND & ABBREVIATIONS

Proposal No. 606532-136278

606352_HD(LEGEND).DWG Plotted on 27-Feb-2025 10:33 AM

A00840 - 358

Proposal No. 606532-136278
606352_HD(GENERAL NOTES).DWG Plotted on 27-Feb-2025 10:33 AM
A00840 - 359

SURVEY NOTES

1. THE EXISTING CONDITION SHOWN ON THE SURVEY BASE PLAN ARE A RESULT OF AN ON THE GROUND INSTRUMENT SURVEY PERFORMED BY DAWOOD ENGINEERING, INC., BOSTON, MASSACHUSETTS, IN SEPTEMBER, 2022 AND SUPPLEMENTED IN DECEMBER 2023.
2. THE MOST RECENT SITE VISIT WAS COMPLETED IN OCTOBER 2024 TO VERIFY THAT THE EXISTING CONDITIONS SHOWN ON THE PLAN ARE THE CURRENT CONDITIONS IN THE FIELD.
3. THE OWNERS HAVE BEEN CHECKED AND UPDATED AS OF DECEMBER, 2023.
4. COORDINATES, IN U.S. SURVEY FEET, ARE IN THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM (MCS), MAINLAND ZONE, REFERENCED TO THE NORTH AMERICAN DATUM OF 1983, (NAD 83/2011, EPOCH 2010.00), BASED ON THE KeyNetGPS VIRTUAL REFERENCE SYSTEM (VRS).
5. ELEVATIONS, IN U.S. SURVEY FEET, ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) BASED ON THE KeyNetGPS VIRTUAL REFERENCE SYSTEM (VRS)
6. SUBSURFACE UTILITY LINES AND FEATURES, AS SHOWN HEREON, WERE COMPILED FROM FIELD EVIDENCE AND/OR AVAILABLE RECORD INFORMATION (SEE REFERENCES), AND THEIR LOCATIONS ARE ONLY APPROXIMATE. ACTUAL LOCATIONS MUST BE DETERMINED IN THE FIELD.
7. DAWOOD ASSUMES NO RESPONSIBILITY FOR DAMAGES INCURRED AS A RESULT OF UTILITIES OMITTED OR INACCURATELY SHOWN.
8. BEFORE DESIGNING FUTURE CONNECTIONS, THE APPROPRIATE UTILITIES MUST BE CONSULTED.
9. BEFORE CONSTRUCTION, ALL UTILITIES, PUBLIC AND PRIVATE, MUST BE NOTIFIED (SEE MASSACHUSETTS GENERAL LAWS, CHAPTER 82 SECTION 40). CALL "DIG SAFE" 1-888-DIG-SAFE. (888-344-7233).
10. BATHYMETRIC SURVEY DATA BASED ON A BATHYMETRIC SURVEY PERFORMED BY HEIDECKER LAND SURVEYING, LLC ON OCTOBER 5, 2022

UTILITY NOTE

1. EXISTING UTILITIES, WHERE SHOWN HEREON, ARE APPROXIMATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPERLY LOCATING AND COORDINATING ANY ON-SITE ACTIVITY WITH DIG-SAFE AND THE APPROPRIATE UTILITY COMPANY AND MAINTAINING EXISTING UTILITY SYSTEM SERVICE. DIG-SAFE SHALL BE NOTIFIED PER THE COMMONWEALTH OF MASSACHUSETTS STATUTE CHAPTER 82, SECTION 40, AT 1-888-344-7233. NO GUARANTEE IS IMPLIED OR INTENDED AS TO THE ACCURACY, LOCATION OR THAT ALL UTILITIES AND/OR SUBSURFACE STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL VERIFY SIZE, LOCATION AND INVERTS OR UTILITIES AND STRUCTURES AS REQUIRED PRIOR TO THE START OF CONSTRUCTION.

NATIONAL GRID GAS NOTES

1. IF THE PROPOSED CONSTRUCTION IS WITHIN CLOSE PROXIMITY OF HIGH PRESSURE TRANSMISSION GAS MAIN, CONTACT NATIONAL GRID'S DAMAGE PREVENTION DEPARTMENT FOR SPECIFIC REQUIREMENTS. IT IS RECOMMENDED THAT:

   - A NATIONAL GRID REPRESENTATIVE IS ON SITE CONTINUOUSLY DURING ANY EXCAVATION/SUBSURFACE WORK WITHIN 15 FEET OF A TRANSMISSION FACILITY.

   - WHEN WORKING WITHIN 15' OF THE OUTSIDE PERIMETER OF ANY TRANSMISSION PIPELINE, HAND TOOLS AND VACUUM EXCAVATION MUST BE USED UNTIL THE EXACT ALIGNMENT HAS BEEN VERIFIED

   - WHEN WORKING WITHIN 15' OF THE OUTSIDE PERIMETER OF ANY TRANSMISSION PIPELINE, VERIFICATION HOLES SHOULD BE DUG USING HAND TOOLS/VACUUM EXCAVATION AT 50 FT INTERVALS OVER TRANSMISSION MAIN THAT RUNS ADJACENT TO A PROPOSED INDIVIDUAL CONSTRUCTION EXCAVATION.

   - WHERE CROSSING TRANSMISSION GAS PIPE WITH UTILITIES AND UNDERGROUND STRUCTURES, TEST HOLES MUST BE DUG AT THE CROSSING TO CONFIRM THE DEPTH, INVERT ELEVATION, AND SEPARATION.

   - ONCE THE EXACT ALIGNMENT OF TRANSMISSION PIPING HAS BEEN VERIFIED USING HAND TOOLS AND VACUUM EXCAVATION, POWERED EXCAVATION MAY BE USED WITHIN 15' OF THE PIPELINE, **BUT NO CLOSER THAN THE TRANSMISSION PIPELINE SAFETY ZONE (18" + 1/2 THE DIAMETER OF THE PIPELINE).**

GENERAL NOTES

1. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR SHALL SUBMIT FOR REVIEW A SCHEDULE OF OPERATIONS IN ADDITION TO OTHER CONTRACT REQUIREMENTS TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, HIGHWAY DIVISION.
2. WHERE THE NEW CONSTRUCTION COINCIDES WITH PRESENT TRAVELED WAYS, THE CONTRACTOR SHALL PERFORM THEIR WORK IN A MANNER ACCEPTABLE TO THE ENGINEER SO THAT INTERFERENCE TO BUSINESSES AND ABUTTERS, ON ACCOUNT OF THE CONSTRUCTION WORK, IS KEPT TO A MINIMUM. THE CONTRACTOR WILL NOT BE ALLOWED TO PARK EQUIPMENT OR STOCKPILE MATERIAL ON THE TRAVELED WAYS OVERNIGHT OR WHEN NOT IN USE. THE CONTRACTOR SHALL MAINTAIN SAFE AND REASONABLE ACCESS TO AND FROM ABUTTING PROPERTIES AT ALL TIMES AT NO ADDITIONAL COST.
3. THE CONTRACTOR SHALL EXCAVATE TEST PITS TO VERIFY LOCATIONS OF EXISTING UTILITIES AS DIRECTED BY THE ENGINEER.
4. THE CONTRACTOR SHALL COORDINATE THIS WORK WITH THE UTILITY COMPANIES DOING WORK IN THE SAME AREA. THE CONTRACTOR SHALL ALLOW THE UTILITY COMPANIES AND THEIR REPRESENTATIVES TO INSTALL THEIR SYSTEMS WITHIN MASSDOT AND/OR TOWN OWNED STREETS AND EASEMENTS.
5. THE CONTRACTOR'S ATTENTION IS DIRECTED TO EXISTING LABELED SEWER MANHOLE OR DRAINAGE MANHOLE COVERS SHOWN ON THE PLANS AS THEY MAY NOT ACCURATELY REPRESENT THE UNDERGROUND SERVICE. PRIOR TO ANY WORK THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF AN EXISTING COVER NOT ACCURATELY REPRESENTING THE SERVICE BELOW.
6. NO EXISTING PUBLIC UTILITY STRUCTURES SHALL BE ABANDONED AND/OR DISMANTLED WITHOUT AUTHORIZATION FROM THE ENGINEER.
7. THE CONTRACTOR SHALL PROVIDE METHODS DURING DEWATERING OPERATIONS AND FOR STORM WATER RUNOFF NOT TO ALLOW SILT OR DEBRIS TO ENTER EXISTING DRAINAGE FACILITIES OR CREATE NUISANCES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING EXISTING OR NEW FACILITIES IF SILTATION OCCURS DUE TO THE CONTRACTOR'S OPERATIONS.
8. FINAL LOCATION OF TRAFFIC SIGNS AND SUPPORTS SHALL BE SHOWN ON THE TRAFFIC PLAN AND MAY, IF NECESSARY, AT DISCRETION OF THE ENGINEER, BE MODIFIED IN THE FIELD AS APPROPRIATE.
9. DETAILS FOR SIGN SUPPORTS SHALL BE IN ACCORDANCE WITH MASSDOT STANDARD DRAWINGS.
10. DAMAGE OF PROPERTY BEYOND THE WORK LIMITS CAUSED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE, SUBJECT TO THE APPROVAL OF THE ENGINEER AND ACCEPTANCE OF THE PROPERTY OWNER.
11. THE CONTRACTOR SHALL CLEAR AND GRUB/REMOVE DEBRIS WITHIN THE LIMITS OF THE SHLO AND EASEMENT AREAS.
12. THE CONTRACTOR SHALL DISPOSE OF ALL WASTE MATERIAL IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS AT THEIR OWN EXPENSE IF NOT OTHERWISE SPECIFIED, OUTSIDE OF THE PROJECT LIMITS.
13. ALL EXISTING TOWN AND PRIVATE UTILITY CASTINGS SUCH AS WATER BOXES, CURB STOPS, MANHOLE FRAMES AND COVERS, CATCH BASIN FRAME AND GRATES AND OTHER CASTINGS SHALL BE ADJUSTED BY THE CONTRACTOR TO LINE AND GRADE AS DIRECTED BY THE ENGINEER UNLESS OTHERWISE SPECIFIED IN THE SPECIAL PROVISIONS OR ON THE CONTRACT PLANS.
14. THE CONTRACTOR SHALL PROVIDE ACCESS TO ALL UTILITIES THROUGHOUT THE PROJECT SO THAT THE VARIOUS UTILITY OWNERS HAVE ACCESS TO VAULTS AND MANHOLES TO OPERATE VALVES AND OTHER CONTROLS ON THEIR SYSTEM.
15. THE LOCATIONS OF PROPOSED PIPELINES, STRUCTURES AND UTILITY RELOCATIONS MAY BE MODIFIED TO SUIT FIELD CONDITIONS AT THE DISCRETION OF THE ENGINEER.
16. OFFSETS TO CATCH BASINS ARE TO THE CENTER OF THE GRATE.
17. IF THE CONTRACTOR DAMAGES UTILITY SERVICES, THEY SHALL IMMEDIATELY NOTIFY THE RESPECTIVE UTILITY COMPANY AND SHALL IMMEDIATELY REPLACE OR REPAIR, UNLESS INDICATED OTHERWISE BY THE RESPECTIVE UTILITY OWNER.
18. ALL PROPOSED DRAINAGE CONNECTIONS TO EXISTING STRUCTURES WILL BE INCLUDED IN THE COST OF INSTALLATION OF THE NEW PIPE OR STRUCTURE.
19. RIM ELEVATIONS MAY BE SUBJECT TO FIELD ADJUSTMENTS AS DIRECTED BY THE ENGINEER. ELEVATIONS ON CATCH BASINS ARE REFERENCED TO THE CENTER OF GRATE AT FACE OF CURB.
20. WHERE WATERLINES, DRAINAGE PIPES OR STRUCTURES ARE ABANDONED IN PLACE, CONTRACTOR SHALL MAKE SURE THAT ALL CONNECTING PIPES, INLETS AND OUTLETS ARE PLUGGED. ALL LIVE CONNECTIONS SHALL BE CONNECTED TO THE NEW SYSTEM.
21. WHEN A PROPOSED CATCH BASIN INTERFERES WITH ANY UNDERGROUND UTILITY, A GUTTER INLET SHALL BE USED.
22. ALL EXISTING DRAINAGE STRUCTURES AND PIPE TO REMAIN WITHIN THE PROJECT LIMITS SHALL BE CLEANED AND SEDIMENT DISPOSED OF.
23. DRAINAGE ELEVATIONS ARE PROVIDED FOR DESIGN PURPOSES ONLY. THE CONTRACTOR SHALL VERIFY, BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED DRAINAGE DESIGN. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER. ONLY AFTER THE CONTRACTOR VERIFIES ELEVATIONS FOR THE CONSTRUCTABILITY OF THE DRAINAGE SYSTEM SHALL ANY OF THE STRUCTURES BE ORDERED.
24. ALL PEDESTRIAN CURB RAMPS SHALL CONFORM TO THE MASSACHUSETTS ARCHITECTURAL ACCESS BOARD (AAB) RULES AND REGULATIONS AND THE AMERICANS WITH DISABILITIES ACT (ADA) GUIDELINES. SEE LATEST MASSDOT CONSTRUCTION STANDARDS.
25. IN ALL LOCATIONS WHERE PROPOSED SIDEWALK TRANSITIONS TO MEET EXISTING GRADE, SIDEWALK OR PAVED AREA, SLOPE SHALL NOT EXCEED 1:12.
26. AN UNOBSTRUCTED PATH OF TRAVEL WITH A MINIMUM WIDTH OF 3'-0" SHALL BE MAINTAINED PAST ALL OBSTRUCTIONS (UTILITY POLES, SIGNS, SIGNAL FOUNDATIONS AND MASTS, MAILBOXES, ALONG DRIVE OPENINGS, ETC.)
27. EXISTING CURB (GRANITE AND CONCRETE) IN GOOD CONDITION SHALL BE RESET. NEW CURB SHALL BE USED ONLY AFTER ALL EXISTING CURB HAS BEEN RESET.
28. ADA COMPLIANT ACCESS MUST BE MAINTAINED AT ALL TIMES.
29. THE CONTRACTOR SHALL COORDINATE THIS WORK WITH THAT OF ADJACENT PROJECTS UNDERWAY AT THE SAME TIME.

RESTORATION NOTES:

1. DECOMPACT (SCARIFY) AREAS OF COMPACTED SOIL, RESTORE WITH COMPOST BLANKET, CORRESPONDING SEED MIX AND JUTE MESH IF REQUIRED FOR STEEP SLOPES.
2. COMPOST BLANKET AND SEEDING SHALL OCCUR AFTER FINAL GRADING. TEMPORARY SEEDING MAY BE UTILIZED TO STABILIZE EXPOSED SURFACES IF STABILIZATION WILL NOT OCCUR WITHIN 14 DAYS OF THE DISTURBANCE.
3. SEEDING WITH COMPOST BLANKET SHALL BE PER THE SPECIAL PROVISIONS.
4. SEED RATES SHALL BE INCREASED AS SPECIFIED FOR SLOPE CONDITIONS.

EROSION AND SEDIMENT CONTROL NOTES:

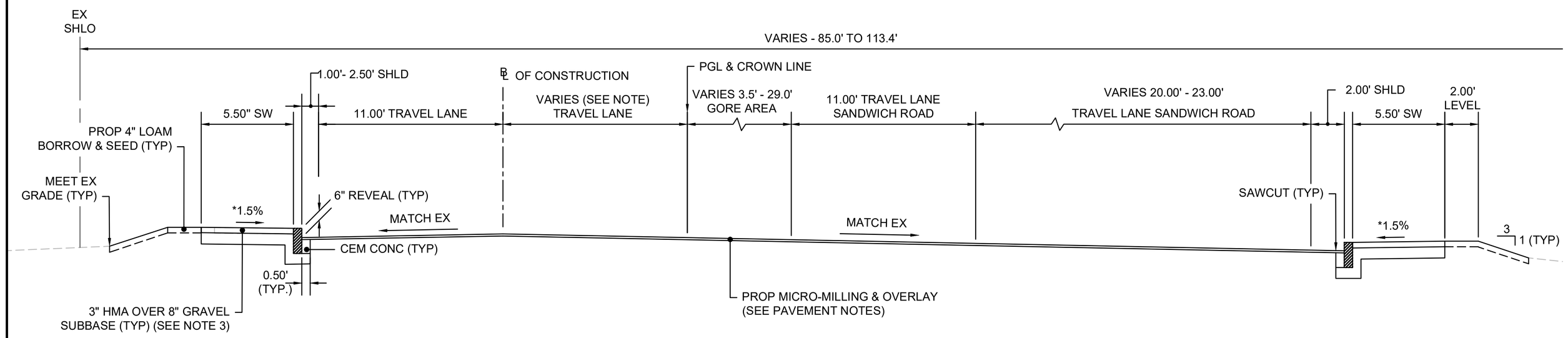
1. COMPOST FILTER TUBES (OR SIMILAR BARRIER APPROVED BY THE ENGINEER) SHOWN ON LANDSCAPE PLAN SHALL BE LEFT TO DEGRADE OVER TIME AND THEREFORE MUST BE COMPRISED OF 100% BIODEGRADABLE MATERIALS- BURLAP, COTTON, HEMP, ETC.
2. USE SHALL BE IF AND WHERE NEEDED AND AS APPROVED BY THE ENGINEER. PLACEMENT SHALL BE WHERE MOST EFFECTIVE TO REDUCE POTENTIAL EROSION OF SLOPES UNTIL AT LEAST 75% VEGETATIVE COVER ESTABLISHES.
3. THE EROSION AND SEDIMENTATION CONTROLS SHOWN ON THE PLANS ARE INTENDED TO REPRESENT THE MINIMUM CONTROLS NECESSARY TO MEET ANTICIPATED SITE CONDITIONS. ADDITIONAL MEASURES SHALL BE IMPLEMENTED AS CONDITIONS WARRANT OR AS DIRECTED BY THE ENGINEER.
4. THE CONTRACTOR SHALL MAINTAIN EROSION CONTROLS THROUGHOUT CONSTRUCTION. THE CONTRACTOR SHALL REPLACE DAMAGED EROSION CONTROLS AT THE OWNER AND ENGINEER'S REQUEST AT NO ADDITIONAL EXPENSE TO THE OWNER.
5. THE CONTRACTOR SHALL NOT LEAVE DISTURBED AREAS UNSTABILIZED FOR PERIODS MORE THAN 14 DAYS. PROVIDE TEMPORARY SEED OR MULCH ON DISTURBED AREAS THAT WILL REMAIN EXPOSED FOR GREATER THAN 14 DAYS.

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	47
PROJECT FILE NO.	606352		

TYPICAL SECTIONS

606352_HD(TYPICALS).DWG Plotted on 27-Feb-2025 10:33 AM

Proposal No. 606532-136278

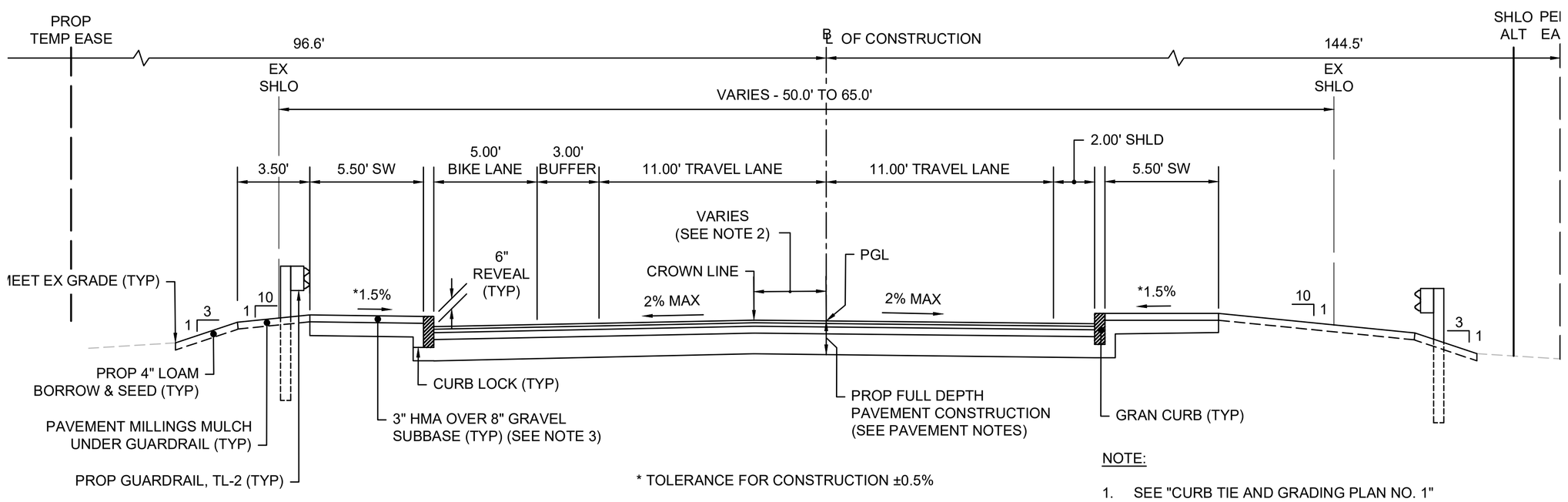


* TOLERANCE FOR CONSTRUCTION ±0.5%

TYPICAL SECTION - MILL AND OVERLAY
STA 11+76.50 TO 12+55.00
NOT TO SCALE

NOTE:

1. SEE "CURB TIE AND GRADING PLAN NO.1" FOR PGL AND CROWN LINE OFFSETS.

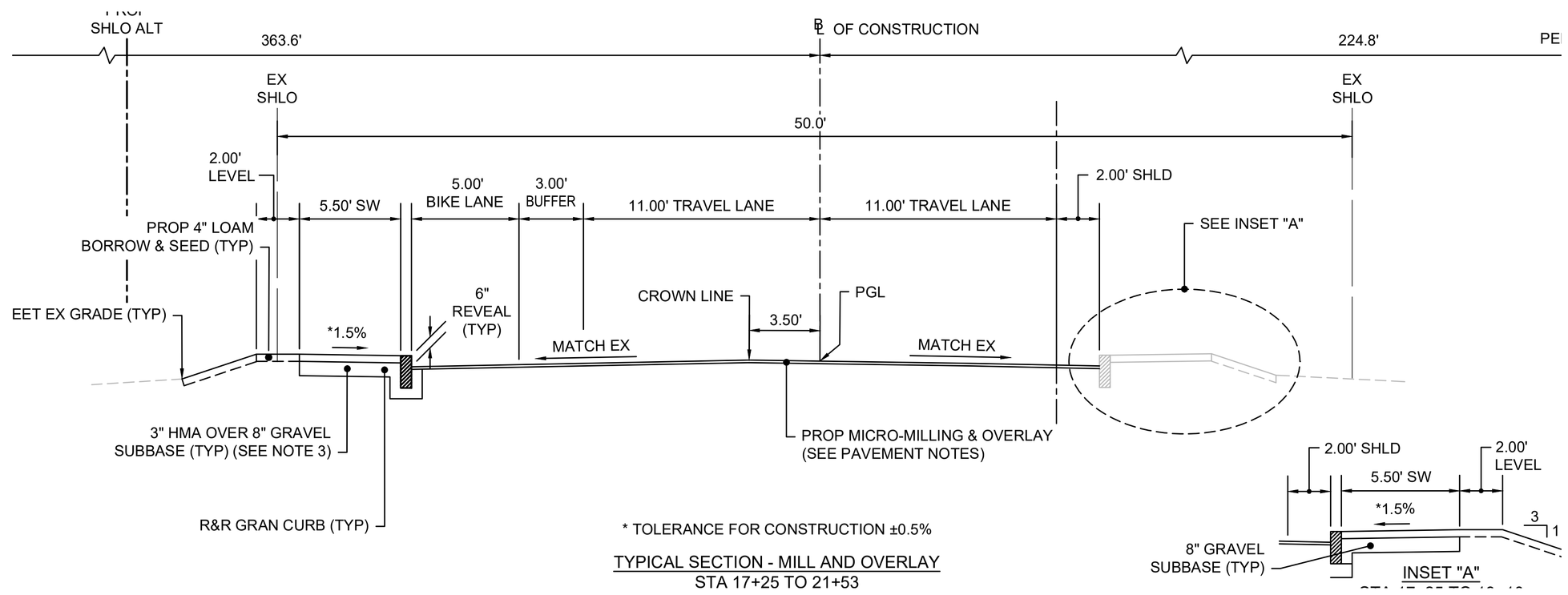


* TOLERANCE FOR CONSTRUCTION ±0.5%

TYPICAL SECTION - FULL DEPTH RECONSTRUCTION
STA 12+55.00 TO 14+96.62
STA 15+53.29 TO 17+25.00
NOT TO SCALE

NOTE:

1. SEE "CURB TIE AND GRADING PLAN NO. 1" FOR PGL AND CROWN LINE OFFSETS.



* TOLERANCE FOR CONSTRUCTION ±0.5%

TYPICAL SECTION - MILL AND OVERLAY
STA 17+25 TO 21+53

PAVEMENT NOTES

PROPOSED FULL DEPTH CONSTRUCTION

SURFACE COURSE:	1.5" SUPERPAVE BRIDGE SURFACE COURSE - 9.5 (SSC-B-9.5)
INTERMEDIATE COURSE:	2.5" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0)
BASE COURSE:	4.5" SUPERPAVE BASE COURSE - 37.5 (SBC-37.5)
SUBBASE:	4" DENSE GRADED CRUSHED STONE FOR SUB-BASE OVER 8" GRAVEL
SUBGRADE	SPECIAL BORROW AS REQUIRED BASED ON EXISTING SUBGRADE MATERIALS

PROPOSED MICROMILL AND OVERLAY

MICROMILL:	1.5 EXISTING PAVEMENT
OVERLAY	1.5" SUPERPAVE SURFACE COURSE - 9.5 (SSC-9.5)

PROPOSED HMA DRIVEWAY

SURFACE COURSE:	1.5" SUPERPAVE SURFACE COURSE - 9.5 (SSC-9.5) 2.5" SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5)
BASE COURSE:	8" SUITABLE EXISTING GRAVEL ADD GRAVEL BORROW, TYPE B AS REQUIRED

PROPOSED HMA SW

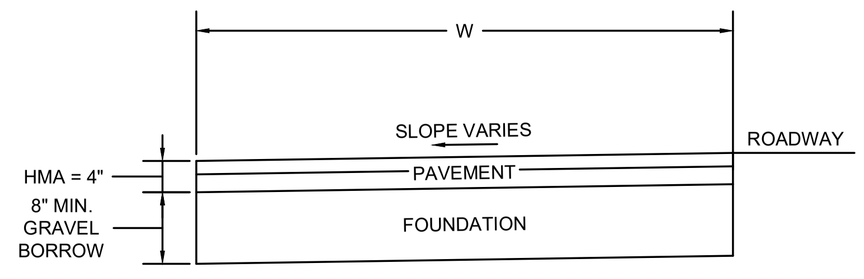
SURFACE COURSE:	1.25" SUPERPAVE SURFACE COURSE - 9.5 (SSC-9.5) 1.75" SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5)
BASE COURSE:	8" GRAVEL BORROW, TYPE B

PROPOSED CEMENT CONCRETE WHEELCHAIR RAMPS

SURFACE COURSE:	4" CEMENT CONCRETE (AIR RETAINED, 4000 PSI, 3/4, 610)
BASE COURSE:	8" GRAVEL BORROW, TYPE B

NOTES:

1. ASPHALT EMULSION FOR TACK COAT SHALL BE SPRAYED FOR 95% UNIFORM COVERAGE PRIOR TO PAVING
2. ALL HMA SHALL BE IN ACCORDANCE WITH SECTION 450.
3. ALL GRAVEL BORROW MEETING SPECIFICATION SHALL BE RETAINED IN PLACE, COMPACTED, AND LEVELED AS REQUIRED.



LEGEND
W = WIDTH
HMA = 4" HOT MIX ASPHALT
(1.5" SUPERPAVE SURFACE COURSE- 9.5 (SSC-9.5) OVER
2.5" SUPERPAVE SURFACE COURSE SURFACE- 12.5 (SSC 12.5))

DRIVEWAY APRON DETAIL
NOT TO SCALE

HIGHWAY GUARD DETAILS

TRAILING ANCHORAGE
STA 14+24.98 LT TO STA 14+33.98 LT
STA 16+43.85 LT TO STA 16+53.17 LT
STA 16+44.03 RT TO STA 16+53.40
STA 16+51.17 LT TO STA 16+60.54 LT

GUARDRAIL, TL-2 (SINGLE FACED)
STA 14+33.98 LT TO STA 14+63.96 LT
STA 15+88.38 LT TO STA 16+43.85 LT
STA 15+88.38 RT TO STA 16+44.03 RT

TRANSITION TO BRIDGE RAIL
STA 14+63.96 LT TO STA 14+96.71 LT
STA 15+54.57 LT TO STA 15+88.38 LT
STA 15+54.57 RT TO STA 15+88.38 RT

GUARDRAIL TANGENT END TREATMENT, TL-2
STA 17+46.78 LT TO STA 17+59.27 LT

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEETS 11 AND 12

DRAINAGE DETAILS

SEE SHEETS 11 AND 12

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	47
PROJECT FILE NO.	606352		

CONSTRUCTION PLAN NO. 1

INSET A

R&D EXIST FISHWAY EXIT
#10 OLD GLEN CHARLIE ROAD
MAP 129 LOT 1162
TOWN OF WAREHAM
#6-8 OLD GLEN CHARLIE ROAD
MAP 129 LOT RA
ERIN K. MACLURE
DEED BOOK 50537 PAGE 166
PLAN BOOK 11 PLAN 1115
LIMIT OF DISTURBANCE (TYP)
#2848
MAP 129 LOT 1078
WAREHAM LAND TRUST, INC.
DEED BOOK 37870 PAGE 247
PROP S.H.L.O. ALT NO. 8953
VEGETATED WETLAND
APPROX. EDGE OF RIVER 11/16/22
WF A-2
WF A-3
WF A-5
WF A-6
WF A-7
WF A-8
WF A-10
WF A-12
WF A-13
S-101
S-102
S-103
S-104
S-105
S-106 A-1
S-107
S-108
S-109
S-110 A-14
P-105
P-106
P-107
P-108
P-109
P-110
P-111
P-112
P-113
P-114
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P-128
P-129
P-130
P-131
P-132
P-133
P-134
P-135
P-136
P-137
P-138
P-139
P-140
P-141
P-142
P-143
P-144

WARE HAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	47

PROJECT FILE NO. 606352

CONSTRUCTION PLAN NO. 2

HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS
SEE SHEET 5	NONE	SEE SHEETS 11 AND 12	SEE SHEETS 11 AND 12

CONTINUED ON SHEET NO. 5

FOR PROFILE: SEE SHEET NO. 8

SCALE: 1" = 20'

0 20 50 100

RECONSTRUCTION AND OVERLAY

STA 17+25

PROP STEEL W-BEAM TANGENT END TREATMENT TL-2

END PROP S.H.L.O ALT NO. 8953

PROP HMA DWY 2-2

#2850
MAP 129 LOT 107.7
JAS REALTY, LLC
DEED BOOK 57625 PAGE 52

BEGIN PROP S.H.L.O ALT NO. 8953

PROP PERMANENT EASEMENT

NAD 83

N

#2854
MAP 129 LOT 107.6
JAS REALTY, LLC
DEED BOOK 58294 PAGE 52
PLAN 377 OF 2003
PLAN BOOK 36 PLAN 746

#2856
MAP 129 LOT 107.5
2856 REALTY TRUST
DEED BOOK 56177 PAGE 152
PLAN BOOK 3556 PLAN 466

PROP TEMP EASEMENT

PROP HMA DWY 2-4

PROP SAWCUT MEET EX PVMT

RET MB

PROP VGC

PROP HMA DWY 2-3

END PROP S.H.L.O ALT NO. 8953

PROP TEMP EASEMENT

PROP HMA DWY 2-5

PROP BERM

PROP TEMP EASEMENT

PROP LOAM & SEED

PROP HMA SW

PROP GRAN TRANS CURB

RET INLET STONE

PROP LOAM & SEED

PROP HMA DWY 2-6

RET CONC SW

END RAD SW
END RAD VGC
END PROP VGC

PROP SAWCUT MEET EX PVMT

BEGIN PROP SW

BEGIN RAD VGC

PROP LOAM & SEED

PROP PCR 2-2 WITH DETECTABLE WARNING PANEL

PROP TEMP EASEMENT

#2858
MAP 129 LOT 109.3,A
TOWN OF WAREHAM
DEED BOOK 12544 PAGE 81

PROJECT END
STA 21+53
N27393.49,736.1
E881496.3048

PROP MILL AND OVERLAY

RET CURB

PROP SAWCUT MEET EX PVMT

RET CURB

RET CURB

RET CURB

RET BIT SW

RET BIT SW

LOCATION LINE OF 1925 SHLO 2313

BIT CONC PARKING

APPROX.

APPROX.

#2859
MAP 129 LOT 115.3,A1
N/F
SBJC REALTY, LLC
DEED BOOK 50614 PAGE 189
PLAN BOOK 45 PLAN 1048

GRASS

EX HUMP SHOULD BE LEVELED BY MILLING TO ALLOW FOR POSITIVE DRAINAGE

(1925 STATE HWY ALTERATION LAYOUT NO. 2313)

CRANBERRY HWY WESTBOUND
(RTE 6 & 28)

END RAD SW
END RAD VGC
END PROP HMA SW
END PROP VGC

LIMIT OF DISTURBANCE (TYP)

PROP TEMP EASEMENT

PROP HMA DWY 2-1

PROP PERMANENT EASEMENT 5.5' WIDTH

PROP HMA SW

PROP LOAM & SEED

GRANITE BLOCKS (TYP)

MASONRY

HEDGE

EOP

#2855
MAP 129 LOT 115.1
N/F
WAREHAM LODGE NO. 1548
BENEVOLENT AND PROTECTIVE ORDER OF
THE ELKS OF THE UNITED STATES OF
AMERICA
DEED BOOK 1602 PAGE 395

#2855
1 STORY
WOOD
"WAREHAM LODGE 73
NEW BEDFORD ELKS"

DOOR

CONC STEPS

CONCRETE

PLANTER

CRW

WOOD RAMP

EOG

CONC. WALK

ELM ST
PRIVATE WAY
(ASSUMED 33' WIDE)
(F.K.A. ELM STREET)
UNKNOWN OWNER

OLD GLEN CHARLIE RD
(PUBLIC – 1933 TOWN LAYOUT)

#2854
MAP 129 LOT 107.6
JAS REALTY, LLC
DEED BOOK 58294 PAGE 52
PLAN 377 OF 2003
PLAN BOOK 36 PLAN 746

#2856
MAP 129 LOT 107.5
2856 REALTY TRUST
DEED BOOK 56177 PAGE 152
PLAN BOOK 3556 PLAN 466

#2858
MAP 129 LOT 109.3,A
TOWN OF WAREHAM
DEED BOOK 12544 PAGE 81

#2859
MAP 129 LOT 115.3,A1
N/F
SBJC REALTY, LLC
DEED BOOK 50614 PAGE 189
PLAN BOOK 45 PLAN 1048

#2855
MAP 129 LOT 115.1
N/F
WAREHAM LODGE NO. 1548
BENEVOLENT AND PROTECTIVE ORDER OF
THE ELKS OF THE UNITED STATES OF
AMERICA
DEED BOOK 1602 PAGE 395

RAD EX GUARDRAIL AND POSTS

+25.00
OFFSET: 0.00

PROP SAWCUT

END PVMT MILLINGS

PROP LOAM & SEED

END PVMT MILLINGS

PROP STEEL W-BEAM GUARDRAIL TL-2 (TYP)

BEGIN PROP S.H.L.O ALT NO. 8953

PROP PERMANENT EASEMENT

PROP COMPOST FILLER TUBE (TYP)

PROP HMA SW 5.5' WIDTH

PROP TEMP EASEMENT

END PROP HMA SW

PROP LOAM & SEED ISLAND

RAD BIT BERM

PROP GRAN TRANSITION

CONST ℄

CROWN OF ROAD

PROP LOAM & SEED ISLAND

PROP VGC

PROP HMA SW

RAD INLET STONE

RET CURB

PROP SAWCUT MEET EX PVMT

RET CURB

RET INLET STONE

RAR MAILBOX

APPROXIMATE

DRIVEWAY EASEMENT

PROP LOAM & SEED

PROP HMA DWY 2-6

PROP GRAN TRANS CURB

PROP HMA DWY 2-5

PROP TEMP EASEMENT

PROP PCR 2-1 WITH DETECTABLE WARNING PANEL

END RAD VGC
END PROP VGC

PROP TEMP EASEMENT

PROP SAWCUT MEET EX PVMT

PROP HMA DWY 2-3

END PROP S.H.L.O ALT NO. 8953

PROP TEMP EASEMENT

PROP HMA SW 5.5' WIDTH

PROP COMPOST FILLER TUBE (TYP)

PROP PERMANENT EASEMENT

BEGIN PROP S.H.L.O ALT NO. 8953

PROP STEEL W-BEAM GUARDRAIL TL-2 (TYP)

PROP PERMANENT EASEMENT

PROP LOAM & SEED

PROP HMA DWY 2-1

PROP HMA SW

PROP LOAM & SEED

PROP HMA DWY 2-2

END PROP S.H.L.O ALT NO. 8953

PROP STEEL W-BEAM TANGENT END TREATMENT TL-2

PROP SAWCUT

END PVMT MILLINGS

RET CURB

RET CURB

RET CURB

RET CURB

RET BIT SW

RET BIT SW

PROP SAWCUT MEET EX PVMT

RET CURB

PROP MILL AND OVERLAY

PROJECT END
STA 21+61
N27393.49,736.1
E881496.3048

PROP TEMP EASEMENT

PROP PCR 2-2 WITH DETECTABLE WARNING PANEL

PROP LOAM & SEED

BEGIN RAD VGC

BEGIN PROP SW

PROP SAWCUT MEET EX PVMT

END RAD SW
END RAD VGC
END PROP VGC

RET CONC SW

RET INLET STONE

RAD INLET STONE

RET CURB

PROP LOAM & SEED ISLAND

PROP VGC

END RAD VGC
END PROP VGC

PROP GRAN TRANSITION

CONST ℄

CROWN OF ROAD

PROP LOAM & SEED ISLAND

END PROP HMA SW

PROP LOAM & SEED

END PVMT MILLINGS

PROP SAWCUT

RAD EX GUARDRAIL AND POSTS

+25.00
OFFSET: 0.00

PROP HMA SW

PROP PERMANENT EASEMENT

PROP STEEL W-BEAM GUARDRAIL TL-2 (TYP)

BEGIN PROP S.H.L.O ALT NO. 8953

PROP COMPOST FILLER TUBE (TYP)

PROP HMA SW 5.5' WIDTH

PROP TEMP EASEMENT

END PROP S.H.L.O ALT NO. 8953

PROP PERMANENT EASEMENT

PROP LOAM & SEED

PROP HMA DWY 2-2

END PROP S.H.L.O ALT NO. 8953

PROP STEEL W-BEAM TANGENT END TREATMENT TL-2

PROP SAWCUT

END PVMT MILLINGS

RECONSTRUCTION AND OVERLAY

STA 17+25

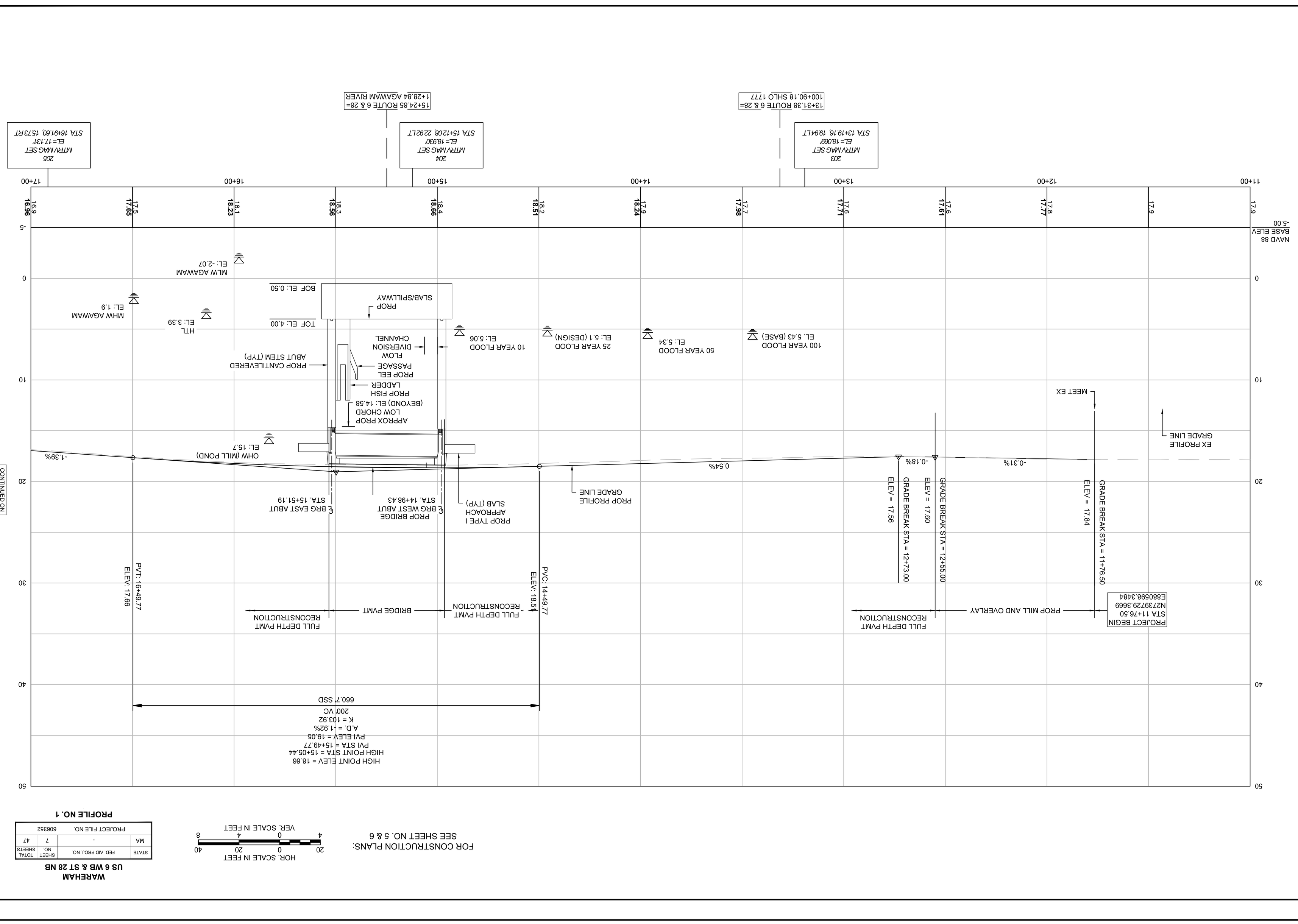
1917 SHLO 1777 BASELINE

L1

L2

PI +69.61

606352_HDCONSTRUCTION 2.DWG Plotted on 27-Feb-2025 10:34 AM



FOR CONSTRUCTION PLANS:
SEE SHEET NO. 5 & 6

HOR. SCALE IN FEET
20 0 20 40
VER. SCALE IN FEET
4 0 4 8

WAREHAM
US 6 WB & ST 28 NB

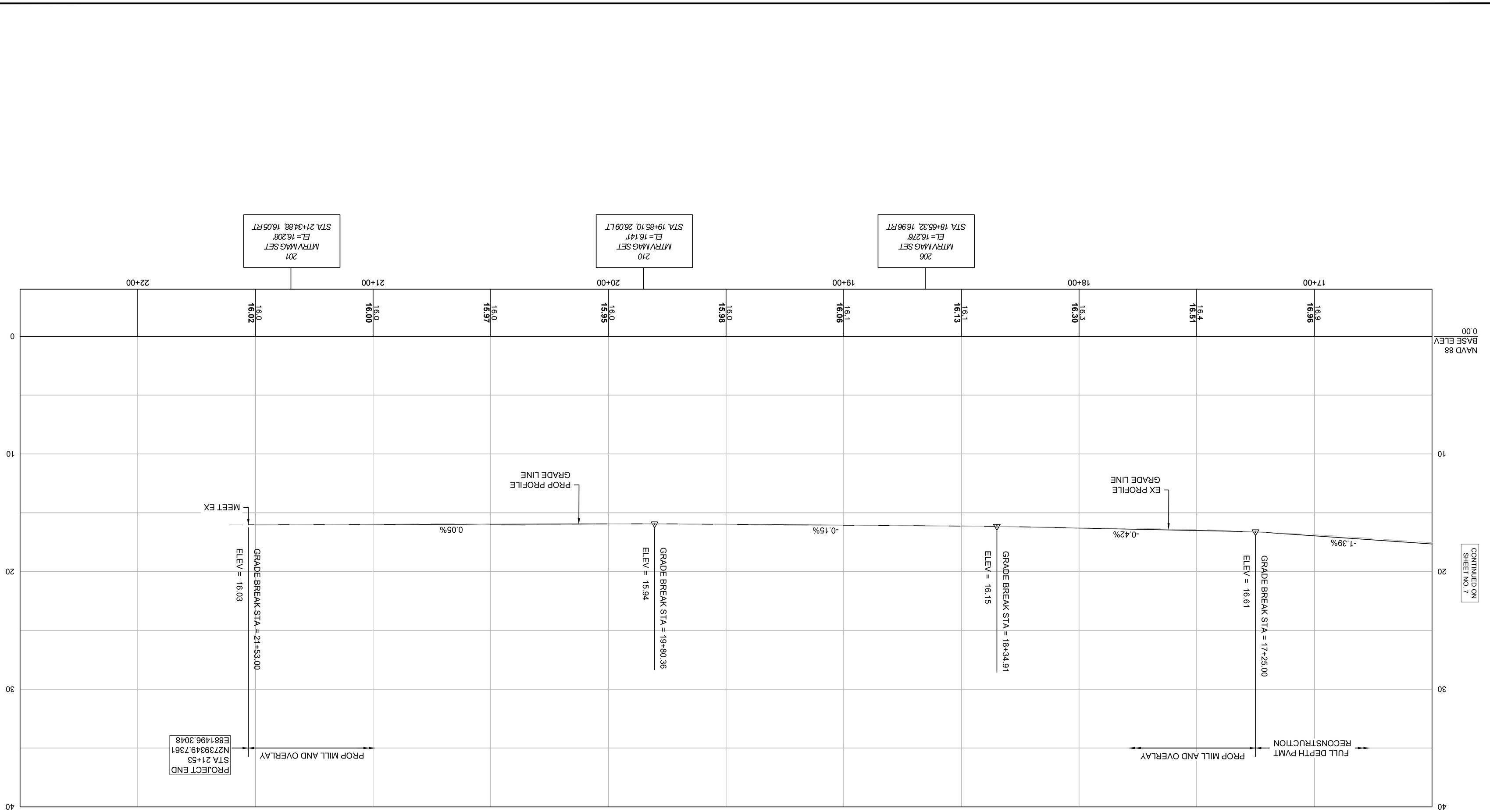
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	7	47
PROJECT FILE NO. 606352			

PROFILE NO. 1

606352_HDPROFILE1.DWG Plotted on 27-Feb-2025 10:34 AM

A00840 - 363

Proposal No. 606532-136278



FOR CONSTRUCTION PLANS:
SEE SHEET NO. 5 & 6

HOR. SCALE IN FEET
20 0 20 40

VER. SCALE IN FEET
4 0 4 8

WARE HAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	8	47
PROJECT FILE NO. 606352			

PROFILE NO. 2

606352_HD(PROFILE).DWG Plotted on 27-Feb-2025 10:35 AM

A00840 - 364

Proposal No. 606532-136278

606352_HD\DRAINAGE 1).DWG Plotted on 27-Feb-2025 10:35 AM

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	47
PROJECT FILE NO.	606352		

DRAINAGE & UTILITY PLAN NO. 1

N

NAD 83

PROJECT BEGIN
STA 11+76.50
N2739729.3669
E880598.3484

AMES ISLAND RD

(RTE 6 & 28)
CRANBERRY HWY

(RTE 6) SANDWICH RD
(1925 STATE HWY ALERATION LAYOUT NO. 2313)

#2842
MAP 129 LOT 1073
N/F
KELLEY'S MARINE, INC.
DEED BOOK 46158 PAGE 251

#2844
MAP 129 LOT 1074
COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF FISHERIES, WILDLIFE AND
ENVIRONMENTAL LAW ENFORCEMENT
LC CERTIFICATE 64582
LC DOCUMENT 410556 (TAKING)
LC DOCUMENT 715880 (ORDER)
LC PLAN 38403-A

#2841
MAP 129 LOT 1148.A
N/F
LYNCH FAMILY LIVING TRUST
DEED BOOK 26889 PAGE 147
PLAN BOOK 3944 PLAN 191

MAP 129 LOT 1148.B
N/F
LYNCH FAMILY LIVING TRUST
DEED BOOK 26889 PAGE 147
PLAN BOOK 3944 PLAN 191

MAP 129 LOT 1148.C
COMMONWEALTH OF
MASSACHUSETTS
DEED BOOK 11494
PAGE 48
PLAN 699 OF 1992

#2845
MAP 129 LOT 1149
WAREHAM LAND TRUST, INC.
DEED BOOK 37870 PAGE 247

#2849
MAP 129 LOT 1150
WAREHAM B. P. O. ELKS, #1548
DEED BOOK 3061 PAGE 48
PLAN BOOK 1 PLAN 544

MAP 129 LOT 1161
AGAWAM MILL POND
OWNER UNKNOWN

AGAWAM MILL POND

AGAWAM RIVER

WAREHAM LAND TRUST, IN
BOOK 37870 PAGE 247
#2848 CRANBERRY HWY

PROP PERMANENT EASEMENT

DEMOLISH EX CULVERT
CONSTRUCT PROP BRIDGE W-06-020 (CCV) &
SPILLWAY (SEE BRIDGE PLANS FOR DETAILS)

LIMIT OF DISTURBANCE (TYP)

PROP PERMANENT EASEMENT

PROPOSED NORMAL POOL EL: 14.3

PROPOSED ORDINARY HIGH WATER EL: 15.7

PROPOSED NORMAL POOL EL: 14.3

PROPOSED ORDINARY HIGH WATER EL: 15.7

PROP PERMANENT EASEMENT

R&R UP#102/138 (BO EVERSOURCE)

R&R UP#102/139 w/20 ft PUSH BRACE (BO EVERSOURCE)

REM UP (BO EVERSOURCE)

LIMIT OF HYDROGRAPHIC SURVEY

PROP TEMP EASEMENT

R&R UP#102/137 w/20 ft PUSH BRACE (BO EVERSOURCE)

R&R OHW (BO)

R&R UP#102/140 w/20' PUSH BRACE (BO EVERSOURCE)

PROP WATER LINE SEE SHEET NO. 13

LOCATION LINE OF 1917 SHLO 1777

PRC +93.02

PROP LOCATION OF GAS MAIN SEE SHEET NO. 47

R&R OHW (BO)

PT +56.56

R&R OHW (BO) (TYP)

PROP OHW (BO)

REM UP (BO VERIZON)

RET UP

ADJ

CONST ℄

PROP 12" RCP
19 LF @ S=1.0%

REM UP (BO VERIZON)
R&R OHW (BO) (TYP)

RET EX PIPE
ADJ CB
ADJ MH

R&R OHW (BO VERIZON)(TYP)

TEMP RELOCATION OF GAS MAIN SEE SHEET NO. 47

TEMP OHW (BO)

RET OHW

RET UP

PROP OHW (BO)

PROP UP (BO EVERSOURCE)

RET EX FENCE

R&D WG

TEMP UP w/GUY ANCHOR (BO EVERSOURCE)

PROP SHED

TIE EXIST PIPE INTO PROP PIPE EX INV: 10.34'

R&R OHW (BO) (TYP)

PROP CONC HW INV: 10.25

TEMP OHW (BO)

TEMP UP W/ GUY ANCHOR (BO EVERSOURCE)

GRAVEL DRIVE (SEE DETAIL)

TEMP OHW (BO)

PROP OHW (BO)

PROP UP W/GUY ANCHOR (BO EVERSOURCE)

REM UP (BO VERIZON)

PROP LEVEL SPREADER (SEE DETAIL)

PROP SEDIMENT FOREBAY (TYP)

PROP UNDERDRAIN INV: 6.00

CONNECT TO EX 2" GAS MAIN, PROP 2" GATE VALVE AND BOX (BO NGRID) (TYP BOTH SIDES)

PROP PERMANENT EASEMENT

PROP SEDIMENT FOREBAY CHECK DAM (SEE DETAIL)

PROP SPILLWAY (SEE DETAIL)

CLEANOUT PORT INV: 6.2 (SEE DETAIL)

PROP PERMANENT EASEMENT

EROSION AND SEDIMENT CONTROL BARRIER (TYP)

PROP BIORETENTION BASIN (SEE DETAIL)

PROP S.H.L.O. ALT NO. 8953

PROP 6" PERFORATED PVC UNDERDRAIN

PROP LIMITS OF BIORETENTION FILTER MEDIA

CONTINUED ON SHEET NO. 10

0 20 50 100

SCALE: 1" = 20'

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	12	47
PROJECT FILE NO.	606352		

DRAINAGE & UTILITY PLAN NO. 2

606352_HD(DRAINAGE 2).DWG Plotted on 27-Feb-2025 10:35 AM

Proposal No. 606532-136278

A00840 - 366

#2854
MAP 129 LOT 1076
JAS REALTY, LLC
DEED BOOK 58294 PAGE 52
PLAN 377 OF 2003
PLAN BOOK 36 PLAN 746

#2850
MAP 129 LOT 1077
JAS REALTY, LLC
DEED BOOK 57925 PAGE 52

#2856
MAP 129 LOT 1075
2856 REALTY TRUST
DEED BOOK 56177 PAGE 182
PLAN BOOK 3556 PLAN 466

#2858
MAP 129 LOT 1093.A
TOWN OF WAREHAM
DEED BOOK 12544 PAGE 81

OLD GLEN CHARLIE RD
(PUBLIC - 1953 TOWN LAYOUT)

PROJECT END
STA 21+53
N2739349.7409
E881496.3071

PROP PERMANENT EASEMENT
PROP S.H.L.O ALT NO. 8953
PROP TEMP EASEMENT
RET UP
PROP 10' SW GUY
(BO EVERSOURCE)
PROP WATER LINE
SEE SHEET NO. 14
PROP PERMANENT EASEMENT
ADJ MH
EROSION AND SEDIMENT
CONTROL BARRIER (TYP)
R&D HYD
ADJ WG
ADJ CB
REMODEL CB
R&D FRAME AND GRATE
PROP FRAME AND GRATE
PROP TEMP EASEMENT
LOCATION LINE OF 1979 SHLO 6314
LOCATION LINE OF 1917 SHLO 1777
1917 SHLO 1777 BASELINE
PI +69.61
21+61
CONTINUED ON SHEET NO. 9
R&R OHW (BO)
PROP OHW (BO)
REM UP (BO VERIZON)
CONST ℄
TEMP OHW (BO)
RET UP
w/20' PUSH BRACE
(BO EVERSOURCE)
PROP TEMP EASEMENT
LIMIT OF DISTURBANCE (TYP)
PROP UP w/ GUY ANCHOR
(BO EVERSOURCE)
TEMP UP w/GUY ANCHOR
(BO EVERSOURCE)
LOCATION LINE OF 1925 SHLO 2313

(RTE 6 & 28)
CRANBERRY HWY WESTBOUND
(1925 STATE HWY ALTERATION LAYOUT NO. 2313)

ELM ST
PRIVATE WAY
(ASSUMED 33' WIDE)
(F.K.A. ELM STREET)
UNKNOWN OWNER

#2855
MAP 129 LOT 1151
N/F
WAREHAM LODGE NO. 1548
BENEVOLENT AND PROTECTIVE ORDER OF
THE ELKS OF THE UNITED STATES OF
AMERICA
DEED BOOK 1602 PAGE 395

#2855
1 STORY
WOOD
"WAREHAM LODGE 73
NEW BEDFORD ELKS"

#2859
MAP 129 LOT 1153.A1
N/F
SBJC REALTY, LLC
DEED BOOK 50614 PAGE 189
PLAN BOOK 45 PLAN 1048

#2850
SPLITLEVEL WOOD

#2854
2 STORY WOOD
"JC ENGINEERING INC"

#2856
1 STORY
WOOD
"GRAFIC SIGN CO."

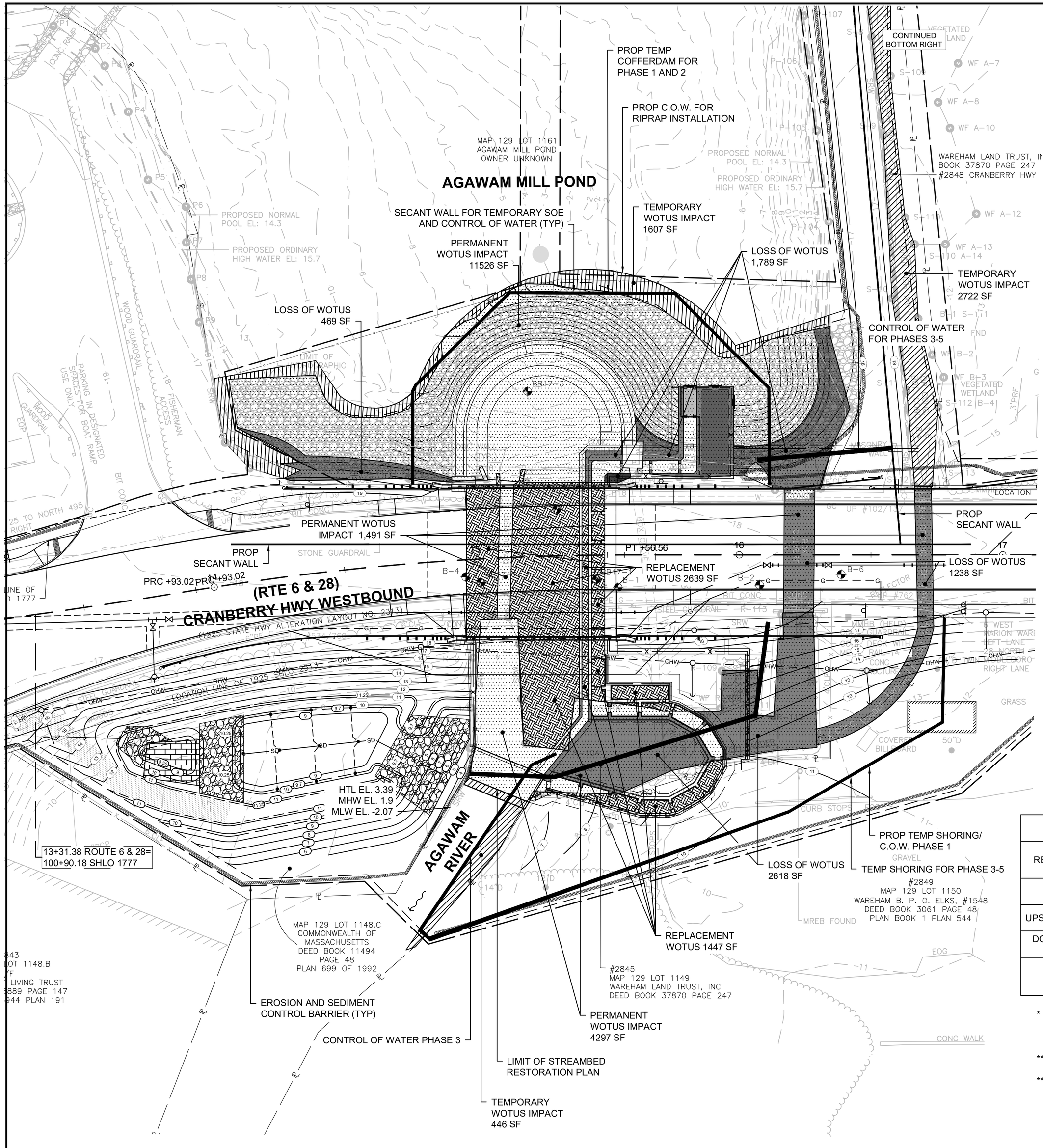
GRASS
WOODS
BIT CONC
BIT CONC PARKING
CONC PAD
CONC WALK
EOG
EOP
HEDGE
MASONRY BLOCK WALL
GRANITE BLOCKS (TYP)
WOOD RAMP
PLANTER
CONC STEPS
CONCRETE
DOOR
METAL GRATE IN CONC
UNDER CONSTRUCTION

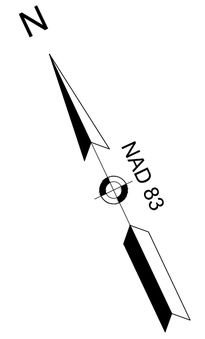
0 20 50 100
SCALE: 1" = 20'

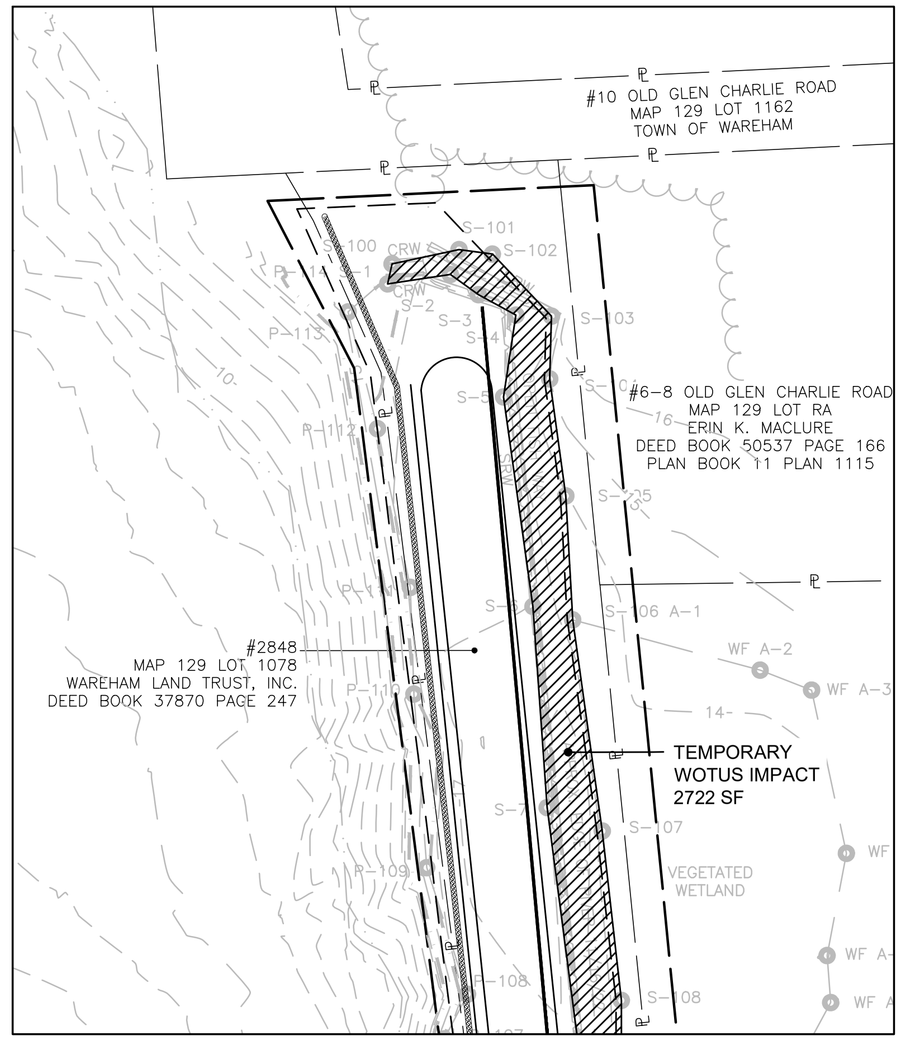
WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	47
PROJECT FILE NO.	606352		

WETLAND IMPACT PLAN







WATERS OF THE UNITED STATES (WOTUS) IMPACT SUMMARY TABLE

RESOURCE AREA	TEMPORARY IMPACTS (S.F.)	PERMANENT IMPACTS* (S.F.)	IMPACT TOTALS (S.F.)	LOSS OF WOTUS*** (S.F.)	REPLACEMENT WOTUS* (S.F.)	TOTAL (S.F.)
UPSTREAM OF DAM**	4,328	13,017	17,345	3,496	2,639	857
DOWNSTREAM OF DAM	446	4,297	4,743	2,618	1,447	1,172
		TOTAL IMPACTS TO WOTUS (S.F.)	22,088		TOTAL LOSS OF WOTUS (S.F.)	2,029

* THE PROPOSED FOOTPRINT OF DREDGED AND FILL IS THE SAME AREA AS PERMANENT IMPACTS TO WOTUS IN MILL POND. IN THE AGAWAM RIVER THE PROPOSED FOOTPRINT OF FILL IS THE SAME AREA AS PERMANENT IMPACTS, HOWEVER NOT ALL AREAS REQUIRE DREDGE (DREDGE AREA WITHIN THE AGAWAM RIVER = 2,413 S.F.).

** QUANTITIES INCLUDE CULVERTS.

*** LOSS OF WOTUS IS THE AREA IN WHICH EXISTING WOTUS IS PROPOSED TO BE CHANGED TO UPLAND OR A STRUCTURE IN ASSOCIATION WITH THE DAM AND BRIDGE STRUCTURES. AREAS WHERE WOTUS WILL BE PERMANENTLY IMPACTED BUT WILL REMAIN WOTUS ARE NOT INCLUDED IN THIS SUM. THE AREAS OF LOSS OF WOTUS ARE ALSO INCLUDED IN THE PERMANENT WOTUS IMPACT SUM.

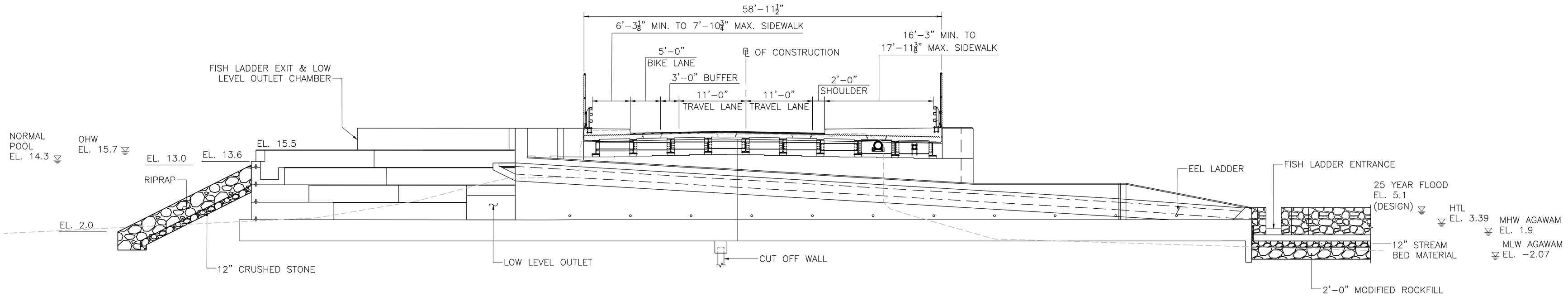
0 20 50 100

SCALE: 1" = 20'

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	12	47
PROJECT FILE NO.	606352		

SPILLWAY SECTION



PROPOSED SPILLWAY SECTION

SCALE: ⅛" = 1'–0"

Proposal No. 606532-136278

606352_BR-SPILLWAY SECTION(W060200).DWG Plotted on 27-Feb-2025 10:36 AM

A00840 - 368

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	13	47
PROJECT FILE NO.	606352		

LANDSCAPE PLAN NO. 1

PROPOSED BENCH

INTERPRETIVE SIGN

PROPOSED METAL PICKET FENCE/GUARDRAIL ON WALL

SALVAGED GRANITE LAID AS PAVEMENT

POSSIBLE TOPICS FOR INTERPRETIVE SIGNS (DEVELOPED BY OTHERS)

SIGN #1 INFORMATION ABOUT FISH LADDERS: *HOW DOES THE FISH LADDER WORK AND WHY ARE THE HERRING MIGRATING?*

SIGN #2 HISTORY OF THE EXISTING FISH RUN: *WHAT DID THE HISTORIC FISH RUN LOOK LIKE AND WHAT IS THE SIGNIFICANCE OF THE HARVEST TO INDIGENOUS PEOPLE?*

SIGN #3 GREEN INFRASTRUCTURE: *WHAT IS A BIORETENTION BASIN AND HOW DO THEY BENEFIT THE ENVIRONMENT, THE RIVER, AND WILDLIFE?*

SIGN #4 HISTORY OF THE AGAWAM MILL POND CREATION: *WHAT IS THE HISTORY OF THE POND AND THE DAM? WHEN AND WHY WAS THE RIVER DAMMED?*

SIGN #5 HISTORIC FISH WAY: *WHAT IS THIS CHANNEL AND WHAT WAS ITS PURPOSE WHEN IT FUNCTIONED? WHAT OTHER WILDLIFE ARE IMPORTANT TO THIS AREA.*

EXISTING ONSITE GRANITE TO BE SALVAGED FOR NEW IMPROVEMENTS

MAP 129 LOT 1161
AGAWAM MILL POND
OWNER UNKNOWN

AGAWAM MILL POND

MATCHLINE - SEE ANDSCAPE PLAN SHEET 2 OF 2

NAD 83

AMES ISLAND RD

(RTE 6) SANDWICH RD
(1925 STATE HWY ALERATION LAYOUT NO. 2313)

(RTE 6 & 28)
CRANBERRY HWY

LOCATION LINE OF 1917 SHLO 1777

1917 SHLO 1777 BASELINE

COMPOST & SEED OVER MODIFIED ROCK FILL AT BIORETENTION BASIN SPILLWAY

INTERPRETIVE SIGN #3

42" HT. METAL PICKET FENCE ON RET. WALL

MEADOW SEED MIX WITH MIXED PLANTING

LOW BUFFER / HEDGE PLANTING

MIXED SHRUB PLANTING AND MEADOW SEED MIX (NO TREE PLANTING PERMITTED ON UPHILL/DAM EMBANKMENT SIDE OF BIORETENTION BASIN)

CONCRETE PAVEMENT AT HARVESTING AREA

MIXED PLANTING FOR SHADING FISH LADDER

LAWN

SIGN MOUNTED TO SHED FACING STREET / ENTRANCE:
TOWN OF WAREHAM
AGAWAM HERRING RUN
ESTABLISHED IN 1838
IN OPERATION SINCE 1632

PROPOSED SHADE TREE, TYP.

PROPOSED STORAGE SHED WITH ROLL-UP DOOR & RAMP WITH SIDE DOOR, SEE STORAGE SHED DETAILS SHEET

BIORETENTION BASIN WITH STANDARD MASSDOT SEED MIXES FOR BASIN BOTTOM AND SIDE SLOPES

AGAWAM RIVER

SALVAGED GRANITE SEATWALL / EDGING WITH SALVAGED ENGRAVED "1850" STONE. ALIGNMENT FOLLOWS THE EDGE OF THE EXISTING UNDERGROUND FISH LADDER.

WOOD GUARDRAIL

SALVAGED GRANITE LAID AS PAVEMENT

INTERPRETIVE SIGN #2

METAL PICKET GATE WITH LOCK

OBSERVATION AREA:
- CONCRETE PAVEMENT
- SALVAGED GRANITE PAVEMENT
- 42" HT. METAL PICKET FENCE ON RETAINING WALL
- 2 BENCHES WITH BACKS
- WOOD GUARDRAIL

TREE AND SHRUB PLANTING ON DOWNHILL SIDE OF BIORETENTION BASIN WITH MEADOW SEED MIX

#2843
MAP 129 LOT 1148.B
N/F
LYNCH FAMILY LIVING TRUST
DEED BOOK 26889 PAGE 147
PLAN BOOK 3944 PLAN 191

MAP 129 LOT 1148.C
COMMONWEALTH OF MASSACHUSETTS
DEED BOOK 11494
PAGE 48
PLAN 699 OF 1992

EXISTING TREE TO REMAIN. REMOVE INVASIVE SPECIES IN NATURALIZED AREA IN PROJECT LIMITS

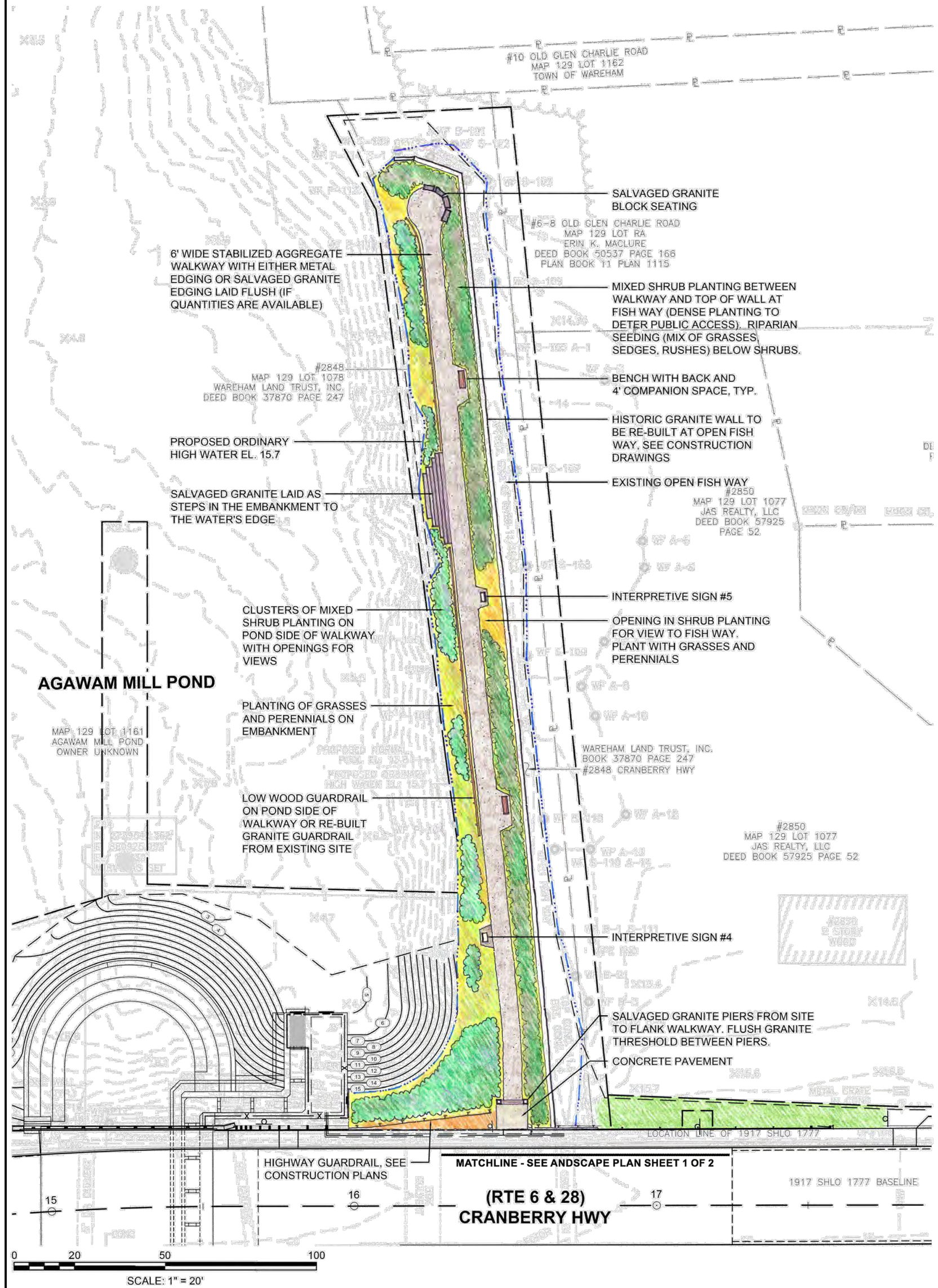
INTERPRETIVE SIGN #1

RESTORE GRAVEL PARKING

APPROX.

0 20 50 100
SCALE: 1" = 20'

WOOD GUARDRAIL (IMAGE OF EXISTING NEARBY)



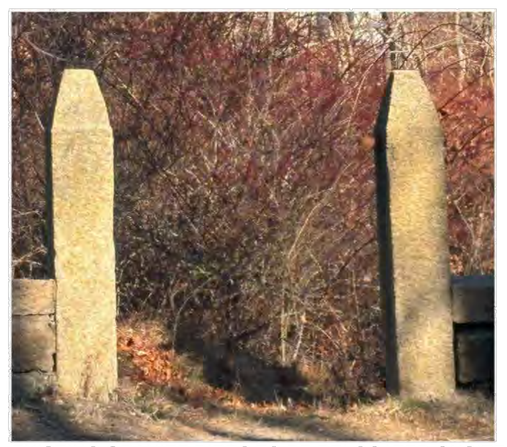
MASTER PLANT LIST

SYM	QTY	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	COMMENTS
DECIDUOUS SHADE TREES						
CO	-	Celtis occidentalis	Hackberry	2-2.5" cal.	B&B	
LT	-	Liriodendron tulipifera	Tulip Poplar	2-2.5" cal.	B&B	
NS	-	Nyssa sylvatica	Black Gum	2-2.5" cal.	B&B	
QB	-	Quercus bicolor	Swamp White Oak	2-2.5" cal.	B&B	
QR	-	Quercus rubra	Northern Red Oak	2-2.5" cal.	B&B	
ORNAMENTAL TREES						
BP	-	Betula populifolia	Gray Birch	6'-7' ht.	B&B	Multi-stem
EVERGREEN TREES						
JV	-	Juniperus virginiana	Eastern Red Cedar	6'-7' ht.	B&B	
SHRUBS						
AA	-	Aronia arbutifolia	Red Chokeberry	18"-24" HT.	CONT.	
CE	-	Cephalanthus occidentalis	Buttonbush	2.5'-3' HT.	CONT.	
IG	-	Ilex glabra	Inkberry Holly	18"-24" HT.	CONT.	
JG	-	Juniperus virginiana 'Grey Owl'	Grey Owl Juniper	12"-15" SPR.	CONT.	
JC	-	Juniperus communis	Common Juniper	12"-15" SPR.	CONT.	
LB	-	Lindera benzoin	Spicebush	2.5'-3' HT.	CONT.	
MP	-	Myrica pensylvanica	Northern Bayberry	2.5'-3' HT.	CONT.	
PM	-	Prunus maritima	Beach Plum	18"-24" HT.	CONT.	
QI	-	Quercus ilicifolia	Scrub (Bear) Oak	2.5'-3' HT.	CONT.	
RA	-	Rhus aromatica	Fragrant Sumac	18"-24" HT.	CONT.	
RA1	-	Rhus aromatica 'Gro-Low'	Gro-Low Fragrant Sumac	10"-12" SPR.	CONT.	
RV	-	Rosa virginiana	Common Virginia Rose	18"-24" HT.	CONT.	
VC	-	Viburnum nudum var. cassinoides	Witherod Viburnum	18"-24" HT.	CONT.	
VD	-	Viburnum dentatum	Arrowwood	18"-24" HT.	CONT.	
PERENNIALS & ORNAMENTAL GRASSES						
ES	-	Eragrostis spectabilis	Purple Lovegrass	1 gal.	CONT.	24" O.C. Spacing
PV	-	Panicum virgatum	Switch Grass	1 gal.	CONT.	24" O.C. Spacing
SS	-	Schizachyrium scoparium	Little Bluestem	1 gal.	CONT.	24" O.C. Spacing
SO	-	Solidago sempervirens	Seaside Goldenrod	1 gal.	CONT.	24" O.C. Spacing
SEED MIXES						
MIX ID		**MIX NAME**	**LOCATION**	**COMMENTS**		
765.472		Steep Slope Mid-Height Mix	Bioretention Basin Side Slopes	75 lbs PLS/acre		
765.553		Wetland - Riparian Mix	Bioretention Basin Bottom	20 lbs PLS/acre		
765.442		Roadside Riverbank	Bioretention Basin Outfall	15 lbs PLS/acre		
765.423		Mid-Height Pollinator Mix	Meadow Seed Mix	20 lbs PLS/acre		
ERNMX-175		Ernst Conservation Seeds: Waterfowl Buffet Mix for Wetland Enhancement	Under-planting on Pond Embankment / Riparian Edges	*Carex vulpinoidea, Carex lurida, Elymus virginicus, Carex scoparia, Carex crinita, Juncus effusus, Carex stipata, Scirpus validus, Carex stricta*		

PROPOSED BENCH

SALVAGED GRANITE STEPS TO WATER'S EDGE

EXAMPLE OF STABILIZED AGGREGATE WALKWAY


EXISTING GRANITE PIERS TO BE RELOCATED ONSITE

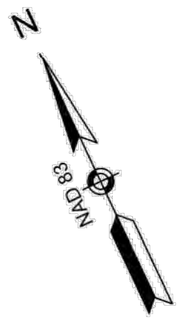
EXISTING GRANITE GUARDRAIL TO BE RELOCATED ONSITE OR SALVAGED

WOOD GUARDRAIL (IMAGE OF EXISTING NEARBY)

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	14	47
PROJECT FILE NO.	606352		

LANDSCAPE PLAN NO. 2

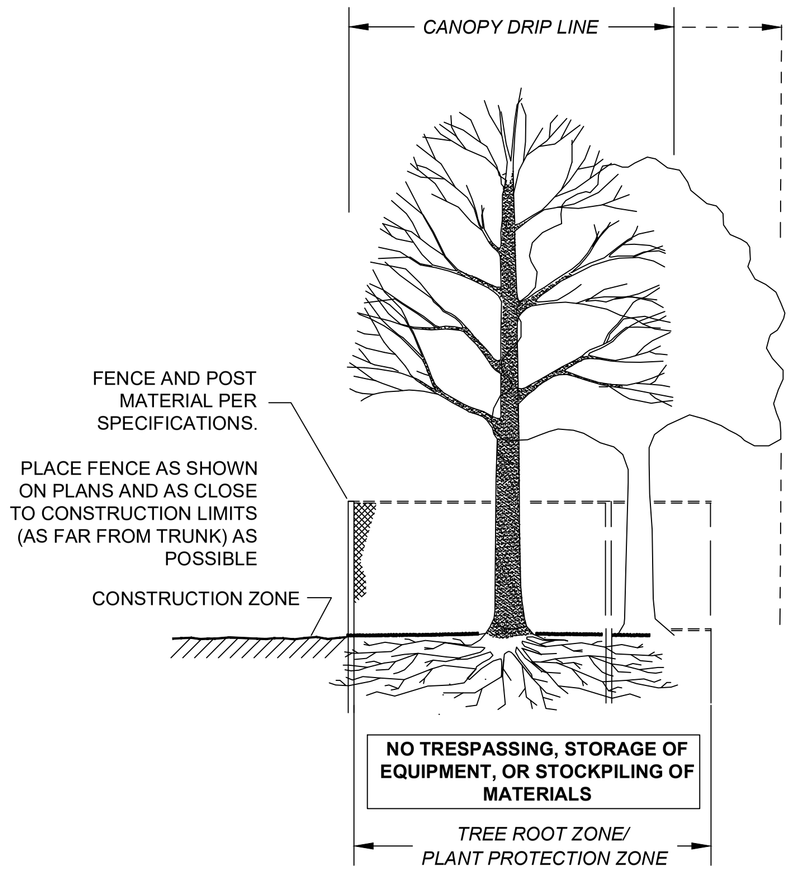


606352_HD(LANDSCAPE 2).DWG Plotted on 27-Feb-2025 10:37 AM

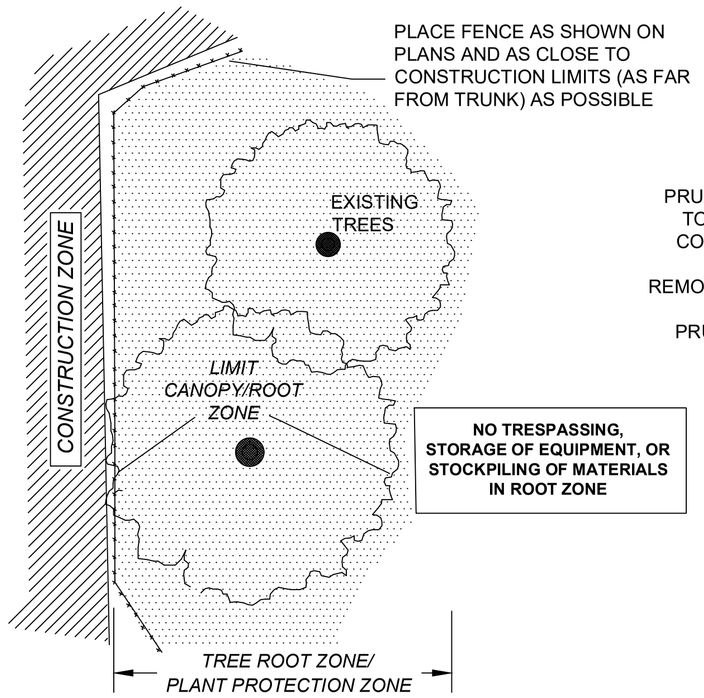
Proposal No. 606532-136278

A00840 - 370

606352_HD(DETAILS).DWG Plotted on 27-Feb-2025 10:37 AM



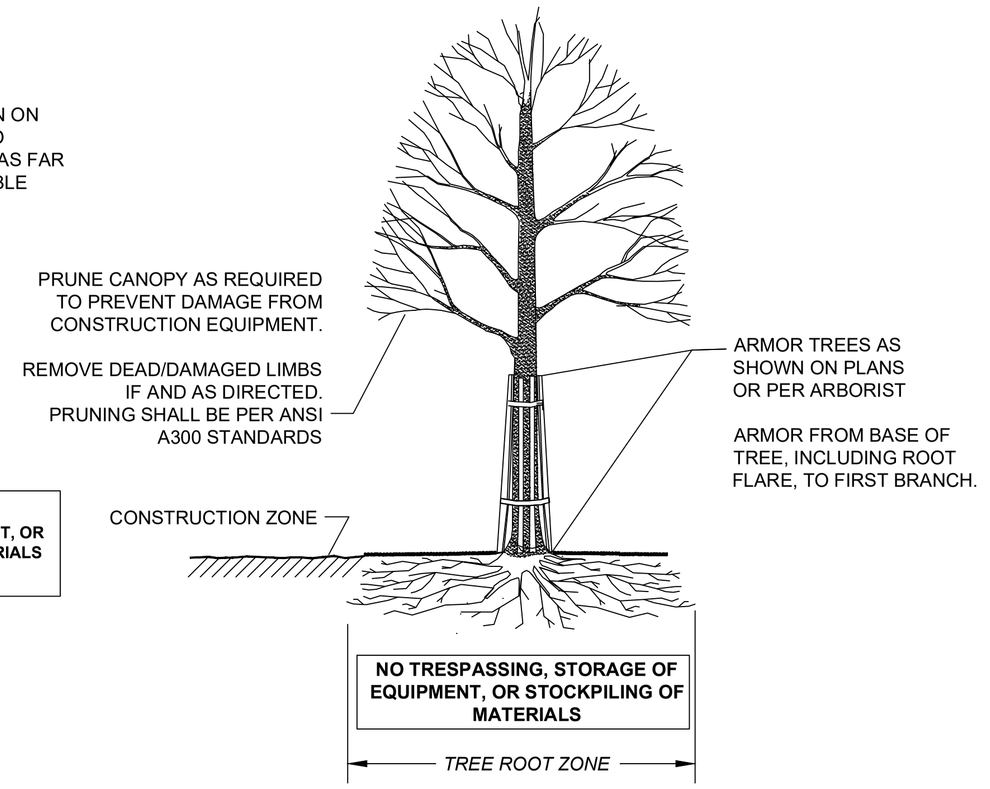
SECTION - FENCE PROTECTION OF ROOT ZONE



PLAN VIEW - FENCE PROTECTION OF ROOT ZONE

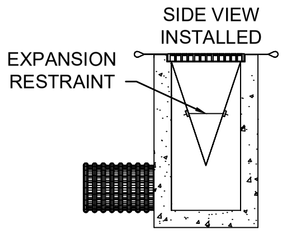
TREE PROTECTION - ROOT ZONE

NOT TO SCALE

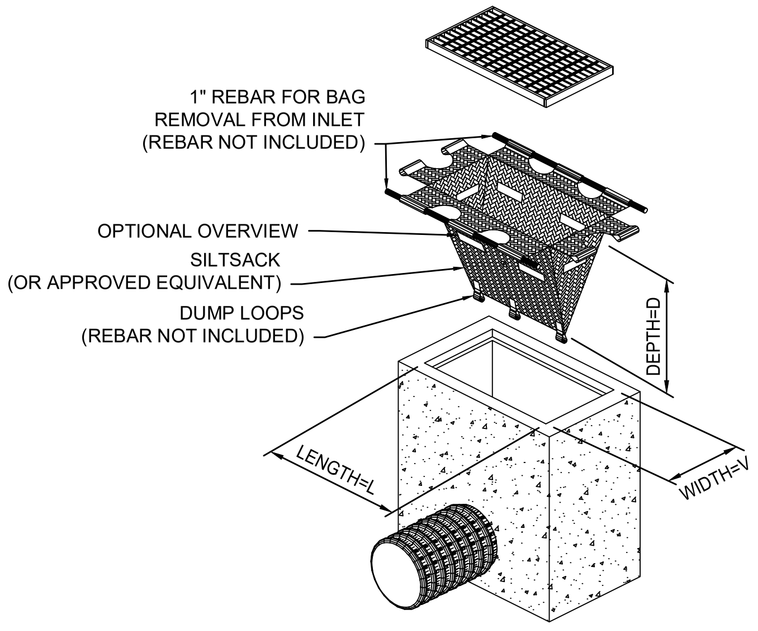


SECTION - TRUNK ARMORING & PRUNING

TREE PROTECTION - TRUNK

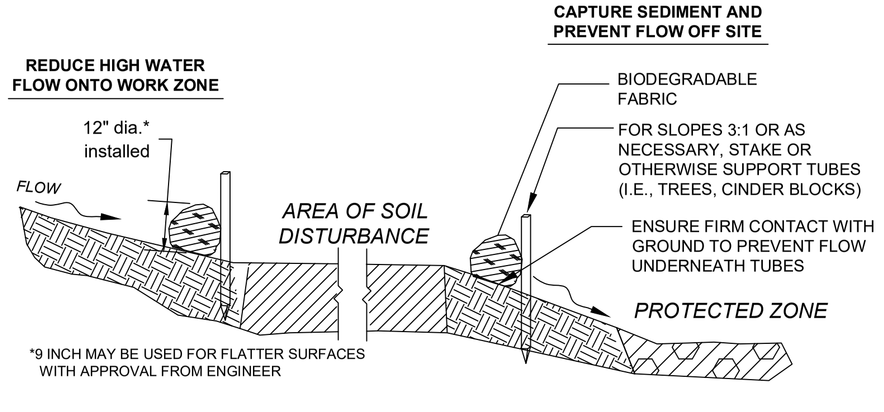


INSTALLATION DETAIL



TEMPORARY INLET PROTECTION

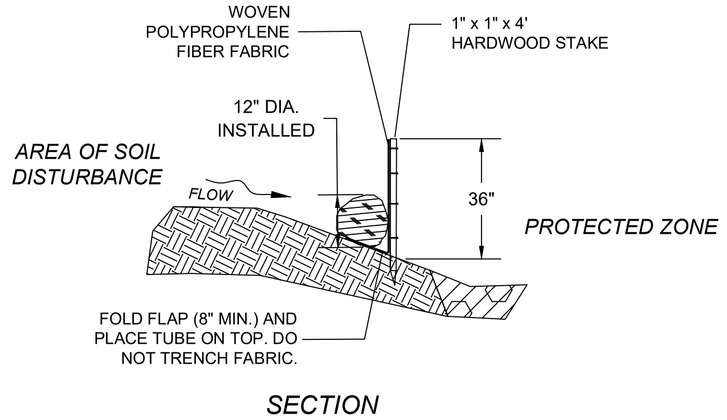
NOT TO SCALE



SECTION

SEDIMENT BARRIER - COMPOST FILTER TUBES

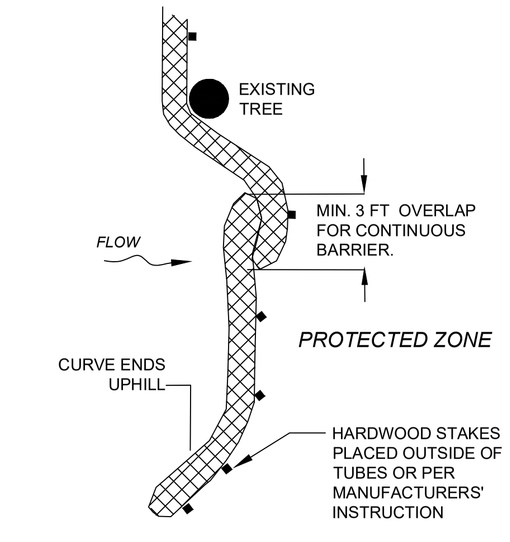
NOT TO SCALE



SECTION

COMPOST FILTER TUBE & SILT FENCE

NOT TO SCALE



PLACE TUBE ALONG CONTOURS AND PERPENDICULAR TO FLOW.

PLACE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE

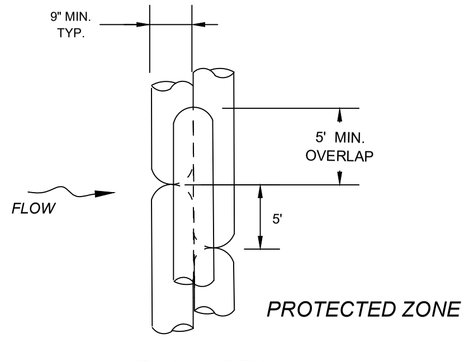
ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLACE STAKES AS NEEDED TO SECURE TUBES IN PLACE.

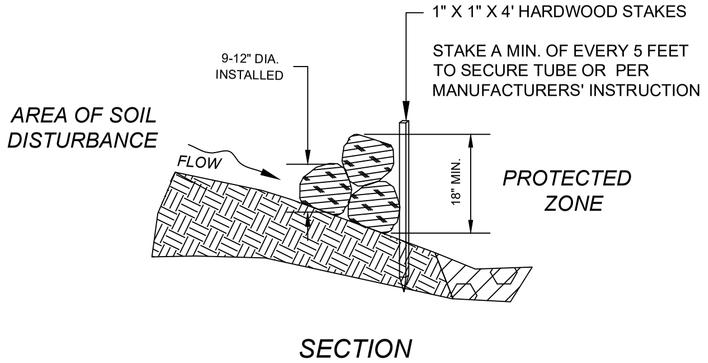
PLAN VIEW

COMPOST FILTER TUBE

NOT TO SCALE



PLAN VIEW



SECTION

COMPOST FILTER TUBE BERM (SLOPES 2:1 OR STEEPER)

NOT TO SCALE

Proposal No. 606532-136278
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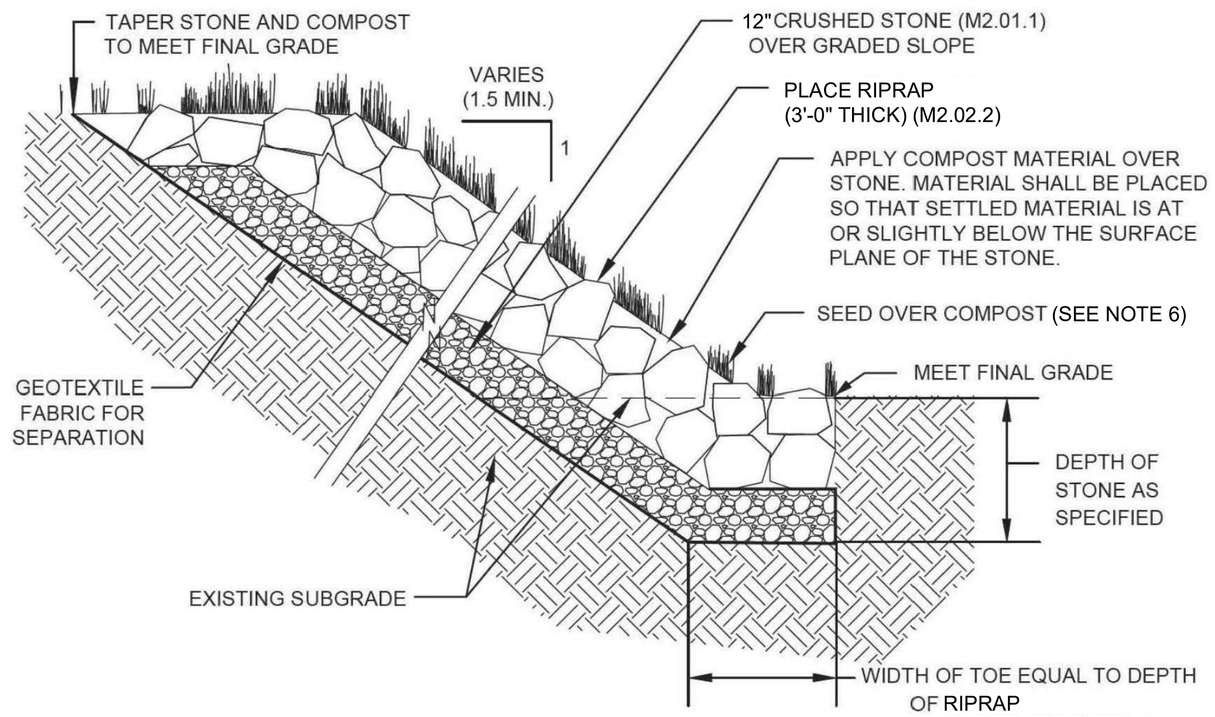
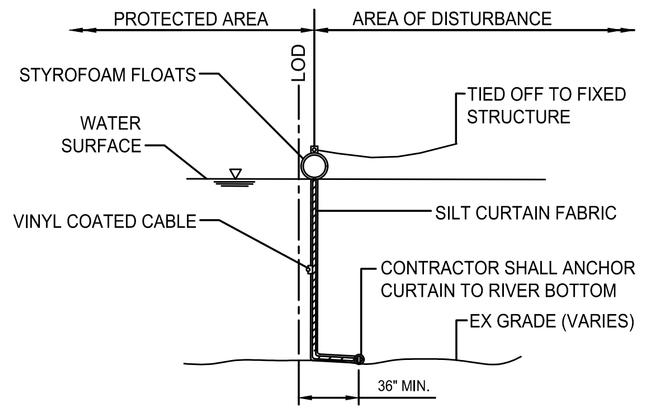


COMPOST AND SEED OVER RIPRAP

SCALE: N.T.S.

NOTES:

1. THE EROSION AND SEDIMENTATION CONTROLS SHOWN ON THE PLANS ARE INTENDED TO REPRESENT THE MINIMUM CONTROLS NECESSARY TO MEET ANTICIPATED SITE CONDITIONS. ADDITIONAL MEASURES SHALL BE IMPLEMENTED AS CONDITIONS WARRANT OR AS DIRECTED BY THE OWNER OR OWNER'S REPRESENTATIVE.
2. THE CONTRACTOR SHALL MAINTAIN EROSION CONTROLS THROUGHOUT CONSTRUCTION. THE CONTRACTOR SHALL REPLACE DAMAGED EROSION CONTROLS AT THE OWNER AND ENGINEER'S REQUEST AT NO ADDITIONAL EXPENSE TO THE OWNER.
3. THE CONTRACTOR SHALL NOT LEAVE DISTURBED AREAS UNSTABILIZED FOR PERIODS MORE THAN 14 DAYS. PROVIDE TEMPORARY SEED OR MULCH ON DISTURBED AREAS THAT WILL REMAIN EXPOSED FOR GREATER THAN 14 DAYS.
4. REMOVE AND STOCKPILE LOAM WITHIN LIMITS OF CONSTRUCTION. EXISTING LOAM REQUIRES AMENDMENT PRIOR TO PLACEMENT. CONTRACTOR MAY ONLY EXPORT EXCESS LOAM NOT REQUIRED TO COMPLETE THE PROJECT.
5. TURBIDITY BARRIER TO REMAIN IN PLACE DURING ACTIVITIES CAUSING TURBID CONDITIONS. TURBIDITY BARRIER MAY BE REMOVED FROM OUTSIDE THE COFFERDAM ONLY AFTER ALL ACTIVITIES CAUSING DISTURBANCE TO SEDIMENT HAVE CEASED AND SUSPENDED PARTICLES HAVE SETTLED
6. SEED OVER COMPOST VARIES. REFER TO LANDSCAPE DRAWINGS FOR APPROPRIATE SEED MIX TYPE PER LOCATION.



NOTES:

1. TURBIDITY BARRIER TO REMAIN IN PLACE DURING ACTIVITIES CAUSING TURBID CONDITIONS. TURBIDITY BARRIER MAY BE REMOVED FROM OUTSIDE THE COFFERDAM ONLY AFTER ACTIVITIES CAUSING DISTURBANCE TO SEDIMENT HAVE CEASED AND SUSPENDED PARTICLES HAVE SETTLED.
2. REQUIRED DEPTH OF CURTAIN MAY VARY

TYPICAL TURBIDITY BARRIER

NOT TO SCALE

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	16	47
PROJECT FILE NO.	606352		

CONSTRUCTION DETAILS NO. 2

SECTION A-A

NOTES:

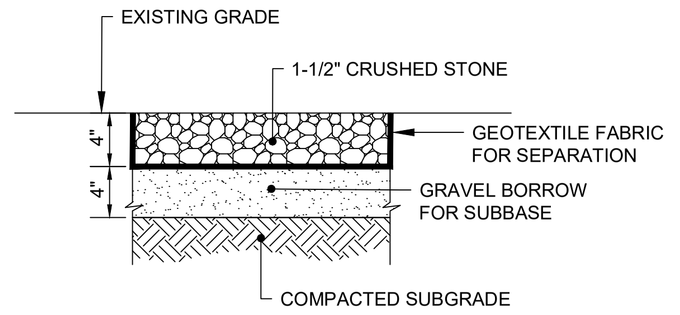
1. CONTRACTOR SHALL FILL VOIDS BETWEEN CURB SECTIONS WITH MORTAR.
2. SEED OVER COMPOST SHALL BE PER THE LANDSCAPE DRAWINGS.

SPILLWAY DETAIL

NOT TO SCALE

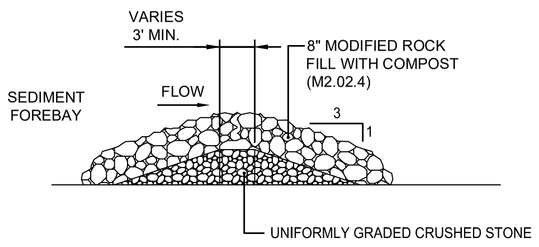
CLEANOUT DETAIL

NOT TO SCALE



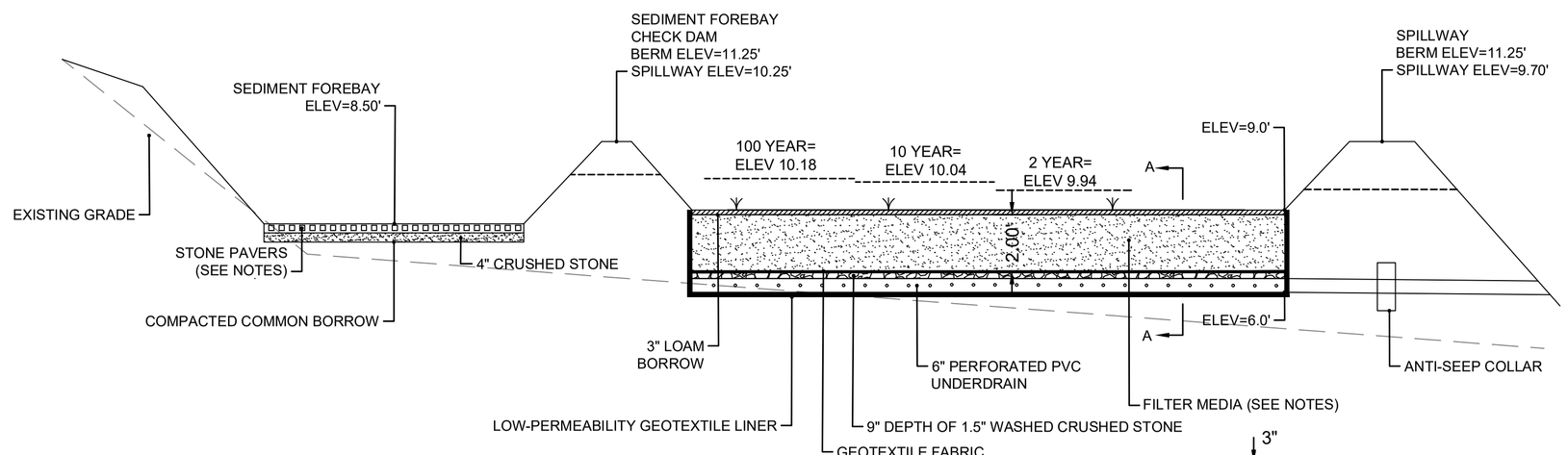
GRAVEL DRIVE DETAIL

NOT TO SCALE



SEDIMENT FOREBAY CHECK DAM

NOT TO SCALE



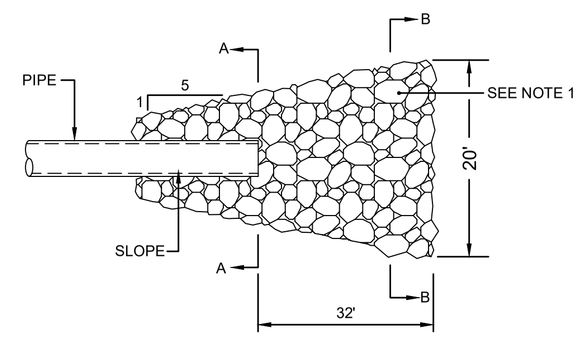
BIORETENTION BASIN DETAIL

NOT TO SCALE

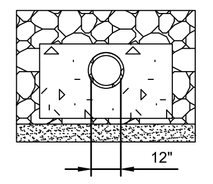
SECTION A-A

NOTES:

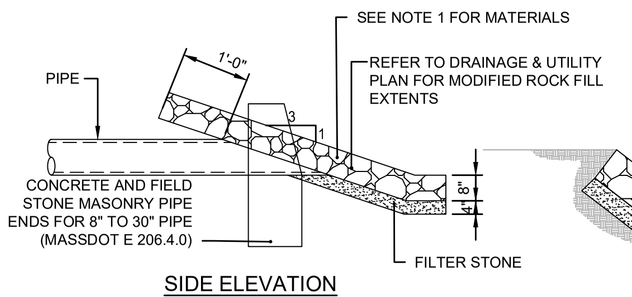
1. INDIVIDUAL PAVERS SHOULD HAVE A MINIMUM DEPTH OF 4 INCHES AND SHOULD BE PLACED WITH A 2-INCH SPACING ON ALL SIDES.
2. IF STONE PAVERS ARE NOT AVAILABLE, OTHER RIGID MATERIALS SUCH AS CONCRETE PAVERS MAY BE USED AS DIRECTED BY THE ENGINEER.
3. BIORETENTION SOIL MEDIA SHALL BE UNIFORM, FREE OF STONES, STUMPS, ROOTS, OR SIMILAR MATERIALS LARGER THAN 0.187 INCHES. NO COMPOST SHALL BE USED IN THE PLANTING MIX UNLESS SPECIFIED BY THE ENGINEER.
4. BIORETENTION SOIL MEDIA SHALL CONSIST 3 TO 10% ORGANIC CONTENT BY VOLUME, HAVE A SOIL pH BETWEEN 6 AND 7, HAVE A CATION EXCHANGE CAPACITY OF MINIMUM 10 mEq/100 mL AT pH OF 7.0, AND PARTICLE DISTRIBUTION OF:
   - 4.A. 5% MAXIMUM VERY COARSE SAND/GRAVEL
   - 4.B. 80-90% SAND
   - 4.C. 15% MAXIMUM SILT
   - 4.D. 5% MAXIMUM CLAY
5. SEED WITH STANDARD MASSDOT SEED MIXES FOR BASIN BOTTOM AND SIDE SLOPES IN ACCORDANCE WITH THE LANDSCAPE DRAWINGS AND SPECIAL PROVISIONS. REFER TO LANDSCAPE DRAWINGS FOR SEED TYPE AND LOCATION. REFER TO THE SPECIAL PROVISIONS FOR APPROPRIATE RATES.
6. LOW-PERMEABILITY LINER SHALL HAVE A MAXIMUM IN-SITU HYDRAULIC CONDUCTIVITY OF LESS THAN 0.03 FT/DAY.
7. TURF REINFORCEMENT JUTE MESH SHALL BE APPLIED ON ALL SLOPES 2H:1V OR STEEPER.
8. ANTI-SEEP COLLAR AND CLEANOUTS ARE CONSIDERED INCIDENTAL TO THE COST OF THE SUBDRAIN ITEM.



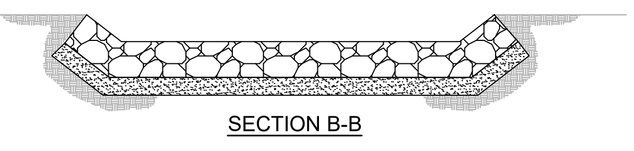
PLAN



SECTION A-A



SIDE ELEVATION



SECTION B-B

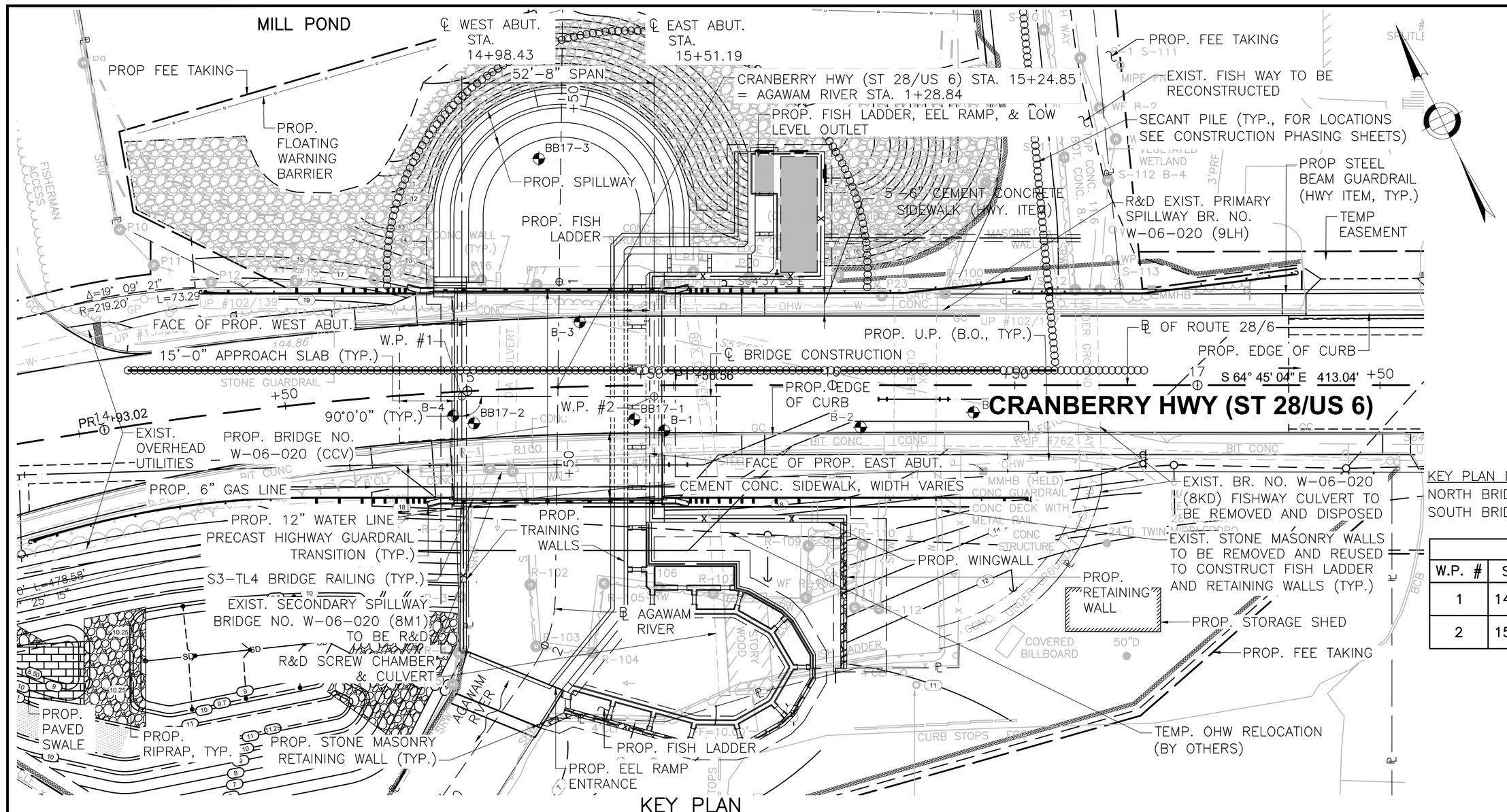
NOTE:

1. PROVIDE THE FOLLOWING MATERIALS WHERE INDICATED ON THE PLANS:
   1.1. MODIFIED ROCK FILL (M2.02.4)

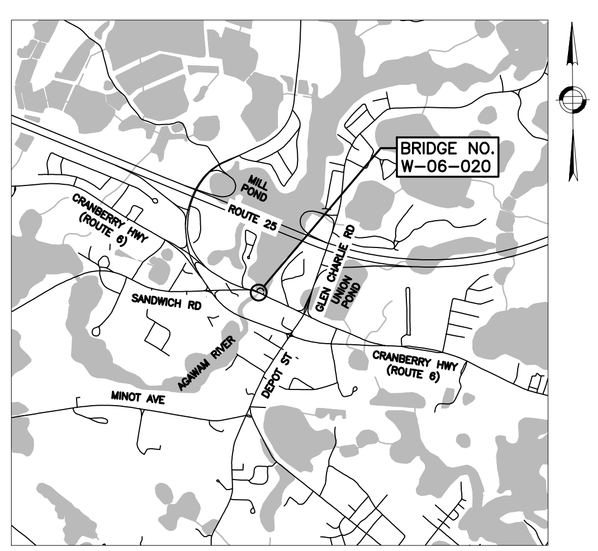
LEVEL SPREADER

NOT TO SCALE

Proposal No. 606532-136278
606352_HD(DETAILS).DWG Plotted on 27-Feb-2025 10:37 AM
A00840 - 372



KEY PLAN
SCALE: 1" = 20'



LOCUS
SCALE: 1"=2,000'

KEY PLAN NOTE:
NORTH BRIDGE SIDEWALK WIDTH: 6'-3 1/8" MIN. TO 7"-10 3/4" MAX.
SOUTH BRIDGE SIDEWALK WIDTH: 16'-3" MIN. TO 17'-11 3/4" MAX.

CONSTRUCTION WORKING POINTS				
W.P. #	STATION	OFFSET	NORTHING	EASTING
1	14+98.43	1.38' RT	N2739626.125	E880903.067
2	15+51.19	3.05' RT	N2739603.660	E880950.702

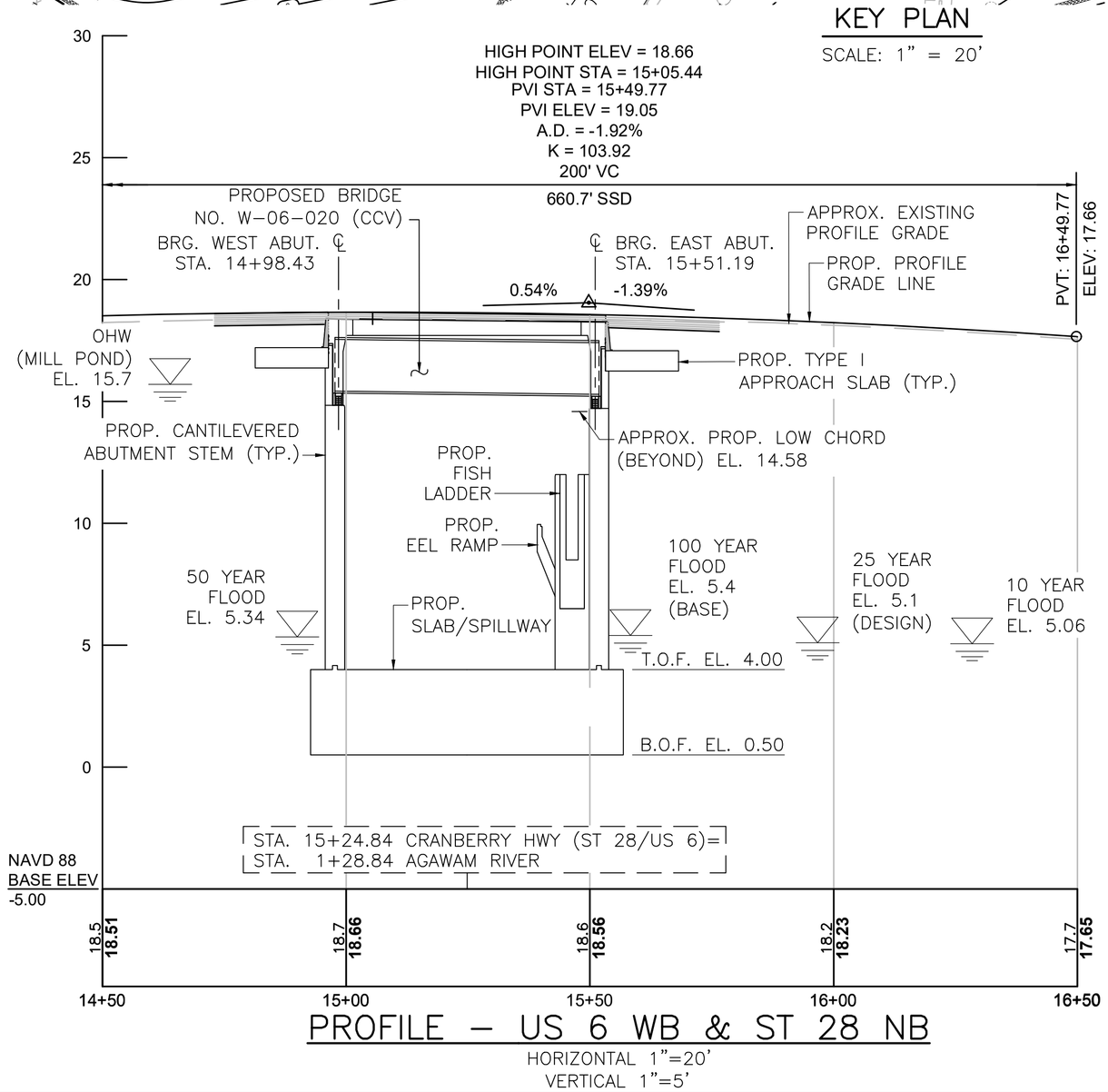
WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	17	47
PROJECT FILE NO.	606352		

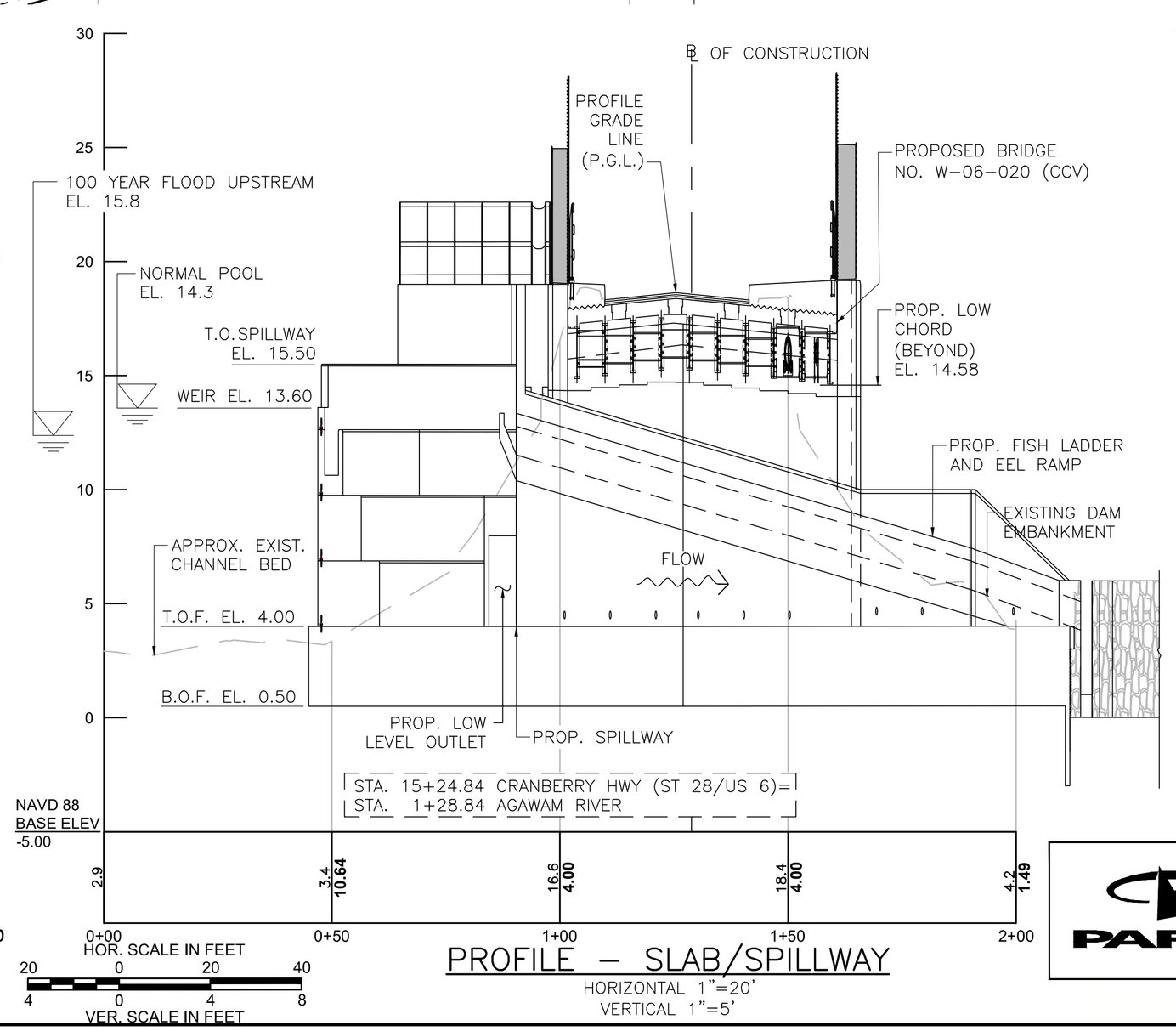
KEY PLAN & INDEX

INDEX OF DRAWINGS

01	KEY PLAN & INDEX
02	BRIDGE NOTES
03–08	BORING LOGS NO. 1–6
09	BRIDGE & SPILLWAY GENERAL PLAN
10	BRIDGE & SPILLWAY ELEVATION
11	BRIDGE & SPILLWAY DEMOLITION PLAN
12–15	PHASED CONSTRUCTION SECTIONS NO. 1–4
16–24	PHASED CONSTRUCTION PLANS NO. 1–9
25–26	TEMPORARY BRIDGE DETAILS NO. 1–2
27	FOOTING GENERAL PLAN
28	WEST ABUTMENT PLAN & ELEVATION
29	EAST ABUTMENT PLAN & ELEVATION
30–32	ABUTMENT SECTIONS & DETAILS NO. 1–3
33	WINGWALL PLAN & ELEVATION
34	WINGWALL SECTIONS & DETAILS
35–36	TRAINING WALLS
37	JOINT DETAILS
38	WILDLIFE PASSAGE PLAN
39–41	WILDLIFE PASSAGE SECTIONS & DETAILS NO. 1–3
42–44	SPILLWAY SECTIONS & DETAILS NO. 1–3
45–46	LOW LEVEL OUTLET SECTIONS & DETAILS NO. 1–2
47	STORAGE SHED DETAILS
48	FRAMING PLAN & STRINGER ELEVATION
49–51	STEEL DETAILS NO. 1–3
52	BEARING DETAILS
53	TRANSVERSE SECTION
54–55	DECK SECTIONS & DETAILS NO. 1–2
56–57	GUARDRAIL TRANSITIONS NO. 1–2
58	S3–TL4 BRIDGE RAIL DETAILS
59	PROTECTIVE SCREEN TYPE I
60	TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION



PROFILE – US 6 WB & ST 28 NB
HORIZONTAL 1"=20'
VERTICAL 1"=5'



PROFILE – SLAB/SPILLWAY
HORIZONTAL 1"=20'
VERTICAL 1"=5'

PARE CORPORATION
ENGINEERS - SCIENTISTS - PLANNERS
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
401-334-4100

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION

MassDOT Massachusetts Department of Transportation Highway Division

BRIDGE REPLACEMENT
WAREHAM
US 6 WB & ST 28 NB
OVER AGAWAM RIVER

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

STATE BRIDGE ENGINEER ____ CHIEF ENGINEER

17-December-2024

Second Structural Submittal (S2)

606352_BR1(W060020).DWG Plotted on 27-Feb-2025 10:38 AM

Proposal No. 606532-136278

A00840 - 373

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	18	47
PROJECT FILE NO.	606352		

BRIDGE NOTES

GENERAL NOTES:

DESIGN
IN ACCORDANCE WITH THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, XTH EDITION, 20XX, FOR HL–93 LOADING.

EXISTING CONDITIONS
ALL DIMENSIONS AND DETAILS SHOWN FOR THE EXISTING STRUCTURE ARE BASED ON LIMITED FIELD MEASUREMENTS AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENTS AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ADEQUACY AND ACCURACY THEREOF, AND SHALL 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. EXISTING STRUCTURE IS SHOWN THUS — · — · — · — EXCEPT AS NOTED.

SURVEY NOTEBOOKS
ELECTRONIC SURVEY WAS USED. A COPY OF THE DATA FILE MAY BE OBTAINED FROM THE TOWN OF WAREHAM.

BENCHMARK
STATION #203: MAG. NAIL SET IN SIDEWALK, N2739701.77 E880739.15, EL. 18.07
STA. 12+90.94, OFF 105.63 LT
STATION #205: MAG. NAIL SET IN SIDEWALK, N2739532.32 E881072.28, EL. 17.13
STA. 16+91.60, OFF 15.73 RT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

DATE
DATE TO BE PLACED ON THE INSIDE FACE OF THE NORTHEAST AND SOUTHWEST HIGHWAY GUARDRAIL TRANSITIONS. A SHEET SHOWING THE SIZE AND CHARACTER OF NUMERALS WILL BE FURNISHED. THE DATE USED SHALL BE THE LATEST YEAR OF CONTRACT COMPLETION AS OF THE DATE THE FIRST HIGHWAY GUARDRAIL TRANSITION IS CONSTRUCTED. BOTH HIGHWAY GUARDRAIL TRANSITIONS SHALL FEATURE THE SAME DATE.

FOUNDATIONS
FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER. THE GEOTECHNICAL REPORT, REVISED DECEMBER 2022, IS AVAILABLE UPON REQUEST.

UNSUITABLE MATERIAL
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 M 31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS	#7 BARS	#8 BARS
1. NONE	19"	24"	29"	33"	38"
2. 12" OF CONCRETE BELOW BAR	25"	31"	37"	43"	49"
3. COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	43"	50"	57"
4. COATED BARS, ALL OTHER CASES	30"	37"	48"	56"	64"
5. CONDITION 2. AND 3.	30"	37"	48"	56"	64"
6. CONDITION 2. AND 4.	30"	37"	48"	56"	64"

ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

ALL REINFORCING STEEL SHALL BE EPOXY COATED.

LAP LENGTHS ABOVE ARE BASED ON 4000 PSI CONCRETE STRENGTH.

UTILITIES
THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

MEMBRANE WATERPROOFING
ALL MEMBRANE WATERPROOFING USED ON BRIDGE DECKS SHALL BE MEMBRANE WATERPROOFING FOR BRIDGE DECKS – SPRAY APPLIED.

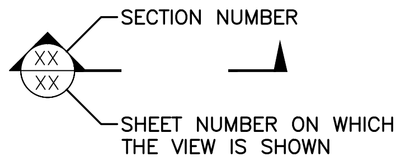
CONCRETE MIXES
ALL CONCRETE SHALL BE 5000 PSI CONCRETE, EXCEPT AS NOTED BELOW:

SIDEWALKS AND GUARDRAIL TRANSITIONS SHALL BE 5000 HP PSI HP CONCRETE

STRUCTURAL STEEL
ALL STRUCTURAL STEEL SHALL BE AASHTO M270 GRADE 50 UNLESS OTHERWISE NOTED HEREIN. UNLESS OTHERWISE NOTED, ALL STRUCTURAL STEEL SHALL BE GALVANIZED. THE STRUCTURAL STEEL FOR THE TEMPORARY BRIDGE SHALL BE UNCOATED.

SCALES
SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS.
DIVIDE SCALES BY 2 FOR HALF SIZE PRINTS.

SECTION MARK



ESTIMATED QUANTITIES (NOT GUARANTEED)		
STORAGE FACILITY OR BUILDING	1	LS
STEEL GRATING FOR WALK	400	SF
ALUMINUM SLIDE GATE	1	LS
SHED DISPOSAL	1	LS
DEMOLITION OF BRIDGE NO. W–06–020 (9LH)	1	LS
DEMOLITION OF BRIDGE NO. W–06–020 (8M1)	1	LS
DEMOLITION OF BRIDGE NO. W–06–020 (8KD)	1	LS
DEMOLITION OF TEMPORARY BRIDGE	1	LS
MUCK EXCAVATION	500	CY
REINFORCED CONCRETE EXCAVATION	240	CY
BRIDGE EXCAVATION	7240	CY
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	2610	CY
CRUSHED STONE	400	TON
CRUSHED STONE FOR BRIDGE FOUNDATIONS	1210	TON
FINE GRADING AND COMPACTING – SUBGRADE AREA	5930	SY
MANHOLE (9 TO 14 FOOT DEPTH)	1	EA
24 INCH POLYMERIC PRECOATED CORRUGATED METAL PIPE	70	LF
12 INCH DUCTILE IRON INSULATED PIPE (BRIDGE)	104	FT
TEMPORARY GAS BYPASS	1	LS
10 INCH STEEL CASING FOR GAS PIPE	60	LF
SUPERPAVE BRIDGE SURFACE COURSE – 9.5 (SSC–B–9.5)	32	TON
SUPERPAVE BRIDGE PROTECTIVE COURSE – 9.5 (SPC–B–9.5)	32	TON
72 INCH CHAIN LINK FENCE (PIPE TOP RAIL (LINE POST OPTION)	230	FT
48 INCH CHAIN LINK FENCE (PIPE TOP RAIL) VINYL COATED (LINE POST OPTION)	130	FT
48 INCH CHAIN LINK GATE WITH GATE POSTS	10	FT
CHAIN LINK FENCE REMOVED AND STACKED	160	FT
STONE MASONRY WALL IN CEMENT MORTAR	40	CY
STONE MASONRY VENEER	445	SY
STONE MASONRY REMOVED AND STACKED	327	CY
GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL	1040	SY
LOAM FOR LAWNS	30	CY
SEEDING	30	SY
5000 PSI, 0.75IN., 585 HP CEMENT CONCRETE	2765	CY
STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	203000	LB
MECHANICAL REINFORCING BAR SPLICERS	2100	EA
SECANT WALLS	1	LS
TEMPORARY SHORING	1	LS
ALUMINUM HANDRAIL	70	FT
RIPRAP	3620	TON
STREAMBED FILL	30	CY
CONTROL OF WATER – STRUCTURE NO. W–06–020 (CCV)	1	LS
WARNING SIGNS AND BUOYS	1	LS
TEMPORARY BRIDGE STRUCTURE	1	LS
BRIDGE STRUCTURE – BRIDGE NO. W–06–020 (CCV)	1	LS

TRAFFIC DATA	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2043	
AVERAGE DAILY TRAFFIC – PRESENT	14,255	
AVERAGE DAILY TRAFFIC – DESIGN YEAR	16,260	
DESIGN HOURLY VOLUME	1,464	
DIRECTIONAL DISTRIBUTION	N/A	
TRUCK PERCENTAGE – AVERAGE DAY	9%	
TRUCK PERCENTAGE – PEAK HOUR	9%	
DESIGN SPEED	40 MPH	
DIRECTIONAL DESIGN HOURLY VOLUME	N/A	

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	2500 YEARS
DESIGN SPECTRA	
As	0.126
SDs	0.210
SD1	0.113
SITE CLASS	D
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	7.7
DESIGN FLOOD DISCHARGE (C.F.S.)	113
DESIGN FLOOD FREQUENCY (YEARS)	25
DESIGN FLOOD VELOCITY (F.P.S.)	3.1
DESIGN FLOOD ELEVATION (FEET, NAVD)	5.13
BASE (100–YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	167
BASE FLOOD ELEVATION (FEET, NAVD)	5.43
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)	100
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	N
EVIDENCE OF SCOUR AND EROSION	N

TEMPORARY WATER CONTROL DESIGN DATA	
UPSTREAM	
DESIGN FLOOD DISCHARGE (C.F.S.)	212
DESIGN FLOOD FREQUENCY (YEARS)	100
DESIGN FLOOD VELOCITY (F.P.S.)	6.8
DESIGN FLOOD ELEVATION (FEET, NAVD)	12.4
DOWNSTREAM	
DESIGN FLOOD DISCHARGE (C.F.S.)	212
DESIGN FLOOD FREQUENCY (YEARS)	100
DESIGN FLOOD VELOCITY (F.P.S.)	3.1
DESIGN FLOOD ELEVATION (FEET, NAVD)	3.7

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

606352_BR2(W060020).DWG Plotted on 27-Feb-2025 10:38 AM
A00840 - 374
Proposal No. 606532-136278
Second Structural Submittal (S2) 17-December-2024

CRANBERRY HIGHWAY
ROUTE 6WB/ROUTE 28NB

SPILLWAY PLAN
SCALE: 1/8" = 1'-0"

MILL POND
APPROX. NORMAL POOL EL. 14.3
APPROX. ORDINARY HIGH WATER EL. 15.7
R&D EXISTING SCREW CHAMBER AND BOX CULVERT
EDGE OF FOOTING (TYP.)
LOW LEVEL OUTLET INV. EL 4.00 STA. 3+39.00 OFF. 38.05 LT
PROP. DAM HAZARD SIGN ON BUOY
FLOATING WARNING BARRIER (TYP.)
PROP. FEE TAKING
RIPRAP
PROPOSED FISH LADDER SLIDE GATE
PROP. EEL RAMP EXIT
FISH LADDER EXIT
LOW LEVEL INLET INV. EL 4.00 STA. 15+85.88 OFF. 38.96 LT
PROPOSED LOW LEVEL OUTLET AND SLIDE GATE
6'-0" CHAIN LINK FENCE
EXIST. MAIN SPILLWAY TO REMAIN OPEN DURING PROP. SPILLWAY CONSTRUCTION (PHASE 1 & 2). R&D CULVERT AND SPILLWAY AFTER PHASE 2 IS COMPLETE
PROP. MID LEVEL OUTLET AND SLIDE GATE
PROP. 12" WATER MAIN
℄ AGAWAM RIVER
R21'-2" SPILLWAY
FLOW
℄ EAST ABUT. STA. 15+51.19
℄ WEST ABUT. STA. 14+98.43
16-1/2" LEVEL (TYP.)
R&D EXISTING SECONDARY SPILLWAY
1925 S.H.L.O. NO. 2313
PHASE 2
SIDEWALK (VARIES)
UPSTREAM FISH LADDER (BELOW)
ROADWAY (VARIES)
DECK DRAINS (TYP.)
15'-0" APPROACH SLAB
EDGE OF ABUT. FOOTING
REAR FACE OF ABUTMENT
PROP. SECANT WALL
EDGE OF SIDEWALK
W.P. #1 STA. 14+98.43, 1.38' RT
SAW & SEAL JOINT (TYP.)
90° (TYP.)
PROP. S3-TL4 BRIDGE RAIL WITH PROTECTIVE SCREEN (TYP.)
PHASE 1
℄ OF BRIDGE CONSTRUCTION
W.P. #2 STA. 15+51.19, 3.05' RT
PRECAST HIGHWAY GUARDRAIL TRANSITION (TYP.)
PROP. GAS MAIN (BY OTHERS)
STEEL BEAM GUARDRAIL (HWY ITEM, TYP.)
PROP. 6'-0" CHAIN LINK FENCE (TYP.)
℄ OF CONSTRUCTION
CRANBERRY HWY (ST 28/US 6) STA. 15+24.85 = AGAWAM RIVER STA. 1+28.84
PROP. BRIDGE NO. W-06-020 (CCV)
PROPOSED TRAINING WALL (TYP.)
R&D EXIST. MASONRY WALLS
PROP. CONC. WINGWALL
TEMP. U.P. (B.O.)
R&D EXIST. STORAGE SHED
PROP. OHW
PROP. STONE VENEER RETAINING WALL
PROP. 4'-0" CHAIN LINK FENCE
TEMP. U.P. (B.O.)
PROP. 6" GAS LINE
6'-0" CHAIN LINK FENCE (TYP.)
EDGE OF CONCRETE SIDEWALK(TYP.)
MODIFIED ROCK FILL FOR STORM WATER TREATMENT BASIN
EEL RAMP ENTRANCE
FISH LADDER ENTRANCE
AGAWAM RIVER FLOOD EBB
DOWNSTREAM FISH LADDER
PROP. CONC. WALKWAY/RAMP
COMPOST FILTER TUBE (TYP.)
PROP. FEE TAKING

MMMM DD, YYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

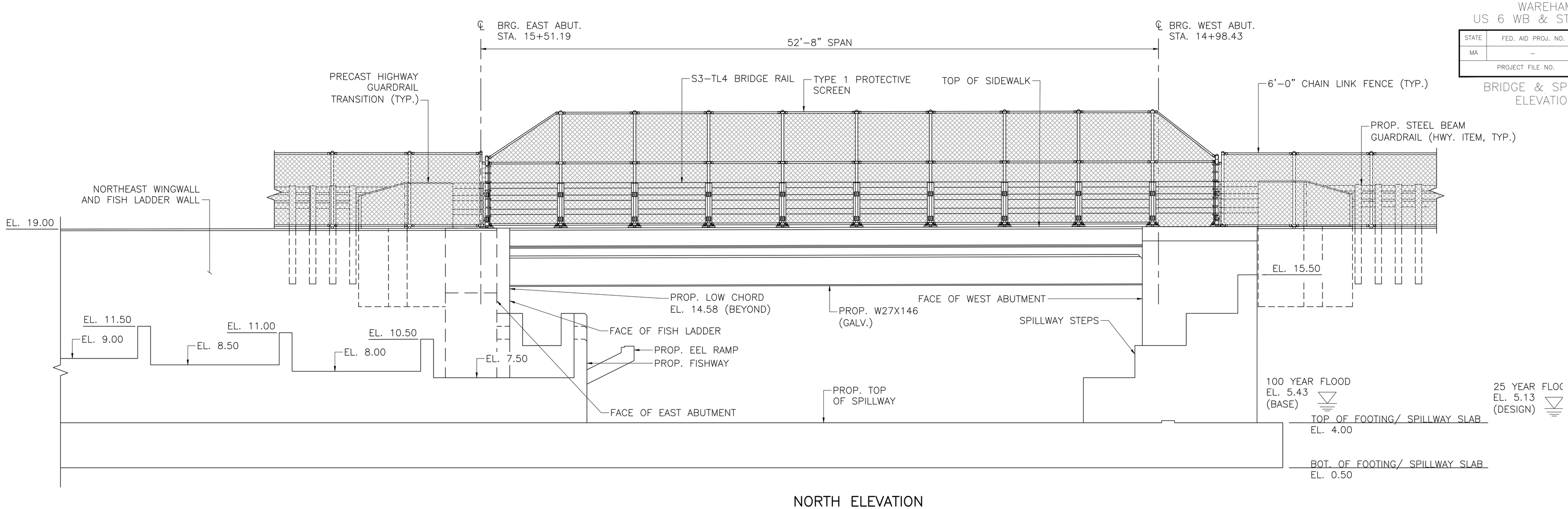
WAREHAM
US 6 WB & ST 28 NB
BRIDGE & SPILLWAY GENERAL PLAN

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	19	47
PROJECT FILE NO.	606352		

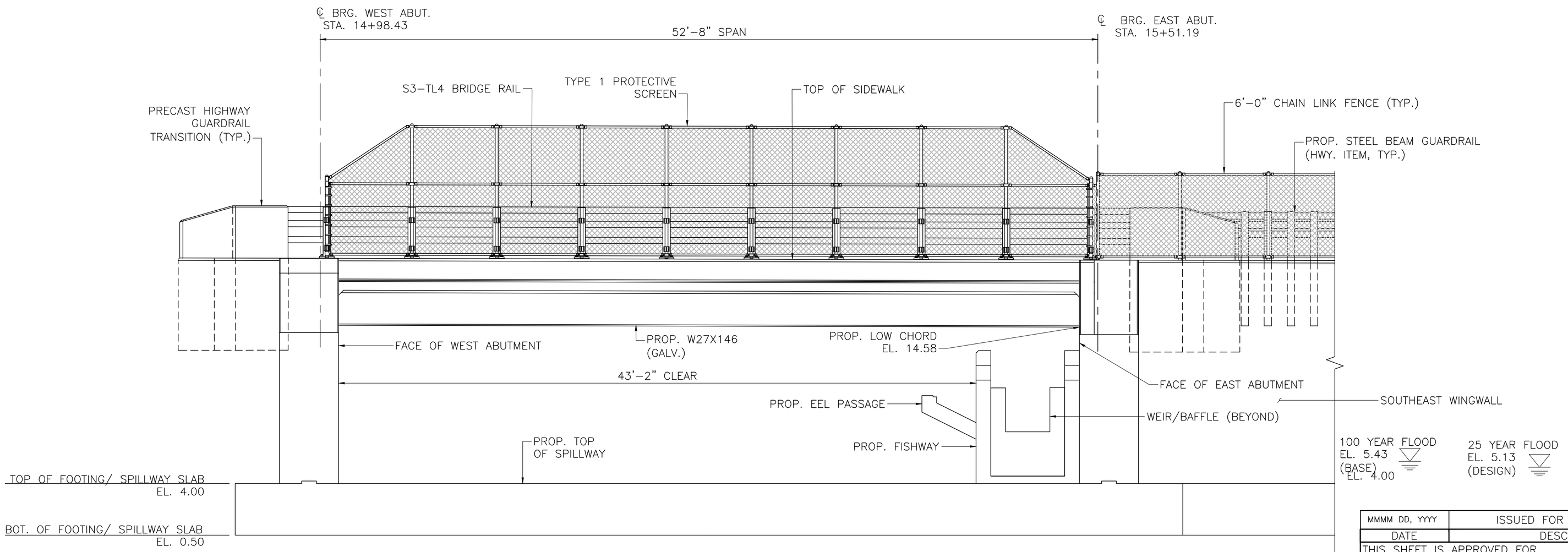
WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	20	47
PROJECT FILE NO.	606352		

BRIDGE & SPILLWAY ELEVATION



NORTH ELEVATION
SCALE: $\frac{1}{4}$" = 1'–0"



SOUTH ELEVATION
SCALE: $\frac{1}{4}$" = 1'–0"

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

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AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

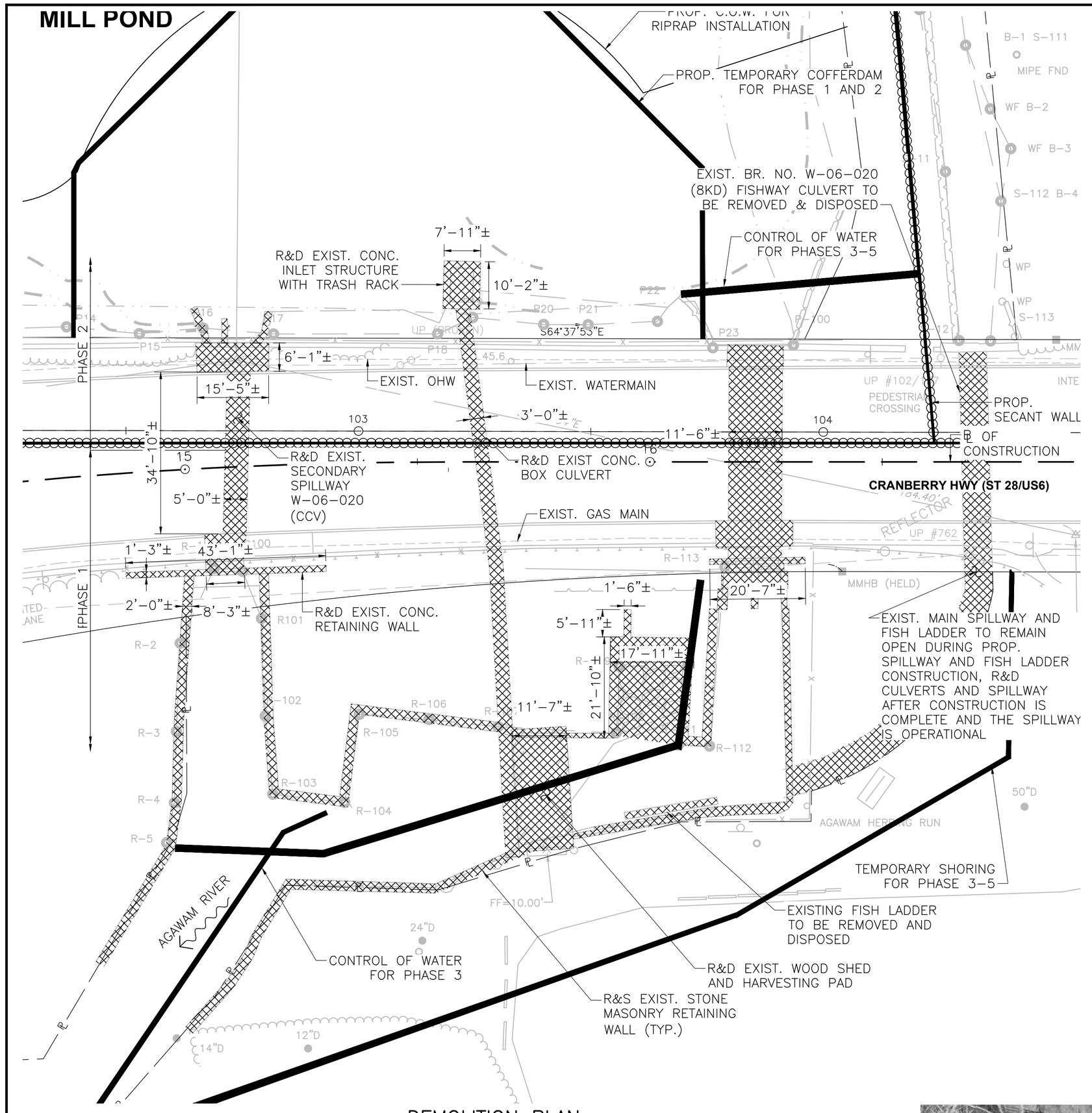
Second Structural Submittal (S2) 17-December-2024

606352_BR10(W080020).DWG Plotted on 27-Feb-2025 10:38 AM

Proposal No. 606532-136278

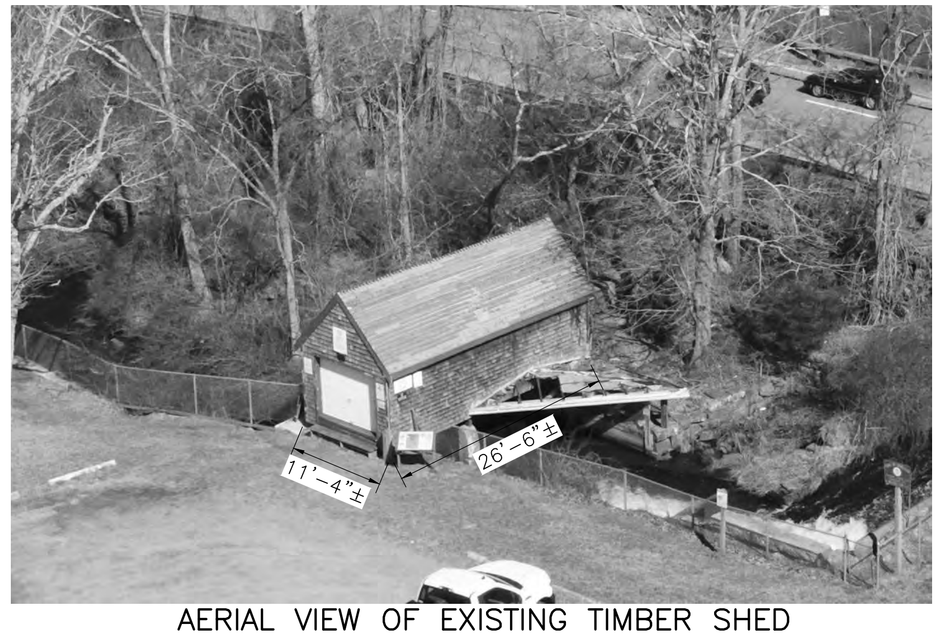
A00840 - 376

Proposal No. 606532-136278



DEMOLITION PLAN

SCALE: 1" = 15'



AERIAL VIEW OF EXISTING TIMBER SHED

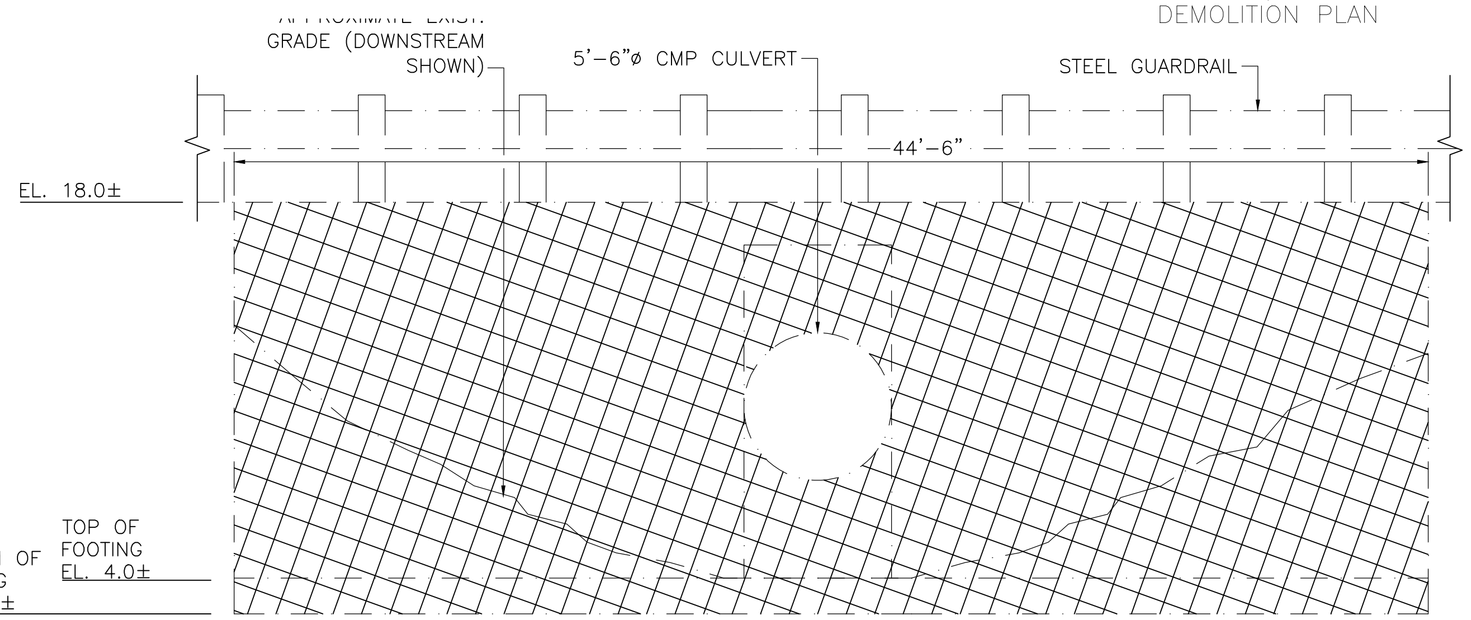
NOT TO SCALE

– INDICATES EXIST. COMPONENTS TO BE REMOVED AND DISPOSED.

WAREHAM
US 6 WB & ST 28 NB

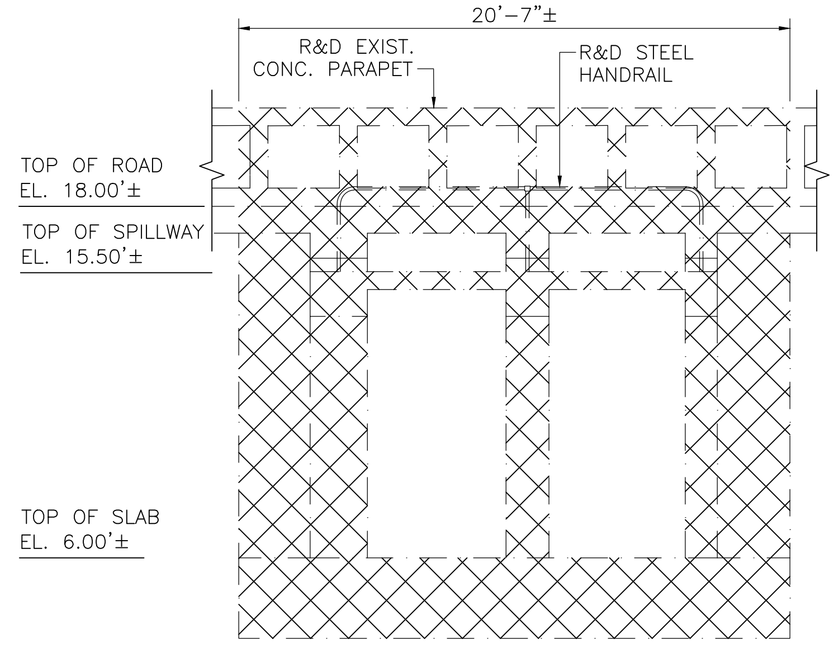
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	21	47
PROJECT FILE NO.	606352		

BRIDGE & SPILLWAY DEMOLITION PLAN



EXISTING SECONDARY SPILLWAY SECTION

SCALE: ¼" = 1'-0"



EXISTING PRIMARY SPILLWAY SECTION

SCALE: ¼" = 1'-0"

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

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AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER

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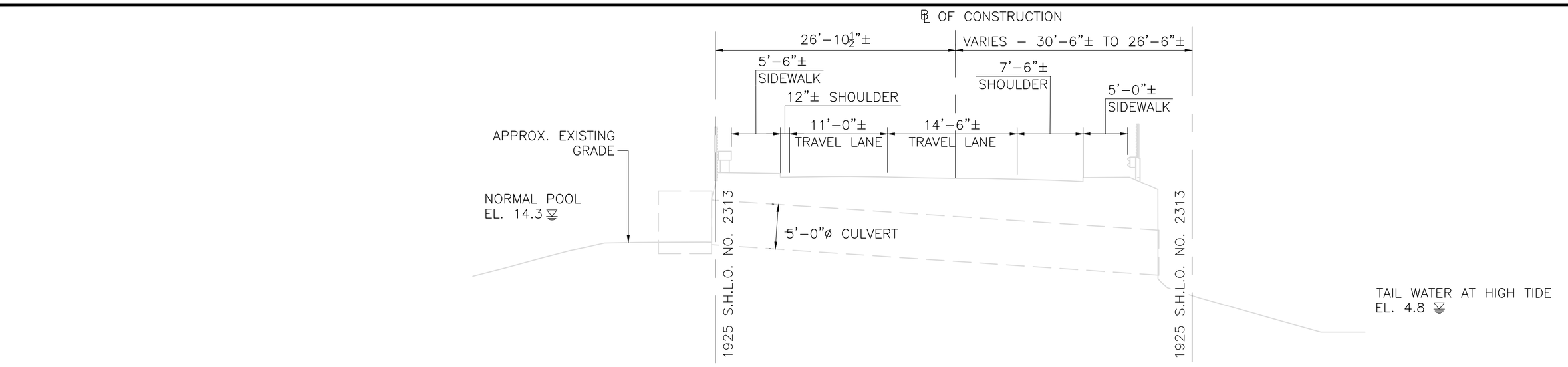
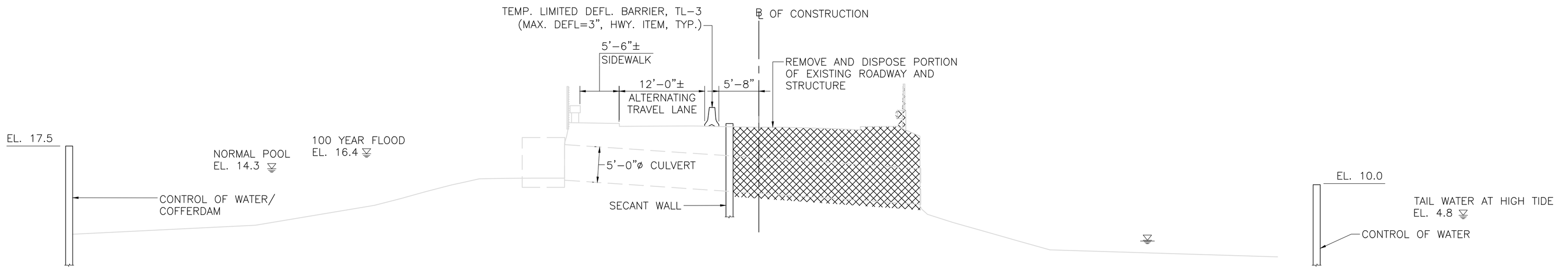
606352_BR11(W060020).DWG Plotted on 27-Feb-2025 10:38 AM
A00840 - 377
Second Structural Submittal (S2) 17-December-2024

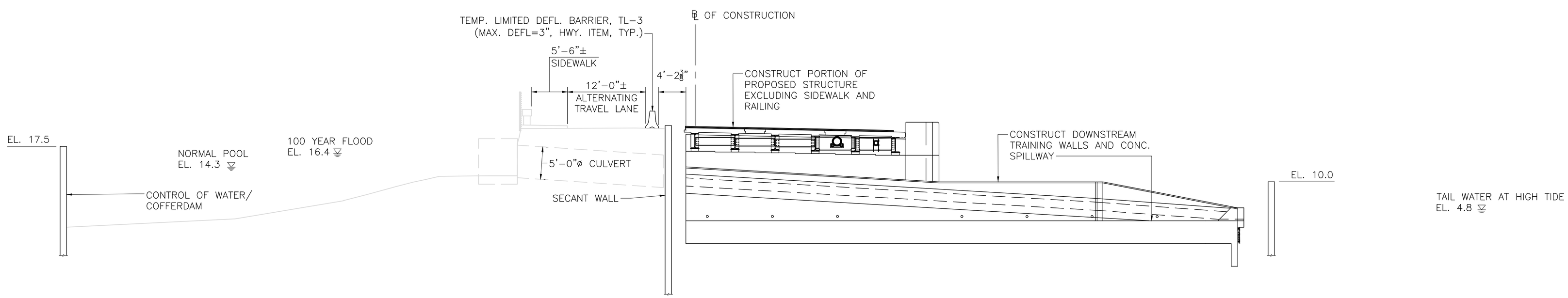


EXISTING CONDITION

SCALE: ⅛" = 1'–0"



PHASE 1A



PHASE 1B

PHASED BRIDGE CONSTRUCTION – PHASE 1

SCALE: ⅛" = 1'–0"

SUGGESTED SEQUENCE OF CONSTRUCTION – PHASE 1

PHASE 1A

- TEMPORARILY RELOCATE SOUTH OVERHEAD UTILITIES TO THE UTILITY POLES ON THE NORTH SIDE OF THE DAM
- PLACE TRAFFIC CONTROL MEASURES AND SHIFT WESTBOUND TRAVEL LANES TO NORTHERN PORTION OF EXISTING STRUCTURE.
- PLACE STEEL SHEETING ALONG PHASE LINE.
- REMOVE AND DISPOSE SOUTHERN PORTION OF EXISTING STRUCTURE.

PHASE 1B

- CONSTRUCT SOUTHERN PORTION OF PROPOSED SUPERSTRUCTURE WITH THE EXCEPTION OF THE SIDEWALK AND BRIDGE RAIL.
- INSTALL PRECAST HIGHWAY GUARDRAIL TRANSITIONS.
- CONSTRUCT THE DOWNSTREAM TRAINING WALLS AND GROUTED RIPRAP SCOUR APRON.
- RELOCATE THE WATER MAIN AND GAS MAIN TO PROPOSED SUPERSTRUCTURE.
- PARTIALLY DEMOLISH THE DOWNSTREAM PORTION OF THE EXISTING PRIMARY SPILLWAY. CONSTRUCT THE TEMPORATY VEHICULAR AND PEDESTRIAN BRIDGE.

NOTES:

1. THE 100 YEAR FLOOD ELEVATIONS FOR CONSTRUCTION WILL BE USED FOR THE DESIGN OF CONTROL OF WATER, COFFERDAMS, AND TEMPORARY SHORING DURING CONSTRUCTION FOR PHASES 1 AND 2.
2. THE TOP OF THE COFFERDAMS AND CONTROL OF WATER SHALL BE A MINIMUM OF 1 FOOT HIGHER THAN THE REQUIRED FLOOD ELEVATIONS FOR CONSTRUCTION.

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER

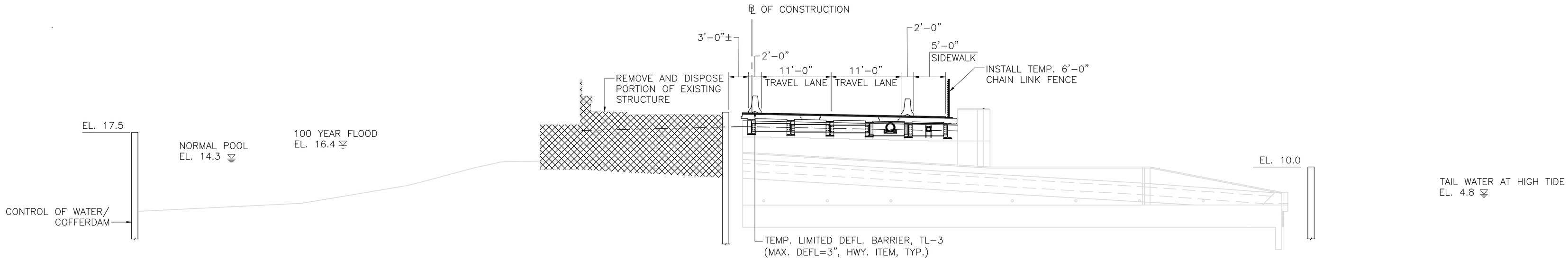
USE ONLY PRINTS OF LATEST DATE

Proposal No. 606532-136278
606352_BR12-15(W086020).DWG Plotted on 27-Feb-2025 11:05 AM
A00840 - 378
Second Structural Submittal (S2) 17-December-2024

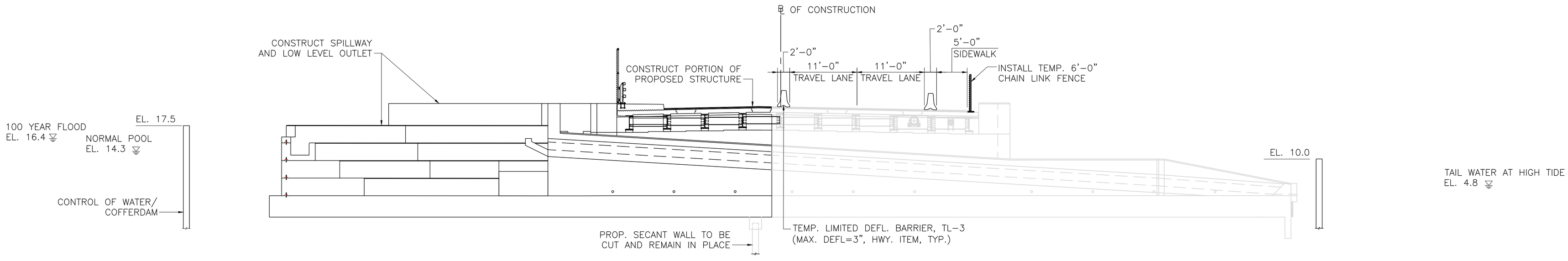
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	23	47
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
SECTIONS NO. 2

606352_BR12-15(W06020).DWG Plotted on 27-Feb-2025 11:05 AM



PHASE 2A



PHASE 2B

PHASED BRIDGE CONSTRUCTION – PHASE 2

SCALE: $\frac{1}{8}$" = 1'–0"

SUGGESTED SEQUENCE OF CONSTRUCTION – PHASE 2

NOTES

1. THE 100 YEAR FLOOD ELEVATIONS FOR CONSTRUCTION WILL BE USED FOR THE DESIGN OF CONTROL OF WATER, COFFERDAMS, AND TEMPORARY SHORING DURING CONSTRUCTION.

2. THE TOP OF THE COFFERDAMS AND CONTROL OF WATER SHALL BE A MINIMUM OF 1 FOOT HIGHER THAN THE 100 YEAR FLOOR ELEVATIONS FOR CONSTRUCTION.

PHASE 2A

- PERMANENTLY RELOCATE OVERHEAD UTILITIES TO THE SOUTH SIDE OF THE DAM.
- PLACE TRAFFIC CONTROL MEASURES AND SHIFT WESTBOUND TRAVEL LANES TO SOUTHERN PORTION OF PROPOSED SUPERSTRUCTURE.
- REMOVE AND DISPOSE NORTHERN PORTION OF EXISTING STRUCTURE.

PHASE 2B

- CONSTRUCT NORTHERN PORTION OF PROPOSED BRIDGE STRUCTURE, SPILLWAY, LOW LEVEL OUTLET CHAMBER, AND UPSTREAM PORTION OF FISH LADDER.
- REMOVE EARTH SUPPORT AROUND STRUCTURE WHILE ABANDONING REMAINING PORTIONS IN PLACE.
- REMOVE UPSTREAM AND DOWNSTREAM CONTROL OF WATER MEASURES AND DIVERT FLOW TO PROPOSED SPILLWAY IN PREPARATION FOR REMOVAL OF THE EXISTING PRIMARY SPILLWAY.

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

Second Structural Submittal (S2) 17-December-2024

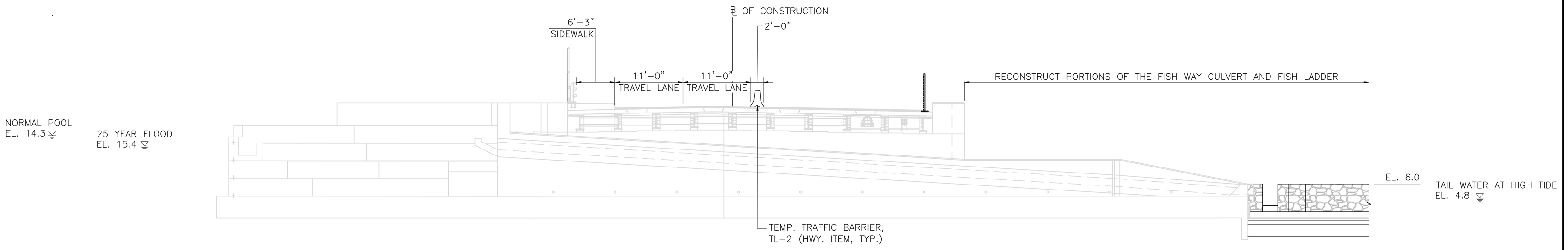
Proposal No. 606532-136278

A00840 - 379

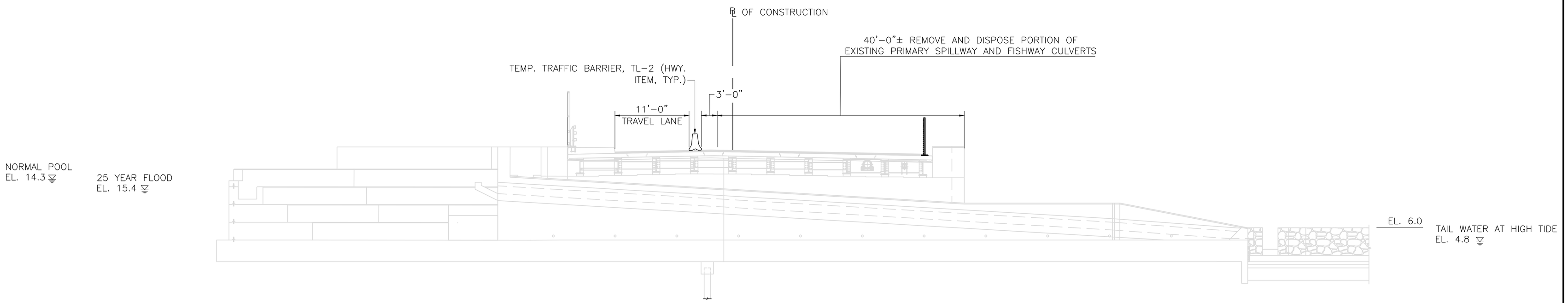
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	24	47
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
SECTIONS NO. 3

606352_BR12-15(W06020).DWG Plotted on 27-Feb-2025 11:05 AM



PHASE 3



PHASE 4

PHASED BRIDGE CONSTRUCTION – PHASES 3–4

SCALE: $\frac{1}{8}$" = 1'–0"

SUGGESTED SEQUENCE OF CONSTRUCTION – PHASES 3–4

NOTES:

1. THE 100 YEAR FLOOD ELEVATIONS FOR CONSTRUCTION WILL BE USED FOR THE DESIGN OF CONTROL OF WATER, COFFERDAMS, AND TEMPORARY SHORING DURING CONSTRUCTION.
2. THE TOP OF THE COFFERDAMS AND CONTROL OF WATER SHALL BE A MINIMUM OF 1 FOOT HIGHER THAN THE 100 YEAR FLOOD ELEVATIONS FOR CONSTRUCTION.

PHASE 3

- PLACE TRAFFIC CONTROL MEASURES AND SHIFT WESTBOUND TRAVEL LANES TO NORTHERN PORTION OF STRUCTURE. INSTALL UPSTREAM AND DOWNSTREAM TEMPORARY CONTROL OF WATER MEASURES FOR FISH LADDER CONSTRUCTION AND DEMOLITION OF EXISTING CULVERT AND SPILLWAY.
- CONSTRUCT DOWNSTREAM PORTION OF FISH LADDER AND DIVERT FLOW TO PROPOSED FISH LADDER IN PREPARATION OF REMOVAL/ABANDONING OF EXISTING FISHWAY/SPILLWAY.
- REMOVE AND DISPOSE PORTIONS OF PRIMARY SPILLWAY AND FISHWAY, FISH LADDER AND TEMPORARY BRIDGE. RECONSTRUCT PORTIONS OF EXISTING FISH LADDER AND CONSTRUCT THE EEL PASSAGE IN THE DOWNSTREAM AREA.

PHASE 4

- PLACE TRAFFIC CONTROL MEASURES AND SHIFT SOUTHERN WESTBOUND LANE TO SOUTH SIDE OF DEMOLITION.
- REMOVE AND DISPOSE PORTION OF EXISTING PRIMARY SPILLWAY AND RECONSTRUCT PORTION OF THE FISH LADDER.

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

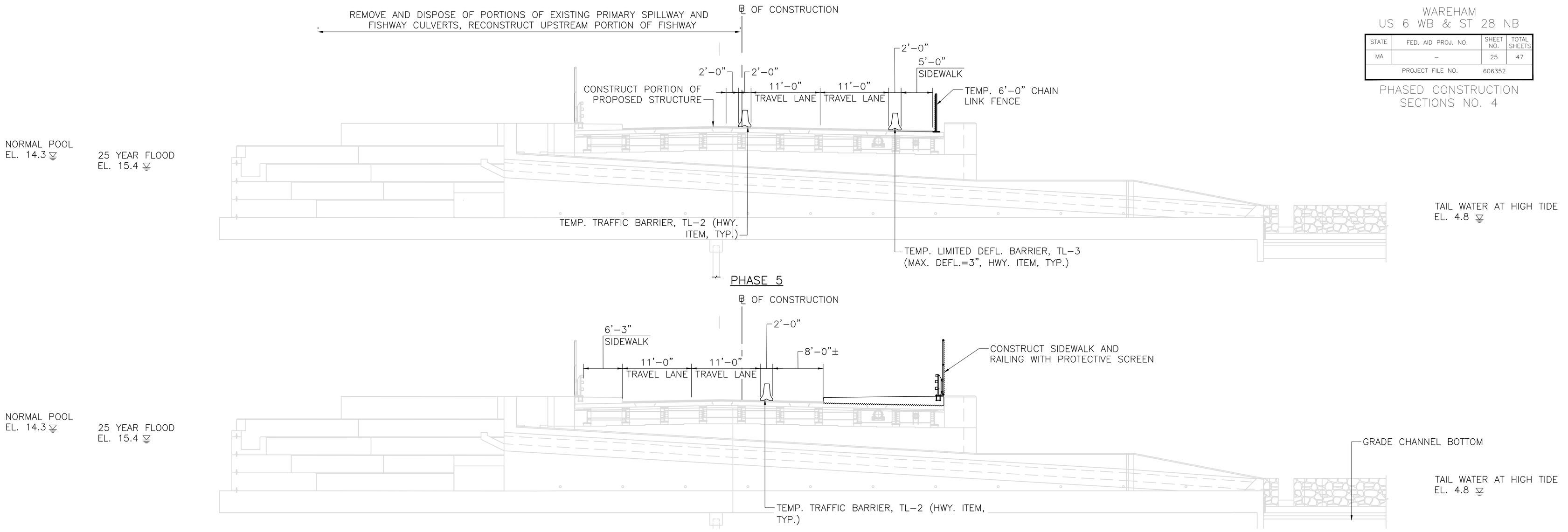
Second Structural Submittal (S2) 17-December-2024

Proposal No. 606532-136278

A00840 - 380

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	25	47
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
SECTIONS NO. 4



PHASED BRIDGE CONSTRUCTION – PHASE 5–6

SCALE: $\frac{1}{8}$" = 1'–0"

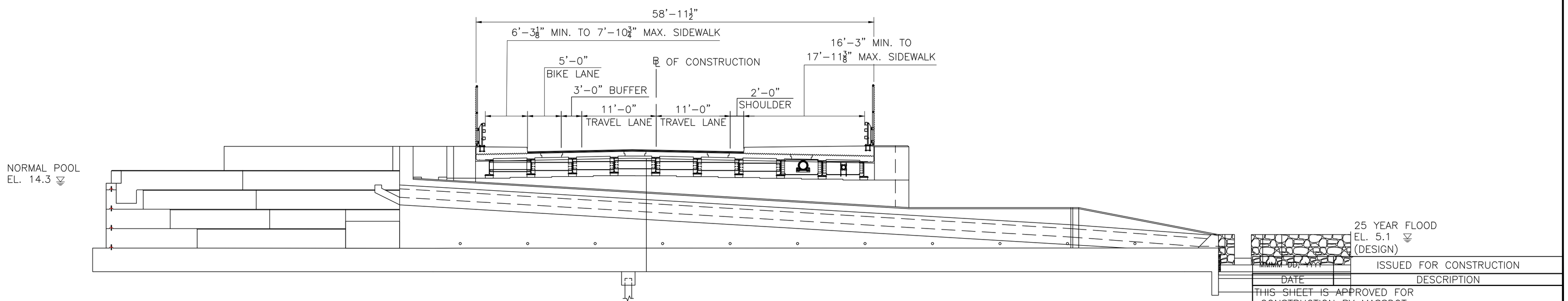
SUGGESTED SEQUENCE OF CONSTRUCTION – PHASES 5–6

PHASE 5

- PLACE TRAFFIC CONTROL MEASURES AND SHIFT WESTBOUND LANES TO SOUTHERN PORTION OF PROPOSED SUPERSTRUCTURE.
- REMOVE AND DISPOSE PORTIONS OF EXISTING PRIMARY SPILLWAY.
- RECONSTRUCT THE REMAINING PORTION OF THE EXISTING FISH LADDER UNDER THE ROADWAY.
- RECONSTRUCT THE UPSTREAM PORTION OF THE EXISTING FISH LADDER CHANNEL AND RETAINING WALLS.

PHASE 6

- GRADE DOWNSTREAM CHANNEL AND REMOVE WATER CONTROL MEASURES FROM UPSTREAM AND DOWNSTREAM OF THE DAM.
- PLACE TRAFFIC CONTROLS AND SHIFT WESTBOUND TRAVEL LANES TO NORTH SIDE OF PROPOSED SUPERSTRUCTURE.
- REMOVE AND DISPOSE OF TEMPORARY WEARING SURFACE.
- CONSTRUCT SOUTHERN SIDEWALK AND INSTALL S3–TL4 RAIL AND PROTECTIVE SCREEN.
- PLACE FINAL PAVING, STRIPING, AND SIGNAGE. REMOVE TRAFFIC CONTROL MEASURES AND OPEN ROADWAY TO FINAL TRAFFIC PATTERN. CONSTRUCT STORAGE SHED IN DOWNSTREAM AREA.



PROPOSED CONDITION

SCALE: $\frac{1}{8}$" = 1'–0"

MMM DD, YYYY	
DATE	DESCRIPTION
ISSUED FOR CONSTRUCTION	

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

606352_BR12-15(W060020).DWG Plotted on 27-Feb-2025 11:08 AM
Second Structural Submittal (S2) 17-December-2024
Proposal No. 606532-136278
A00840 - 381

606352_BR16(W060020).DWG Plotted on 27-Feb-2025 10:43 AM

Proposal No. 606532-136278

A00840 - 382

AGAWAM MILL POND

MILL POND

FEE TAKING

LIMIT OF HYDROGRAPHIC SURVEY

PROP. TEMPORARY COFFERDAM

EXIST. CONC. INLET STRUCTURE WITH TRASH RACK

ONE WAY TRAFFIC (SEE TTCP'S)

PLACE STEEL SHEETING ALONG PHASE LINE

CONC WALL (TYP.)

CONC STRUCTURE

APPROX. EDGE OF POND

TOP OF WATER=13.6± (CULVERT NOT VISIBLE– NO ACCESS)

MASONRY WALL

TOP CONC. 11.6
BOT. CONC. 8.4

P-103

P-102

S-11

B-1 S-111

PIPE FND

WF B-2

WF B-3

S-12 B-4

WP

S-113

TEMP. EASEMENT

CRANBERRY HIG
WES
(1925 STATE HIGHWA

1917 SHLO NO. 1777

LOCATION LINE OF 1917 SHLO 1777

5'–6"± SIDEWALK

CRANBERRY HIGHWAY
(ROUTE 28NB/6WB)

TEMP. LIMITED DEFLECTION BARRIER TL–3 (MAX. DEFL. 3")

12'–0"± TRAVEL LANE

TEMP. PAVEMENT MARKINGS

R&D SOUTH PORTION OF EXISTING SECONDARY SPILLWAY

℄ OF CONSTRUCTION

STONE GUARDRAIL

PT +58.56

R&D SOUTHERN PORTION OF BOX CULVERT

SECANT WALL AT PHASE LINE

TRAFFIC BARREL (TYP.)

TEMPORARILY RELOCATE OVERHEAD UTILITIES TO NORTH SIDE OF ROADWAY

1923 SHLO NO. 2313

EXIST. MAIN SPILLWAY TO REMAIN OPERATIONAL DURING PHASES 1 & 2

EXIST. FISH WAY TO REMAIN OPERATIONAL DURING PHASE 1 & 2

6 WEST
MARION-WAREHAM
LEFT LANE
28 NORTH
MIDDLEBORO
RIGHT LANE

TEMPORARY RELOCATION OF GAS MAIN, 6" STEEL PIPE, SUPPORTED ON UTILITY BRIDGE (BY OTHERS)

PROP. TEMPORARY SHORING/C.O.W. PHASE 1

FEE TAKING

SUGGESTED DEWATERING BASIN LOCATION

AGAWAM RIVER

R&D EXIST. WOOD SHED AND CONC. HARVESTING PAD

FF=10.00'

AGAWAM HERRING RUN

COVERED BILLBOARD

GRASS

CURB STOPS

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

PHASE 1A

SCALE: 1" = 10'

Second Structural Submittal (S2) 17-December-2024

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	27	47
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
PLANS NO. 2

AGAWAM MILL POND

MILL POND

LIMIT OF HYDROGRAPHIC SURVEY

FEE TAKING

TEMPORARY CONTROL OF WATER FOR RIPRAP INSTALLATION

EXIST. CONC. INLET STRUCTURE WITH TRASH RACK

ONE WAY TRAFFIC (SEE TTCP'S)

PROP. TEMPORARY COFFERDAM

LAYOUT ALTERATION

TEMP. EASEMENT

CRANBERRY HIG
WES
(1925 STATE HIGHWA

1917 SHLO NO. 1777

LOCATION LINE OF 1917 SHLO 1777

5'–6"± SIDEWALK

12'–0"± TRAVEL LANE

CRANBERRY HIGHWAY (ROUTE 28NB/6WB)

INTERSTATE 195 WEST

EXISTING SECONDARY SPILLWAY

TEMP. LIMITED DEFL. BARRIER, TL–3

℄ OF CONSTRUCTION

EXIST. MAIN SPILLWAY

INSTALL PORTIONS OF WATERMAIN UP TO THE PHASE LINE

CONSTRUCT SOUTHERN PORTION OF APPROACH SLAB (TYP.)

CONSTRUCT SOUTHERN PORTION OF PROP. BRIDGE/SPILLWAY/FISH LADDER STRUCTURE

1923 SHLO NO. 2313

CONSTRUCT TEMPORARY SIDEWALK (HWY. ITEM)

CONSTRUCT SOUTHERN RETAINING WALL

CONSTRUCT PARTIAL SIDEWALK WITH S3–TL4 RAILING

PARTIALLY DEMOLISH PORTION OF MAIN CULVERT AND SPILLWAY, CONSTRUCT TEMPORARY BRIDGE NO. W–06–020 (XXX)

RELOCATE GAS MAIN TO PROPOSED SUPERSTRUCTURE

TEMPORARILY RELOCATE UTILITY POLES AND OHW TO SOUTH EMBANKMENT

CONSTRUCT DOWNSTREAM TRAINING WALLS AND GROUTED RIPRAP SCOUR APRON

EXISTING FISH WAY

PROP. TEMPORARY SHORING/C.O.W. PHASE 1

SUGGESTED DEWATERING BASIN LOCATION

FEE TAKING

AGAWAM RIVER

PHASE 1B

SCALE: 1" = 10'

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

Proposal No. 606532-136278
606352_BR17(W060020).DWG Plotted on 27-Feb-2025 10:43 AM
A00840 - 383
Second Structural Submittal (S2) 17-December-2024

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	28	47
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
PLANS NO. 3

AGAWAM MILL POND

MILL POND

FEE TAKING

LIMIT OF HYDROGRAPHIC SURVEY

C.O.W FOR INSTALLATION OF RIPRAP

R&D EXIST. CONC. INLET STRUCTURE AND REMAINING PORTION OF CONC. CULVERT

R&D REMAINING PORTION OF EXISTING AUXILLARY SPILLWAY

SUGGESTED DEWATERING BASIN LOCATION

EXIST. PRIMARY SPILLWAY TO REMAIN OPERATIONAL DURING PHASES 1&2

TEMP. CHAINLINK FENCE (TYP.)

TEMPORARY EASEMENT

FEE TAKING

LOCATION LINE OF 1917 SHLO 1777

1917 SHLO NO. 1777

CRANBERRY HIGHWAY (ROUTE 28NB/6WB)

R&D EXIST. WATERMAIN AFTER PROP. WATERMAIN IS IN SERVICE

INTERSTATE 195 WEST
BEAR RIGHT

INSTALL REMAINING PORTION OF THE WATERMAIN

END OF CONSTRUCTION

11'-0" TRAVEL LANE

11'-0" TRAVEL LANE

5'-0" SIDEWALK

TEMP. PAVEMENT MARKINGS

STONE GUARDRAIL

STEEL GUARDRAIL

CONC. DECK WITH METAL RAIL

TRAVEL PROHIBITED IN BREAKDOWN LANE

TEMP. LIMITED DEFL. BARRIER, TL-3 (TYP.)

AGAWAM RIVER

FISH LADDER

APPROX.

CURB STOPS

EOG

PEDESTRIAN CROSSING

C 1923 SHLO NO. 2313

6 WEST
MARION WAREHAM
LEFT LANE
28 NORTH
MIDDLEBORO
RIGHT LANE

205
N: 2739532.324'
E: 881072.276'
EL: 17.131'
MTRAV MAG SET

EXISTING SH WAY

PHASE 2A
SCALE: 1" = 10'

CONSTRUCTION ZONE

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

Second Structural Submittal (S2) 17-December-2024

606352_BR18(W060020).DWG Plotted on 27-Feb-2025 10:44 AM

Proposal No. 606532-136278

A00840 - 384

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	29	47
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
PLANS NO. 4

AGAWAM MILL POND

MILL POND

FEE TAKING

INSTALL PORTIONS OF RIPRAP

LIMIT OF HYDROGRAPHIC SURVEY

CONSTRUCT PROP SPILLWAY

CONSTRUCT REMAINING PORTION OF PROPOSED BRIDGE STRUCTURE

CONSTRUCT REMAINING PORTION OF APPROACH SLAB (TYP.)

CONSTRUCT REMAINING UPSTREAM PORTION OF PROP. FISH LADDER

CONSTRUCT PROP. LOW LEVEL OUTLET

SUGGESTED DEWATERING BASIN LOCATION

EXIST. PRIMARY SPILLWAY TO REMAIN OPERATIONAL DURING PHASES 1&2

FEE TAKING

TEMPORARY EASEMENT

CRANBERRY HIG
WES
(1925 STATE HIGHWA

1917 SHLO NO. 1777

LOCATION LINE OF 1917 SHLO 1777

CRANBERRY HIGHWAY (ROUTE 28NB/6WB)

INTERSTATE 195 WEST
BEAR HOLE

℄ OF CONSTRUCTION

11'-0" TRAVEL LANE

11'-0" TRAVEL LANE

5'-0" SIDEWALK

TRAVEL PROHIBITED IN BREAKDOWN LANE

STONE GUARDRAIL

STEEL GUARDRAIL

CONC. DECK WITH METAL RAIL

MMHB (HELD)

C1923 SHLO NO. 2313

6 WEST
MARION WAREHAM
LEFT LANE
28 NORTH
MIDDLEBORO
RIGHT LANE

205
N: 2739532.324'
E: 881072.276'
EL: 17.131'
MTRAV MAG SET

TEMP. LIMITED DEFL. BARRIER, TL-3 (TYP.)

AGAWAM RIVER

FISH LADDER

APPROX. ℄

CURB STOPS

EOG

FEE TAKING

PEDESTRIAN CROSSING

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

PHASE 2B
SCALE: 1" = 10'

Second Structural Submittal (S2) 17-December-2024

606352_BR19(V006020).DWG Plotted on 27-Feb-2025 10:44 AM

Proposal No. 606532-136278

A008405 - 385

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	30	47
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
PLANS NO. 5

CONTROL OF WATER FOR PHASES 3-5

TEMP. EASEMENT

FEE TAKING

1917 SHLO NO. 1777

LOCATION LINE OF 1917 SHLO 1777

6'-3" SIDEWALK

11'-0" TRAVEL LANE

11'-0" TRAVEL LANE

PEDESTRIAN CROSSING

CRANBERRY HIGHWAY (ROUTE 28NB/6WB)

INTERSTATE 195 WEST
REAR RIGHT

TEMP. PAVEMENT MARKINGS

℄ OF CONSTRUCTION

PBT +56.56

1923 SHLO NO. 2313

PEDSTRIAN CROSSING

TRAVEL PROHIBITED IN BREAKDOWN

STEEL GUARDRAIL

CONC GUARDRAIL

CONC BARR WITH METAL RAIL

R&D PORTIONS OF EXIST. FISH WAY

205
N: 2739532.324'
E: 881072.276'
EL: 17.131'
MTRAV MAG SET

TEMP. LIMITED DEFL. BARRIER, TL-3 (TYP.)

CONTROL OF WATER FOR PHASE 3

SUGGESTED DEWATERING BASIN LOCATION

TEMPORARY SHORING FOR PHASE 3-5

AGAWAM RIVER

FEE TAKING

FEE TAKING

GRAVEL

MAP 129 LOT 1148.C
COMMONWEALTH OF MASSACHUSETTS
DEED BOOK 11494
PAGE 48
PLAN 699 OF 1992

#2849
MAP 129 LOT 1150
WAREHAM B. P. O. ELKS, #1548
DEED BOOK 3061 PAGE 48
PLAN BOOK 1 PLAN 544

MREB FOUND

AGAWAM RIVER
ESTUARY INFORMATION

EOG

PHASE 3A

SCALE: 1" = 10'

MMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

Second Structural Submittal (S2) 17-December-2024

606352_BR19(W66020)_PHASE 3.DWG Plotted on 27-Feb-2025 10:45 AM

Proposal No. 606532-136278

A00840 - 386

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	31	47
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
PLANS NO. 6

CRANBERRY HIGHWAY (ROUTE 28NB/6WB)

1917 SHLO NO. 1777

LOCATION LINE OF 1917 SHLO 1777

1923 SHLO NO. 1913

6'-3" SIDEWALK

11'-0" TRAVEL LANE

11'-0" TRAVEL LANE

FEE TAKING

TEMP. EASEMENT

CONTROL OF WATER

TEMP. PAVEMENT MARKINGS

℄ OF CONSTRUCTION

PEDESTRIAN CROSSING

INTERSTATE 195 WEST

MARION WAREHAM

LEFT LANE

28 NORTH

RECONSTRUCT FISH WAY CHANNEL AND REPAIR FISH WAY ROOF

205
N: 2739532.324'
E: 881072.276'
EL: 17.131'
MTRAV MAG SET

CONSTRUCT FISH LADDER RETAINING WALL AND FOOTING

TEMP. LIMITED DEFL. BARRIER, TL-3 (TYP.)

CONTROL OF WATER

AGAWAM RIVER

FEE TAKING

TEMPORARY SHORING

CONSTRUCT WALKWAY TO HARVESTING PAD AREA

CONSTRUCT PROPOSED FISH LADDER

SUGGESTED DEWATERING BASIN LOCATION

MREB FOUND

AGAWAM RIVER ESTUARY INFORMATION

EOG

GRAVEL

STONE GUARDRAIL

STEEL GUARDRAIL

CONC GUARDRAIL

CONC BACK WITH METAL RAIL

TRAVEL PROHIBITED IN BREAKDOWN LANE

REFLECTOR

+50 PBT +56.56

+56.56

+86.14 PC

+07.06 PT

+50

+65

2+65

PHASE 3B

SCALE: 1" = 10'

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

Second Structural Submittal (S2) 17-December-2024

606352_BR19(W06020) - PHASE 3B.DWG Plotted on 27-Feb-2025 10:45 AM

Proposal No. 606532-136278

A00840 - 387

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	32	47
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
PLANS NO. 7

AGAWAM MILL POND

MILL POND

FEE TAKING

LIMIT OF HYDROGRAPHIC SURVEY

CONC WALL (TYP.)

CONC STRUCTURE

TOP OF WATER = 6.8 (CULVERT NOT VISIBLE DUE TO ACCESS)

APPROX EDGE OF WATER

(BROKEN)

MASONRY

FEE TAKING

TEMPORARY EASEMENT

CRANBERRY HIG
WES
(1925 STATE HIGHWA

1917 SHLO NO. 1777

PROP. TEMP. PAVEMENT MARKINGS

PROP. SECANT WALL

11'-0" TRAVEL LANE

LOCATION LINE OF 1917 SHLO 1777

R&D PORTION OF EXISTING PRIMARY SPILLWAY CULVERT

CRANBERRY HIGHWAY (ROUTE 28NB/6WB)

INTERSTATE 195 WEST
REAR ABUT

STONE GUARDRAIL

DIA CULVERT

56.56

PEDESTRIAN CROSSING

1923 SHLO NO. 2313

6 WEST
MARION WAREHAM
LEFT LANE
28 NORTH
MIDDLEBORO
RIGHT LANE

R&D POTION OF EXISTING FISH LADDER

INSTALL TEMP. 6'-0" CHAIN LINK FENCE

FISH LADDER RETAINING WALL AND FOOTING

REMOVE THE PORTION OF THE WATERLINE OVER THE EXISTING CULVERT AND REPLACE PIPE IN LINE WITH BURIED PIPE

205
N: 2739532.324'
E: 881072.276'
EL: 17.131'
MTRAV MAG SET

+86.14 PC

107.06 PT

AGAWAM RIVER

SUGGESTED DEWATERING BASIN LOCATION

AGAWAM HERRING RUN

FEE TAKING

CURB STOPS

EOG

PHASE 4

SCALE: 1" = 10'

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

Proposal No. 606532-136278

606352_BR19(W66020)_PHASE 4.DWG Plotted on 27-Feb-2025 10:46 AM

Second Structural Submittal (S2) 17-December-2024

A00840 - 388

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	33	47
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
PLANS NO. 8

606352_BR19(W66020) - PHASE 5.DWG Plotted on 27-Feb-2025 10:46 AM

Proposal No. 606532-136278

A00840 - 389

48"x84" WARNING SIGN ON BUOY

FEE TAKING

MILL POND

48"x72" TRIM HAZARD SIGN ON BUOY

PROPERTY LINE

PROP. FLOATING WARNING BARRIER

INSTALL REMAINING PORTION OF RIPRAP

LIMIT OF HYDROGRAPHIC SURVEY

RECONSTRUCT FISH WAY WALLS AND CHANNEL BOTTOM

LAYOUT ALTERATION

R&D REMAINING EXIST. PRIMARY SPILLWAY

R&D EXIST. FISHLADDER, INSTALL PROP. HEADWALL AND INLET

TEMPORARY EASEMENT

1917 SHLO NO. 1777

11'-0" TRAVEL LANE

11'-0" TRAVEL LANE

5'-0" SIDEWALK

1923 SHLO NO. 2313

TEMP. LIMITED DEFL. BARRIER, TL-3 (TYP.)

AGAWAM RIVER

AGAWAM HERRING RUN

CURB STOPS EOG

1917 SHLO 1777 BASELINE

LOCATION LINE OF 1917 SHLO 1777

LOCATION LINE OF 1925 SHLO 2313

INTERSTATE 495 WEST BOUND RAMP

MMON CB/

MIPE CD

INSET A

SIDEWALK CLOSED

CRANBERRY HIGHWAY (ROUTE 28NB/6WB)

WAREHAM NEW BEDFORD ELKS LODGE #73

#10 OLD GLEN CHARLIE ROAD
MAP 129 LOT 1162
TOWN OF WAREHAM

#6-8 OLD GLEN CHARLIE ROAD
MAP 129 LOT RA
ERIN K. MACLURE
DEED BOOK 50537 PAGE 166
PLAN BOOK 11 PLAN 1115

R&D EXIST. FISHWAY EXIT

OPEN FISH WAY

MMON SB/ DISK

APPROX. ℄ OF CONSTRUCTION

PHASE 5
SCALE: 1" = 10'

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

Second Structural Submittal (S2) 17-December-2024

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	34	47
PROJECT FILE NO.	606352		

PHASED CONSTRUCTION
PLANS NO. 9

AGAWAM MILL POND

MILL POND

PROP. FLOATING WARNING BARRIER

FEE TAKING

LIMIT OF HYDROGRAPHIC SURVEY

SPILLWAY AND LOW LEVEL OUTLET

CONC WALL (TYP.)

CONC STRUCTURE

TOP OF WATER=13.6± (CULVERT NOT VISIBLE – NO ACCESS)

FEE TAKING

TEMPORARY EASEMENT

CRANBERRY HIG
WES
(1925 STATE HIGHWA

LOCATION LINE OF 1917 SHLO 1777

1917 SHLO NO. 1777

6'-3" SIDEWALK

11'-0" TRAVEL LANE

11'-0" TRAVEL LANE

CRANBERRY HIGHWAY (ROUTE 28NB/6WB)

INTERSTATE 195 WEST BEAR RIGHT

℄ OF CONSTRUCTION

STONE GUARDRAIL

CONSTRUCT PROPOSED SOUTH SIDEWALK

TEMP. TRAFFIC BARRIER, TL-3 (TYP.)

CONSTRUCT SIDEWALK AND RAILING WITH PROTECTIVE SCREEN

PERMANENTLY RELOCATION OVERHEAD UTILITIES TO FINAL POSITION

1923 SHLO NO. 2313

CONSTRUCT STORAGE SHED

6 WEST
MARION WAREHAM
LEFT LANE
28 NORTH
MIDDLEBORO
RIGHT

205
N: 2739532.324'
E: 881072.276'
EL: 17.131'
MTRAV MAG SET

PROPOSED MODIFIED ROCK FILL FOR STORMWATER TREATMENT UNIT

+86.14 PC

+107.06 PT

AGAWAM RIVER

AGAWAM HERRING RUN

PHASE 6

SCALE: 1" = 10'

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

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USE ONLY PRINTS OF LATEST DATE

Second Structural Submittal (S2) 17-December-2024

606352_BR19(W66020) - PHASE 6.DWG Plotted on 27-Feb-2025 10:47 AM

Proposal No. 606532-136278

A00840 - 390

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	35	47
PROJECT FILE NO.	606352		

SECANT WALL LAYOUT

MILL POND

CRANBERRY HIGHWAY (ROUTE 28NB/6WB)

STA. 15+17.45
OFF. 98.34L

℄ AGAWAM RIVER

SECANT WALL FOR TEMPORARY SOE AND CONTROL OF WATER (TYP.)

135°0'0" (TYP.)

STA. 15+73.11
OFF. 97.48L

SPILLWAY AND LOW LEVEL OUTLET

STA. 14+82.80
OFF. 64.71L

STA. 16+9.61
OFF. 60.89L

90°0'0"

STA. 16+9.50
OFF. 4.89L

84°44'10"

STA. 14+78.57
OFF. 7.12L

STA. 14+08.79
OFF. 15.012L

PRC +93.02

PT +56.56

℄ OF CONSTRUCTION

LIMITS OF 3'–0" DIAMETER SECANT WALLS

STA. 16+61.00
OFF. 6.38L

STA. 16+85.75
OFF. 4.89L

STA. 16+30.43
OFF. 341.01L

INSET A

SEE INSET A

1917 SHLO NO. 1777

1923 SHLO NO. 2313

VEGETATED WETLAND

WEST MARION W LEFT LANE

SECANT WALL PLAN

SCALE: 1" = 10'

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

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AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

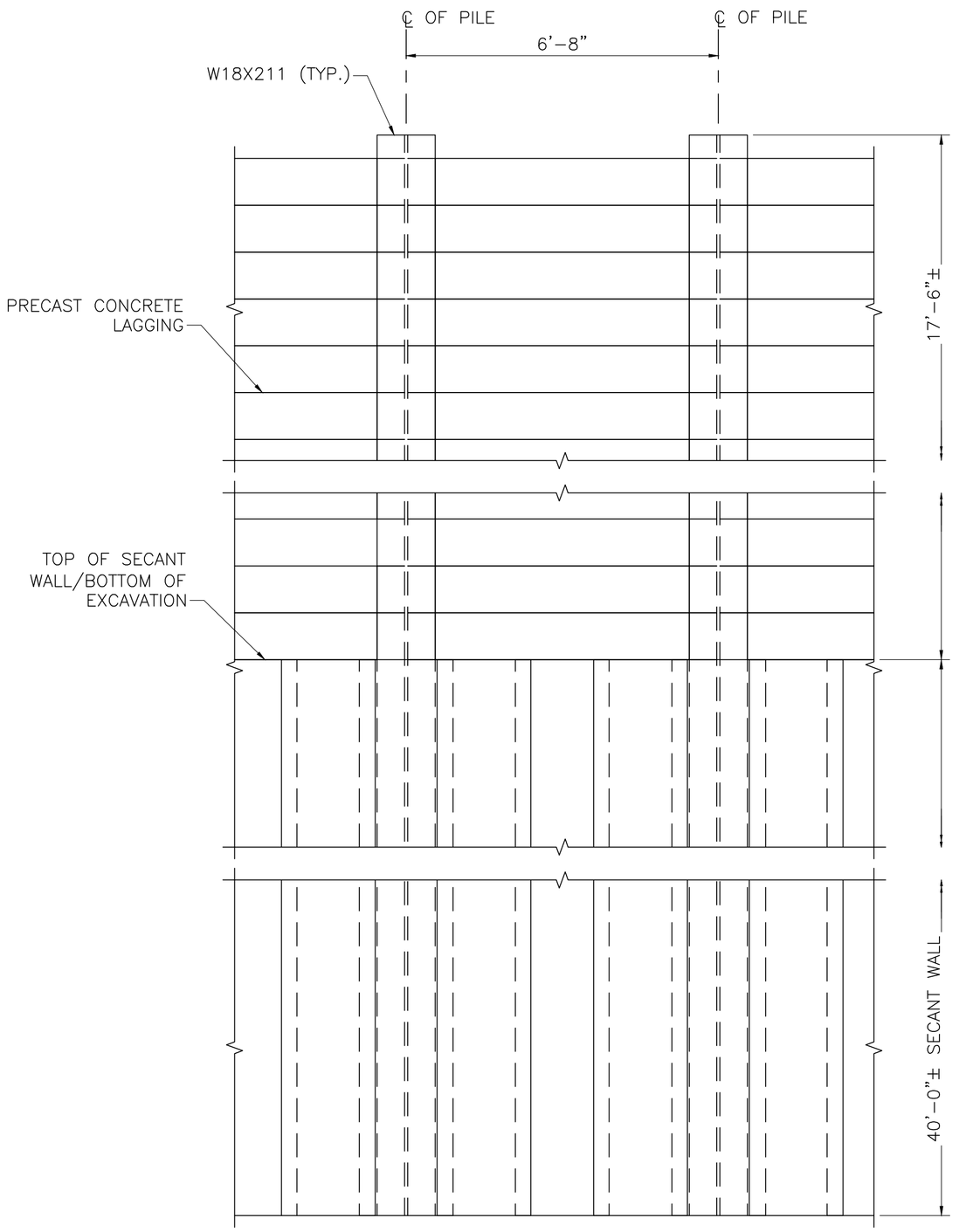
SHEET ---- OF 77 SHEETS BRIDGE NO. W-06-020 (CCV)

Proposal No. 606532-136278

606352_BRX(W06020) - SECANT WALL.DWG Plotted on 27-Feb-2025 10:47 AM

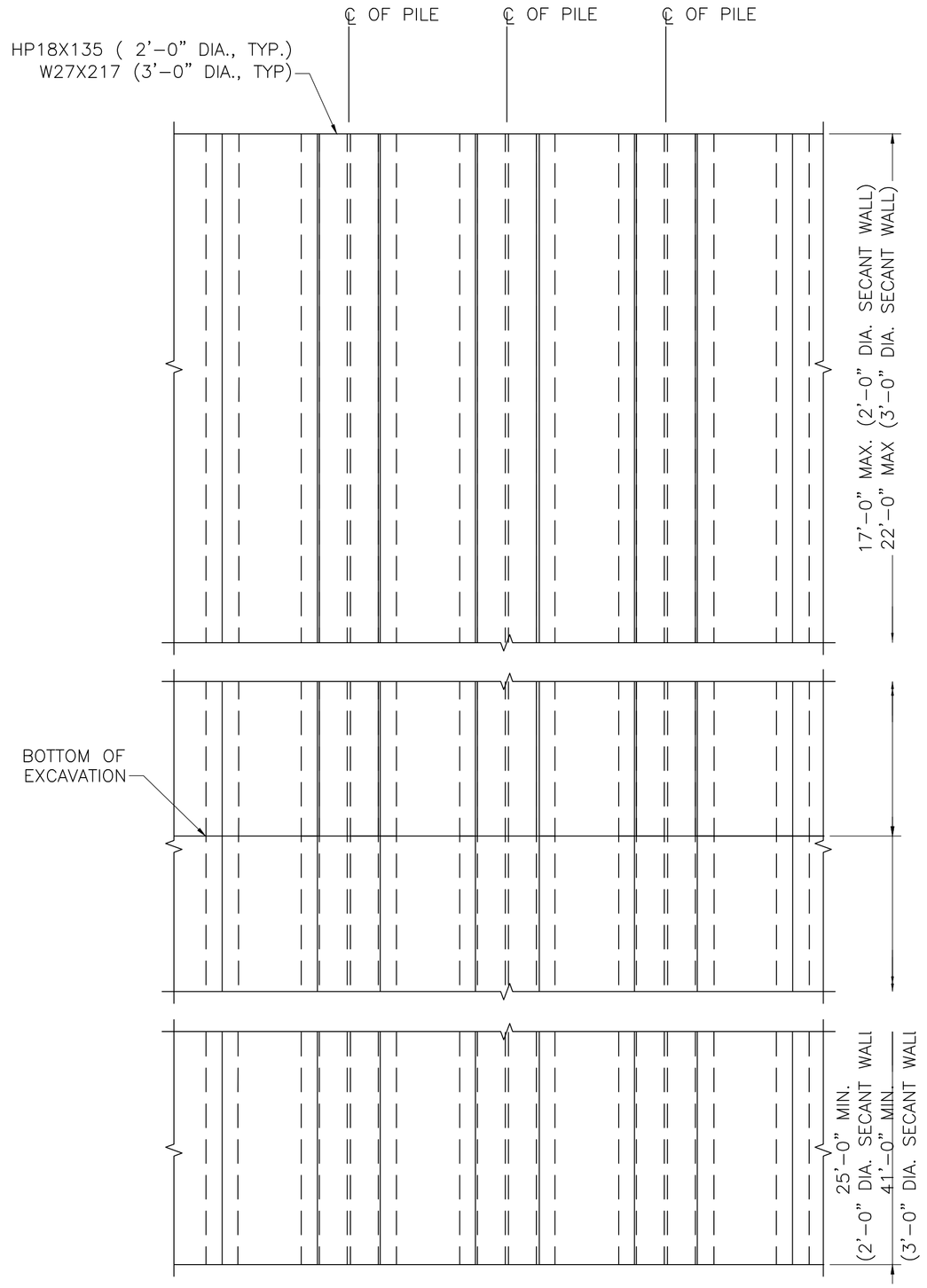
A00840 - 391

Second Structural Submittal (S2) 17-December-2024



COFFERDAM SECANT WALL ELEVATION

SCALE: ½" = 1'–0"

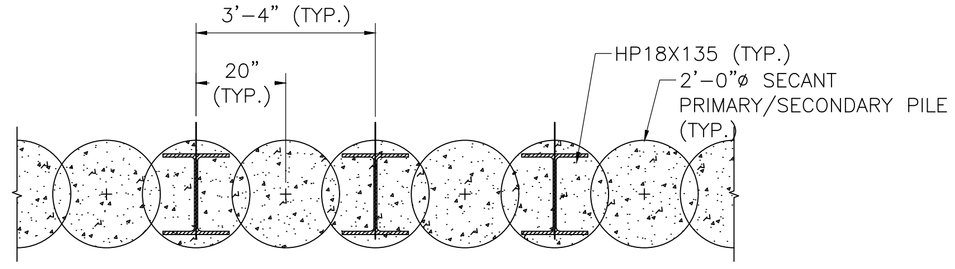


EXCAVATION SUPPORT/CUTOFF SECANT WALL ELEVATION

SCALE: ½" = 1'–0"

EXCAVATION SUPPORT NOTES:

1. GROUND WATER SHALL BE LOWERED AT LEAST 2'–0" BELOW THE DESIGNATED BOTTOM OF EXCAVATIONS BY PUMING BOTH ON THE INSIDE AND OUTSIDE OF THE EXCAVATION SUPPORT SYSTEM PRIOR TO PLACEMENT OF ALL MATERIAL. REFER TO BORING LOGS FOR GROUND WATER INFORMATION.

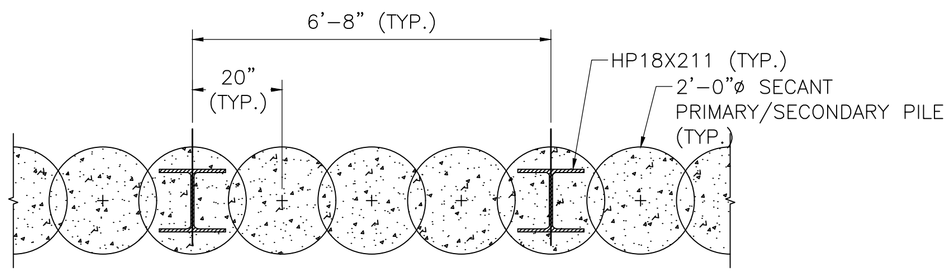


EXCAVATION SUPPORT/CUTOFF SECANT WALL SECTION

SCALE: ½" = 1'–0"

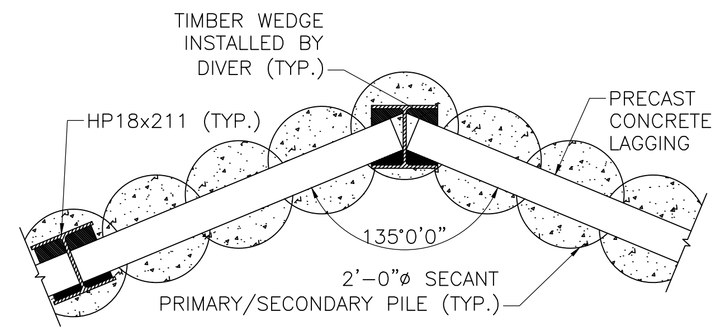
COFFERDAM NOTES:

1. SECANT WALLS AND PRECAST CONCRETE PANEL LAGGING SHALL BE 5000 PSI, ¾", 685 HP CEMENT CONCRETE.
2. STRUCTURAL STEEL SHALL BE AASHTO M270 GRADE 50, UNCOATED.
3. PROPOSED STEEL H PILES SHALL BE FULLY EMBEDDED IN THE SECONDARY SECANT WALL PILES.
4. PRECAST CONCRETE PANELS SHALL BE PLACED WITH WATER TIGHT SEALERS AT THE INTERFACE WITH THE STEEL PILES. THE BOTTOMS OF THE PANEL SECTIONS SHALL BE GROUTED AS REQUIRED FOR WATER CUTOFF AT THE INTERFACE WITH THE SECANT WALL.
5. THE CONTRACTOR SHALL INSTALL A WATERPROOFING/SEALING MEMBRANE AS REQUIRED BEHIND THE PRECAST CONCRETE LAGGING TO REDUCE LEAKAGE INTO THE EXCAVATION AREA.
6. AFTER THE INSTALLATION OF THE SYSTEM, THE CONTRACTOR SHALL GRADUALLY DEWATER THE EXCAVATION AREA AND CONTINUE DEWATERING AS REQUIRED DUE TO LEAKAGE AND SEEPAGE INTO THE EXCAVATED AREA.



COFFERDAM SECANT WALL SECTION

SCALE: ½" = 1'–0"



COFFERDAM SECANT WALL SECTION AT TURN

SCALE: ½" = 1'–0"

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

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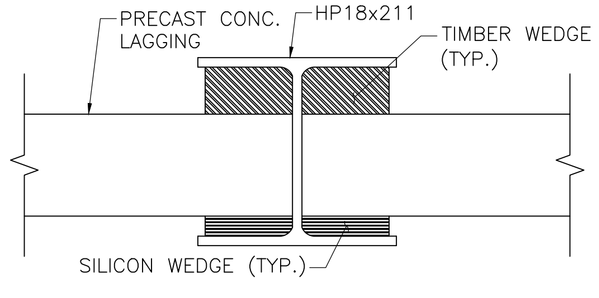
USE ONLY PRINTS OF LATEST DATE

Proposal No. 606532-136278
606352_BRX(W06020) - SECANT WALL.DWG Plotted on 27-Feb-2025 10:47 AM
A00840 - 392
Second Structural Submittal (S2) 17-December-2024

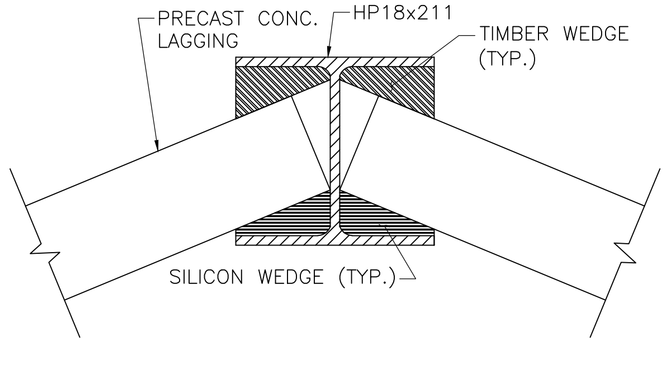
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	37	47
PROJECT FILE NO.	606352		

SECANT WALL DETAILS NO. 2



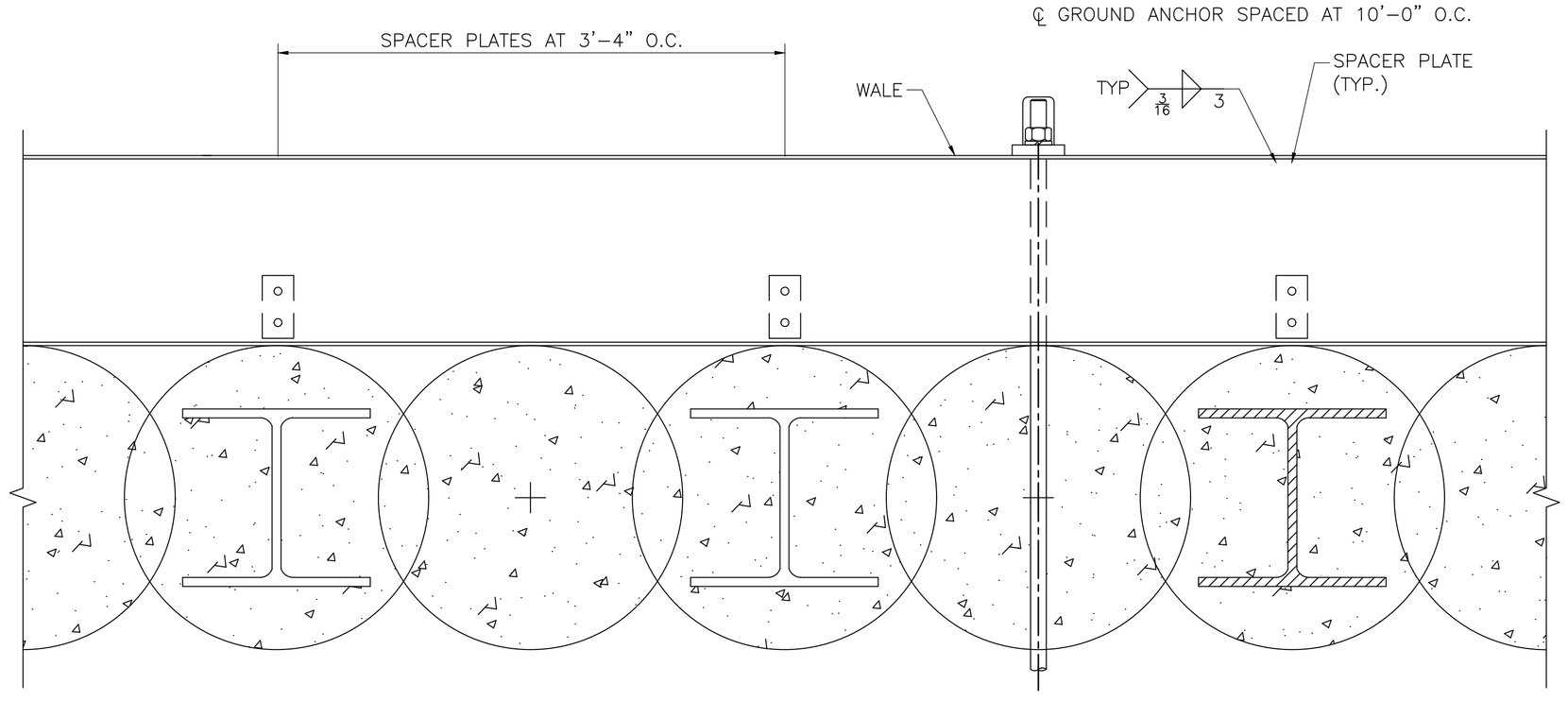
TYPICAL LAGGING WEDGE DETAIL

SCALE: 1½" = 1'–0"

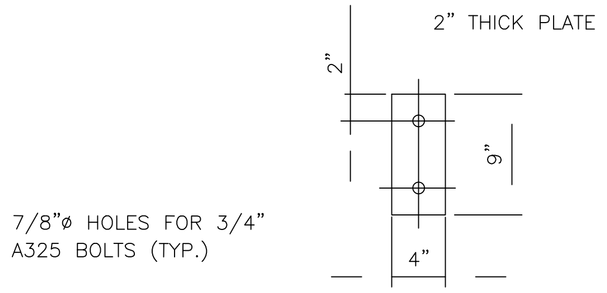


TYPICAL LAGGING WEDGE DETAIL AT TURN

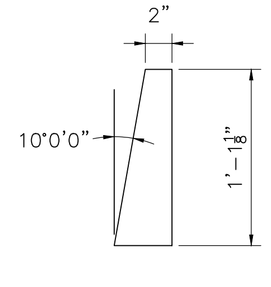
SCALE: 1½" = 1'–0"



WALE PLAN



SPACER PLATE



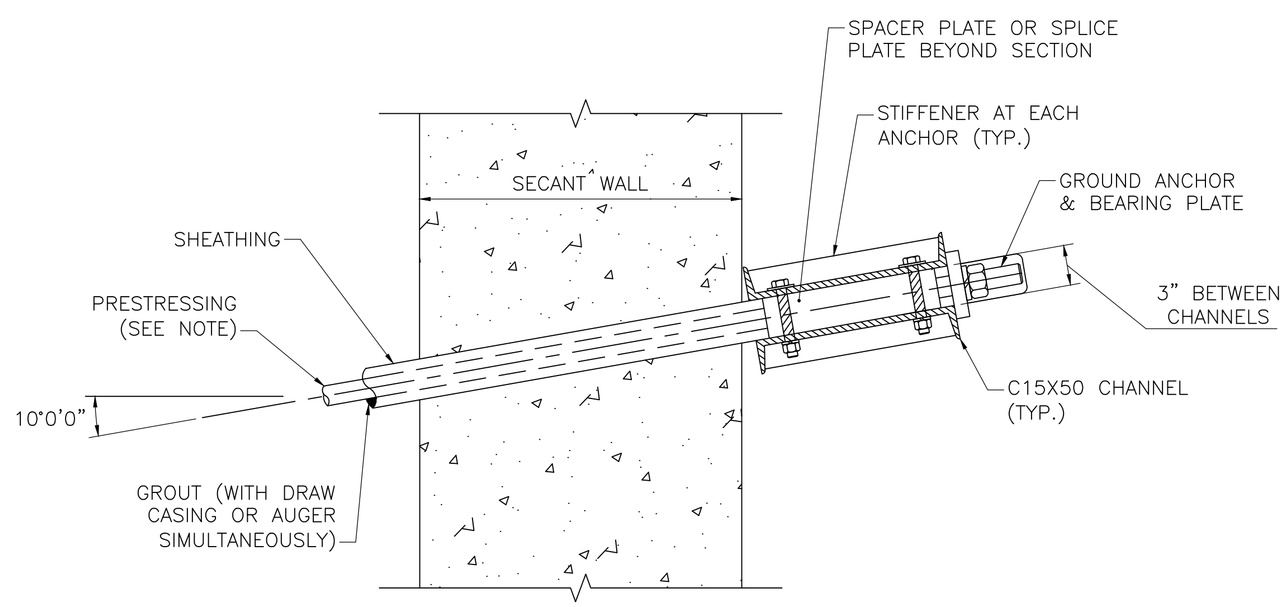
WEDGE PLATE

TYPICAL WALE DETAILS

SCALE: 1½" = 1'–0"

EXCAVATION SUPPORT NOTES:

1. GROUND WATER SHALL BE LOWERED AT LEAST 2'–0" BELOW THE DESIGNATED BOTTOM OF EXCAVATIONS BY PUMING BOTH ON THE INSIDE AND OUTSIDE OF THE EXCAVATION SUPPORT SYSTEM PRIOR TO PLACEMENT OF ALL MATERIAL. REFER TO BORING LOGS FOR GROUND WATER INFORMATION.



GROUND ANCHOR DETAIL

SCALE: 1½" = 1'–0"

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DATE	DESCRIPTION

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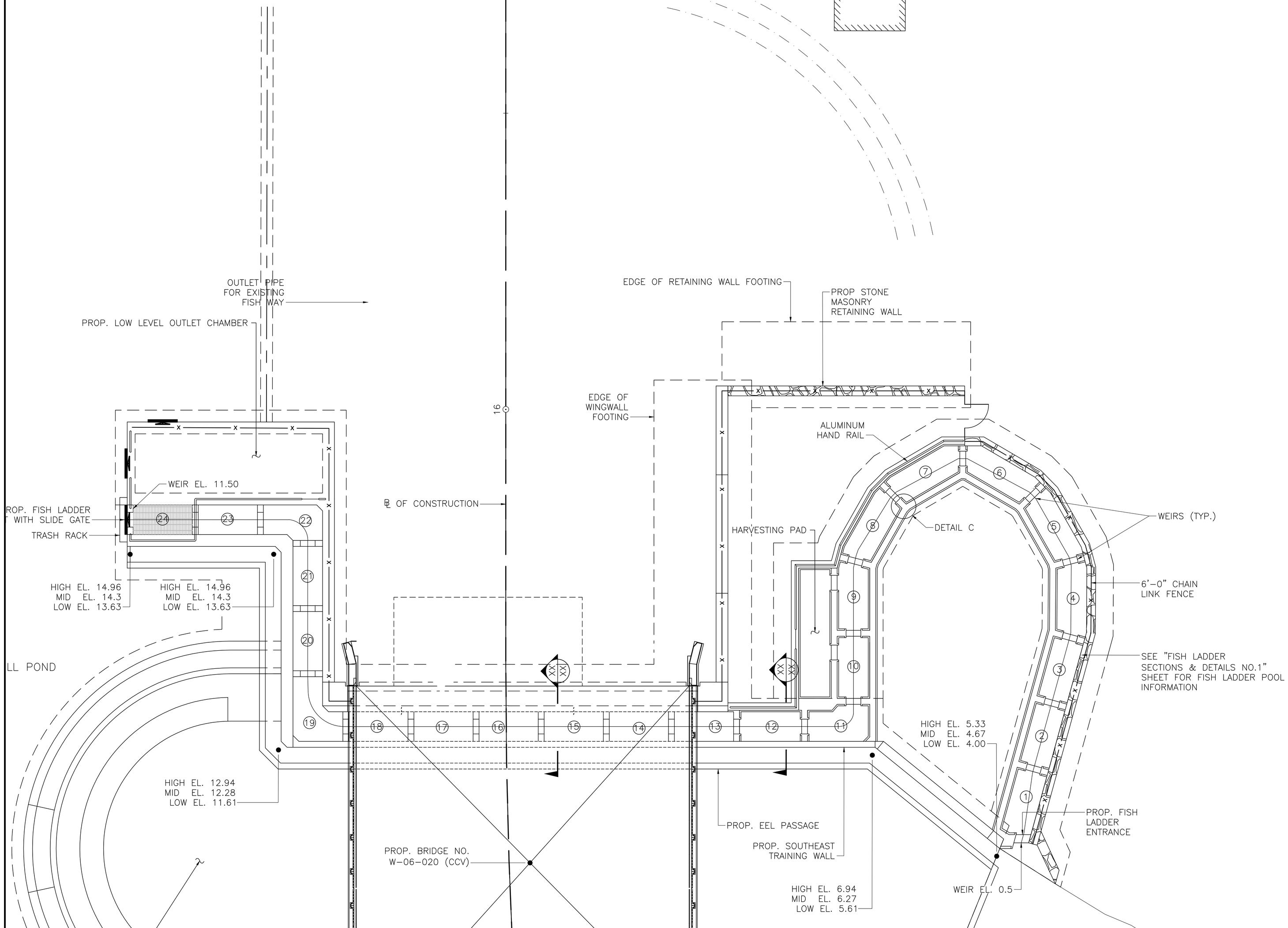
USE ONLY PRINTS OF LATEST DATE

Proposal No. 606532-136278
606352_BRX(W06020) - SECANT WALL.DWG Plotted on 27-Feb-2025 10:47 AM
A00840 - 393
Second Structural Submittal (S2) 17-December-2024

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	38	47
PROJECT FILE NO.	606352		

WILDLIFE PASSAGE PLAN



FISH LADDER PLAN
SCALE: $\frac{1}{8}$" = 1'-0"

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

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USE ONLY PRINTS OF LATEST DATE

Proposal No. 606532-136278

606352_BR28(W06020).DWG Plotted on 27-Feb-2025 10:48 AM

A00840 - 394

Second Structural Submittal (S2) 17-December-2024

DATE	DESCRIPTION
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION

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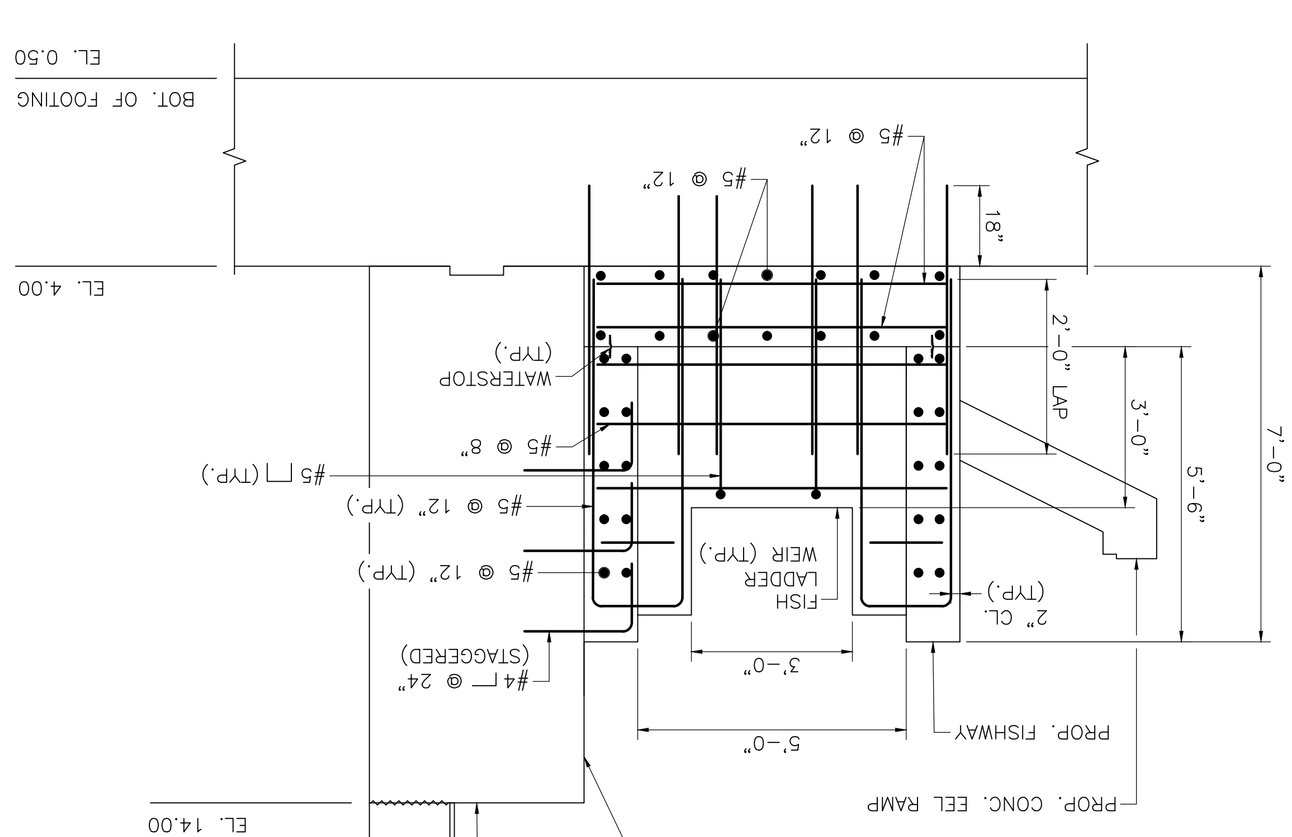
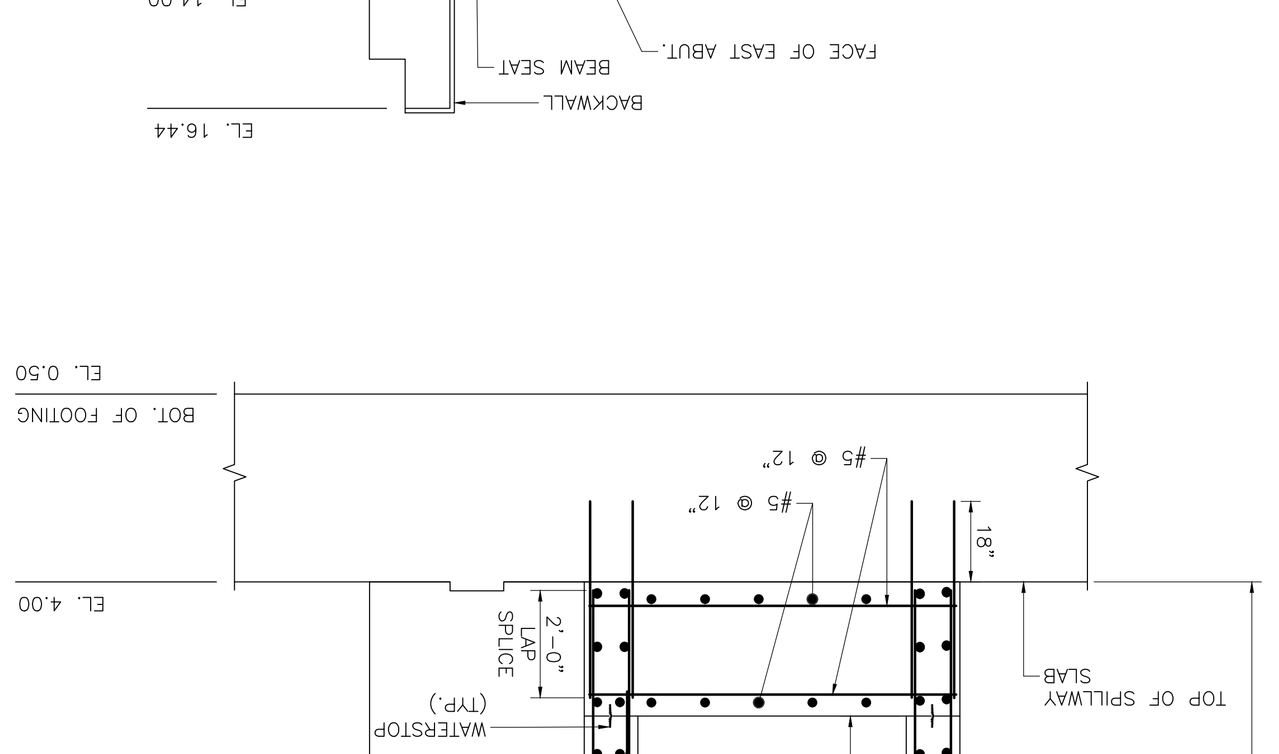
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

DOWNSTREAM FISH LADDER LAYOUT INFORMATION

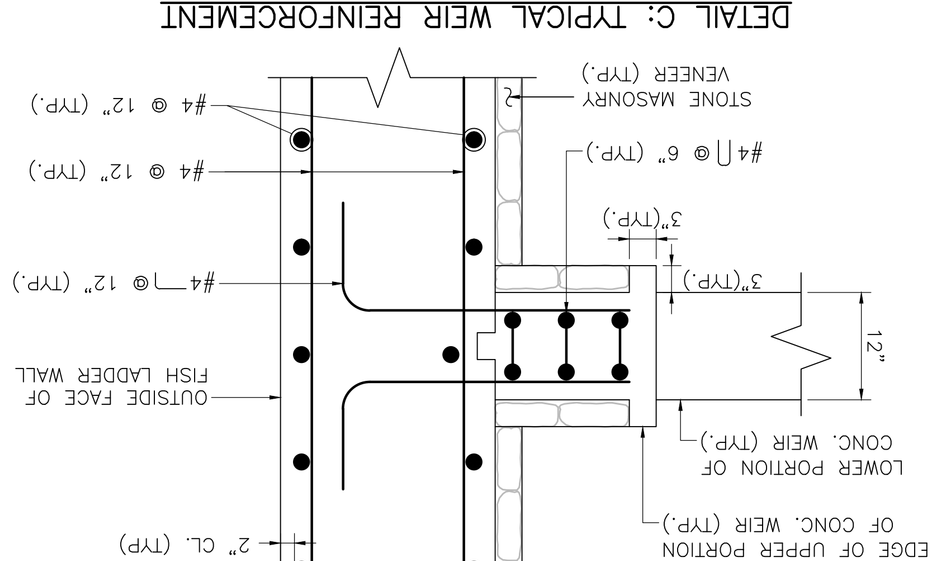
POOL NUMBER	B.O. POOL ELEVATION	DOWNSTREAM STATION	OFFSET (FT)	UPSTREAM STATION**	OFFSET (FT)
1	0.00	15+25.51	87.00 RT	15+37.14	88.86 RT
2	0.00	15+38.19	89.14 RT	15+49.29	92.06 RT
3	0.00	15+50.35	92.33 RT	15+61.04	95.13 RT
4	0.00	15+62.01	95.40 RT	15+73.89	95.47 RT
5	0.50	15+74.86	95.21 RT	15+85.17	89.34 RT
6	1.00	15+85.88	88.64 RT	15+91.70	77.69 RT
7	1.50	15+91.70	76.69 RT	15+85.88	65.73 RT
8	2.00	15+85.17	65.03 RT	15+74.86	59.16 RT
9	2.50	15+73.89	58.90 RT	15+62.71	58.72 RT
HARVESTING PAD	4.50	15+70.73	54.99 RT	15+58.96	54.97 RT
10	3.00	15+61.71	58.72 RT	15+50.88	58.71 RT
11	3.50	15+49.82	58.70 RT	15+45.92	50.92 RT
12	4.00	15+45.93	49.92 RT	15+46.04	39.42 RT
13	4.50	15+46.06	38.42 RT	15+46.16	28.42 RT
14	5.00	15+46.18	27.42 RT	15+46.28	17.42 RT
15	5.50	15+46.29	16.42 RT	15+46.40	6.42 RT
16	6.00	15+46.41	5.42 RT	15+46.51	4.58 LT
17	6.50	15+46.52	5.58 LT	15+46.62	15.58 LT
18	7.00	15+46.63	16.58 LT	15+46.72	26.58 LT
19	7.50	15+46.73	27.58 LT	15+54.93	33.46 LT
20	8.00	15+55.90	33.46 LT	15+65.88	33.46 LT
21	8.50	15+66.88	33.46 LT	15+76.88	33.46 LT
22	9.00	15+77.88	33.46 LT	15+81.38	40.96 LT
23	9.50	15+81.38	41.96 LT	15+81.38	51.96 LT
24	10.00	15+81.38	52.96 LT	15+81.38	63.96 LT

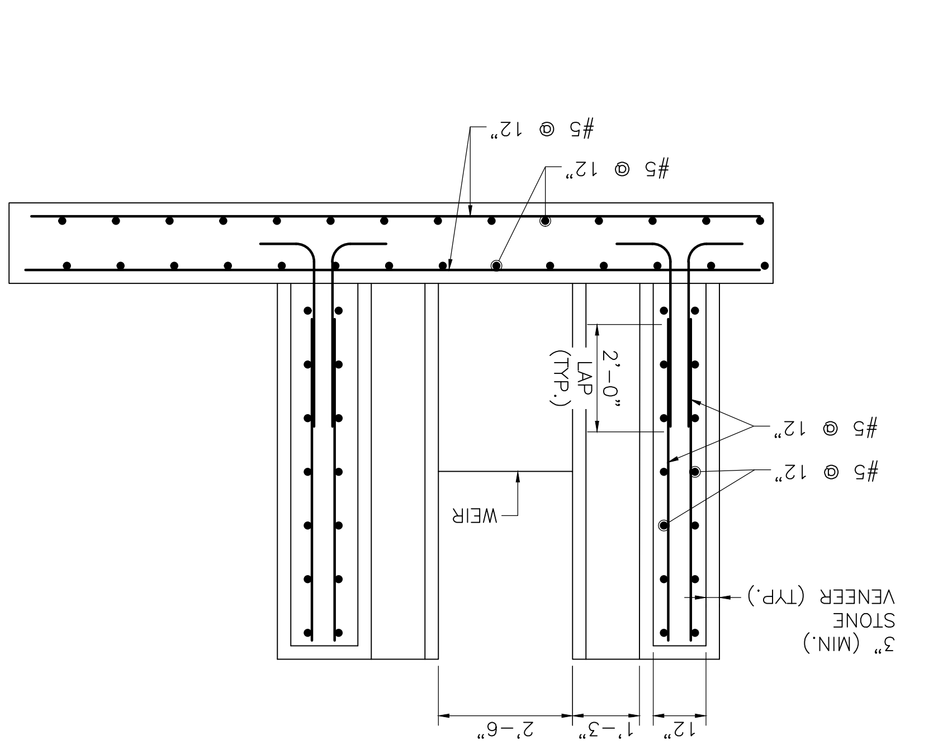




DETAIL C: TYPICAL WEIR REINFORCEMENT

SCALE: 1" = 1'-0"

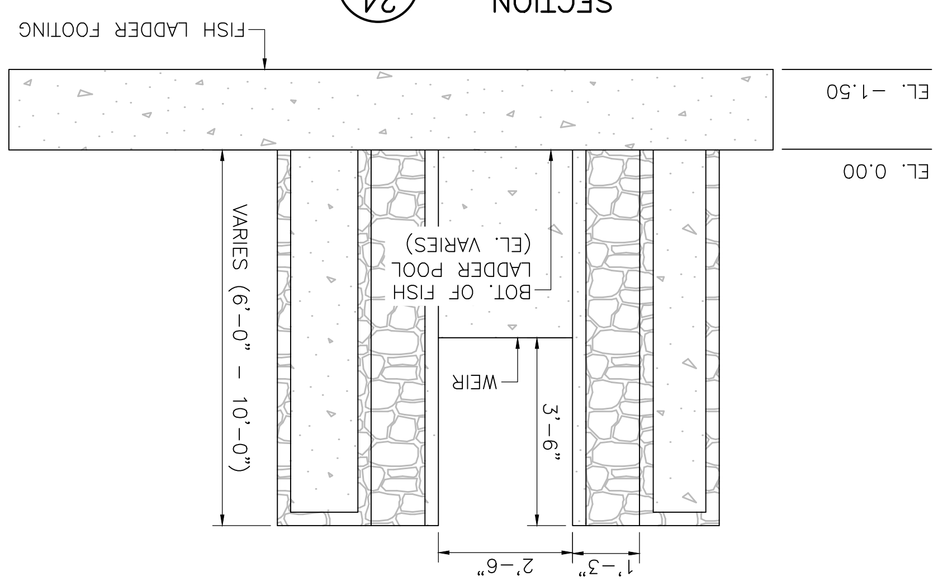


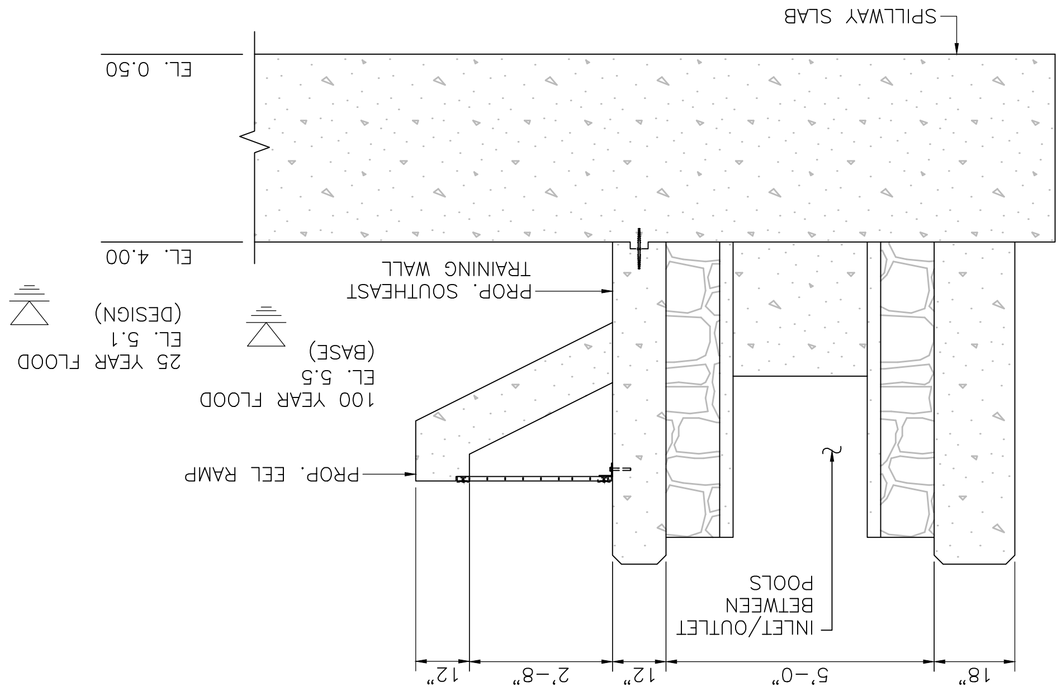


SECTION

24 / 41

SCALE: 2" = 1'-0"

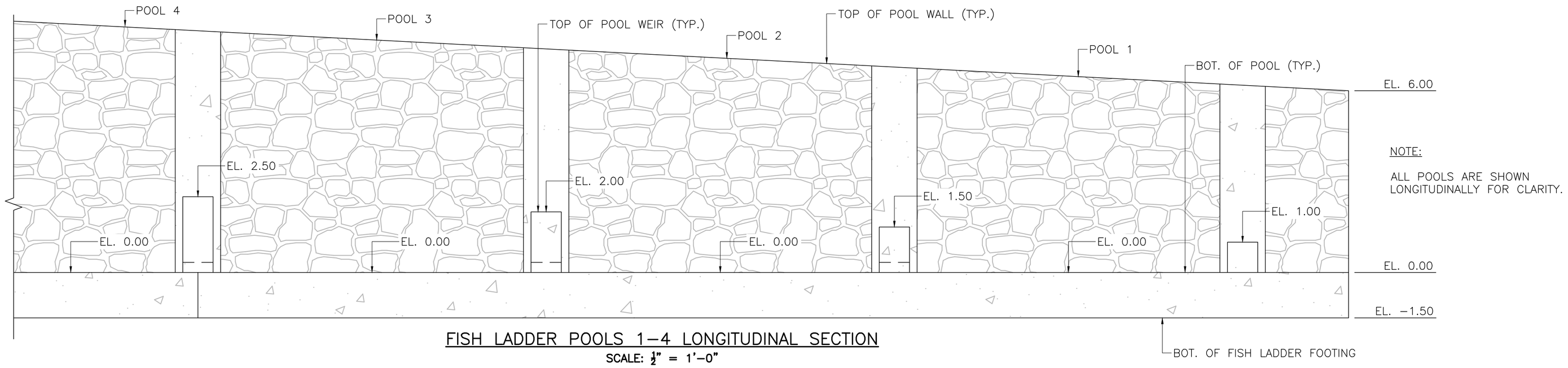




WARE HAM
US 6 WB & ST 28 NB

WILDLIFE PASSAGE SECTIONS & PERMIT DETAILS NO. 1

STATE	FED. AID PROJ. NO.	–	SHEET NO.	39	TOTAL SHEETS	114
MA	PROJECT FILE NO. 606352					

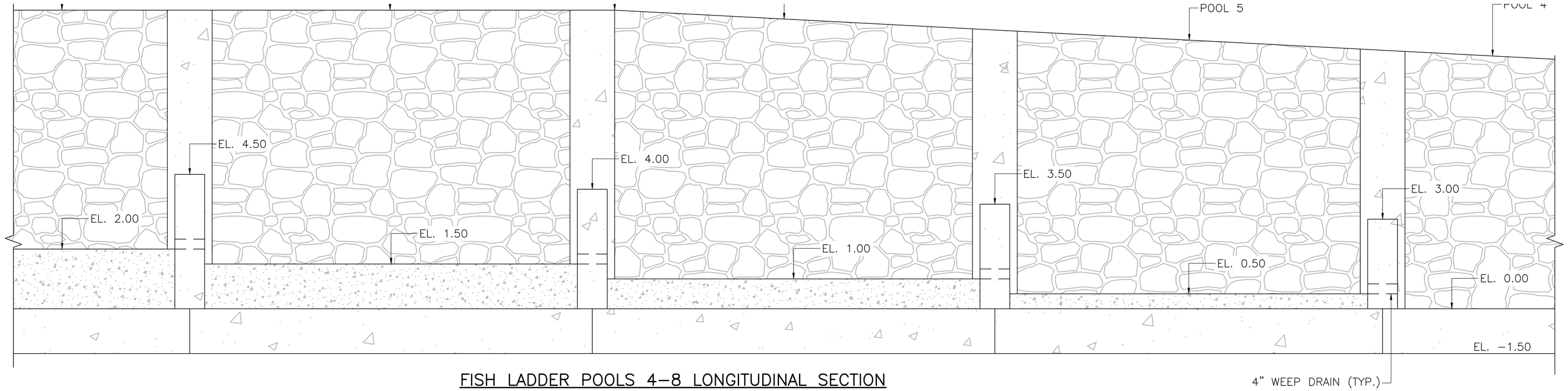


NOTE:

ALL POOLS ARE SHOWN LONGITUDINALLY FOR CLARITY.

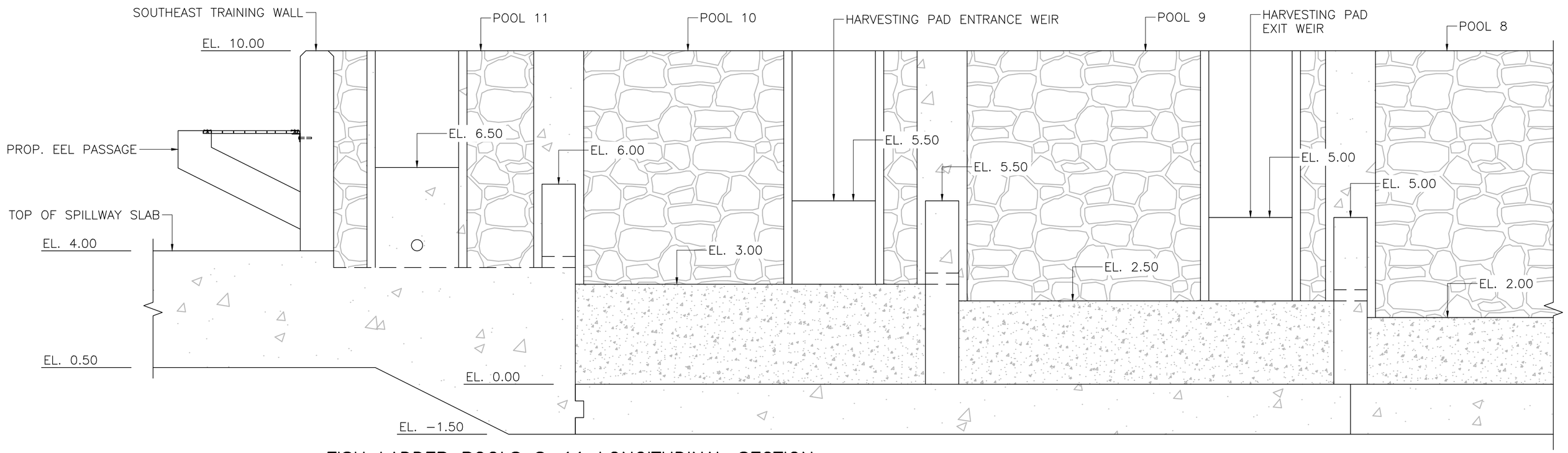
FISH LADDER POOLS 1–4 LONGITUDINAL SECTION

SCALE: ½" = 1'–0"



FISH LADDER POOLS 4–8 LONGITUDINAL SECTION

SCALE: ½" = 1'–0"



FISH LADDER POOLS 8–11 LONGITUDINAL SECTION

SCALE: ½" = 1'–0"

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	40	114
PROJECT FILE NO.	606352		

WILDLIFE PASSAGE SECTIONS & DETAILS NO. 2

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

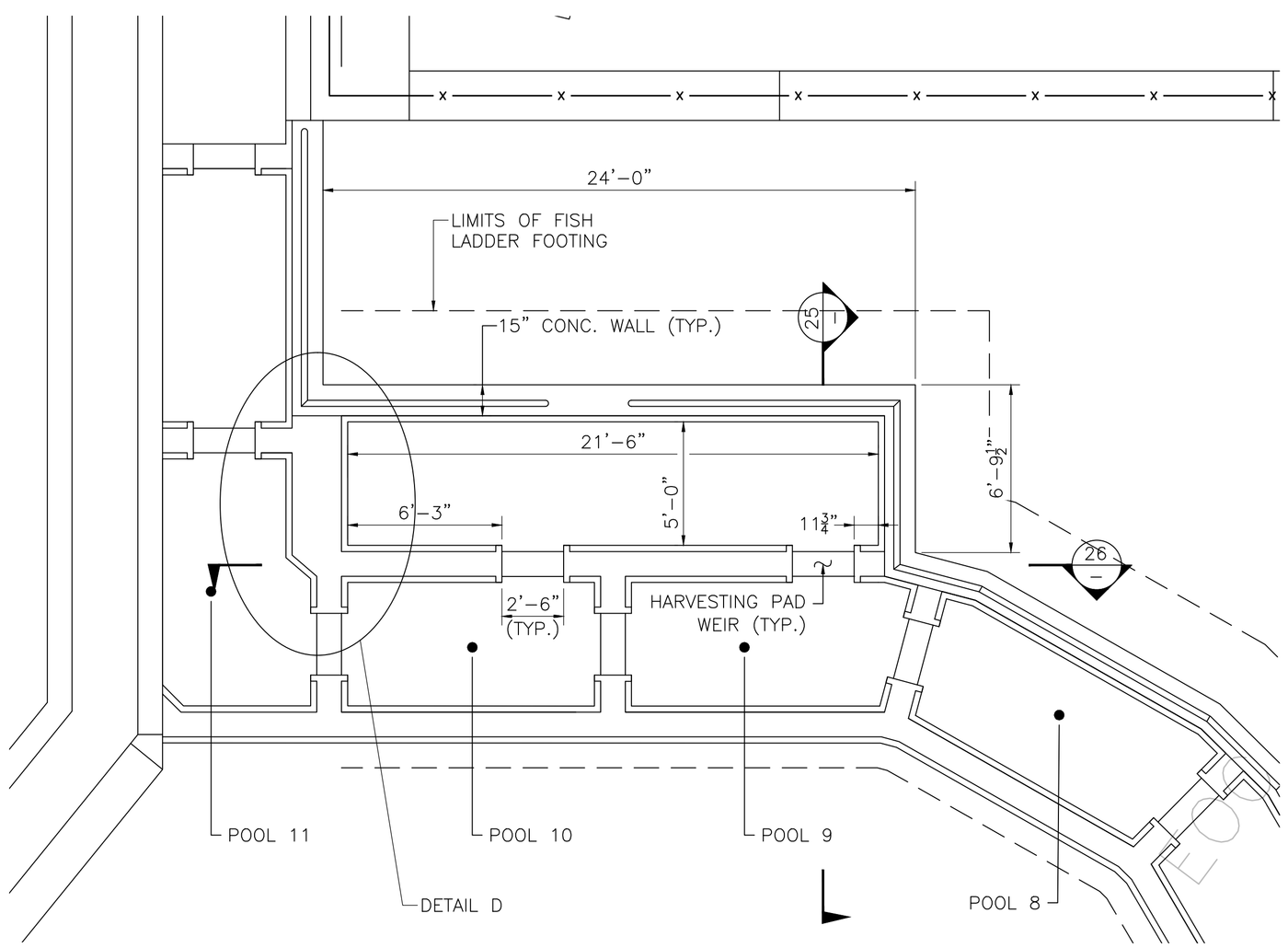
SHEET ---- OF 77 SHEETS BRIDGE NO. W–06–020 (CCV)

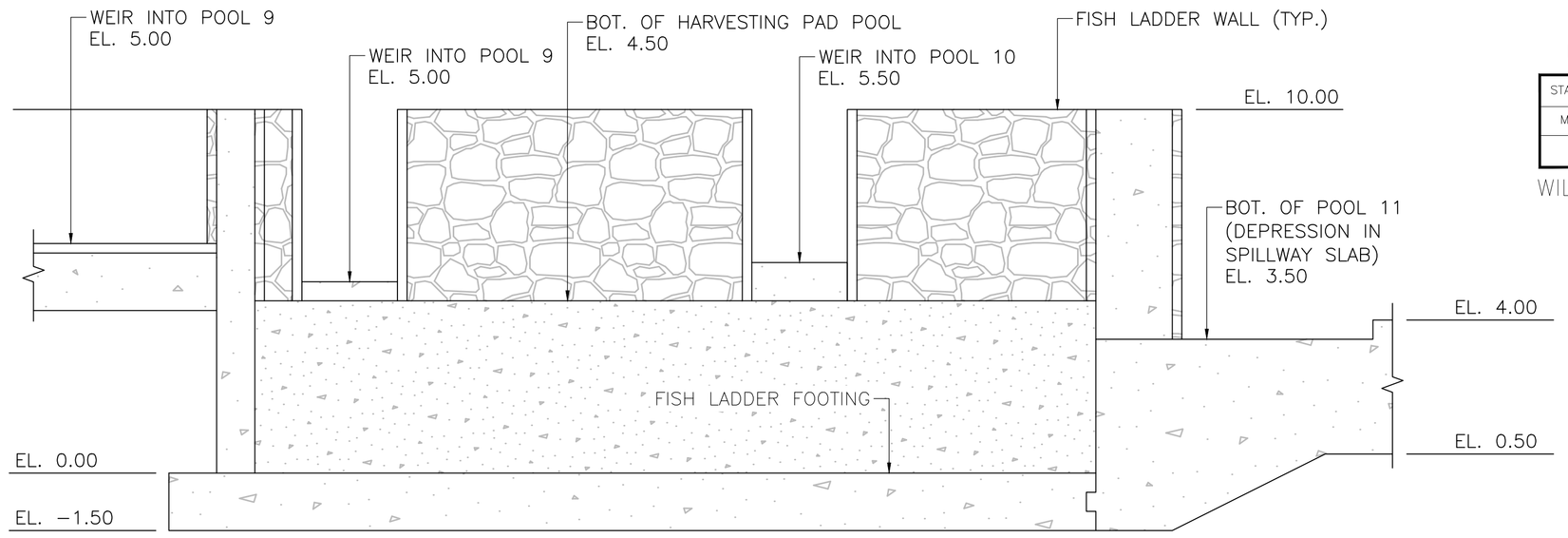
606352_BR29-31(W06020).DWG Plotted on 27-Feb-2025 10:48 AM

Second Structural Submittal (S2) 17-December-2024

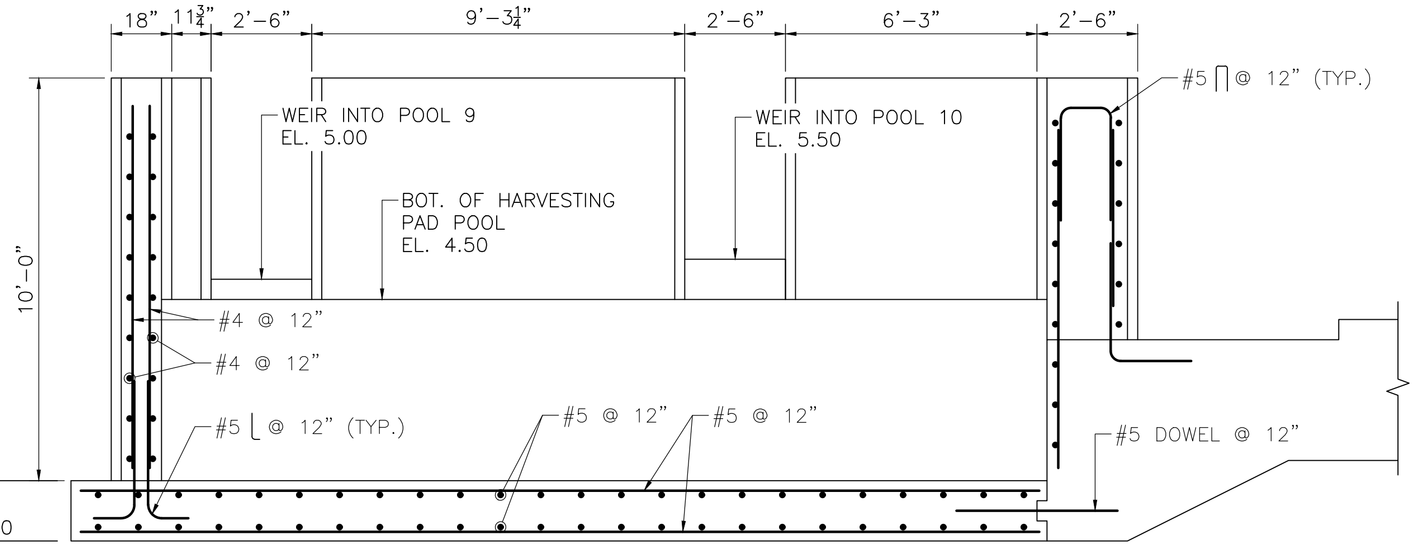
Proposal No. 606532-136278

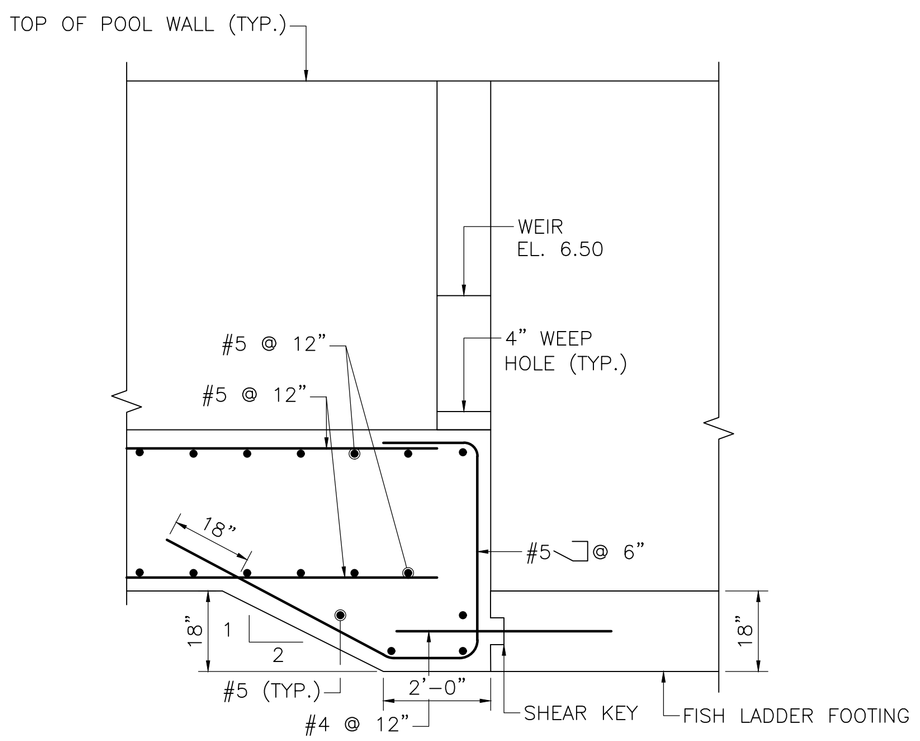
A00840 - 396



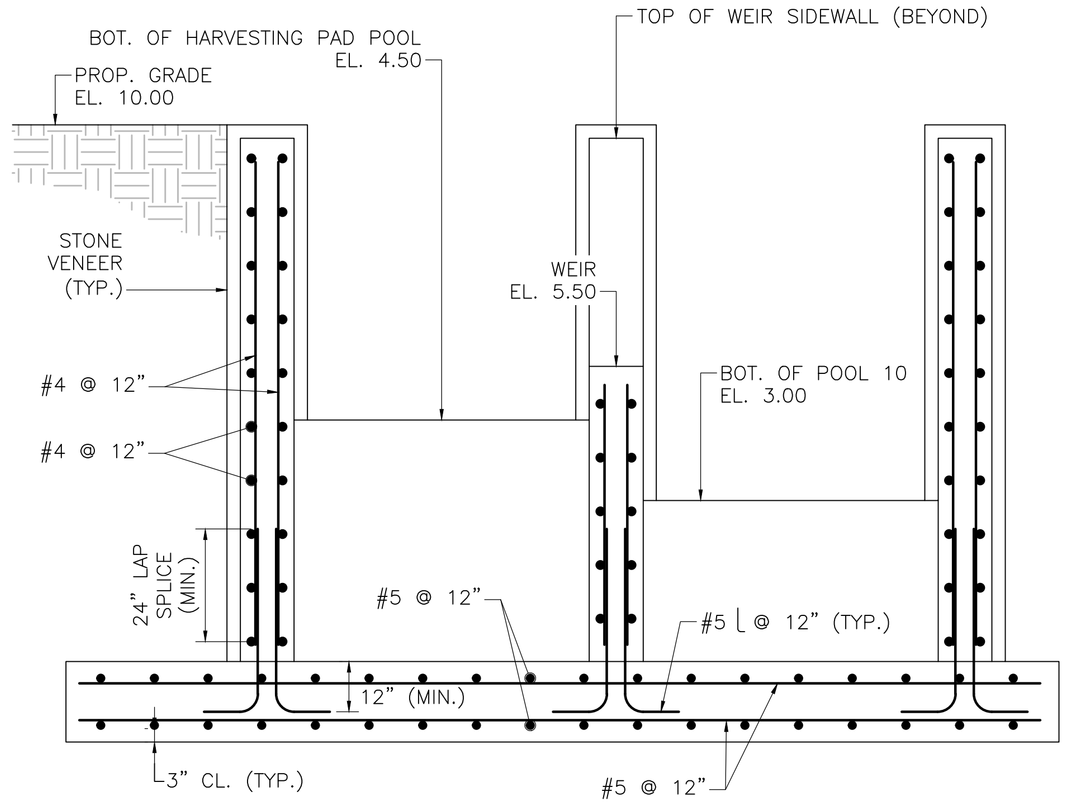


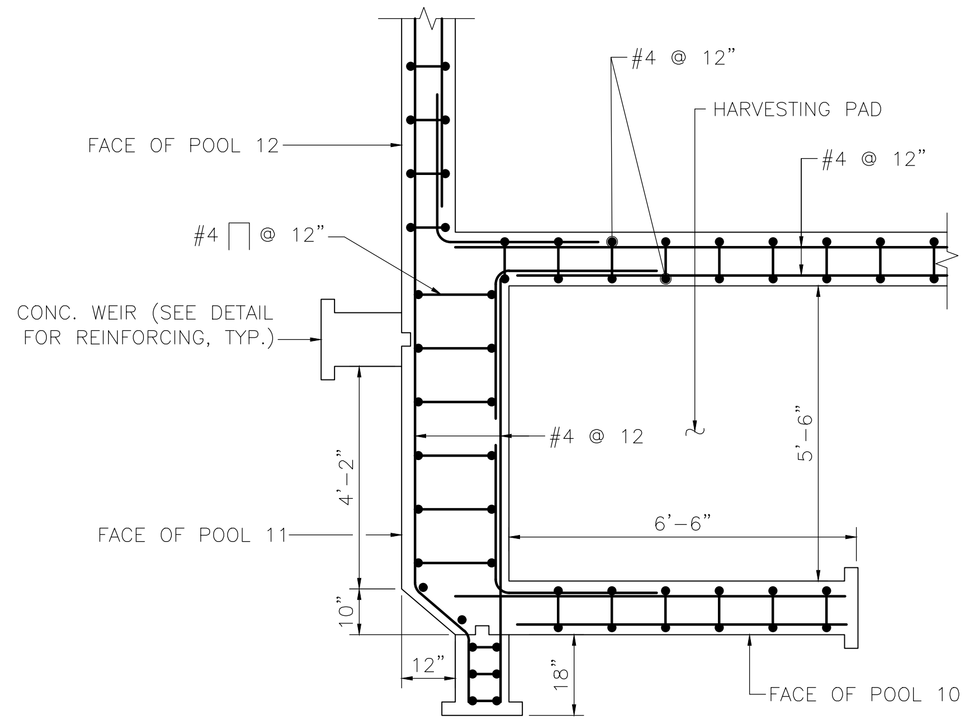
SECTION 26 –
SCALE: ⅜" = 1'-0"





FOOTING HAUNCH REINFORCEMENT
SCALE: ½" = 1'-0"





DETAIL D: HARVESTING PAD WALL REINFORCEMENT
SCALE: ½" = 1'-0"

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	41	114
PROJECT FILE NO.	606352		

WILDLIFE PASSAGE SECTIONS & DETAILS NO. 3

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER
USE ONLY PRINTS OF LATEST DATE

SHEET ---- OF 77 SHEETS BRIDGE NO. W-06-020 (CCV)

Proposal No. 606532-136278

606352_BR29-31(W060020).DWG Plotted on 27-Feb-2025 10:49 AM

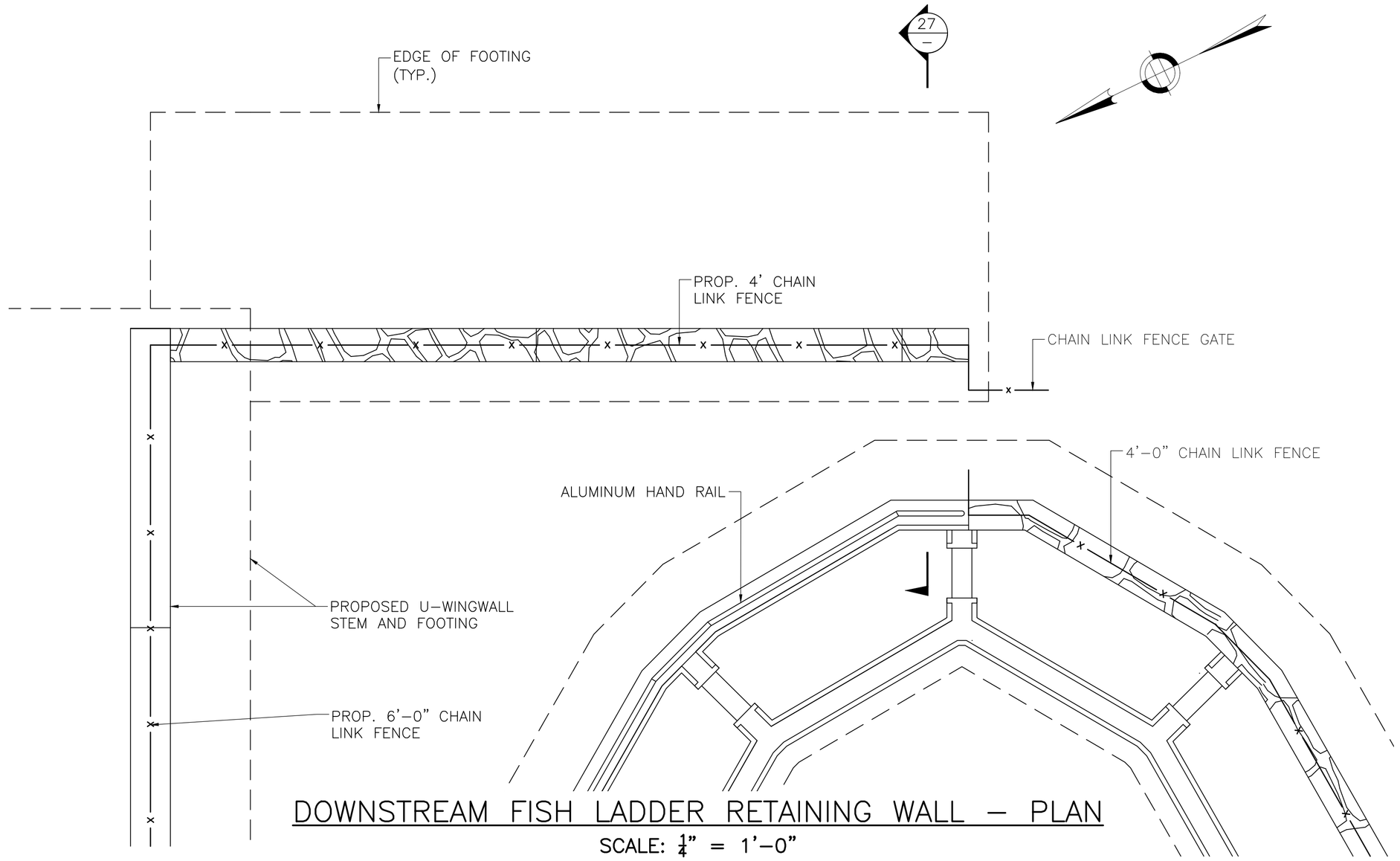
A00840 - 397

Second Structural Submittal (S2) 17-December-2024

606352_BR29-31(W060020).DWG Plotted on 27-Feb-2025 10:49 AM

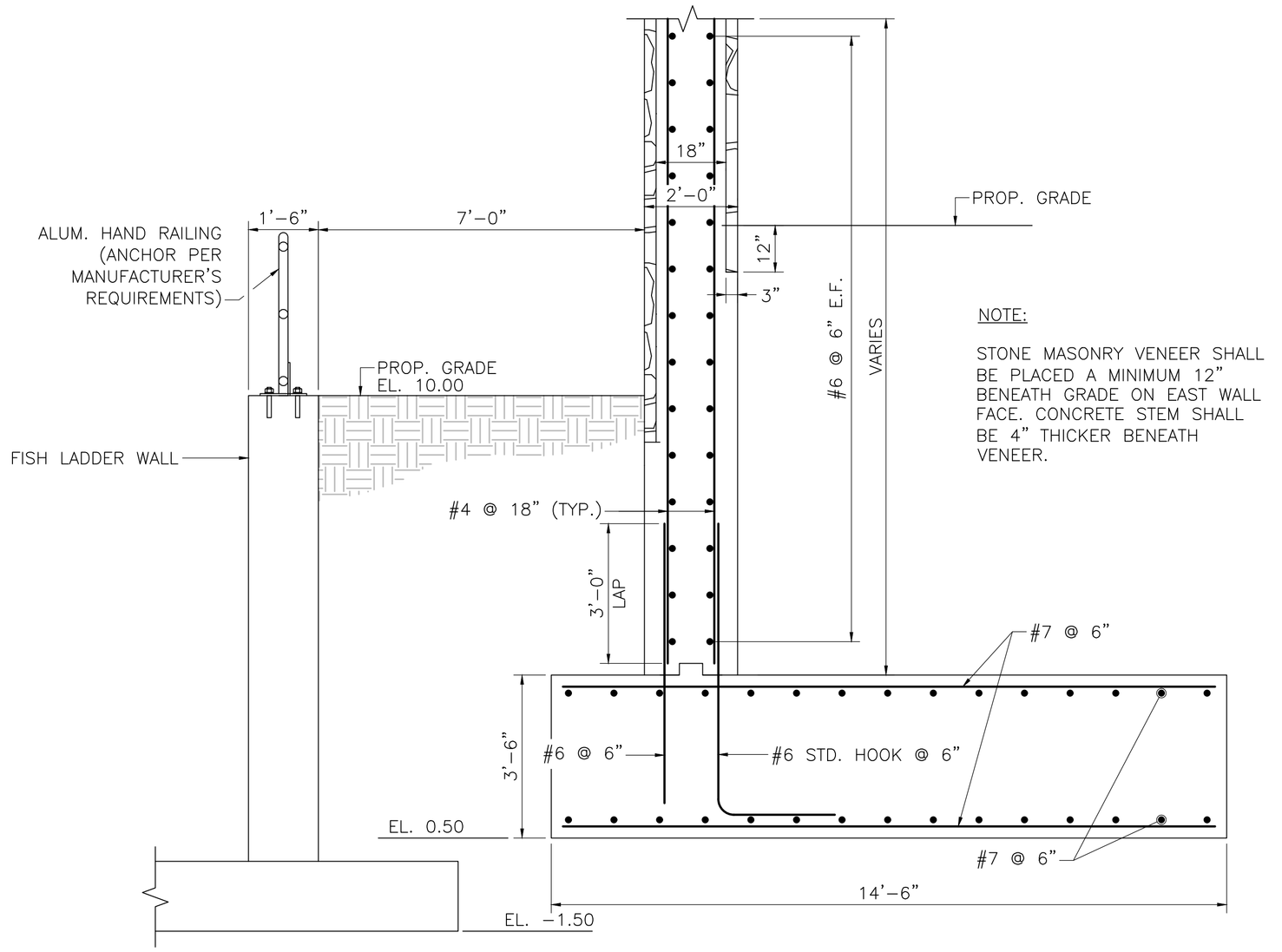
Proposal No. 606532-136278

A00840 - 398



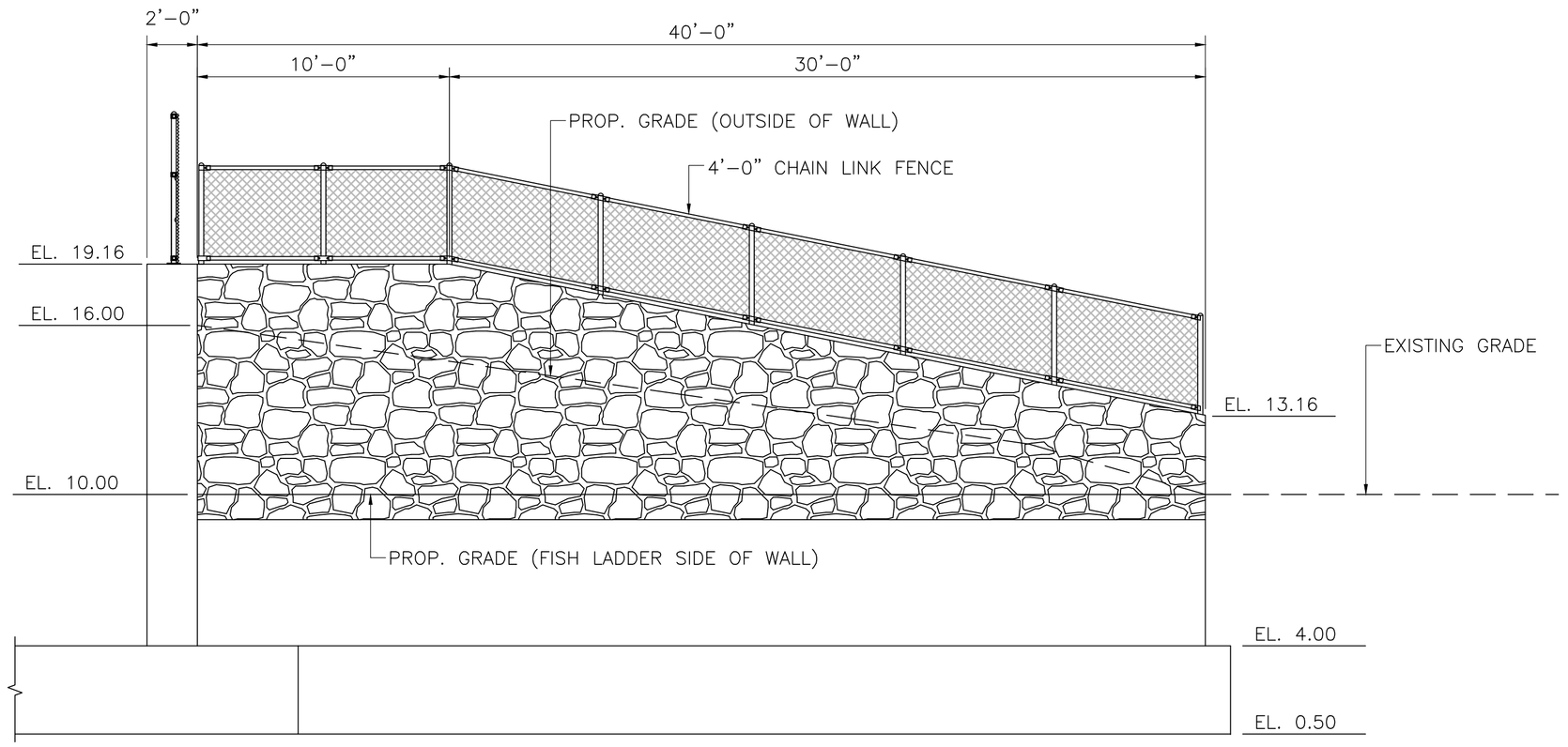
DOWNSTREAM FISH LADDER RETAINING WALL – PLAN

SCALE: $\frac{1}{4}$" = 1'–0"



NOTE:

STONE MASONRY VENEER SHALL BE PLACED A MINIMUM 12" BENEATH GRADE ON EAST WALL FACE. CONCRETE STEM SHALL BE 4" THICKER BENEATH VENEER.



DOWNSTREAM FISH LADDER RETAINING WALL – ELEVATION

SCALE: $\frac{1}{4}$" = 1'–0"

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

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AUTHORIZED SIGNATORY: _____ STATE BRIDGE ENGINEER
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Second Structural Submittal (S2) 17-December-2024

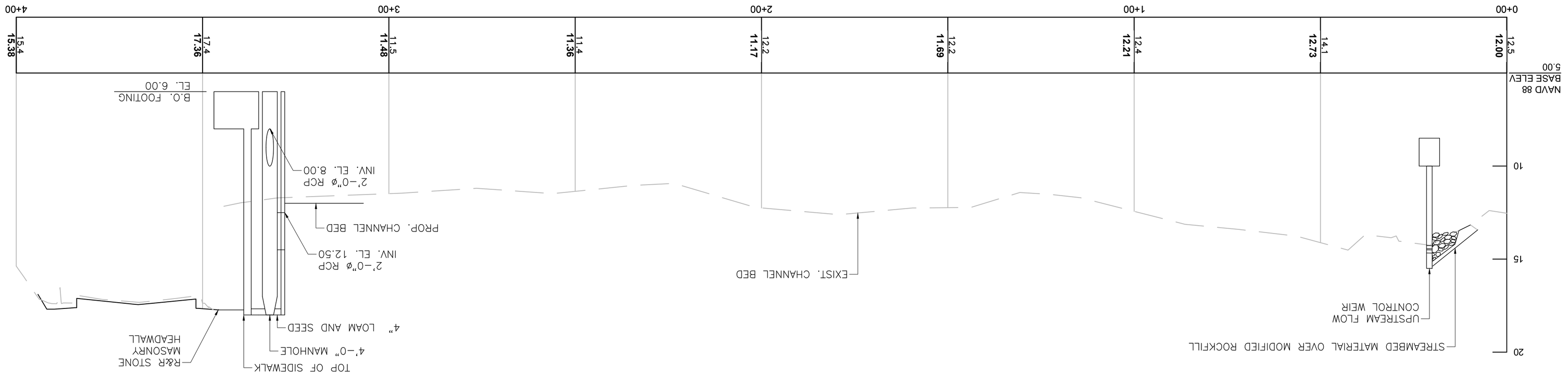
DATE	DESCRIPTION
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION

THIS SHEET IS APPROVED FOR CONSTRUCTION BY MASSDOT
AUTHORIZED SIGNATORY: STATE BRIDGE ENGINEER

USE ONLY PRINTS OF LATEST DATE

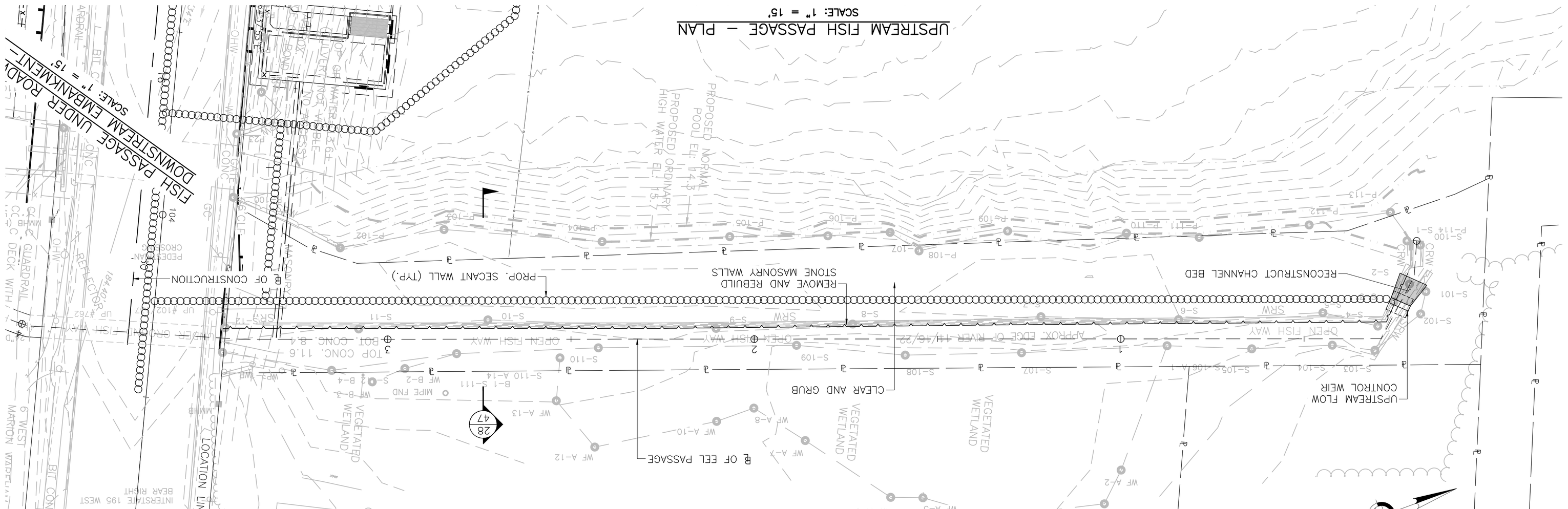
UPSTREAM FISH PASSAGE - PROFILE

HORIZONTAL 1"=15'
VERTICAL 1"=5'



UPSTREAM FISH PASSAGE - PLAN

SCALE: 1" = 15'



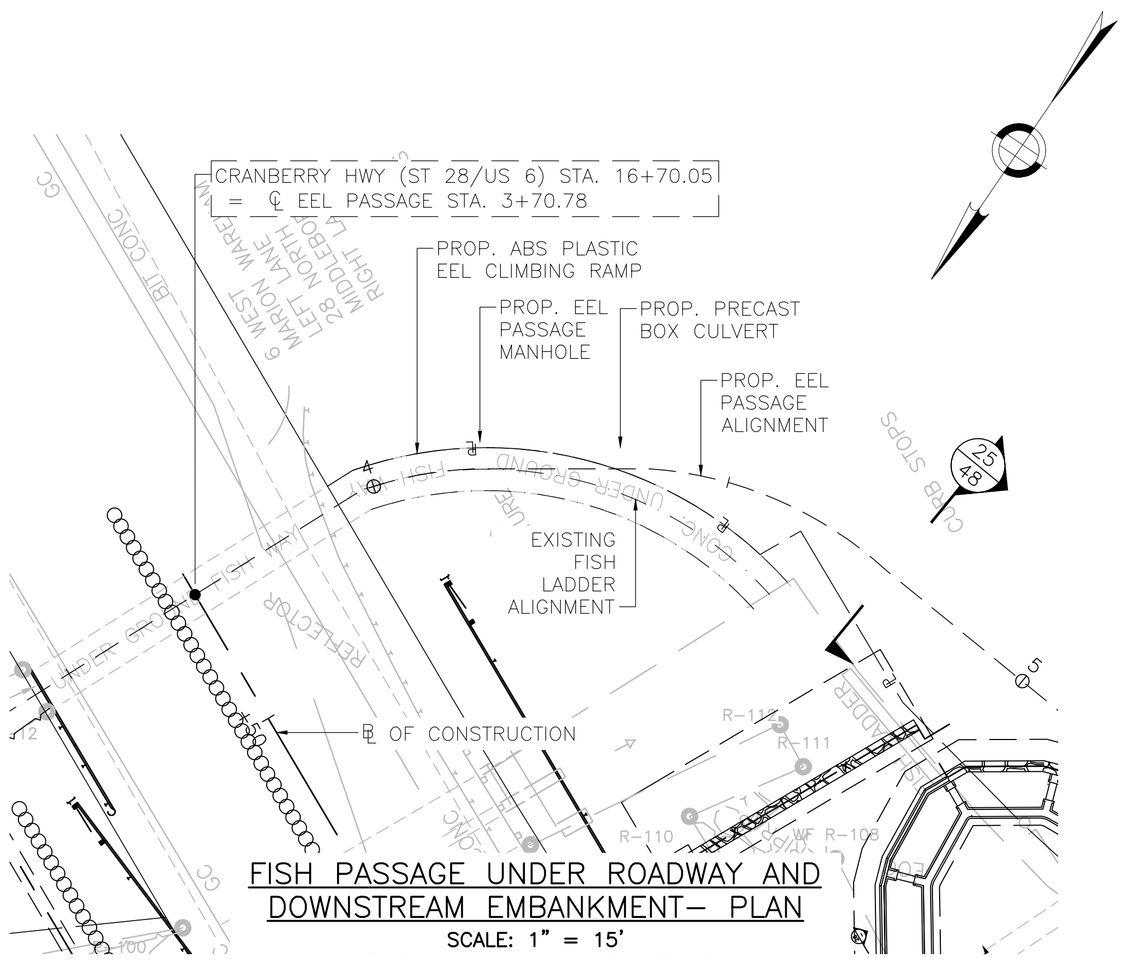
WILDLIFE PASSAGE SECTIONS & DETAILS NO. 5

WAREHAM
US 6 WB & ST 28 NB

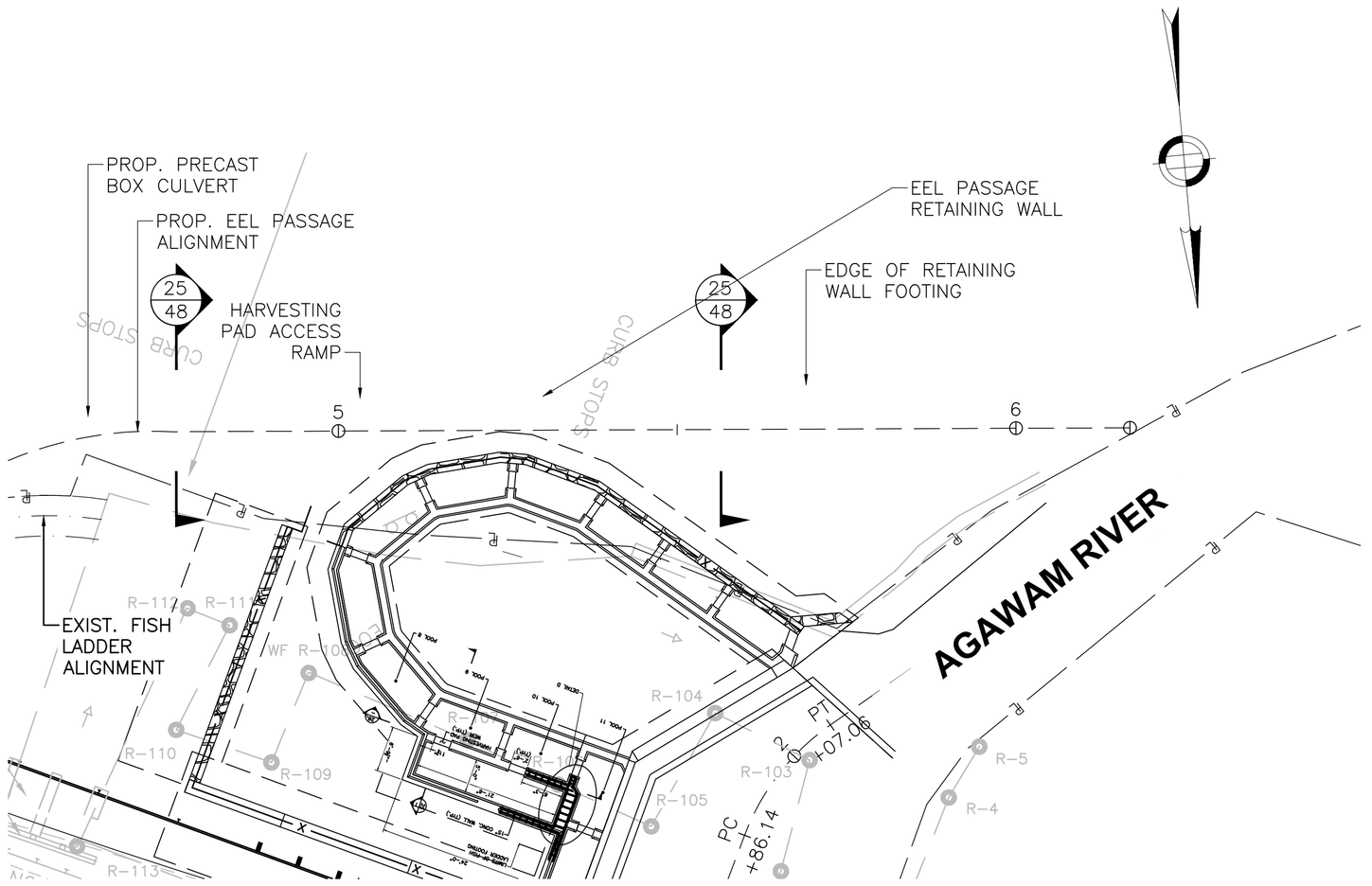
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	43	114
PROJECT FILE NO. 606352			

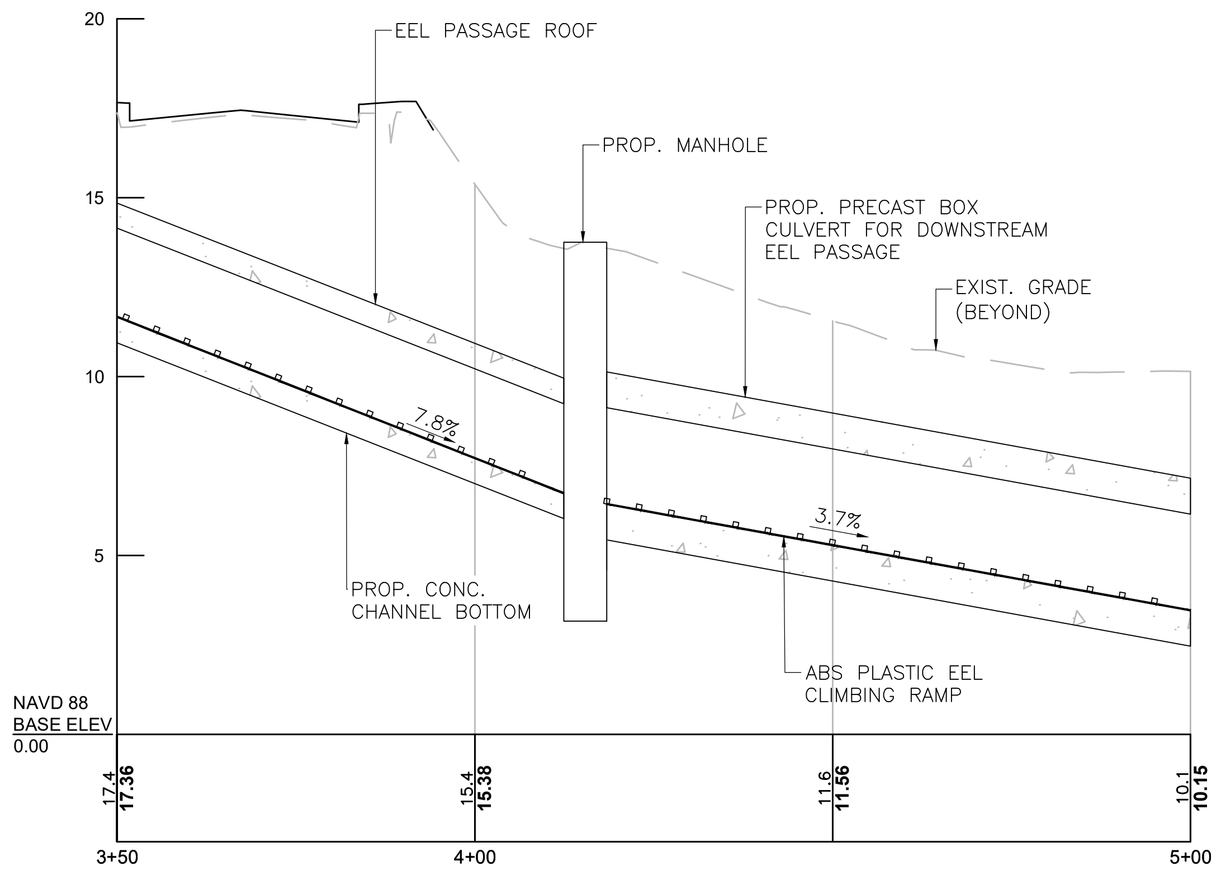
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	44	114
PROJECT FILE NO.	606352		

WILDLIFE PASSAGE SECTIONS
& DETAILS NO. 6

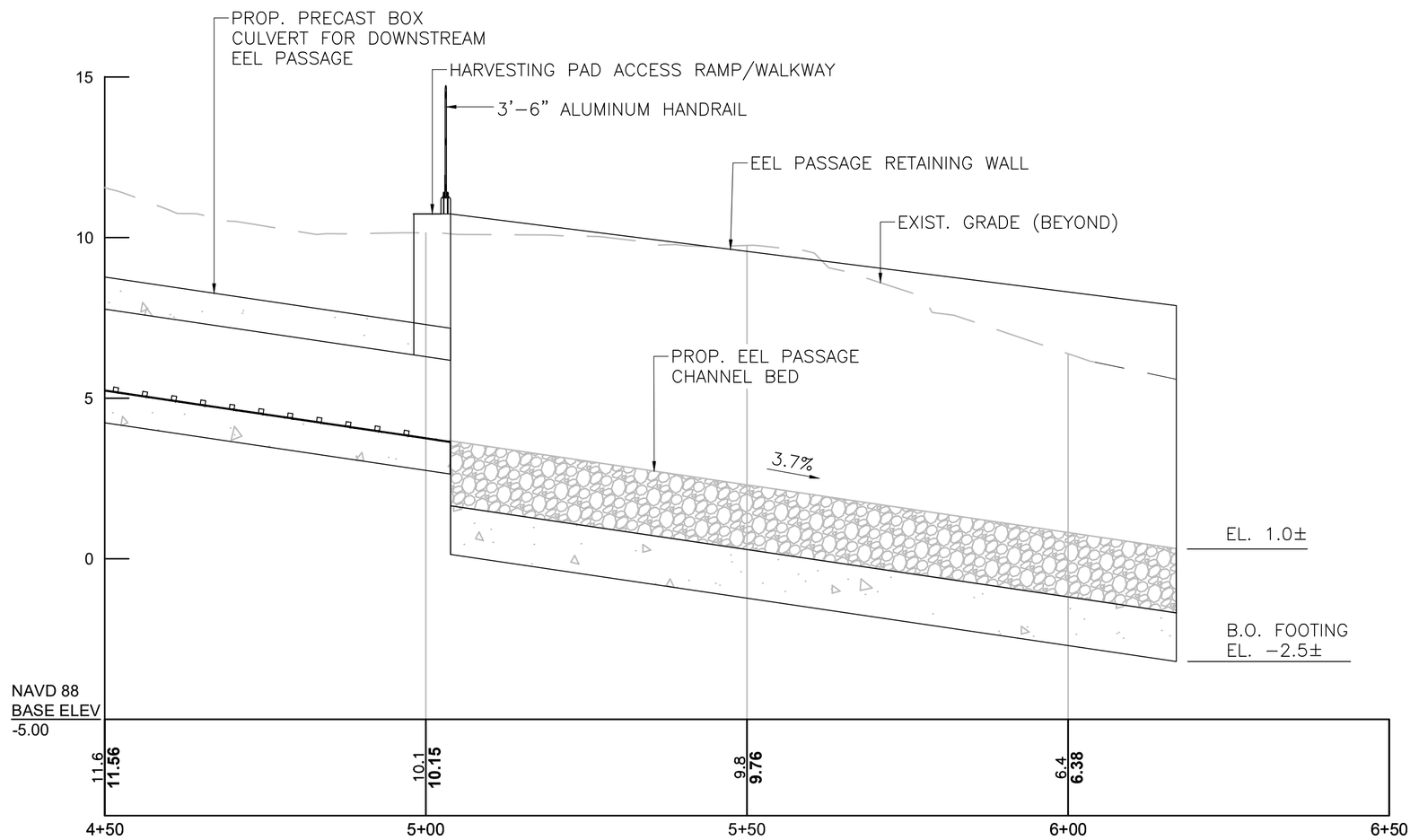


FISH PASSAGE UNDER ROADWAY AND DOWNSTREAM EMBANKMENT– PLAN
SCALE: 1" = 15'





FISH PASSAGE UNDER ROADWAY AND DOWNSTREAM EMBANKMENT – PROFILE
HORIZONTAL 1"=15'
VERTICAL 1"=3'



DOWNSTREAM FISH PASSAGE – PROFILE
HORIZONTAL 1"=15'
VERTICAL 1"=3'

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

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606352_BR29-31(W060020).DWG Plotted on 27-Feb-2025 10:49 AM
Proposal No. 606532-136278
A00840 - 400
Second Structural Submittal (S2) 17-December-2024

DATE	DESCRIPTION
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION

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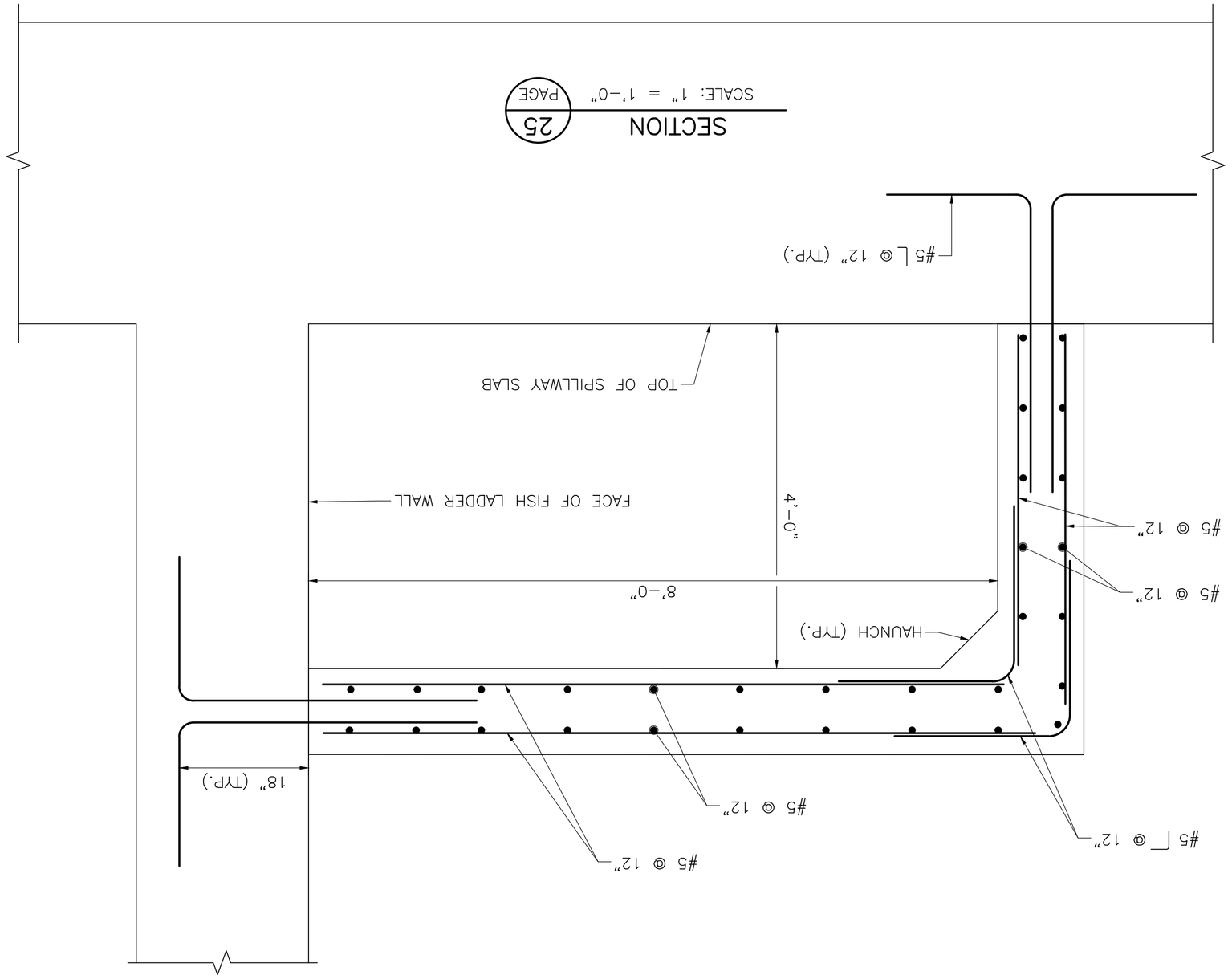
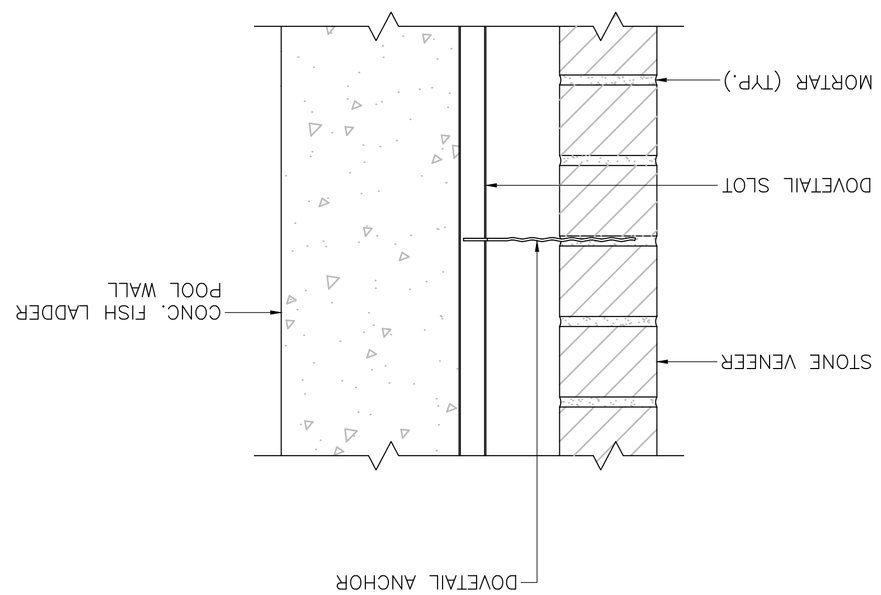
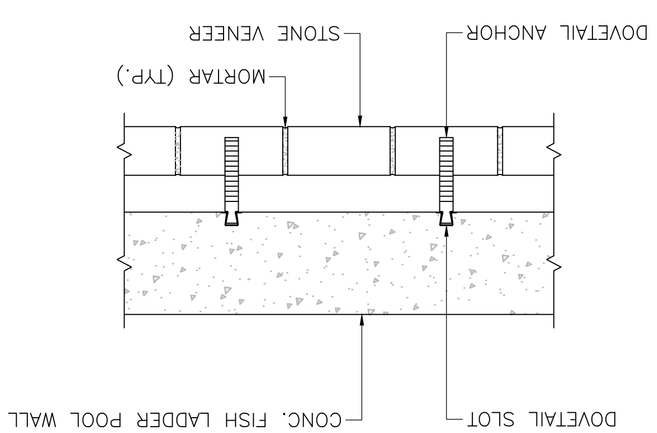


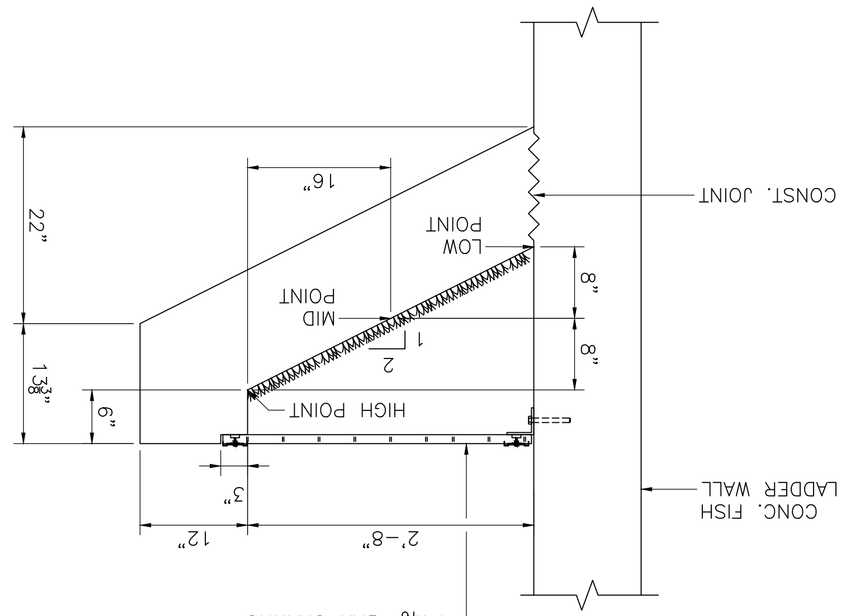
SECTION 25
SCALE: 1" = 1'-0"



STONE VENEER ATTACHMENT SECTION
SCALE: 3" = 1'-0"



STONE VENEER ATTACHMENT PLAN
SCALE: 2" = 1'-0"



UPSTREAM EEL RAMP SECTION
SCALE: 1" = 1'-0"

WARE HAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	45	114
PROJECT FILE NO. 606352			

WILDLIFE PASSAGE SECTIONS
& DETAILS NO. 7

606352_BR29-31(W06020).DWG Plotted on 27-Feb-2025 10:49 AM

Second Structural Submittal (S2) 17-December-2024

A00840 - 401

Proposal No. 606532-136278

Second Structural Submittal (S2) 17-December-2024

A00840 - 402

606352_BR29.31(W06020).DWG Plotted on 27-Feb-2025 10:50 AM

Proposal No. 606532-136278

SHEET ---- OF 77 SHEETS BRIDGE NO. W-06-020 (CCV)

DATE	DESCRIPTION
MMMM DD, YYYY	ISSUED FOR CONSTRUCTION

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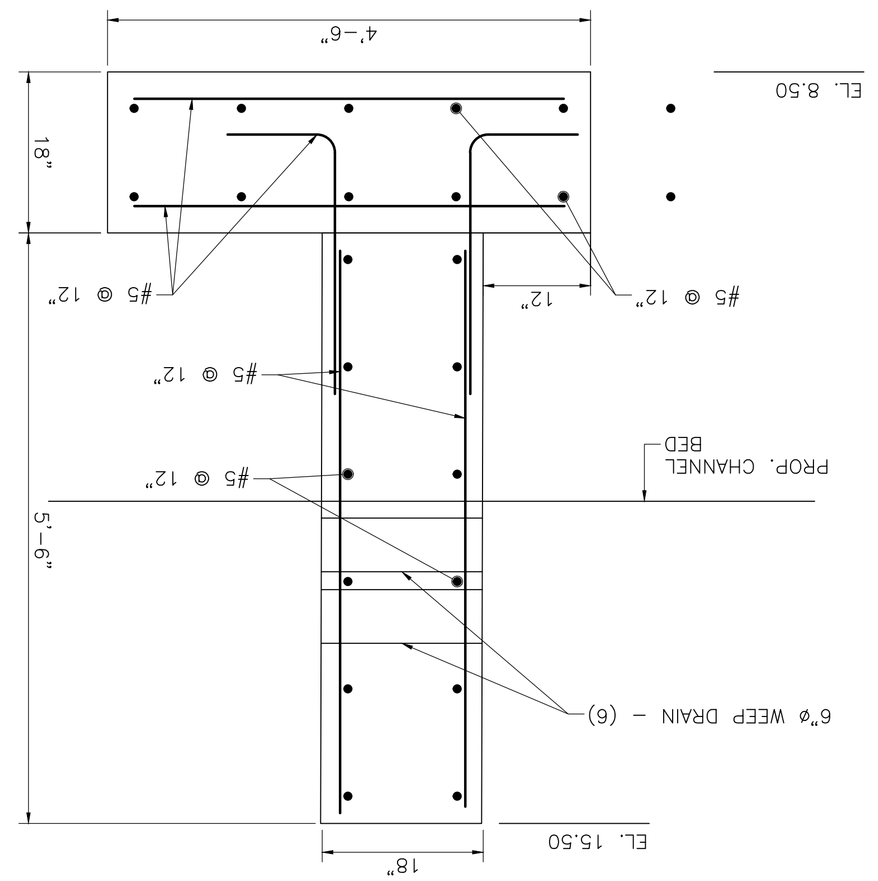
WAREHAM
US 6 WB & ST 28 NB

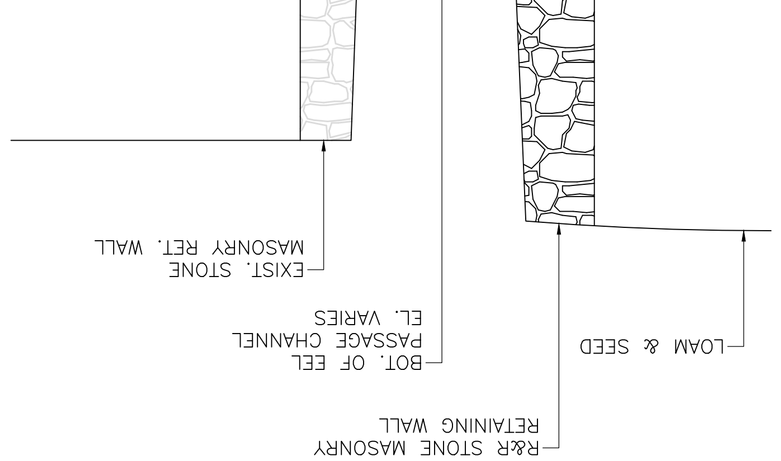
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	46	114
PROJECT FILE NO. 606352			

WILDLIFE PASSAGE SECTIONS
& DETAILS NO. 8

UPSTREAM FLOW CONTROL WEIR
SCALE: 1" = 1'-0"

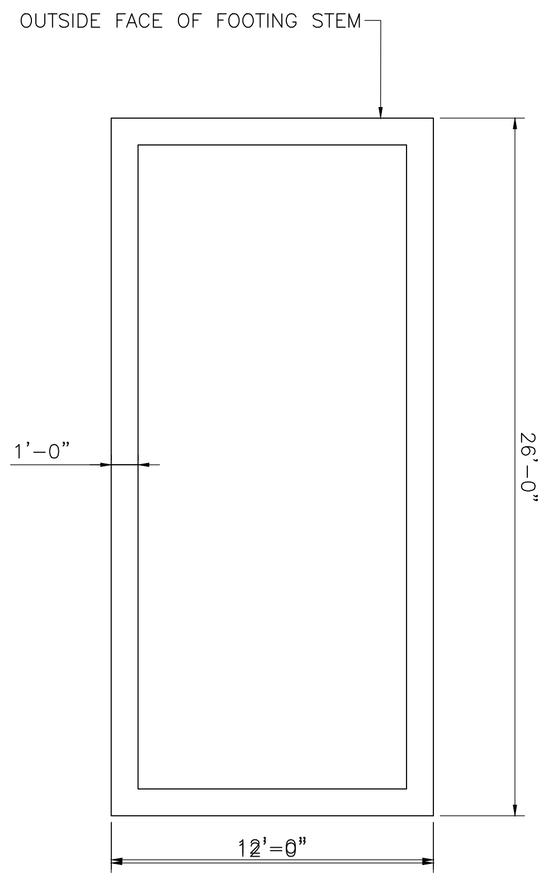


SECTION 22
SCALE: 1" = 1'-0"

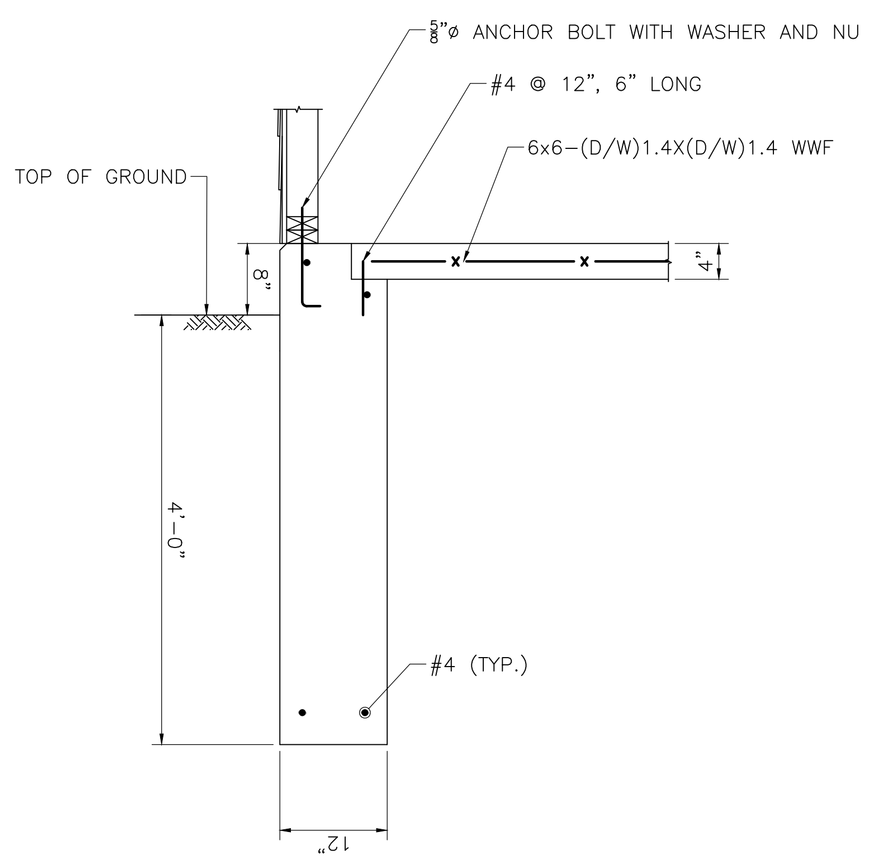


STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	47	47
PROJECT FILE NO.	606352		

STORAGE SHED DETAILS



STORAGE SHED FOUNDATION PLAN
SCALE: ¼" = 1'–0"

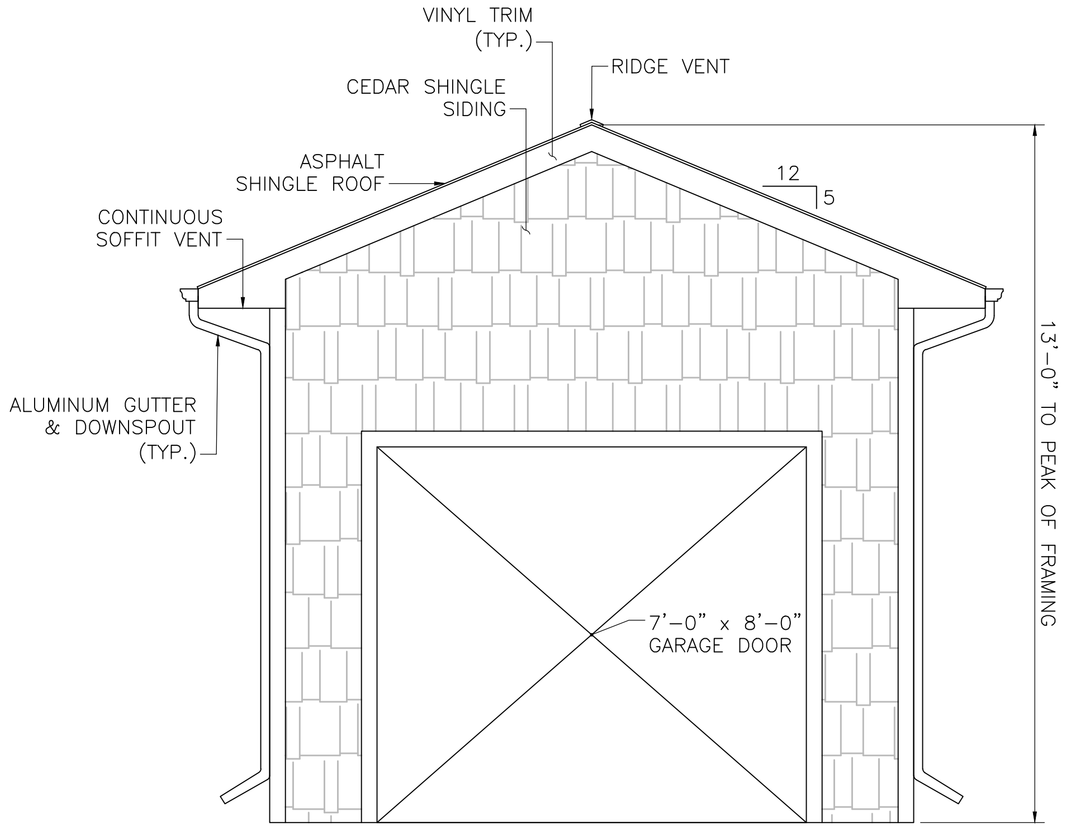


FOUNDATION SECTION
SCALE: 1" = 1'–0"

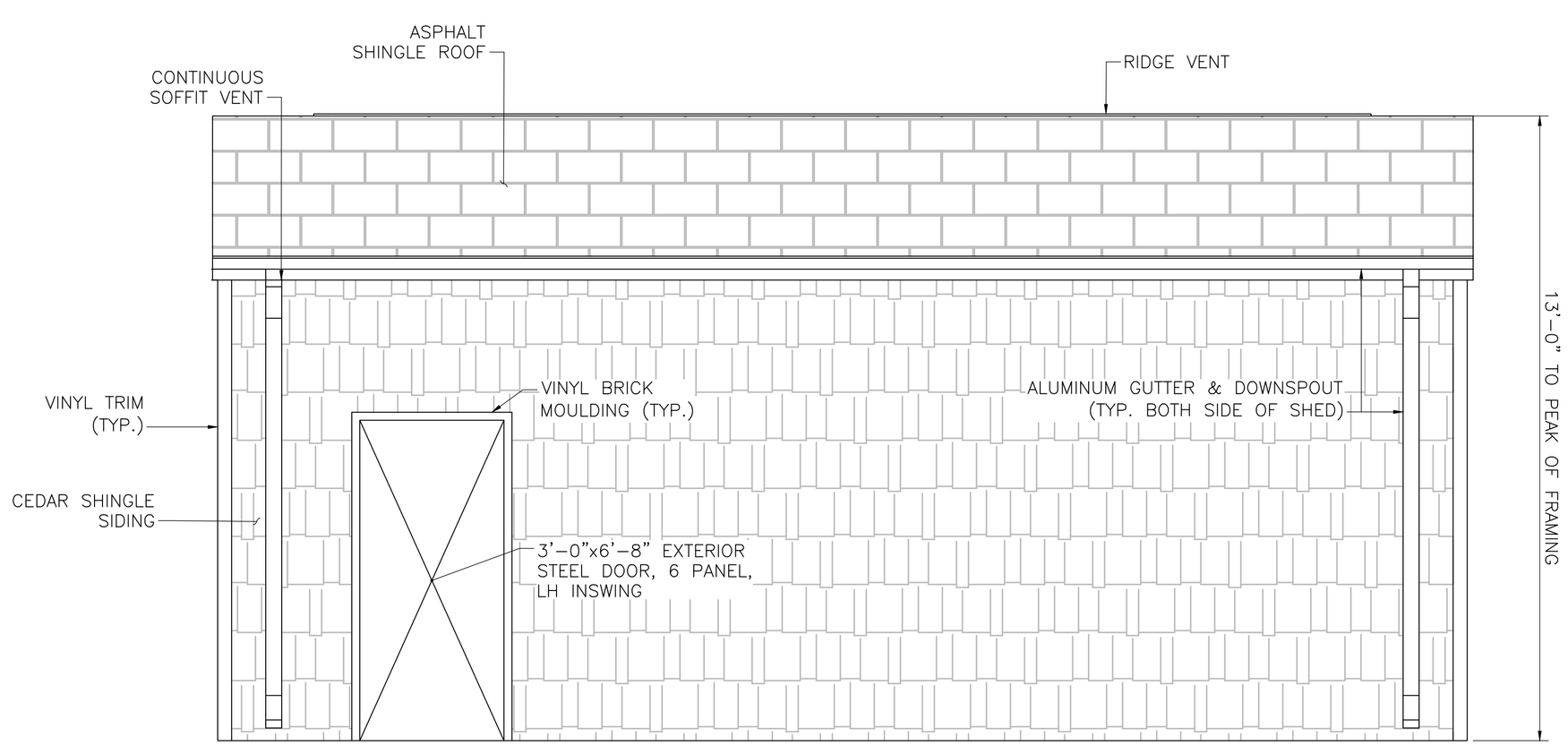
NOTES:
1. THE BUILDING STRUCTURE SHALL BE DESIGNED FOR ALL APPLICABLE REQUIREMENTS OF THE MASSACHUSETTS BUILDING CODE CMR 780 AND THE FOLLOWING:

   RISK CATEGORY I
   GROUND SNOW LOAD: 30 PSF
   BASIC WIND SPEED: 129 MPH

2. ALL FOUNDATION CONCRETE SHALL BE 4000 PSI, 610 CEMENT CONCRETE.
3. ALL STEEL REINFORCING SHALL BE AASHTO M31 GRADE 60.
4. THE MAXIMUM SOIL BEARING PRESSURE SHALL NOT EXCEED 4000 PSI.



STORAGE SHED FRONT ELEVATION
SCALE: ½" = 1'–0"



STORAGE SHED SIDE ELEVATION
SCALE: ½" = 1'–0"

MMMM DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION

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Proposal No. 606532-136278
A00840 - 403
STORAGE SHED DETAILS-2.DWG Plotted on 27-Feb-2025 10:50 AM
Second Structural Submittal (S2) 17-December-2024

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

March 21, 2025

MassDOT Environmental
10 Park Plaza
Boston, MA 02116
ATTN: Courtney Walker

RE: 401 WATER QUALITY CERTIFICATION
Administrative Completeness and Technical Deficiency Review
401 WQC Application No: 24-WW11-0003-APP
MassDOT Project #: 606352

AT: Mill Pond Dam
Cranberry Highway (Route 28) over the Agawam River
Wareham, MA

Dear Ms. Walker:

MassDEP has completed its Administrative Review of the application for the above-referenced Water Quality Certification (WQC) application and notes that the application still requires a proof of public notice to be administratively complete.

MassDEP has completed its Technical Review of the application and is requesting submittal of the following additional information:

1. The project narrative states that Route 28 has two travel lanes but provides no dimensions for them. Please provide the roadway dimensions of Route 28 for existing and proposed conditions.

2. Page 3 of the project narrative states that the secondary spillway is "…located about 112 feet left of the right abutment". Please express this location as a compass direction.

This information is available in alternate format. Please contact MassDEP at 617-626-1282.
TTY# MassRelay Service 1-800-439-2370
MassDEP Website: www.mass.gov/dep

Printed on Recycled Paper

3. Are the existing stormwater catch basins within the project limits deep sump catch basins? If not, please evaluate replacing them with deep sump catch basins to improve upon TSS removal across the project.

4. Section 3.4 of the Narrative states that there will be a 3,354 sf increase of impervious area, the Stormwater Report narrative states the increase will be 3,373 sf and the HydroCAD report shows an increase of 3,278 sf. Please clarify which value is correct.

5. The application notes that the proposed fish ladder will likely need to be operational before the existing fish ladder can be decommissioned. How will construction be sequenced to maintain fish passage until the proposed fish ladder is operational?

6. The bioretention area will require clearing and grading along steep slope adjoining the Agawam River. Can it be shifted away to maintain the existing vegetation along the riparian corridor? Sheet 13 indicates that portions of the upland along the bank are proposed to be planted; however, the overflow spillway extends right up to the edge of river.

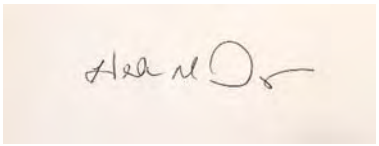
7. The applications states that the bioretention area will be lined as there are D-type soils and high groundwater; accordingly, it is proposed to be lined. It is noted that borings were taken within the roadway. How were D-type soils and high ground determined in the vicinity of the proposed bioretention area? If this feature could be unlined, it would provide recharge.

8. The O&M Plan needs to reference SCM inspection and maintenance frequencies per Volume 2, Chapter 2 of the MA Stormwater Handbook.

Upon receipt of all requested supplemental information, MassDEP has 30 calendar days in which to issue or deny a certification.

Should you have any questions relative to this letter, please contact me at heidi.davis@mass.gov or Tyler Lewis at tyler.lewis@mass.gov.

Sincerely,



Heidi M. Davis
Highway Unit Supervisor

Ecc: DEP – Maissoun Reda
MassDOT – Melissa Lenker
MA DMF – Brad Chase
Pare Corporation – Erika Klinkhammer – eklinkhammer@parecorp.com
Pare Corporation – Eric Silva – esilva@parecorp.com
Wareham Conservation Commission – Christine Santos - csantos@wareham.ma.us

Engineers Scientists Planners
parecorp.com

PARE CORPORATION

April 28, 2025

Department of Environmental Protection
Attn: Ms. Heidi M. Davis
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: **401 WATER QUALITY CERTIFICATION**
Administrative Completeness and Technical Deficiency Review
401 WQC Application No: 24-WW11-0003-APP
Mill Pond Dam
Response to DEP Comments
MassDOT Project # 606352
(Pare Project No. 22147.01)

Dear Ms. Davis:

On behalf of MassDOT Environmental, Pare Corporation submits the following responses to the MassDEP Administrative Completeness and Technical Deficiency Review letter dated March 21, 2025.

1. **Comment**: *The project narrative states that Route 28 has two travel lanes but provides no dimensions for them. Please provide the roadway dimensions of Route 28 for existing and proposed conditions.*

   Response: The existing roadway dimensions are two 11-foot travel lanes with a 7'-6" shoulder to the south of the roadway and an approximate 2'-0" shoulder on the north of the roadway. Sidewalks to the north are generally 5'-0" in width, sidewalks to the south are 4'3" ±.

   The proposed roadway will consist of the two 11'-0" travel lanes, a 2'-0" shoulder on the south of the roadway, and a 5'-0" bike lane and 3'-0" striped buffer on the north side of the roadway. The two sidewalks would also be reconstructed to accommodate a 5'-6" clear walkway with a 6" curb.

2. **Comment**: *Page 3 of the project narrative states that the secondary spillway is "…located about 112 feet left of the right abutment". Please express this location as a compass direction.*

   Response: The secondary spillway is located about 112 feet west of the western concrete abutment of the primary spillway.

3. **Comment**: *Are the existing stormwater catch basins within the project limits deep sump catch basins? If not, please evaluate replacing them with deep sump catch basins to improve upon TSS removal across the project.*

   Response: Based on coordination with MassDOT District 5 after the 100% design, all catch basins within the project area will be replaced with deep sump catch basins to increase water quality.

8 Blackstone Valley Place
Lincoln, RI 02865
401-334-4100

10 Lincoln Road, Suite 210
Foxborough, MA 02035
508-543-1755

14 Bobala Road, Suite 2B
Holyoke, MA 01040
413-507-3448

4. **Comment**: *Section 3.4 of the Narrative states that there will be a 3,354 sf increase of impervious area, the Stormwater Report narrative states that the increase will be 3,373 sf and the HydroCAD report shows an increase of 3,278 sf. Please clarify which value is correct.*

   Response: The value 3,373 SF increase in impervious area is the correct value.

5. **Comment**: *The application notes that the proposed fish ladder will likely need to be operational before the existing fish ladder can be decommissioned. How will construction be sequenced to maintain fish passage until the proposed fish ladder is operational?*

   Response: The upstream portion and a portion of the downstream section of the proposed fish ladder will be replaced while the proposed bridge and spillway are constructed while flow is diverted to the existing main spillway and fish passage. The remaining downstream portion will be constructed outside of the TOY restrictions for fish migration in the spring and fall to limit the impact to the migrating species.

6. **Comment**: *The bioretention area will require clearing and grading along steep slope adjoining the Agawam River. Can it be shifted away to maintain the existing vegetation along the riparian corridor? Sheet 13 indicates that portions of the upland along the bank are proposed to be planted; however, the overflow spillway extends right up to the edge of river.*

   Response: Based on coordination with the Office of Dam Safety after the 100% submission, no woody vegetation can be placed on the dam or within 20 feet of the dam structure. For this reason, the existing vegetation in this area cannot remain. The Landscape Architect is revising the landscape plans to reflect this change. A vast majority of the vegetation along the slope is invasive, and the vegetation that would be left along the riparian corridor would consist of Multiflora Rose, which cannot remain under Dam Safety regulations.

7. **Comment**: *The applications states that the bioretention area will be lined as there are D-type soils and high groundwater; accordingly, it is proposed to be lined. It is noted that borings were taken within the roadway. How were D-type soils and high ground determined in the vicinity of the proposed bioretention area? If this feature could be unlined, it would provide recharge.*

   Response: Borings B-4 and BB17-2 each identified a groundwater elevation which would prevent infiltration within the system. All borings within the roadway embankment have consistent soil types at EL. 6, which indicates that the material at the bottom of the basin will be similar to the material found in the borings within the roadway. Due to steep slopes and excessive vegetative growth, equipment was not able to get down to the basin footprint. NRCS web soil survey was utilized to compare soil conditions within the basin footprint. Additionally, based on the elevation of the surrounding water bodies, fluctuations in Seasonal High Ground Water could have additional impacts to the basin if it were not to be lined.

8. **Comment**: *The O&M Plan needs to reference SCM inspection and maintenance frequencies per Volume 2, Chapter 2 of the MA Stormwater Handbook.*

   Response: Per the MassDOT Operation and Maintenance Plan Template: “Maintenance actions will not occur at any set frequency, but rather will be based on condition and impact to functionality”. However, the O&M Plan has been revised to reflect the SCM inspection and maintenance frequencies per Volume 2, Chapter 2 of the MA Stormwater Handbook.

If you have any questions or would like to discuss our responses further, please feel free to contact me.

Please note that an additional document has been attached to this RTC letter for DEP's records and documentation to add to the WQC application: the No Take Determination letter from the MA Natural Heritage and Endangered Species Program's (NHESP) Massachusetts Endangered Species Act (MESA) review for the project.

Sincerely,

Erika Klinkhammer
Senior Environmental Scientist

EK/MC/ES/dp

Enclosure: Revised O&M Plan | LTPPP
NHESP MESA Review No Take Determination letter, dated April 23, 2025

Z:\JOBS\22 Jobs\22147.02 MassDOT Wareham Mill Pond Dam-MA\CORRESP\Comments\DEP WQC\DEP WQC RTC_Wareham Mill Pond Dam 606352.docx

BRIDGE REPLACEMENT - US 6 WB & ST 28 NB (BRIDGE NO. W-06-020)

Stormwater Management System Operation and Maintenance Plan and Long-Term Pollution Prevention Plan

Wareham

PREPARED FOR

massDOT

10 Park Plaza
Boston, MA 02116

PREPARED BY

Pare Corporation
8 Blackstone Valley Place
Lincoln, RI, 02865

February 10, 2025

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1

Stormwater Management System Operation and Maintenance (O&M) Plan

This Stormwater Management System Operation and Maintenance (O&M) Plan describes the approach for inspection and maintenance of drainage infrastructure and structural stormwater control measures (SCMs) to minimize contaminant loading for the Mill Pond Dam Bridge Replacement in Wareham, MA. In general, inspection and maintenance activities will be conducted consistent with the National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer System (MS4) and MassDOT's anticipated NPDES Transportation Separate Storm Sewer System (TS4) Permit.

This document has been prepared per the requirements of Massachusetts Department of Environmental Protection (MassDEP) Regulations 310 CMR 10.05 (6)(k)(9) and satisfies the requirements of Massachusetts Stormwater Standard 9.

1.1 Responsible Party

In accordance with MassDOT procedures, the MassDOT District #5 office located in Taunton, MA, is responsible for the maintenance of all stormwater management systems on MassDOT roads within the project area.

Questions or concerns regarding activities associated with this O&M Plan should be addressed to MassDOT's District #5 office located at 1000 County Street, Taunton, MA 02780, phone (857) 368-5000, during regular weekday hours, or to MassDOT's Highway Operations Center located in South Boston, MA at (800) 227-0608 during all other times and days, including weekends and holidays.

1.2 Inspection and Maintenance Measures and Record-Keeping

See Appendix B of the Stormwater Management Report for the proposed stormwater system within the project limits. The stormwater management system covered by this O&M Plan consists of the following measures:

- Deep Sump Catch Basins
- Hard Bottomed Sediment Forebay
- Bioretention Basin

Bridge Replacement – IS 6 WB & ST 28 NB (Bridge No. W-06-020)

The table below summarizes data that is generally collected for each asset type. For all assets, the inspector and inspection date are recorded. Photo documentation of structure condition is taken and attached to the inspection record.

Inspection Form	Applicable Stormwater Assets	Information Collected
Inlets	› Catch basins › Outlet control structures	› Sediment accumulation › Trash/Debris accumulation › Signs of contamination › Frame and grate condition › Overall structure condition
SCMs	Consistent with the MassDOT Stormwater Design Guide (SDG), SCM categories include: › Infiltration SCMs › Stormwater wetland SCMs › Bioretention SCMs › Other SCMs	› SCM accessibility › Presence of standing water › Level of erosion › Sediment accumulation › Trash/Debris accumulation › Vegetation condition › Overall SCM condition
Storm Discharge Points	› Outlets to SCMs	› Presence of flow › Signs of contaminated flow › Sediment accumulation › Level of erosion › Pipe condition › Scour protection condition › Overall structure condition

Inspection and maintenance records can be made available using the asset management system through request with the MassDOT District 5 Environmental Engineer. Records will be kept for at least three years. Representatives of the Town's Conservation Commission(s), MassDEP, and US EPA may obtain access to these records, upon request. Additionally, MassDOT will allow members and agents of MassDEP and the Conservation Commission(s) to enter and inspect the premises, upon request, to evaluate and ensure that the Operation and Maintenance Plan requirements for each SCM are being followed.

Bridge Replacement – IS 6 WB & ST 28 NB (Bridge No. W-06-020)

Maintenance to be performed on the stormwater system includes:

Stormwater Feature	*Potential Maintenance Actions*	
Deep Sump Catch Basins	• *Inspect Units* • *Clean Units*	- *Four times per year* - *Four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.*
Sediment Forebay	• *Inspect sediment forebay* • *Clean sediment forebays*	- *Monthly* - *Four times per year and when sediment depth is between 3 to 6 feet*
Bioretention Basin	• *Inspect and remove trash* • *Mow* • *Mulch* • *Fertilize* • *Remove dead vegetation* • *Prune*	- *Monthly* - *2 to 12 times per year* - *Annually* - *Annually* - *Annually* - *Annually*

Based on the results of the inspection, repairs will be made in accordance with MassDOT standard practices. Maintenance will be prioritized given the urgency of the required maintenance and availability of staff, contracts, etc. Maintenance may require contracting if existing contracts are unavailable to perform the work. More intensive remedial activities may require permitting and/or an engineering solution.

DEP's handbook represents the goal public works agencies seek to meet. However, due to funding constraints and low staffing levels, it is very challenging to meet the stated frequencies listed in the table above until a programmatic operation and maintenance plan is established, which will supersede this project-specific O&M plan.

1.3 Erosion and Sediment Control Measures during Maintenance Activities

For maintenance activities that could result in discharges of sediments or other contaminants into wetlands, waterways, or other resource areas regulated under 310 CMR 10.00, the responsible maintenance personnel will employ measures to prevent migration of these sediments/contaminants. Such temporary measures may include, but are not necessarily limited to, the use of siltation barriers, catch basin silt sacks/filter bags, pipe plugs, cofferdams deployed within the stormwater structure, turbidity curtains, or other practices designed to prevent such discharges.

Bridge Replacement – IS 6 WB & ST 28 NB (Bridge No. W-06-020)

Where maintenance occurs in areas that are confined, with no risk of discharge to adjacent water bodies, no special measures may be needed. Examples include, but are not limited to: (1) cleaning of a forebay under dry conditions when the work can be completed and exposed surfaces stabilized prior to placing it back into service; and (2) catch basin cleaning where the activity is limited to removing material from a sump below the elevation of the outlet pipe.

1.4 O&M Budget

MassDOT performs maintenance for stormwater management systems as part of their routine operation and maintenance budget for roadways and bridges. Budgets are managed at the district level and vary by fiscal year, depending on funding sources.

2

Long-Term Pollution Prevention Plan

This Long-Term Pollution Prevention Plan (LTPPP) describes the approach for pollution prevention and related maintenance activities for the Mill Pond Dam Bridge Replacement in Wareham, MA. In general, long-term pollution prevention and related maintenance activities will be conducted consistent with:

- The National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer System (MS4),
- MassDOT's anticipated NPDES Transportation Separate Storm Sewer System (TS4) Permit, and
- Measures outlined in MassDOT's Stormwater Management Plan (SWMP).

This LTPPP satisfies the requirements related to pollution prevention under Massachusetts Stormwater Standards 4, 5, 6, and 10.

2.1 Practices for Long-Term Pollution Prevention

For the facilities covered, long-term pollution prevention includes the following measures.

- *good housekeeping;*
- *storing materials and waste products inside or under cover;*
- *vehicle washing;*
- *routine inspections and maintenance of SCMs;*
- *spill prevention and response;*
- *maintenance of lawns, gardens, and other landscaped areas;*
- *storage and use of fertilizers, herbicides, and pesticides;*
- *pet waste management;*
- *operation and management of septic systems; and*
- *proper management of deicing chemicals and snow.*

2.1.1 Litter Pick-up

MassDOT will conduct litter pick-up from the stormwater management facilities in conjunction with routine road maintenance activities.

2.1.2 Inspection and Maintenance of Stormwater Assets

MassDOT will conduct inspection and maintenance of drainage infrastructure and the stormwater control measures (SCMs) in accordance with the O&M Plan, as described in Section 1 and as defined in Volume 2, Chapter 2 of the MA Stormwater Handbook.

2.1.3 Maintenance of Landscaped Areas

Routine mowing will be conducted according to standard MassDOT practices. SCM basin bottoms and embankments designed to impound water should be mowed as required to prevent establishment of woody vegetation.

Except in rare circumstances, MassDOT does not use fertilizers, herbicides, and pesticides for the maintenance of facilities. Exceptions include using fertilizer to ensure the survival of new plantings and herbicides to control invasive plants. Use of fertilizers and herbicides is reviewed and approved by the MassDOT Landscape Design Section and District 5 Environmental Engineer prior to application. Local Conservation Commission review may also be required.

2.1.4 Snow and Ice Management

Snow and Ice Management will be conducted consistent with the practices outlined in the MassDOT Snow and Ice Control Program Environmental Status and Planning Report (ESPR), formerly known as the Snow and Ice Control Generic Environmental Impact Report (GEIR).

In accordance with the Snow and Ice Control ESPR, no sand is used on MassDOT properties for snow and ice control. The exception to this rule is within reduced salt areas where high sodium levels have been found in drinking water sources.

2.1.5 Street Sweeping

Routine highway cleaning, with a brush-type street sweeper, will be conducted in accordance with standard MassDOT practices. Sweeping will occur annually in the Spring.

2.1.6 Prohibition of Illicit Discharges

The MassDEP Stormwater Management Standard 10 prohibits illicit discharges to the stormwater management system. Illicit discharges are discharges that do not consist entirely of stormwater, except for certain specified non-stormwater discharges.

In accordance with the existing MS4 permit and anticipated TS4 permit requirements, examples of discharges from the following sources are not considered illicit discharges:

- Firefighting activities*
- Foundation drains
- Water line flushing
- Footing drains
- Flows from riparian habitats/wetlands
- Potable water sources
- Dechlorinated swimming pool water
- Street wash waters

- Landscape irrigation
- Individual residential car washing
- Uncontaminated groundwater
- Rising groundwater
- Diverted stream flows
- Wash water from residential buildings (no detergents)
- Condensation from air conditioning units
- Run-on from private driveways caused by precipitation
- Lawn watering
- Water from crawl space pumps

*Water from firefighting activities is allowed and need only be addressed where they are identified as significant sources of pollutants to waters of the United States.

Based on plan review and confirmation in the field, there are no known or proposed illicit connections associated with the Mill Pond Dam Bridge Replacement. Should an interconnection to the stormwater management system be identified, the MassDOT PM will coordinate with the District Permits Engineer to confirm if the connections are authorized. For unauthorized connections, the MassDOT PM and/or MassDOT Environmental Services Section will investigate the connections and if they are determined to be illicit, the connections will be managed through MassDOT's Illicit Discharge Detection and Elimination (IDDE) program and/or through other agencies.

MASSWILDLIFE

DIVISION OF
FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

April 23, 2025

Julia Hoogeboom
Massachusetts Department of Transportation - Highway Division, Environmental Services
10 park plaza
Boston, MA 02116

RE: Project Location: Route 6WB/28NB (Cranberry Highway)
Project Description: 606352 - Reconstruction of Mill Pond Dam MA00027
DEP Wetlands File No.: -
NHESP File No.: 25-19461
Heritage Hub Form ID: RC-93812

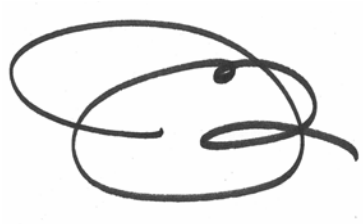
Dear Applicant:

Thank you for submitting the MESA Project Review Checklist, site plans (dated 2/21/25) and other required materials to the Natural Heritage and Endangered Species Program of the MA Division of Fisheries & Wildlife (the "Division") for review pursuant to the Massachusetts Endangered Species Act (MESA) (MGL c.131A) and its implementing regulations (321 CMR 10.00).

Based on a review of the information that was provided and the information that is currently contained in our database, the Division has determined that this project, as currently proposed, **will not result in a prohibited Take** of state-listed rare species. This determination is a final decision of the Division of Fisheries & Wildlife pursuant to 321 CMR 10.18. Any changes to the proposed project or any additional work beyond that shown on the site plans may require an additional filing with the Division pursuant to the MESA. This project may be subject to further review if no physical work is commenced within five years from the date of issuance of this determination, or if there is a change to the project.

Please note that this determination addresses only the matter of state-listed species and their habitats. If you have any questions regarding this letter please contact Emily Holt, Endangered Species Review Assistant, at Emily.Holt@mass.gov, (508) 389-6385.

Sincerely,



Jesse Leddick
Assistant Director

cc: david paulson, Massachusetts Department of Transportation

Engineers Scientists Planners
parecorp.com

PARE CORPORATION

June 4, 2025

Department of Environmental Protection
Attn: Ms. Heidi M. Davis
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: **401 WATER QUALITY CERTIFICATION**
Administrative Completeness and Technical Deficiency Review
401 WQC Application No: 24-WW11-0003-APP
Mill Pond Dam
Response to DEP Comments
MassDOT Project # 606352
(Pare Project No. 22147.01)

Dear Ms. Davis:

On behalf of MassDOT Environmental, Pare Corporation submits the following responses to the email dated May 19, 2025.

1. **Comment**: *Thank you for confirming that deep sump catch basins will be installed to replace the existing catch basins. Please provide a calculated TSS removal for the project area.*

   Response: The TSS removal calculations for the proposed condition are attached to this letter.

2. **Comment**: *Comment #6 inquired if the bioretention spillway could be pulled back from the edge of the river. The response noted that woody vegetation cannot be placed on or within 20 feet of the dam, but the request to pull the spillway back from the river was not addressed.*

   Response: The comment asked if the bioretention basin could be shifted away from the river edge to maintain the existing vegetation. Because the existing vegetation will be removed, based on the request it does not seem necessary to move the bioretention basin.

   The basin was configured to fit within the ROW of the parcel that is currently owned by the state while allowing for the treatment of the outfall that is currently untreated, and maintaining a safe slope for the dam embankment. The spillway was placed to limit the amount of water that will infiltrate behind the existing stone masonry walls during larger events because the wall design is unknown and it is unlikely they were designed with weep drains due to their age. Reconfiguration of the retention basin will require regrading the slopes which will impact the slope stability of the dam embankment, which has already been analyzed per ODS requirements.

   The bioretention basin spillway will be top dressed with compost and Roadside Riverbank Mix (Item No. 765.442) seed mix over the modified rock fill, in order to vegetate the spillway area and provide native vegetation to the riparian corridor in addition to the Mid-height Grassland seed mix (Item No. 765.421) and landscaping along the base of slope outside of the limits of the toe of the dam. Please note the seed mix types have changed since ODS review of the 100% plans, per ODS requirements described in the next comment response.

8 Blackstone Valley Place
Lincoln, RI 02865
401-334-4100

10 Lincoln Road, Suite 210
Foxborough, MA 02035
508-543-1755

14 Bobala Road, Suite 2B
Holyoke, MA 01040
413-507-3448

3. **Comment**: *In addition, though woody vegetation cannot be planted, presumably herbaceous vegetation will be planted instead? Please provide the revised landscape plan once available.*

   Response: Based on coordination with DCR Office of Dam Safety (ODS), the dam crest and embankment areas that are vegetated are generally mowed six times per year. These areas are being planted with seed mixes to allow for regular mowing. Herbaceous plants are also not acceptable to ODS because they can obstruct inspection of certain areas of the dam embankments and deficiencies, such as animal burrows, depression or sink holes, and areas of seepage. The latest revision of the landscape plans are provided as an attachment to this letter.

If you have any questions or would like to discuss our responses further, please feel free to contact me.

Sincerely,

Erika Klinkhammer
Senior Environmental Scientist

EK/ES/dp

Attachment: TSS Removal Calculations (2 pgs.)
100% Landscape Plans (6 sheets)

Z:\JOBS\22 Jobs\22147.02 MassDOT Wareham Mill Pond Dam-MA\CORRESP\Comments\DEP WQC\Additional Comments\DEP WQC RTC_606352.docx

TOTAL SUSPENDED SOLIDS (TSS) REMOVAL - PROPOSED CONDITION

DATE: 05/28/2025

22147.02 - MassDOT Wareham Mill Pond Dam

BMP	TSS Removal Rate	Starting TSS Load	TSS Removed	Remaining Load
PDA-1				
Deep Sump Catch Basin	25%	1.00	0.25	0.75
Sediment Forebay	25%	0.75	0.19	0.56
Bioretention Basin	90%	0.56	0.51	0.06
	total TSS removal:		**94.4%**	
PDA-2				
Deep Sump Catch Basin	25%	1.00	0.25	0.75
	total TSS removal:		**25.0%**	

Drainage Area	Impervious Area (SF)	% of Total Impervious Area	TSS Removed	Weighted % TSS Removal
PDA-1	57,644	0.66	94.4%	62.1%
PDA-2	30,005	0.34	25.0%	8.6%
Total Proposed Impervious Area =	87,649	1.00		**70.6%**
			Total Annual TSS Removal Rate =	**70.6%**
			Total Annual TSS Removal Square Feet =	**61903**

Notes:

* TSS removal efficiency provided by Mass DEP

**** Mass STEP TSS removal efficiency

Proposal No. 606352-136278

606352_LD(LANDSCAPE PLANS).DWG Plotted on 9-Apr-2025 5:42 PM

A00840 - 424

LEGEND

- EXISTING TREE TO REMAIN
- DECIDUOUS SHADE TREE
- MULTISTEM TREE
- EVERGREEN TREE
- SHRUBS
- LAWN SEED
- MID-HEIGHT GRASSLAND SEED MIX
- ROADSIDE RIVERBANK SEED MIX
- COMPOST FILTER TUBE
- GRAVEL SURFACING
- CEMENT CONCRETE PAVING
- SALVAGED GRANITE PLANK PAVING
- BENCH WITH BACK
- SALVAGED GRANITE WALL OR GRANITE PIER
- SALVAGED GRANITE CURB
- WOOD GUARDRAIL
- METAL PICKET FENCE
- INTERPRETIVE SIGN

GENERAL SHEET NOTES:

1. FOR LANDSCAPE NOTES REFER TO SHEET 20.
2. FOR LANDSCAPE DETAILS, REFER TO SHEETS 22-24.

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	19	114
PROJECT FILE NO.	606352		

LANDSCAPE PLANS
SHEET 1 OF 2

MASTER PLANT LIST

SYM	QTY	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	COMMENTS
DECIDUOUS SHADE TREES						
AR	2	Acer rubrum	Red Maple	2-2.5" cal.	B&B	
CO	3	Celtis occidentalis	Hackberry	1.5-2" cal.	B&B	
NS	2	Nyssa sylvatica	Black Gum	1.5-2" cal.	B&B	
QB	5	Quercus bicolor	Swamp White Oak	1.5-2" cal.	B&B	Spring Planting
MULTISTEM TREES						
BP	1	Betula populifolia	Gray Birch	5'-6' ht.	B&B	Multi-stem
EVERGREEN TREES						
JV	2	Juniperus virginiana	Eastern Red Cedar	3'-4' ht.	B&B	
SHRUBS						
AM	10	Aronia melanocarpa	Black Chokeberry	18"-24" HT.	CONT.	
CE	2	Cephalanthus occidentalis	Buttonbush	2'-2.5' HT.	CONT.	
GB	15	Gaylussacia baccata	Black Huckleberry	18"-24" HT.	CONT.	
LB	3	Lindera benzoin	Spicebush	2'-2.5' HT.	CONT.	
MP	10	Myrica pensylvanica	Northern Bayberry	2'-2.5' HT.	CONT.	
PERENNIALS						
AT	75	Asclepias tuberosa	Butterfly Milkweed		PLUG	12" O.C. Spacing
PD	75	Penstemon digitalis	Beard-tongue		PLUG	12" O.C. Spacing
SO	75	Solidago sempervirens	Seaside Goldenrod		PLUG	12" O.C. Spacing
SA	75	Symphyotrichum novae-angliae	New England Aster		PLUG	12" O.C. Spacing
SEED MIXES						
MIX ID		**MIX NAME**	**LOCATION**	**COMMENTS**		
765.421		Mid-Height Grassland Mix	Meadow Areas	18 lbs PLS/acre		
765.442		Roadside Riverbank Mix	Bioretention Basin & Modified Rock Fill	15 lbs PLS/acre		

CONTINUED ON SHEET NO. 20

AGAWAM MILL POND

AMES ISLAND RD

(RTE 6 & 28)
CRANBERRY HWY

(RTE 6) SANDWICH RD
(1925 STATE HWY ALERATION LAYOUT NO. 2313)

AGAWAM RIVER

PROPOSED NORMAL POOL EL: 13.8

PROPOSED ORDINARY HIGH WATER EL: 15.7

LIMIT OF DISTURBANCE (TYP)

PROP S.H.L.O. ALT NO. 8953

RIPRAP, SEE BRIDGE AND SPILLWAY DRAWINGS.

PROPOSED ORDINARY HIGH WATER EL: 15.7

COMPOST FILTER TUBE

ROADSIDE RIVERBANK SEED MIX ON MODIFIED ROCK FILL - BACK OF GUARDRAIL TO ORDINARY HIGH WATER LINE.

METAL PICKET FENCE ON TOP OF WALL, SEE WING WALL AND WILDLIFE PASSAGE DWGS.

LAWN (TYP)

MID-HEIGHT GRASSLAND SEED MIX (TYP)

LEVEL SPREADER, SEE DRAINAGE PLANS

SEDIMENT FOREBAY, SEE DRAINAGE PLANS

GRAVEL ACCESS DRIVEWAY, SEE CONSTRUCTION PLANS

ROADSIDE RIVERBANK SEED MIX

1 CE
3 QB
3 MP
1 CE
1 JV
4 MP
2 NS
11 GB
3 MP
10 AM
3 LB
4 GB
1 JV

20' OFFSET FROM TOE OF DAM (NO TREE / SHRUB PLANTING THIS SIDE).

ROADSIDE RIVERBANK SEED MIX ON MODIFIED ROCK FILL

EXISTING TREE TO REMAIN

3 CO.
1 BP
1 QB

20' OFFSET FROM TOE OF DAM (NO TREE/SHRUB PLANTING THIS SIDE)

MID-HEIGHT GRASSLAND SEED MIX (TYP)

1 QB

LAWN

20 AT
40 PD
25 SO

55 AT
25 SO
50 SA

35 PD
25 SO
25 SA

SALVAGED GRANITE LANDSCAPE CURB

SIGN MOUNTED TO STORAGE SHED

PROP SHED

1 AR

EXISTING LAWN

CONCRETE PAD AT SHED ENTRANCE

CONCRETE RAMP, SEE STORAGE SHED DETAILS

SALVAGED GRANITE BLOCK WALL WITH ENGRAVED "1850" STONE EMBEDDED IN THE FACE OF THE WALL

WOOD GUARDRAIL (TYP)

SALVAGED GRANITE PLANK PAVING (TYP)

SALVAGED GRANITE PIER (TYP OF 2)

INTERPRETIVE SIGN #2

GRAVEL SURFACING, BLEND WITH EXISTING

PROPOSED CEMENT CONCRETE PAVING (TYP)

BENCH WITH BACK (TYP)

INTERPRETIVE SIGN #1

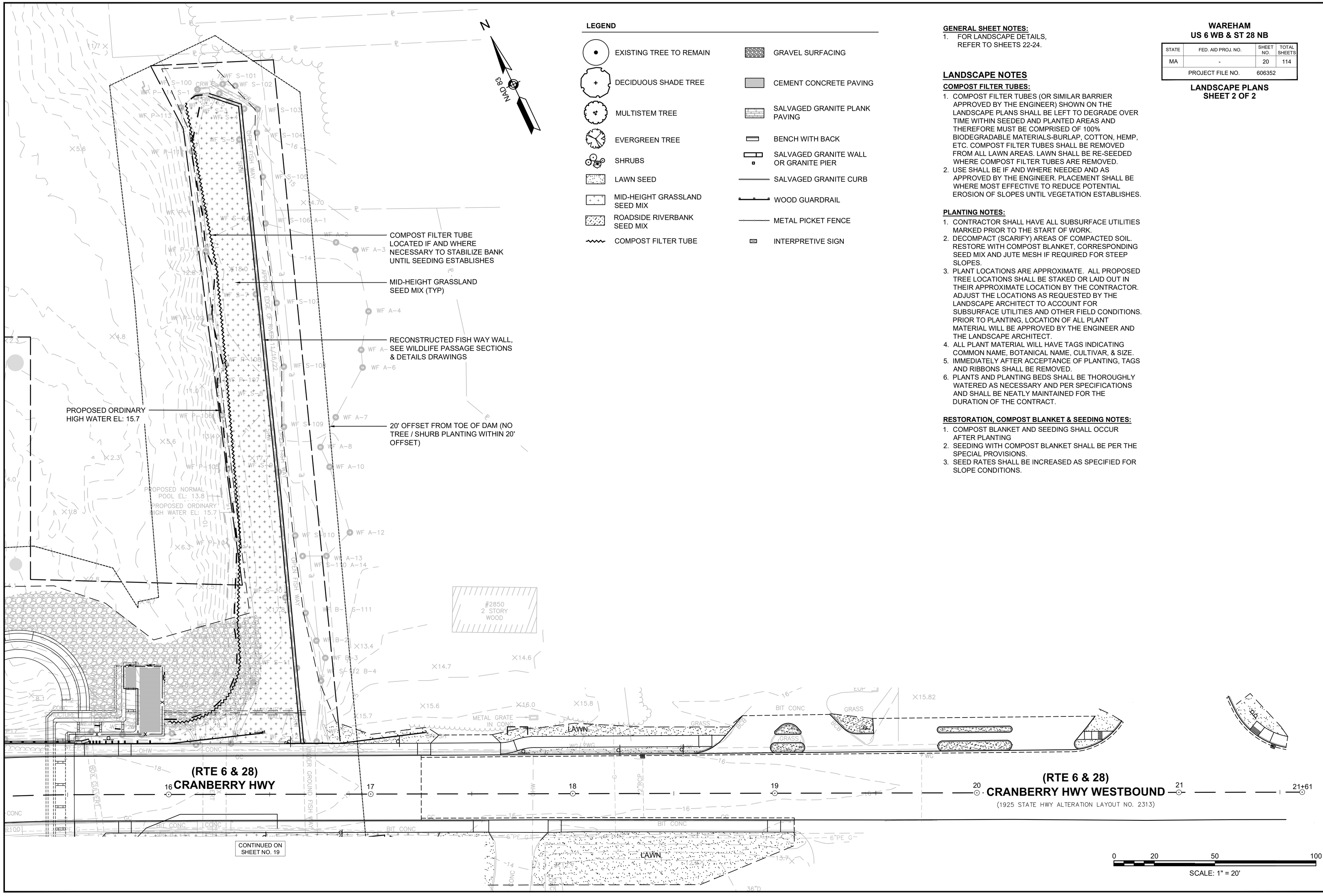
NOTE:
INSTALL 3" DEPTH AGED PINE BARK MULCH SAUCER AT THE BASE OF ALL SHRUBS TO THE EXTENT OF EXCAVATION FOR PLANTING. TREES TO RECEIVE MULCH SAUCER PER THE DETAIL. SEED MIXES SHALL BE APPLIED AS SHOWN TO ALL DISTURBED AREAS THAT DO NOT RECEIVE BARK MULCH.

NOTE:
SEE ENLARGEMENT 1 ON SHEET 21 (LANDSCAPE ENLARGEMENT PLANS) FOR LAYOUT OF LANDSCAPE PAVEMENTS AND SITE FURNISHINGS.

CONTINUED ON SHEET NO. 20

0 20 50 100

SCALE: 1" = 20'



LEGEND

- EXISTING TREE TO REMAIN
- DECIDUOUS SHADE TREE
- MULTISTEM TREE
- EVERGREEN TREE
- SHRUBS
- LAWN SEED
- MID-HEIGHT GRASSLAND SEED MIX
- ROADSIDE RIVERBANK SEED MIX
- COMPOST FILTER TUBE
- GRAVEL SURFACING
- CEMENT CONCRETE PAVING
- SALVAGED GRANITE PLANK PAVING
- BENCH WITH BACK
- SALVAGED GRANITE WALL OR GRANITE PIER
- SALVAGED GRANITE CURB
- WOOD GUARDRAIL
- METAL PICKET FENCE
- INTERPRETIVE SIGN

GENERAL SHEET NOTES:

1. FOR LANDSCAPE DETAILS, REFER TO SHEETS 22-24.

LANDSCAPE NOTES

COMPOST FILTER TUBES:

1. COMPOST FILTER TUBES (OR SIMILAR BARRIER APPROVED BY THE ENGINEER) SHOWN ON THE LANDSCAPE PLANS SHALL BE LEFT TO DEGRADE OVER TIME WITHIN SEEDED AND PLANTED AREAS AND THEREFORE MUST BE COMPRISED OF 100% BIODEGRADABLE MATERIALS-BURLAP, COTTON, HEMP, ETC. COMPOST FILTER TUBES SHALL BE REMOVED FROM ALL LAWN AREAS. LAWN SHALL BE RE-SEEDED WHERE COMPOST FILTER TUBES ARE REMOVED.
2. USE SHALL BE IF AND WHERE NEEDED AND AS APPROVED BY THE ENGINEER. PLACEMENT SHALL BE WHERE MOST EFFECTIVE TO REDUCE POTENTIAL EROSION OF SLOPES UNTIL VEGETATION ESTABLISHES.

PLANTING NOTES:

1. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.
2. DECOMPACT (SCARIFY) AREAS OF COMPACTED SOIL. RESTORE WITH COMPOST BLANKET, CORRESPONDING SEED MIX AND JUTE MESH IF REQUIRED FOR STEEP SLOPES.
3. PLANT LOCATIONS ARE APPROXIMATE. ALL PROPOSED TREE LOCATIONS SHALL BE STAKED OR LAID OUT IN THEIR APPROXIMATE LOCATION BY THE CONTRACTOR. ADJUST THE LOCATIONS AS REQUESTED BY THE LANDSCAPE ARCHITECT TO ACCOUNT FOR SUBSURFACE UTILITIES AND OTHER FIELD CONDITIONS. PRIOR TO PLANTING, LOCATION OF ALL PLANT MATERIAL WILL BE APPROVED BY THE ENGINEER AND THE LANDSCAPE ARCHITECT.
4. ALL PLANT MATERIAL WILL HAVE TAGS INDICATING COMMON NAME, BOTANICAL NAME, CULTIVAR, & SIZE.
5. IMMEDIATELY AFTER ACCEPTANCE OF PLANTING, TAGS AND RIBBONS SHALL BE REMOVED.
6. PLANTS AND PLANTING BEDS SHALL BE THOROUGHLY WATERED AS NECESSARY AND PER SPECIFICATIONS AND SHALL BE NEATLY MAINTAINED FOR THE DURATION OF THE CONTRACT.

RESTORATION, COMPOST BLANKET & SEEDING NOTES:

1. COMPOST BLANKET AND SEEDING SHALL OCCUR AFTER PLANTING
2. SEEDING WITH COMPOST BLANKET SHALL BE PER THE SPECIAL PROVISIONS.
3. SEED RATES SHALL BE INCREASED AS SPECIFIED FOR SLOPE CONDITIONS.

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	20	114
PROJECT FILE NO.	606352		

LANDSCAPE PLANS
SHEET 2 OF 2

Proposal No. 606352-136278

606352_LD(LANDSCAPE PLANS).DWG Plotted on 9-Apr-2025 5:41 PM

Proposal No. 606352-136278

606352_LD(LANDSCAPE PLANS).DWG Plotted on 9-Apr-2025 5:43 PM

A00840 - 426

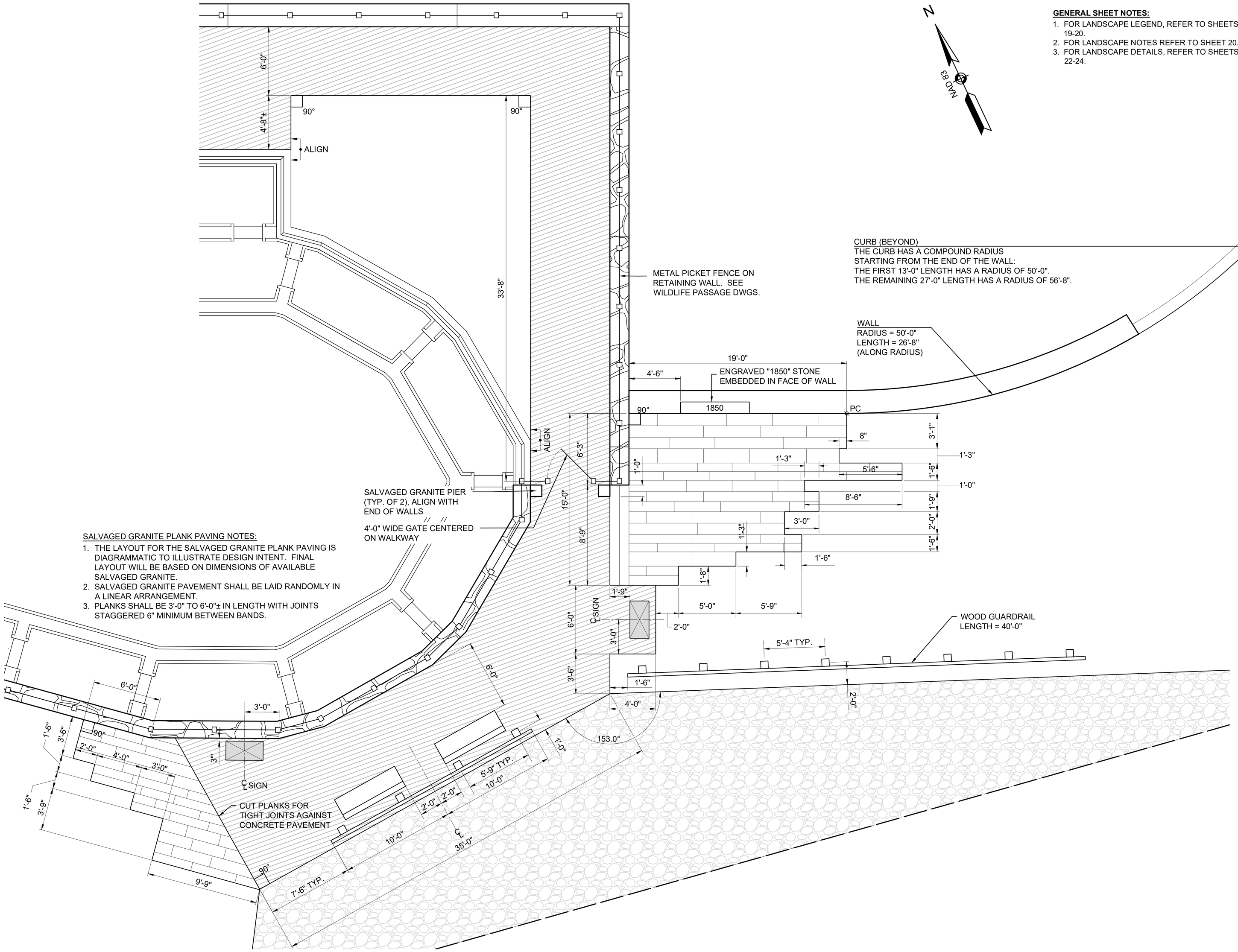
GENERAL SHEET NOTES:

1. FOR LANDSCAPE LEGEND, REFER TO SHEETS 19-20.
2. FOR LANDSCAPE NOTES REFER TO SHEET 20.
3. FOR LANDSCAPE DETAILS, REFER TO SHEETS 22-24.

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	21	114
PROJECT FILE NO.	606352		

LANDSCAPE ENLARGEMENT PLANS
SHEET 1 OF 1



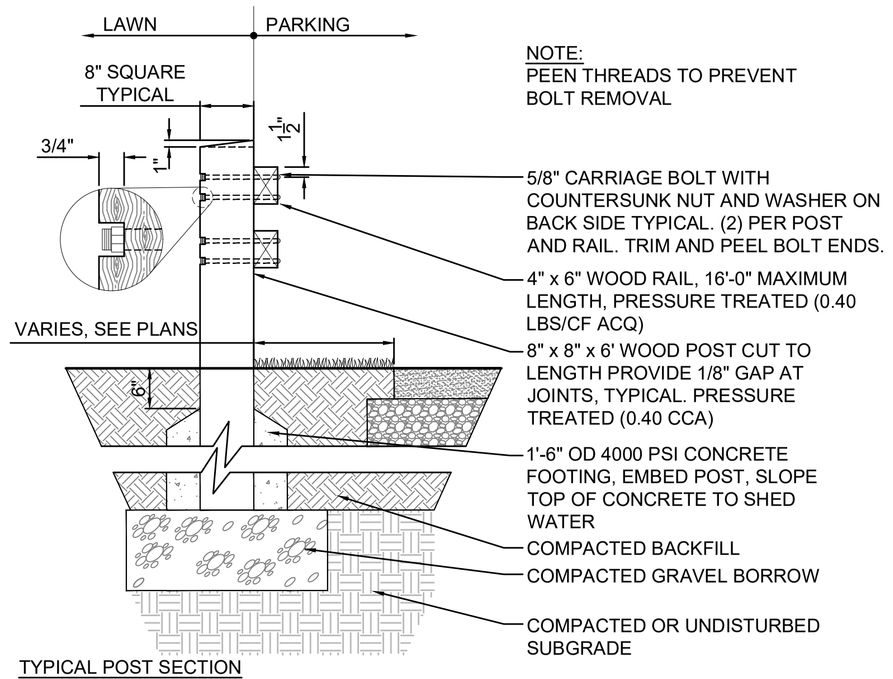
2 FISH LADDER OBSERVATION AREA LAYOUT ENLARGEMENT PLAN

0 4 8 12 16

SCALE: 1/4" = 1'-0"

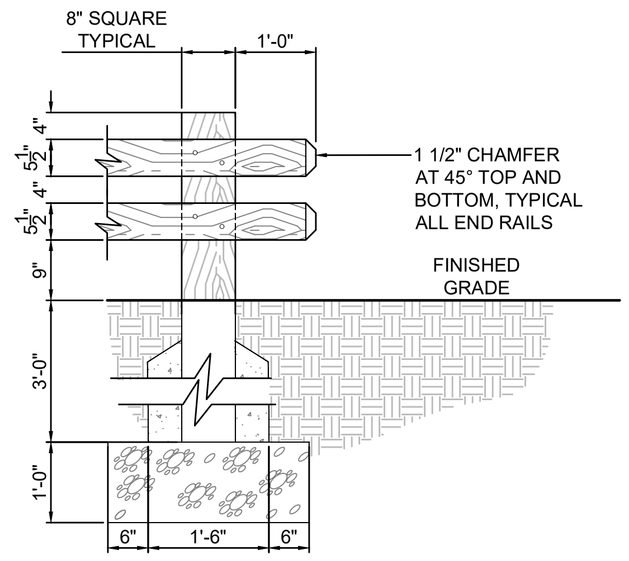
Proposal No. 606352-136278

606352_LD2(LANDSCAPE DETAILS).DWG Plotted on 9-Apr-2025 5:46 PM

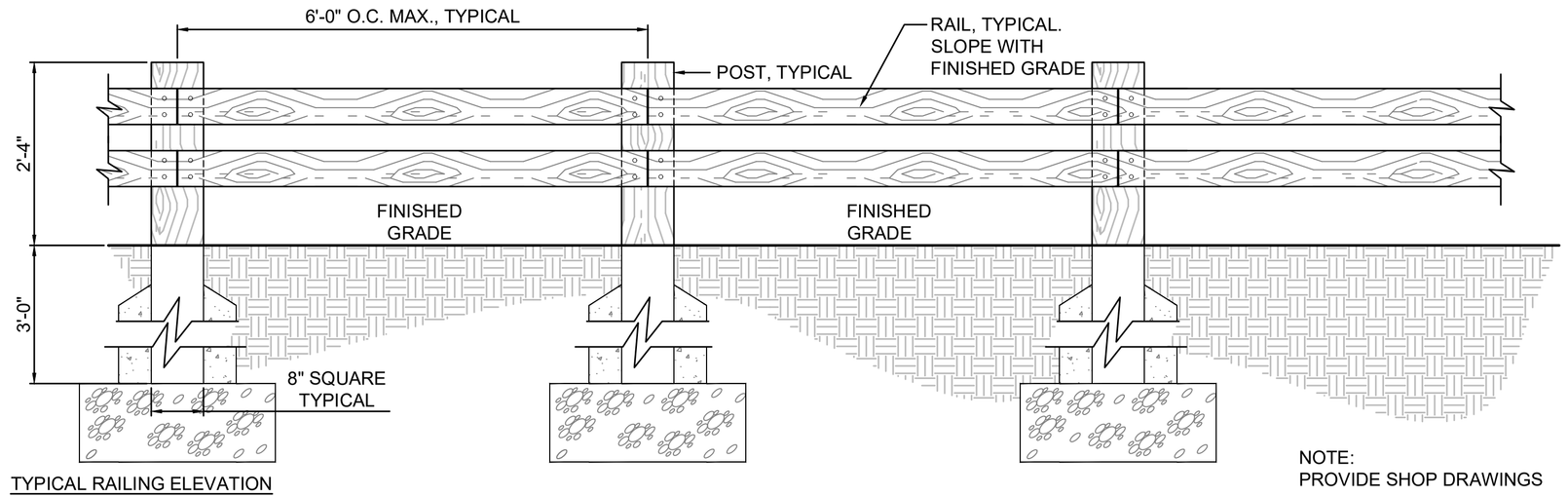


NOTE:
PEEN THREADS TO PREVENT BOLT REMOVAL

TYPICAL POST SECTION



TYPICAL RAILING END

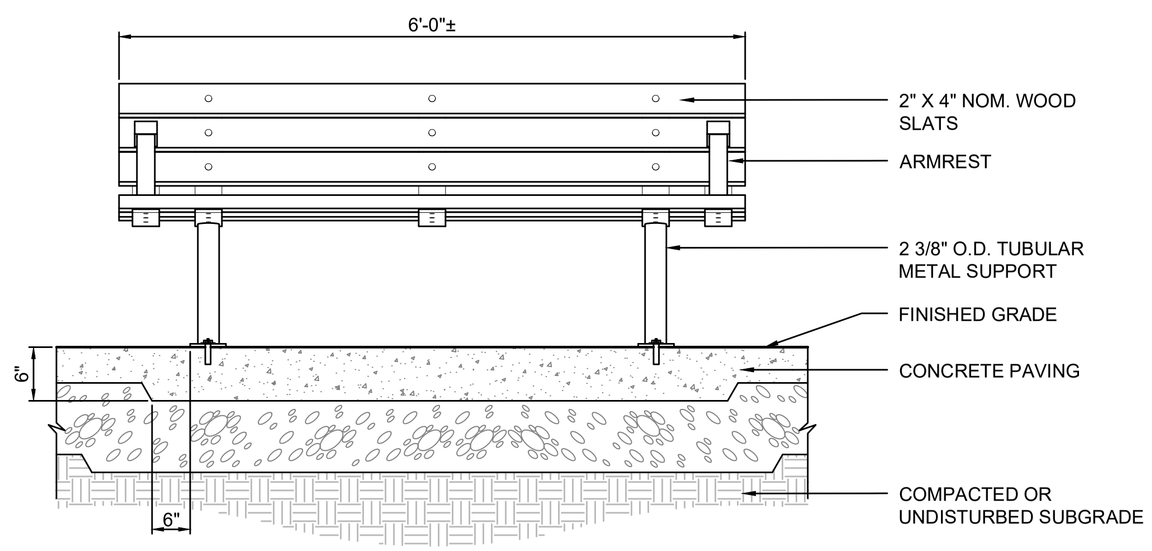


TYPICAL RAILING ELEVATION

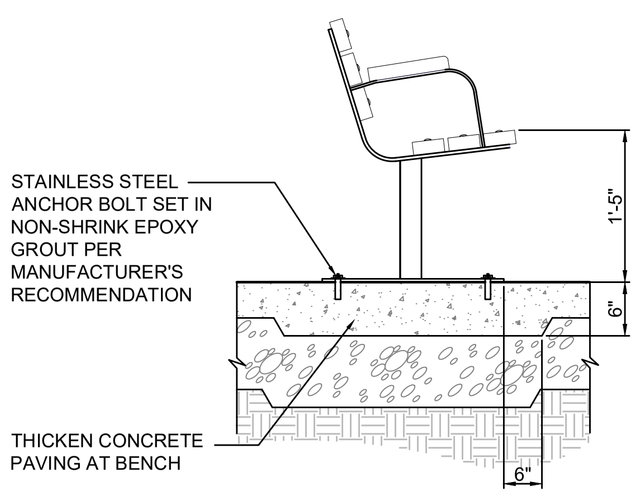
NOTE:
PROVIDE SHOP DRAWINGS

WOOD GUARDRAIL

SCALE: 3/4" = 1'-0"



ELEVATION

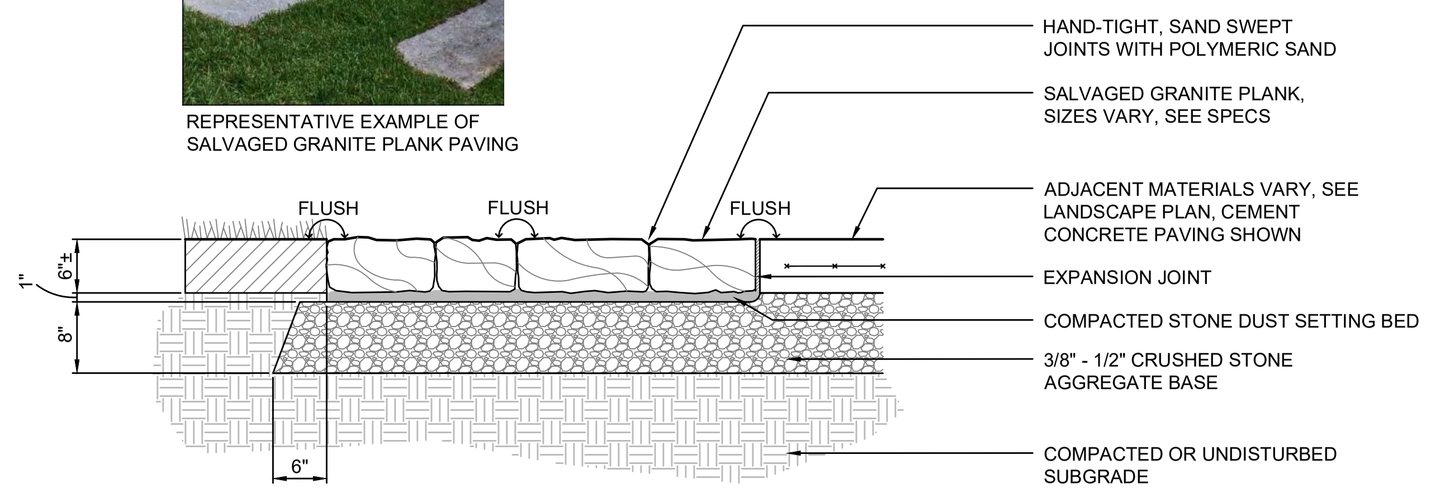


SECTION

BENCH WITH BACK

SCALE: 1" = 1'-0"

REPRESENTATIVE EXAMPLE OF SALVAGED GRANITE PLANK PAVING



SALVAGED GRANITE PLANK PAVING

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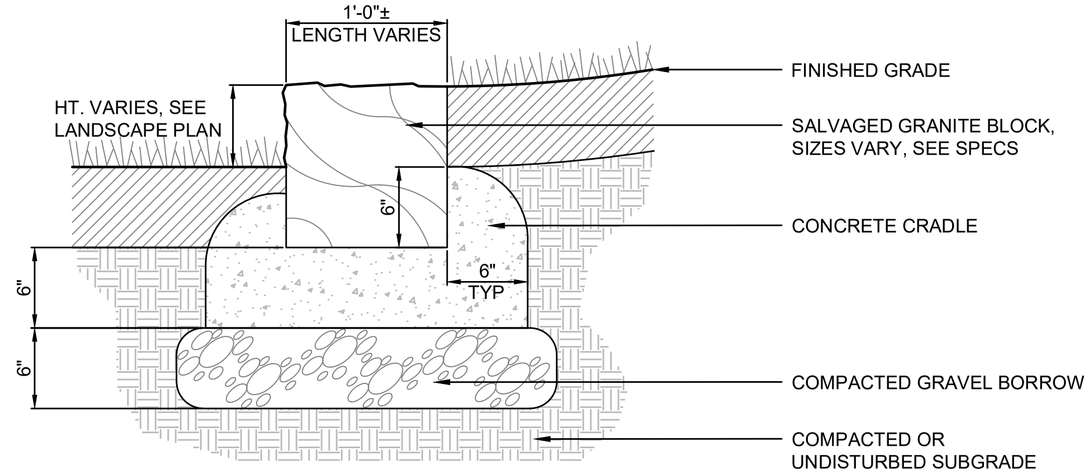
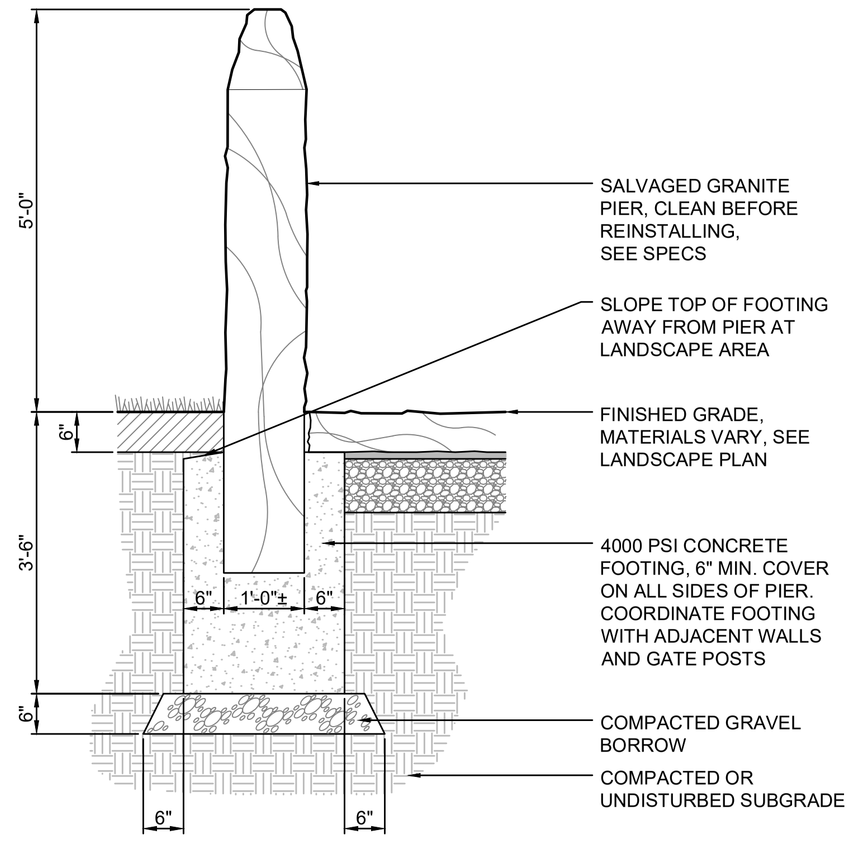


SALVAGED GRANITE LANDSCAPE CURB

SCALE: 1 1/2" = 1'-0"



EXISTING GRANITE PIERS TO BE SALVAGED

SALVAGED GRANITE PIER

SCALE: 3/4" = 1'-0"

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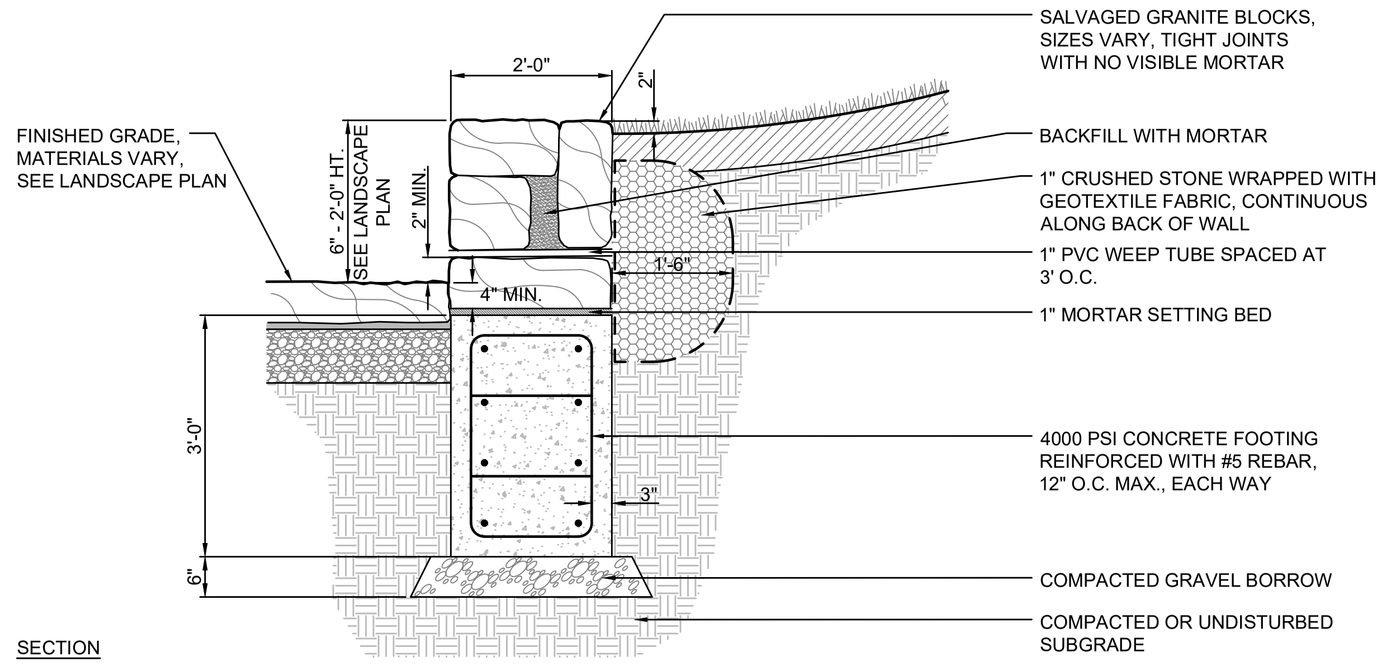
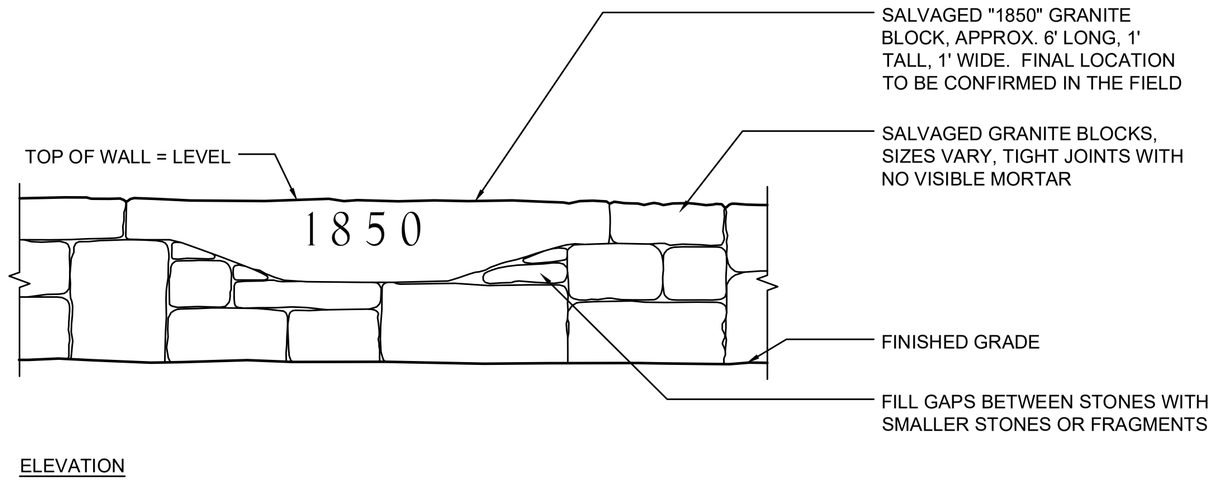


SECTION

NOTES:
1. STONE PATTERN SHALL BE IRREGULAR WITH MIXED STONE SIZES.
2. CLEAN ALL SALVAGED STONE PRIOR TO REUSE.
3. CONSTRUCT WALL MOCKUP, 2' TALL X 2' WIDE X 6' LONG FOR APPROVAL BY LANDSCAPE ARCHITECT.



ELEVATION

EXISTING "1850" GRANITE BLOCK TO BE SALVAGED

SALVAGED GRANITE BLOCK WALL

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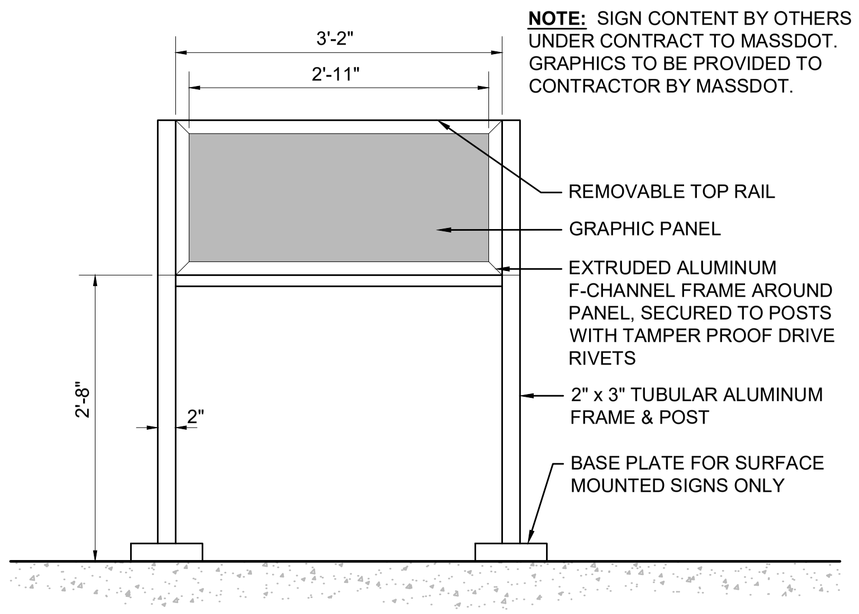
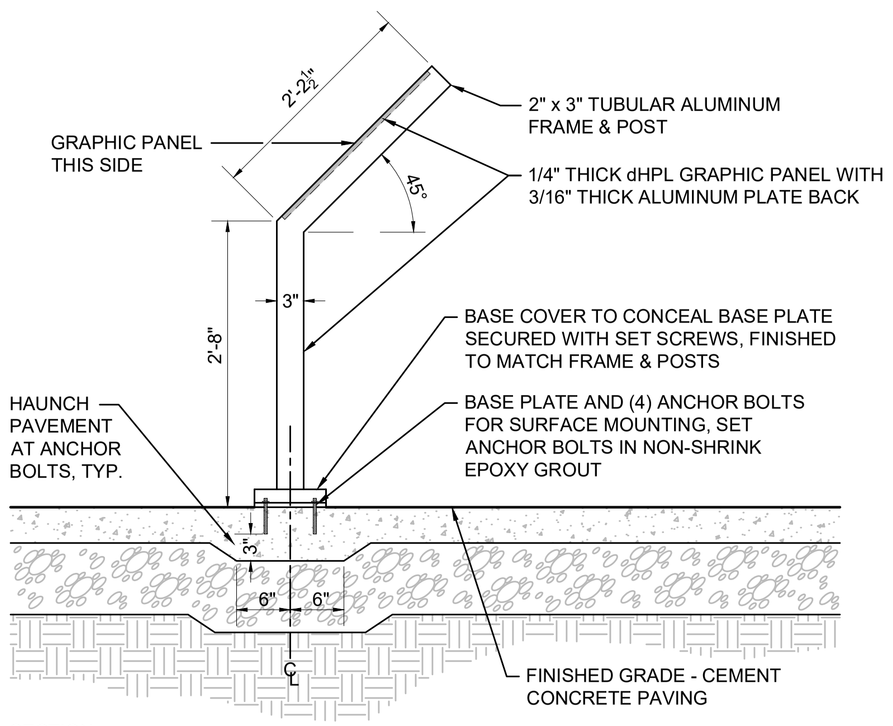


NOTE: SIGN CONTENT BY OTHERS UNDER CONTRACT TO MASSDOT. GRAPHICS TO BE PROVIDED TO CONTRACTOR BY MASSDOT.

ELEVATION - FRONT VIEW



SECTION

INTERPRETIVE SIGN

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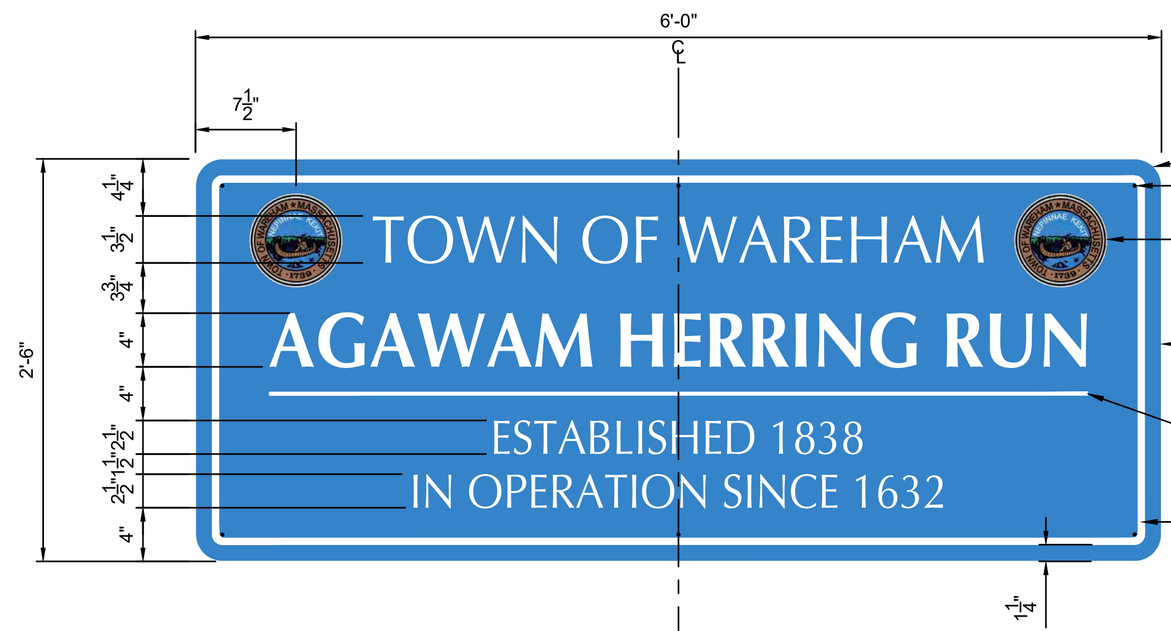
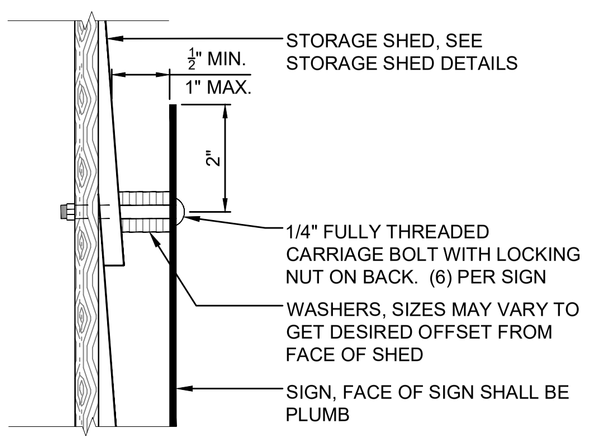


NOTES:
1. GRAPHICS TO BE PROVIDED TO THE CONTRACTOR BY THE LANDSCAPE ARCHITECT.
2. PROVIDE FULL SHOP DRAWINGS FOR APPROVAL.

SIGN COLORS:
BACKGROUND: BLUE
BORDER: WHITE
LETTERING: WHITE, OPTIMA LT. FONT

SIGN LAYOUT
SCALE: 1 1/2"=1'-0"

NOTE: THIS IS INTENDED TO REPLACE AN EXISTING TOWN SIGN ON THE SITE. IF THE PROPERTY OWNERSHIP WILL CHANGE, THE SIGN CONTENT MAY BE MODIFIED ACCORDINGLY.



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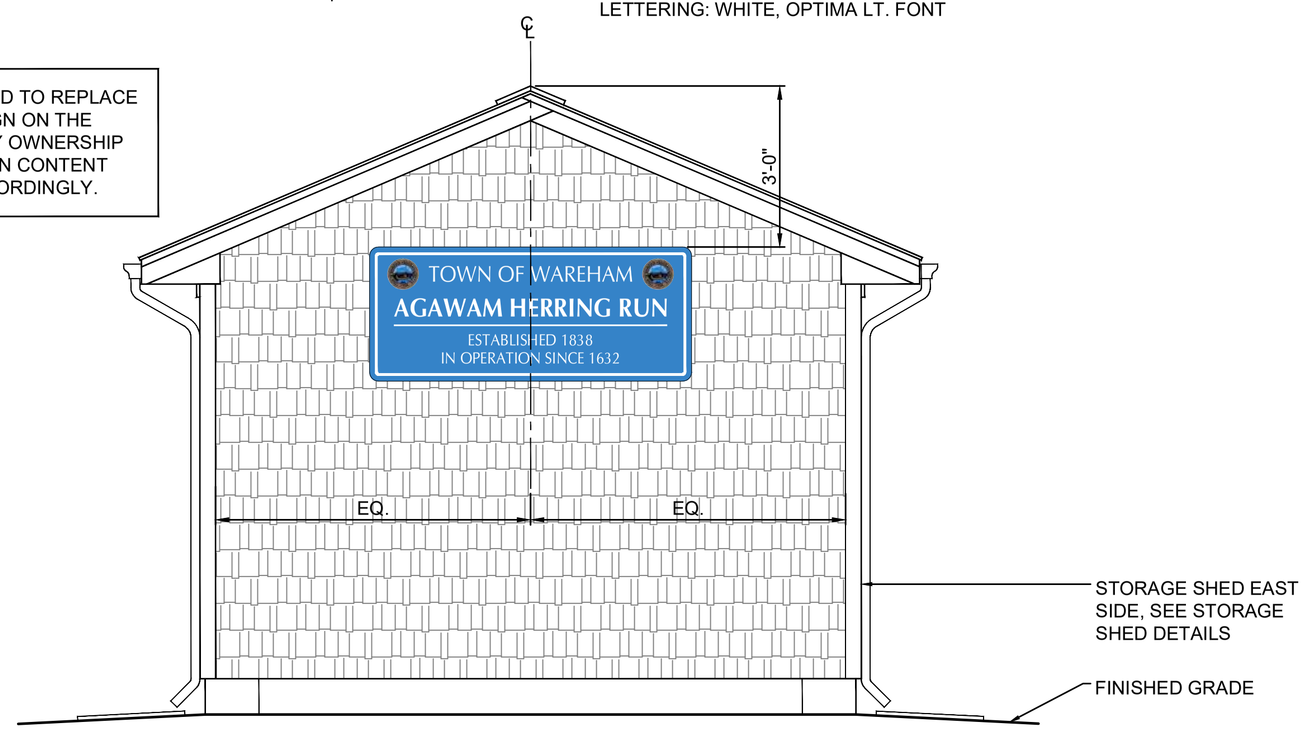

SIGN PLACEMENT ELEVATION
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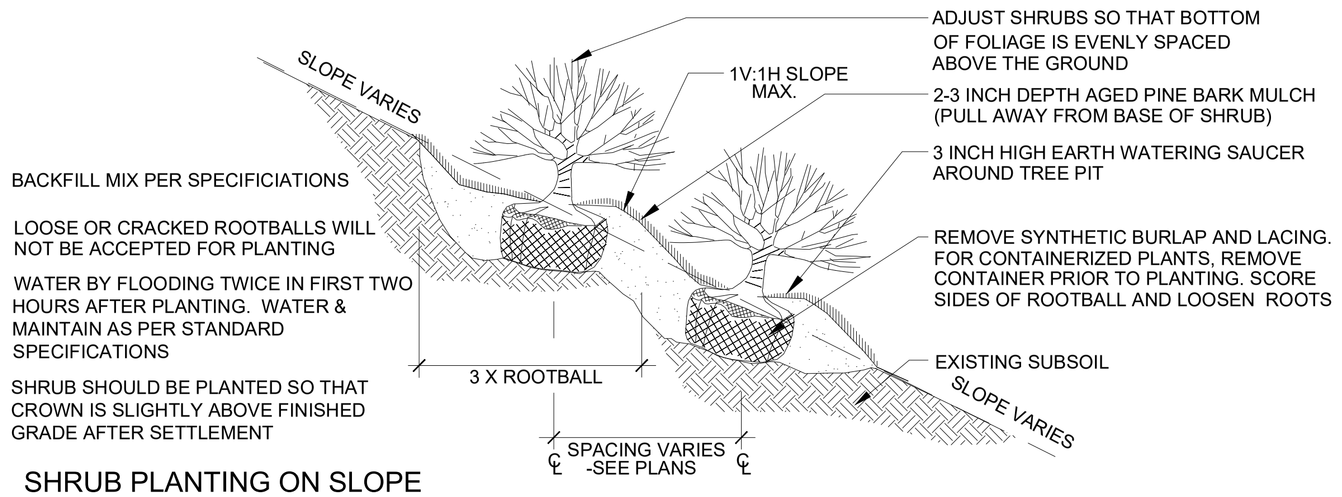
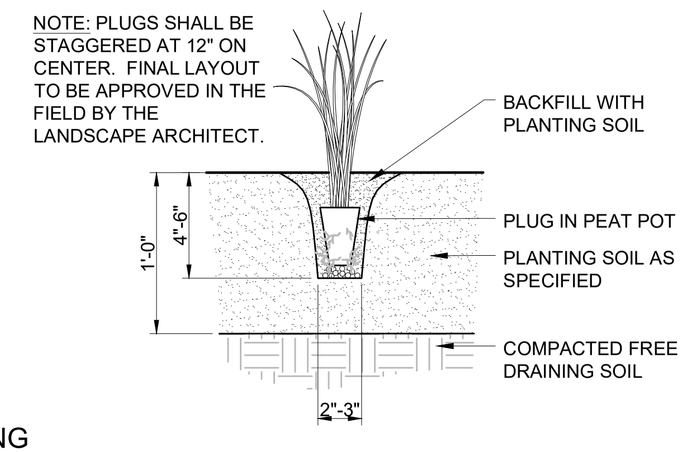
SIGN ON STORAGE SHED

SCALE: AS NOTED



SHRUB PLANTING ON SLOPE

NOT TO SCALE



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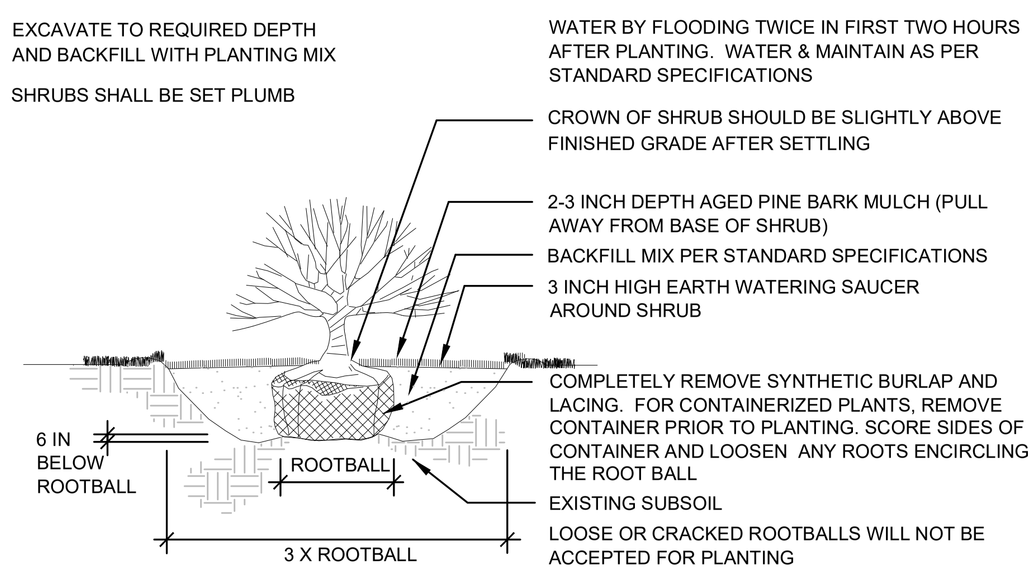

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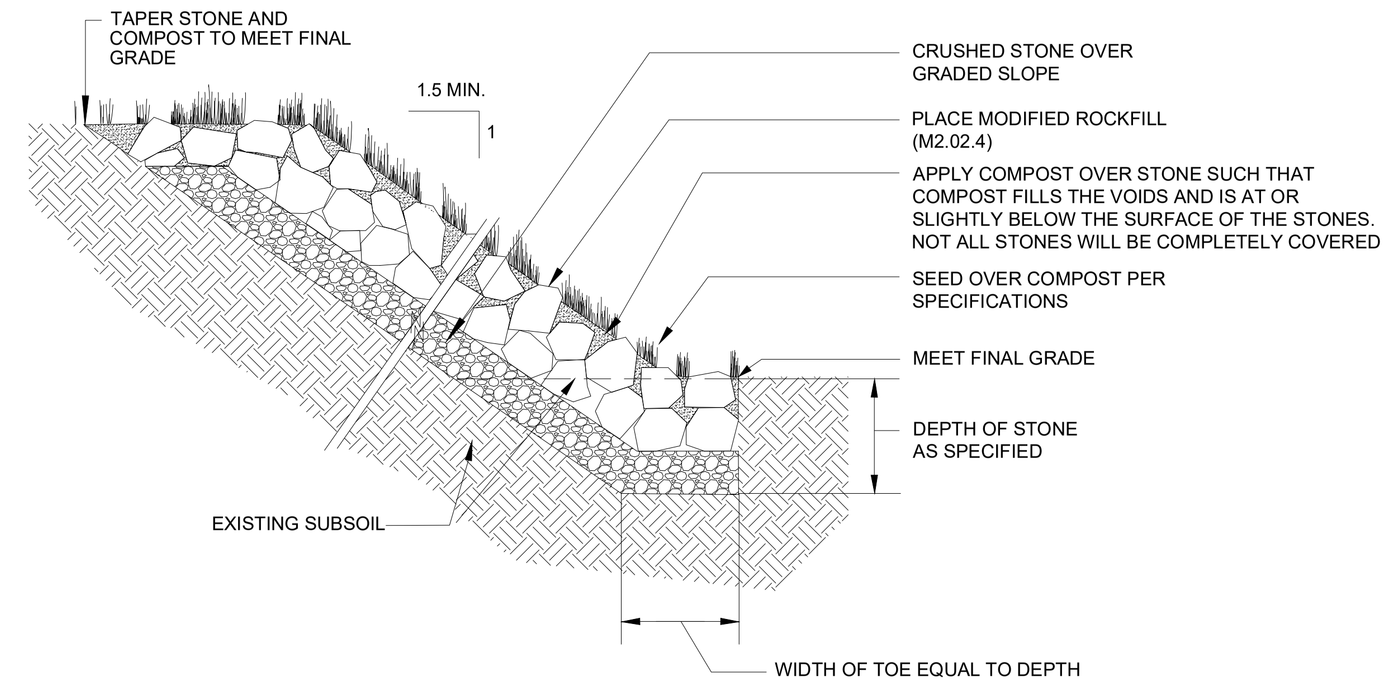
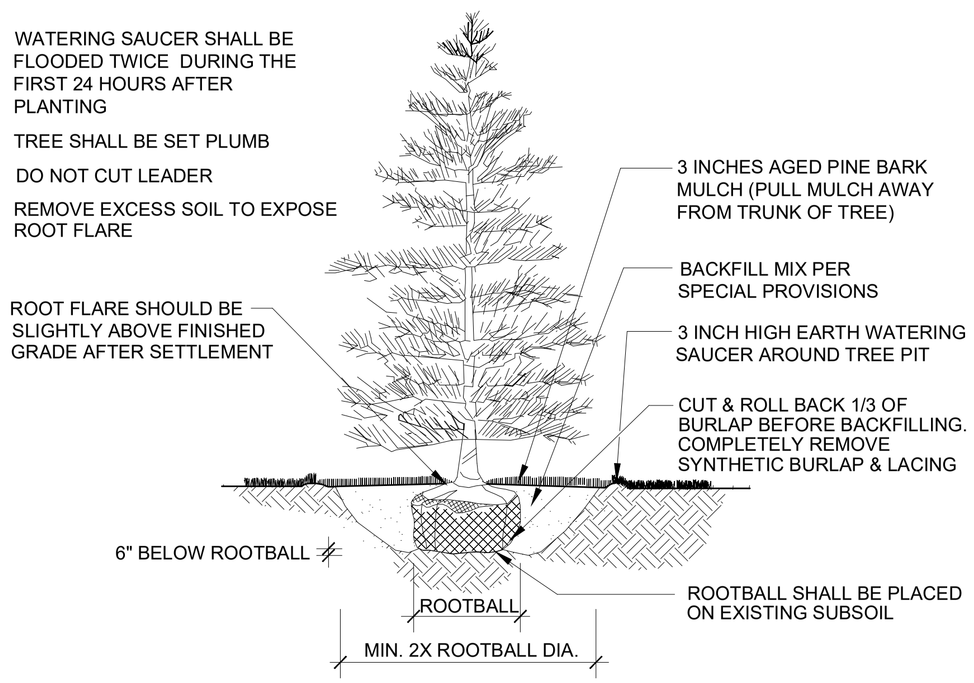


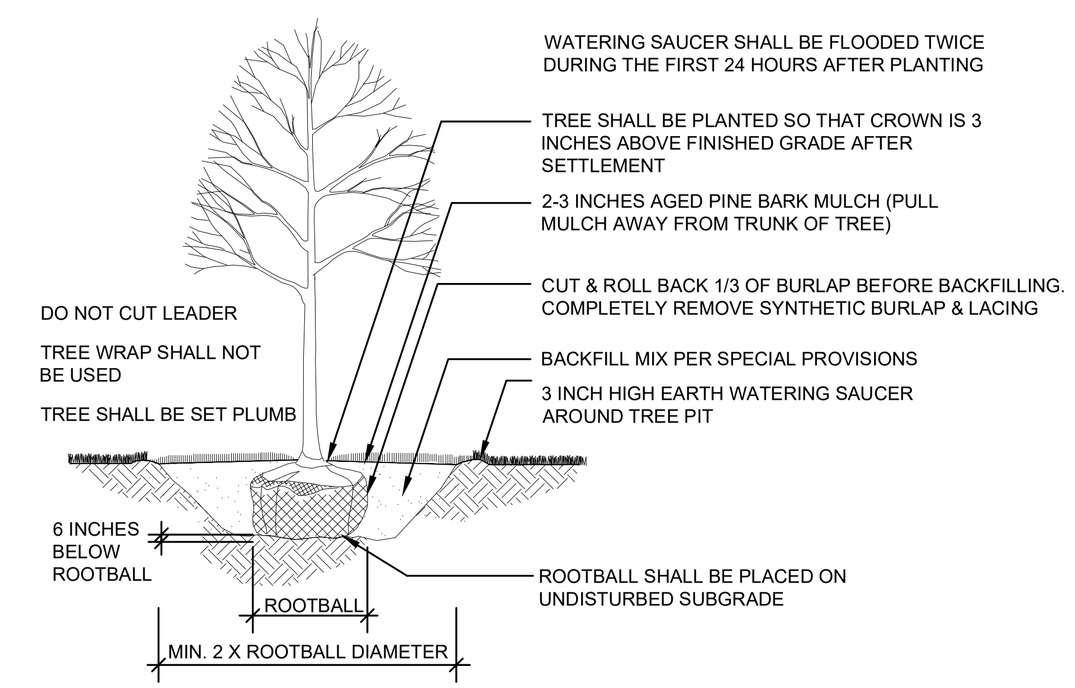
COMPOST AND SEED OVER MODIFIED ROCK FILL

SCALE: NOT TO SCALE



EVERGREEN TREE PLANTING

NOT TO SCALE



DECIDUOUS TREE PLANTING

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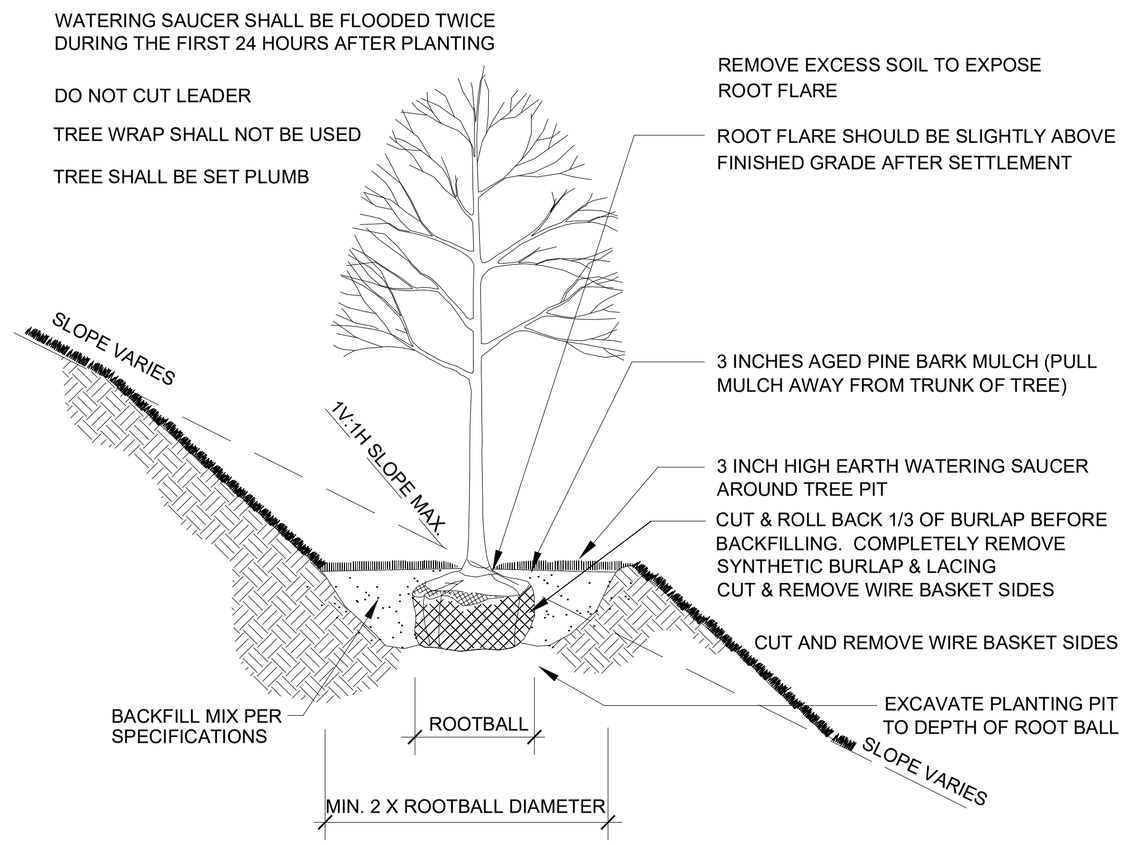

DECIDUOUS TREE PLANTING ON SLOPE

NOT TO SCALE

WAREHAM
US 6 WB & ST 28 NB

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	24	113
PROJECT FILE NO.		606352	

LANDSCAPE DETAILS
SHEET 3 OF 3

606352_LD2(LANDSCAPE DETAILS).DWG Plotted on 9-Apr-2025 5:46 PM

Proposal No. 606352-136278

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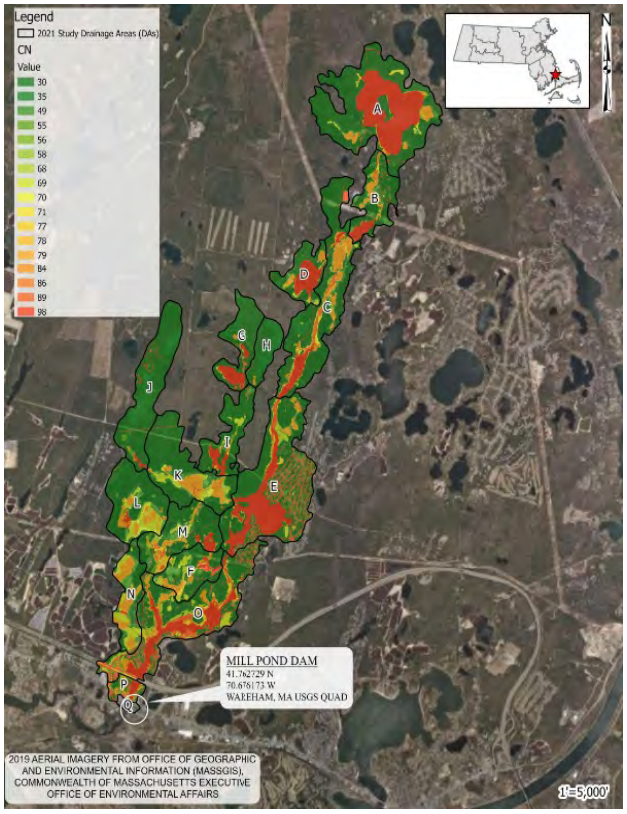
Proposal No. 606352-136278

PREPARED FOR: MASSACHUSETTS DEPARTMENT OF TRANSPORTATION – HIGHWAY (MASSDOT)

HYDRAULIC STUDY REPORT

Cranberry Highway (Route 28)/ Mill Pond Dam Over the Agawam River

WAREHAM, MASSACHUSETTS



PREPARED BY:

PARE CORPORATION
10 LINCOLN ROAD SUITE 210
FOXBORO, MASSACHUSETTS 02035

PARE PROJECT NO. 14199.14

December 2021
Revised July 2025

Cranberry Highway (Route 28) / Mill Pond Dam Over the Agawam

Wareham, MA

HYDRAULIC STUDY REPORT

December 2021
Revised July 2025

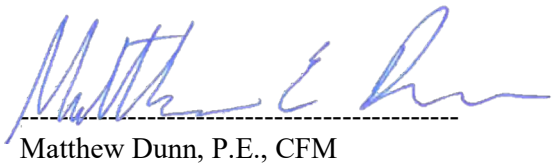
prepared for: MassDOT
10 Park Plaza, room 3170
Boston, MA 02116

prepared by: Pare Corporation
10 Lincoln Road Suite 210
Foxboro, MA 02035

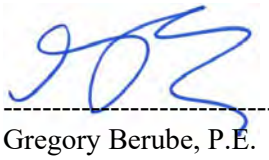
PREFACE

This document entitled "Cranberry Highway (Route 28)/Mill Pond Dam over the Agawam River – Hydraulic Study Report" was prepared by Pare Corporation for the MassDOT. The material in this report reflects Pare's judgment in light of the information available to it at the time of preparation. Any use, reliance on, or decisions made based on this report, its findings or conclusions by any third party are the sole responsibility of such third parties. Pare Corporation accepts no responsibility for damages, if any, suffered by any third party as a result of their use of, decisions made, or actions taken based on this report. This report was prepared under the direction of a Professional Civil Engineer licensed in the Commonwealth of Massachusetts for use by the MassDOT for consideration of the removal and replacement of Mill Pond Dam and installation of proposed bridge.

This report was prepared and reviewed by the following individuals:



Matthew Dunn, P.E., CFM
Senior Project Engineer



Gregory Berube, P.E.
Vice President

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1.0 EXECUTIVE SUMMARY

1.1 Project Purpose

This study has been prepared to evaluate the hydraulic performance of the existing outlet works as well as the proposed outlet works and bridge structures at the Mill Pond Dam (Route 28/Cranberry Highway over the Agawam River) for various flood events. The study has been prepared based on the latest American Association of State Highway Transportation Officials (AASHTO), Federal Highway Administration (FHWA), Army Corps of Engineer (ACOE), and Massachusetts Department of Transportation (MassDOT) guidelines for dams and bridges.

1.2 Scope

This study consists of an evaluation and development of hydrological and hydraulic (H&H) data for Agawam Mill Pond and water sources surrounding the pond. The data was used to develop and complete the H&H analyses of the spillway structures, dam, and bridge. The findings of the H&H analyses have been summarized in this report with supporting information included in the appendices.

1.3 Executive Summary

The scope of this project consists of removal and replacement of the existing primary and secondary spillways, fish way and fish ladder. The existing spillway system will be replaced by a single arched spillway built upstream of Cranberry Highway (Route 28) directing flow beneath the roadway via a single span bridge carrying traffic over the Agawam River. The abutments of the concrete spillway will tie into the bridge abutments. The existing herring run fish way and fish ladder will be replaced by a Step and Pool fish ladder composed of several concrete and stone masonry pool which starts approximately 50 feet downstream from the bridge opening before passing under the proposed bridge superstructure to the fish ladder entrance at the left end of the proposed spillway.

The results of this H&H analysis found that existing outlet works can accommodate storm events in excess of the 500-year storm event; however, the ½ PMF storm event will result in overtopping of the roadway. The proposed dam and bridge rehabilitation program will allow the dam and bridge to accommodate the ½ PMF storm event.

The original H&H analyses for this project was completed in 2015 and is summarized within the February 2016 Hydraulic Report. Updated rainfall data as well as advances in hydrological refinement and calibration tools warranted an update of the original model. This update resulted in significant changes to the model results; the current model appears to more accurately represent historic performance at the site.

2.0 PROJECT DESCRIPTION

2.1 Description of Existing Structure:

2.1.1 Mill Pond Dam (Route 28) Dam

Bridge No. W-06-020 or Mill Pond (Route 28) Dam is located within the Buzzards Bay drainage basin in the Town of Wareham, Plymouth County, Massachusetts. The dam impounds water along the Agawam River to create Mill Pond. The structure and impoundment are shown on the Wareham, Massachusetts USGS quadrangle map near coordinates 41.76279ºN / 70.67623ºW[1], as shown on Figure 1: Locus Plan.

Mill Pond (Rt. 28) Dam is an approximately 285-foot-long, 16.5-foot-high earthen embankment that impounds water along the Agawam River. The crest of the dam supports the Cranberry Highway (Route 6 westbound and 28 northbound). In addition to the dam embankment, the dam system also includes a 230-foot-long dike, a herring run fish way, a primary spillway, a secondary spillway, and an abandoned outlet. The dam is currently classified as a Large sized, High (Class I) hazard potential dam.

The dam's primary spillway system is a concrete culvert leading to a control section consisting of two bays of timber stop logs. West (right) of the primary spillway there is a secondary spillway which consists of a timber stop log control section leading to a riveted steel outlet pipe. A herring fish way is present near the left abutment. The fish way also directs some flow from the pond to the downstream area. The downstream side of the main spillway consists of mortared stone training walls, some with concrete caps, and there is an elevated wooden shed with a concrete slab underneath used to access the dam from the downstream side for harvesting herring. The existing geometric conditions of the superstructure over the spillways are as follows:

W-06-020(9LH) Primary Spillway

Number of Lanes:	2
Skew:	0 degrees
Structure Length:	11'-6" ±
Clear span:	2 Spans: 4'-10" ± Each
Year Built:	1911
Elevations (NAVD88):	
a. Upstream bottom of pond	8.1±
b. Downstream Invert	6.8±
c. Top of stop logs	13.6±

W-06-020(8KD) Fish Ladder

Number of Lanes:	2
Skew:	0 degrees
Structure Length:	115'-0" ±
Clear span:	4'-0" ±
Year Built:	1850

[1] As indicated in the MADCR Dam Safety Database and checked for magnitude of accuracy.

W-06-020(8M1) Auxiliary Spillway

Number of Lanes:	2
Skew:	0 degrees
Structure Length:	16'-5" ±
Clear span:	5'-0" ±
Year Built:	1850
Elevations (NAVD88):	
a. Upstream Invert	10.9±
b. Downstream Invert	5.3±
c. Top of Stop logs	14.1±

2.1.2 Description of Approach Roadway (Cranberry Highway)

Cranberry Highway (Route 6 westbound and 28 northbound) is an Urban Minor Arterial Road that runs through the Town of Wareham. The section of Route 6/28 that crosses the dam carries only Route 6 west bound and Route 28 northbound, as the eastbound/southbound direction is carried by a parallel roadway, located approximately 500 feet to the south. Cranberry Highway is not part of the National Highway System (NHS). The existing geometric conditions of the approach roadway are as follows:

Number of Lanes:	2 lanes, westbound only
Usable Shoulders:	Approximate 7'-6"
Sidewalk width:	South: 4'-3" ±, North: 5'-0" ±
Design Speed:	40 mph
Present Average Daily Traffic:	11,300 vehicles
Percentage Truck Traffic:	2%

2.1.3 Land Uses in the Vicinity of the Bridge

The area upstream of the dam surrounding Agawam Mill Pond is zoned for residential use. Within the residential zone are agricultural areas consisting of cranberry bogs that rely on the Agawam River and Mill Pond as a source of irrigation. Route 6/Route 28 that travels over the dam is located within a commercial zone. The area downstream of the dam is zoned for mixed residential.

2.1.4 Special Site Considerations

- **Rainfall:** A detailed hydrologic model of the 7.7 square mile contributing drainage area to the Mill Pond Dam was developed utilizing the most recent data sets available including NOAA Atlas 14 rainfall data (Reference #9), LiDAR terrain data (Reference #10), as well as land cover (Reference #11) and soils data (Reference #12) layers. The hydrological model was completed in HydroCAD 10.10-5a.
- **Tidal Water**: The water surface elevation of the Agawam River downstream of the dam is tidal.
- **Storm Surge:** As indicated on the FEMA FIRM maps, Mill Pond and the surrounding upstream and downstream areas are inundated by a storm surge from Buzzard Bay up the Agawam River. The areas are reportedly inundated to elevation 15 feet which is a little over one foot above the normal pool elevation of Mill Pond.

- **Dam Safety Regulations:** The bridge not only functions to carry Cranberry Highway across the Agawam River but is also as critical component in the function of the site as a high hazard potential dam. Design of the bridge and associated structures will need to account for not only bridge design requirements but also applicable dam safety regulations and design considerations.
- **Regulation of flow:** The regulation of flow during construction will need to be to be phased and take into account for several factors. These include but are not limited to the following:
  - Inundation from rainfall events.
  - Coordination with local business that rely on Mill Pond and the Agawam River for water supply. Most notably, this will include cranberry growers located upstream of the dam that rely on the impoundment for water supply as part of their operations.
  - Environmental and marine wildlife interests.

2.2 Proposed Improvements:

The scope of the project includes replacing the existing spillway systems at the dam with a new spillway located upstream of the embankment combined with a single span steel beam bridge to carry Cranberry Highway across the Agawam River. The spillway and dam improvement project will consider and be designed to safety accommodate a ½ Probable Maximum Flood (PMF) Spillway Design Flood (SDF) as required by current state dam safety regulations. The bridge will be designed to pass flows in accordance with current MassDOT standards with additional design considerations for dam safety requirements. In addition to the spillway/bridge work, the existing fish way and fish ladder will be replaced with a more efficient Denil fish ladder intended to benefit the marine wildlife that travel the Agawam River.

The proposed spillway will consist of a concrete arch structure with a notched (low stage) section near the center. The structure will be located upstream of Route 28. The flow over the spillway will travel beneath a single span steel beam bridge superstructure supported by concrete abutments.

Proposed Primary Spillway	
Type:	Arched Concrete Weir
Weir Length (Feet):	130 total
Notch	15
Upper Section	115
Elevations (NAVD88):	
Notch	13.6
Upper Section	15.5
Normal Pool	14.3
Base Weir DS	4.0
Proposed Bridge	
Roadway Elevation (NAVD88)	18
Bottom Chord Elevation (NAVD88)	14.6±
Number of Lanes:	2
Skew:	0 degrees
Structure Length (Feet):	50
Clear span (Feet):	43 (50’ total with 7’ wide fish ladder)

The existing fish ladder will be replaced with a Pool and Weir fish ladder which is more appropriate for the area and species of migratory fish that will be using the fish ladder. The downstream portion of the fish ladder consists of rectangular concrete pools separated by rectangular weir. The fish ladder entrance

will match into the existing downstream walls and will create the required attraction flow for the target fish species. A harvesting pad is proposed at the first turn in the fish ladder that allows water to flow into a separate pool area of shallower depth. Access is provided by walkways around the pool for users to reach into the pad and remove the fish. The harvesting pad pool will utilize stop logs which can be manually removed to open the area and placed to close it. More details of the fish ladder design can be found in Appendix D: Wildlife Passage Design Report.

3.0 DATA COLLECTION

The following inspections and data collections were performed within the vicinity of the bridge and the dam to support the bridge/dam replacement project as well as the development of the H&H model for the existing and proposed conditions.

- 2016 Hydraulic Study Report: The original/initial H&H study completed for this project.

- Topographic survey completed by CCR ASSOCIATES of Quincy, MA entitled "Topographic Plans of Land Route 28, Agawam Mill Pond in the Town of Wareham Massachusetts" dated January 30, 2009, was provided to Pare from the MassDOT.

- Dam evaluations and inspections completed by Pare Corporation between 2009 to present. These inspections were performed to inspect and evaluate the conditions of the Mill Pond Dam (Route 28) and its appurtenant structure in accordance with 302 CMR 10.07.

- Phase II Inspection and Evaluation Report was performed for Mill Pond (Route 28) Dam in April 2009 to access condition of the dam and provide alternatives with conceptual repair design and opinions of probable construction costs.

- Underwater inspection of the fish ladder beneath the roadway to the fish ladder entrance in the spillway discharge channel was completed by the MassDOT diver on May 15, 2008. The inspection was completed to evaluate the fish ladder condition.

- Underwater inspection of the dam was completed by the MassDOT divers on March 6, 2009. This inspection includes the underwater portion of the superstructure of the roadway spanning the primary spillway including the upstream walls and the channel downstream of the stoplogs.

4.0 ENGINEERING METHODS

The following subsections present and summarize the H&H analyses completed and the results of the analyses.

4.1 Hydrologic Analysis

4.1.1 Hydrologic Methodology – General

A rainfall-runoff model was developed in HydroCAD (Version 10.10-5a) using the Soil Conservation Service (SCS) TR-20 runoff methodology.

The unit hydrograph that was selected for this analysis was the SCS (Gamma=484), which is the standard unit hydrograph for SCS TR-20 runoff methodology. The unit hydrograph utilizes a best-approximate hydrograph based on the gamma equation (peak rate factor) that is scaled by the time lag to produce the unit hydrograph for the simulation. The lag is defined as the length of time between the centroid precipitation mass and the peak flow of the resulting hydrograph. The lag is a function of the time of concentration Tc. The time of concentration was calculated for each drainage area utilizing the segmental method (i.e. sheet flow, shallow concentrated flow, channel flow, etc.)

The CN represents the portion of the precipitation depth that will lead to runoff, and is a function of soil type (Hydrologic Soil Groups A through D) and land/ground cover (i.e. impervious surfaces (pavement, water, etc.; forests; grass) within the drainage area. An area with a high CN value (e.g., 98 for pavement/water surface, 90 for developed areas in Soil Group D, etc., 80 for forested wetlands in soil groups B) will have low water retention and a high runoff value while a low CN (e.g., 30 for a wooded area with permeable soils) indicates high infiltration and low runoff volume. The composite curve number (CN) used in the model of each watershed is an average CN value weighted by the percent area of each contributing land cover and soil type in the watershed. To develop the CN, ArcGIS software was used to join GIS based NRCS Soil Survey data layers (Reference #8) and MassGIS based Land Cover data layers (Reference #9) into a single data layer with discrete areas of unique soil groups and land cover data. Pare used the 2016 land cover data set (released in September of 2019) that offers a much more detailed data set then the previous 2005 land cover data set, and therefore, more accurate curve number development. A CN Look-Up table specific for Massachusetts and references NRCS TR 55 CN values was used to assign a CN value for each unique soil group and land cover area. The composite CN utilized for each a single watershed or sub-watersheds is an area-weighted average of the CN values contained within the limits of the drainage area. Table 4-3 presents a tabulated explanation of the CN and its meaning:

4.1.2 Rainfall

The rainfall depth values and distribution curves for recurrent storm events (1-year through 1000-year) were obtained from the NOAA Atlas 14 while the PMP rainfall was developed utilizing HMR51 and 52 procedures. The table to the right provides the total rainfall depths (in inches) for each of the storm events included within this analysis.

Table 4-1: Rainfall Depths

Return Interval	Depth (Inches)
1-year	2.9
2-year	3.4
5-year	4.3
10-year	5.0
25-year	6.0
50-year	6.8
100-year	7.6
200-year	8.4
500-year	9.6
1000-year	10.6
PMP	33.0
PMP (72-hr)	39.0

4.1.3 Drainage Areas

As delineated by the USGS Stream Stats program, the drainage area for the dam is reported at 17.0 square miles and generally consists of a mix of cranberry bogs, forest, forested wetland, open water, very low to medium density residential properties, and open land. However, based on a detailed review of the drainage area, a large portion of the northern half of the stream stats returned watershed are kettle holes that are not hydraulically connected by surface water features to the remainder of the watershed. As such, those areas were removed, resulting in a 7.7 square mile drainage area. Details of the StreamStats drainage area and the hand delineated drainage areas are shown within Figure 3: Drainage Areas.

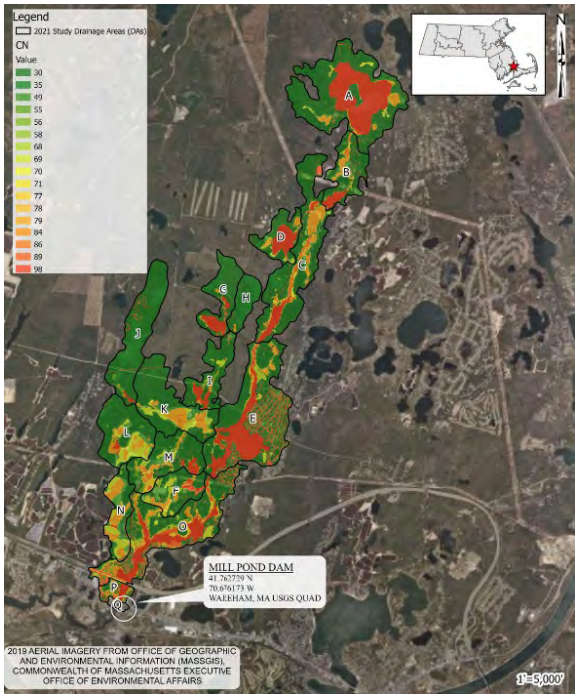


Figure 4-1: Clip of Hydrology Map

The 7.7 square miles was subdivided into 15 individual subbasins to account for certain hydraulic structures and storage areas within the watershed. The locations and details of each subdrainage are presented within Figure 4: Hydrology Map (clip provided above right), as well as the HydroCAD Model included within Appendix C. The following table provides a tabulated summary of the hydrologic parameters that were developed for each subdrainage area.

Table 4-2: Drainage Area Parameters

DA ID	*Name*	*Size (Acres / mi²)*	*Imp. Area (Acres)*	*% Imp*	*CN*	*LFP (miles)*	*Tc (hrs.)*	*Baseflow (CFS)*
A	Halfway Pond	711 / 1.11	242	34%	56	1.5	1.4	2.2
B	Kennard Reservoir	191 / 0.30	35	19%	49	1.2	2.7	0.6
C	Besse Bog Reservoir	504 / 0.79	53	11%	47	2.8	5.3	1.6
D	Fawn Pond	158 / 0.25	51	32%	57	0.8	2.1	0.5
E	Glen Charlie Pond	672 / 1.05	241	36%	59	2.1	2.8	2.1
F	Maple Springs Bogs	182 / 0.28	11	6%	50	0.6	6.8	-
G	Fivemile Pond	189 / 0.30	36	19%	45	1.0	5.7	-
H	Kettle Hole	104 / 0.16	1	1%	34	0.8	10.0	-
I	Maple Springs Brook Dam	191 / 0.30	29	15%	42	1.1	4.4	0.6
J	Maple Springs Road Dam	334 / 0.52	9	3%	34	2.0	5.5	1.0
K	Maple Springs Brook US	354 / 0.55	3	1%	42	1.4	6.0	1.1
L	West Bogs	279 / 0.44	7	2%	45	1.3	9.9	0.9
M	Maple Spring Brook DS	266 / 0.42	22	8%	47	1.2	5.9	0.8
N	Southwest Bogs	179 / 0.28	6	3%	57	1.4	5.0	0.6
O	Mill Pond US	576 / 0.90	179	31%	62	2.0	9.6	2.0
P	Mill Pond DS	54 / 0.08	20	38%	71	0.4	2.7	-
1	Total	4,944 / 7.73	945	19%	51	-	-	11.5

Through research performed during the design of the fish ladder, a USGS resource[1] was located that included measurements of stream flow in the Buzzards Bay Basin, including flow measurements taken along the Agawam River 800 feet downstream of the project site (Mill Pond Dam). According to those measurements, baseflow measurements and cubic feet per square mile (cfsm) correlations were determined to be 29 cfs (1.7 cfsm) for the 95% exceedance level (low flow) and 44 cfs (2.6 cfsm) for the 50% exceedance level (average). As such the baseflow of 44 cfs was used within the HydroCAD model to assess the existing dam performance as well as used to design the proposed dam/bridge improvements.

4.1.4 Hydraulic Structures

Hydraulic structures (e.g. dams, control structures, and roadway embankments with bridges / culverts) were also included in the model. In general, each structure was modelled utilizing a combination of field data collection, previous reports, available LiDAR terrain data, and aerial imagery. Each structure was modeled as a "pond" node with LiDAR terrain data used for the impoundment storage information.

A total of 21 hydraulic structures were included within the model including the following:

Table 4-3: Hydraulic Structures

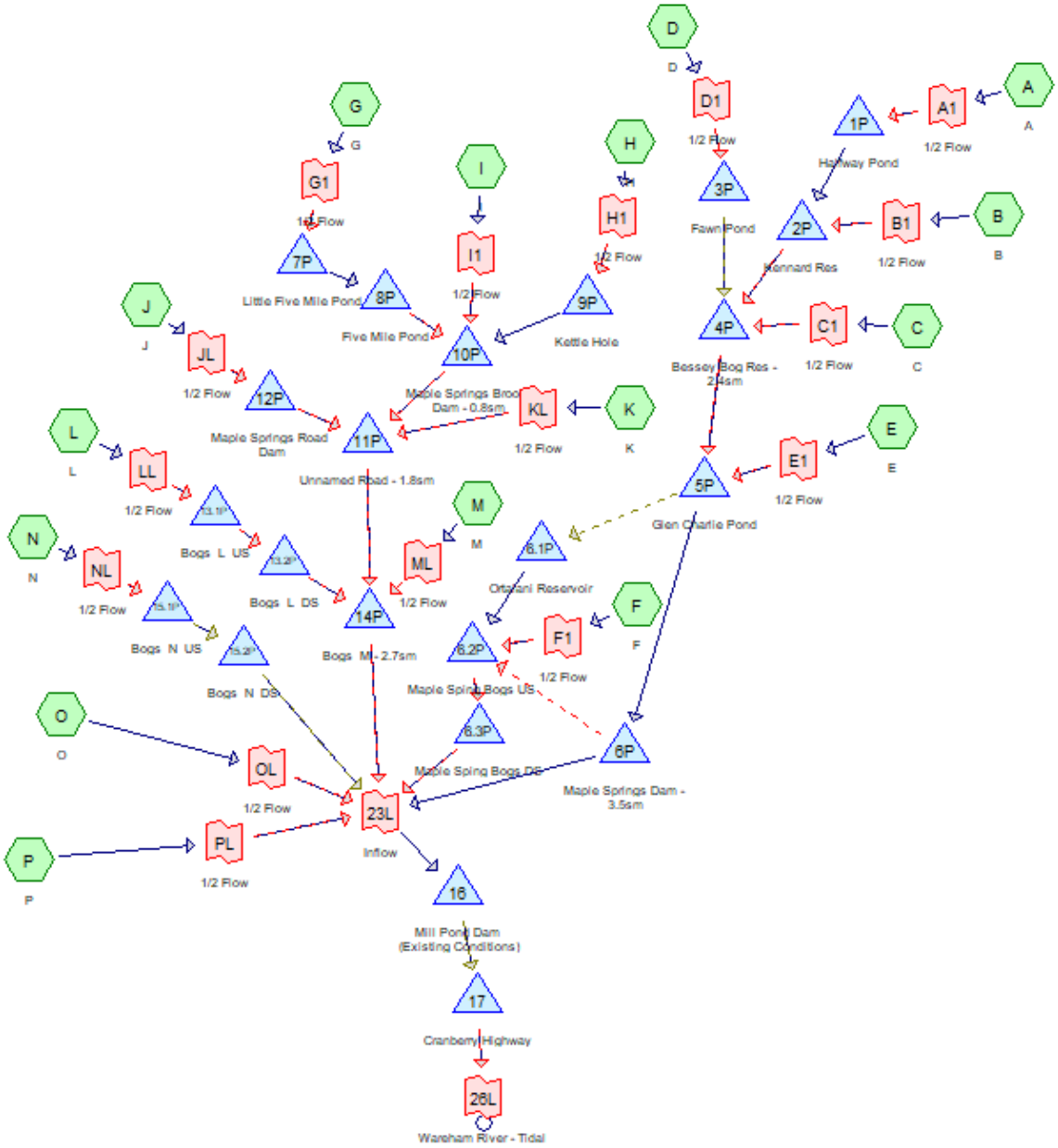
DA ID	*Name*	*Fed By*	*Description*	*Control Elevation*
1P	Halfway Pond	A	Kettle Pond with Possible Overflow	64.0
2P	Kennard Reservoir	1P, B	Reservoir created by Dam	57.1
3P	Fawn Pond	D	Kettle Pond with Culvert	59.5
4P	Besse Bog Reservoir	1P, 3P, C	Reservoir created by Dam	46.5
5P	Glen Charlie Pond	4P, E	Reservoir created by Dam	33.8
6P	Maple Springs Dam	5P	Dam with Small Pond	20.3
6.1P	Ortalani Reservoir	5P	Reservoir created by Dam	34.2
6.2P	Maple Springs Bogs US	6.1P, F	Cranberry Bogs created by Dam	22.7
6.3P	Maple Springs Bogs DS	6.2P	Cranberry Bogs created by Dam	17.0
7P	Little Five Mile Pond	G	Kettle Pond with Possible Overflow	59.5
8P	Five Mile Pond	7P	Kettle Pond with Culvert	51.9
9P	Kettle Hole	H	Kettle Hole	54.9
10P	Maple Springs Brook Dam	8P, 9P, I	Pond created by Dam	29.5
11P	Unnamed Road	10P, 12P, K	Culvert	21.0
12P	Maple Springs Road Dam	J	Pond created by Dam	38.5
13.1P	Bogs_L_US	L	Cranberry Bogs created by Dam	29.5
13.2P	Bogs_L_DS	13.1P	Cranberry Bogs created by Dam	25.6
14P	Bogs_M	11P, 13.2P, M	Cranberry Bogs created by Dam	15.2
15.1P	Bogs_N_US	N	Cranberry Bogs created by Dam	25.0
15.2P	Bogs_N_DS	15.1P	Cranberry Bogs created by Dam	20.0
16	Mill Pond Dam	6P, 6.3P, 14P, 15.2P, O, P	Reservoir created by Dam	14.3
17	Cranberry Highway	16	Bridge	2.1
26L	Wareham River – Tide Cycle	17	MHHW of the tidal Wareham River	4.8

[1] Streamflow, Groundwater Recharge and discharge, and Characteristic of Surficial Deposits in Buzzards Bay Basin, southeastern Massachusetts, by Gardner C. Bent U.S. Geological Survey Water-Resources Investigations Report 95-4234.

4.1.5 H&H Model

The rainfall data, drainage area development, and hydraulic structure development were compiled into a H&H model utilizing HydroCAD (10.10-5a). The SCS TR-20 "runoff method" was assigned to the model and the Initial Abstraction to Retention Ratio (Ia/S) was set at 0.2. A base unit hydrograph gamma value of 484 (SCS) was used and applied to each drainage area node. A 3-minute time step was used. The inflow hydrograph from the PMP was divided in half to develop the hydrograph for the ½ PMF.

The graphic below shows the routing diagram of the HydroCAD model



4.2 Hydraulic Analysis

4.2.1 No-Rise Hydraulic Analysis

The area is in a Zone AE Special Flood Hazard Area with a Base Flood Elevation of El. 14. However, that base flood elevation was determined based upon the expected 100-year storm surge of the Wareham River. There was no riverine model completed by FEMA for the Agawam River. As such, a No-Rise Analysis is not needed for this project. However, the results of the H&H model show that the proposed project will result in a slight reduction in flood levels upstream of the dam and will not result in changes in flood levels downstream of the dam.

4.2.2 Duplicate Effective Model

There is no riverine model from FEMA for the Agawam River; therefore, a duplicative model is not applicable to this project.

4.2.3 Existing Conditions Model

The model described within Section 4.1 of this report was used first to determine and evaluate the hydraulic performance of the existing dam system, summarized within the table below.

Table 4-4: Hydraulic Model Results of Dam– Peak WSEL (El. NAVD88 – feet)

Storm Event		Existing Structures		
Storm Event (yr)	***Peak Inflow (cfs)***	***Outflow (cfs)***	***Peak WSEL (ft)***	***Freeboard (ft)***
10-year	260	105	15.3	2.7
25-year	335	133	15.6	2.4
50-year	398	158	15.8	2.2
100-year	470	187	16.1	1.9
500-year	690	271	16.8	1.2
½ PMF (24 hrs.)	2067	1695	18.8	- 0.8

Blue: indicate over topping of dam

Based on the model results, the existing dam can accommodate storm events in excess of the 500-year storm event. However, during the ½ PMF storm event (SDF), the peak impoundment elevation is expected to be El. 18.8, which will result in dam/roadway overtopping up to 0.8 feet.

4.2.4 Proposed Conditions Model

The proposed conditions were then input in the model to determine and evaluate the hydraulic performance of the dam and bridge, summarized within the table below.

Table 4-5: Hydraulic Model Results of Dam– Peak WSEL (El. NAVD88 – feet)

Storm Event		Proposed Structure		
Storm Event (yr)	***Peak Inflow (cfs)***	***Routed Outflow (cfs)***	***Peak WSEL (ft)***	***Freeboard (ft)***
10-year	260	116	15.1	2.9
25-year	335	145	15.4	2.6
50-year	398	177	15.6	2.4
100-year	470	227	15.8	2.2

500-year	690	382	16.1	1.9
½ PMF (24 hrs.)	2067	1681	17.8	0.2

Based on the model results, the proposed dam and bridge can pass up to and including the ½ PMF storm event. During the ½ PMF storm event, the peak impoundment elevation is expected to be El. 17.8, which will result in 0.2 feet of remaining freeboard at the dam/roadway (as measured from the lowest elevation of the dam/roadway = El. 18.0). If operation of the low-level outlet and mid-level outlet was completed in advanced of the storm, the peak WSEL during the ½-PMF is expected to be El. 17.4, which is 0.6 ft below the lowest elevation of the dam.

The following table presents the hydraulic results of the proposed bridge located downstream of the proposed spillway structure. The proposed bridge has a low chord elevation of 14.58 feet.

Table 4-6: Summary of Hydraulic Performance of Proposed Bridge

Storm Event (yr.)	***Peak Inflow (cfs)***	***Peak WSEL (ft)***	***Velocity (fps)***
10-year	86	9.0	*0.4*
25-year	111	9.2	*0.5*
50-year	137	9.3	*0.6*
100-year	185	9.5	*0.8*
200-year	246	9.8	*1.0*
500-year	335	10.2	*1.3*
½ PMF (24 hrs.)	1670	14.1	*3.9*

Based upon the model results, the proposed bridge will have 5.4 feet of freeboard between the peak pool elevation and the bottom chord during the 25-year storm (the bridge's design storm), which is above the 2.0-foot requirement.

4.3 Scour/Stability Analysis

Typical contraction scour and local abutment scour at the bridge are not anticipated given that the design of the proposed bridge includes a continuous concrete mat foundation from the downstream face of the spillway to the downstream end the bridge. Riprap is proposed to be installed within 50 feet of the downstream edge of the bridge as purely a preventive measure for scouring potential within the downstream channel; however, based upon the historic and modeled flow conditions in the downstream channel, scour within the downstream channel does not appear to be of concern.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The proposed spillway has been designed to safely convey the ½ PMF return frequency flood event. The design of the spillway has included provisions to limit additional flooding downstream of the dam for high frequency storm events (low flow). The proposed bridge can safely convey the ½ PMF with 3.4 feet of freeboard from the low chord. Contraction and local abutment scour are not anticipated given the design of the bridge foundation.

5.2 Recommendations

Additional consideration during final design should be given to the incorporation of steps along the downstream side of the spillway to dissipate the energy of the nappe flowing over the spillway and onto the concrete mat foundation.

Table 5-1: Hydraulic Design Data

Hydraulic Design Data		
Drainage area:	7.7	mi^2
Design flood discharge:	111	cfs
Design flood frequency:	25	yrs.
Design flood velocity:	0.5	fps
Design flood elevation:	9.2	feet (NAVD 88)
Base (100-yr) flood data		
Base flood discharge:	184	cfs
Base flood elevation:	9.5	feet (NAVD 88)
Design and check scour data		
Design scour flood event return frequency:	50	yrs.
Design flood abutment scour depth:	Not Applicable	feet
Design flood pier scour depth:	Not Applicable	feet
Check scour flood event return frequency:	100	yrs.
Check flood abutment scour depth:	Not Applicable	feet
Check flood pier scour depth:	Not Applicable	feet
Flood of record		
Discharge	Unknown	cfs
Frequency (if known)	Unknown	Yrs.
Maximum elevation	Unknown	feet (NAVD 88)
Date:	Unknown	Month, year
History of ice floes:	N	Y or N
Evidence of scour and erosion:	N	Y or N

5.3 Control of Water.

The proposed project is expected to be completed within 4 years of construction. Per Section 2.7.2 of the MassDOT LRFD Manual, for this duration, the temporary water control needs to be designed for the 10% Annual Chance (10-year) flooding discharge. However, due to the construction of the High hazard dam upstream of the bridge, the control of water for the proposed project may be required to be designed to accommodate up to the 100-year event. More details of the control of water design requirements are included within Appendix E: Control of Water Memo within this report.

FIGURES

Cranberry Highway (Route 28)/Mill Pond Dam over the Agawam River
Wareham, Massachusetts

PARE CORPORATION
CELEBRATING 50 YEARS

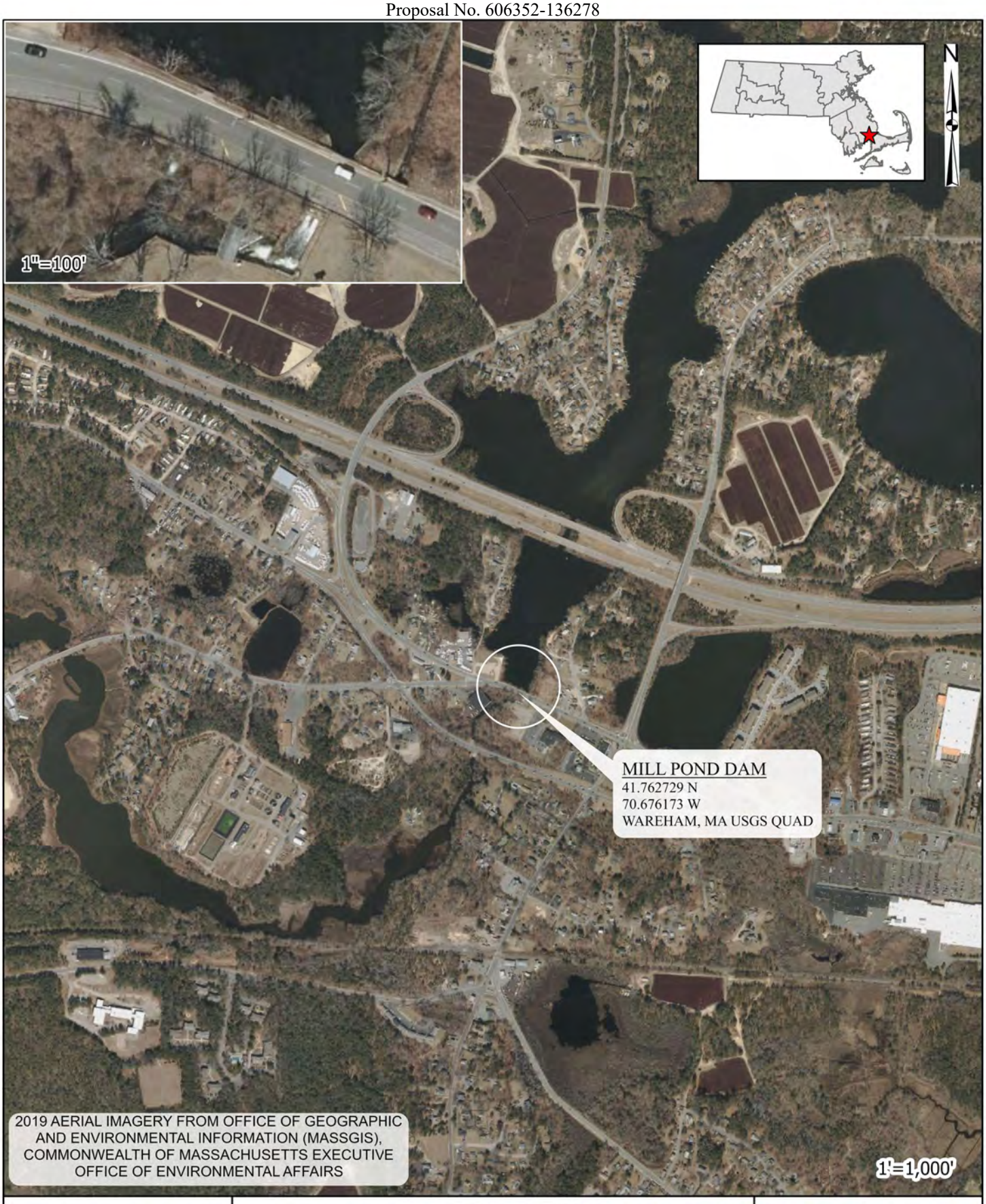
MILL POND DAM

MA00027 / 7-12-310-3
WAREHAM, MASSACHUSETTS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION - HIGHWAY

LOCUS PLAN

DECEMBER 2021 FIGURE 1



PARE CORPORATION
CELEBRATING 50 YEARS

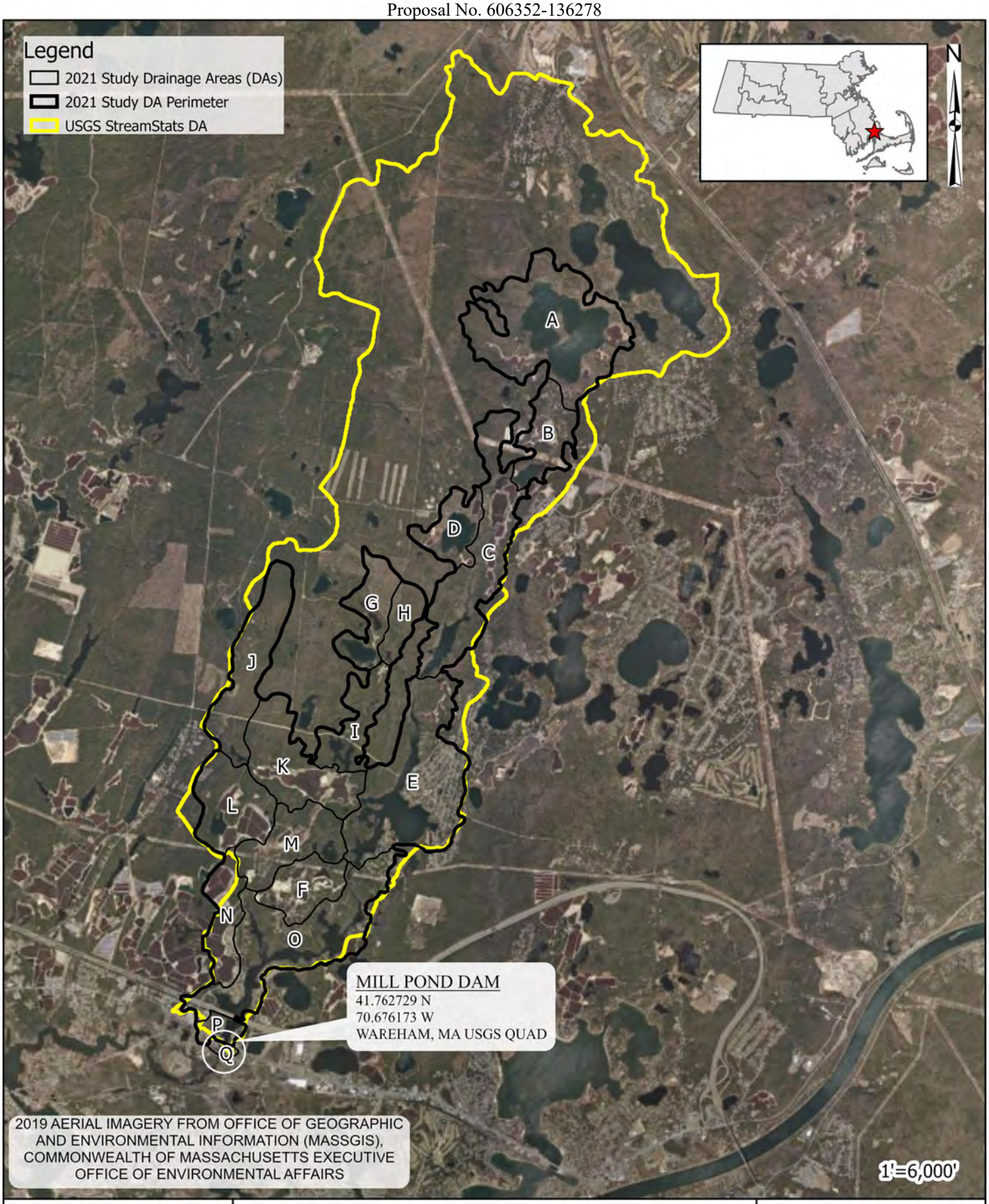
MILL POND DAM

MA00027 / 7-12-310-3
WAREHAM, MASSACHUSETTS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION - HIGHWAY

AERIAL PLAN

DECEMBER 2021 FIGURE 2



PARE CORPORATION
CELEBRATING 50 YEARS

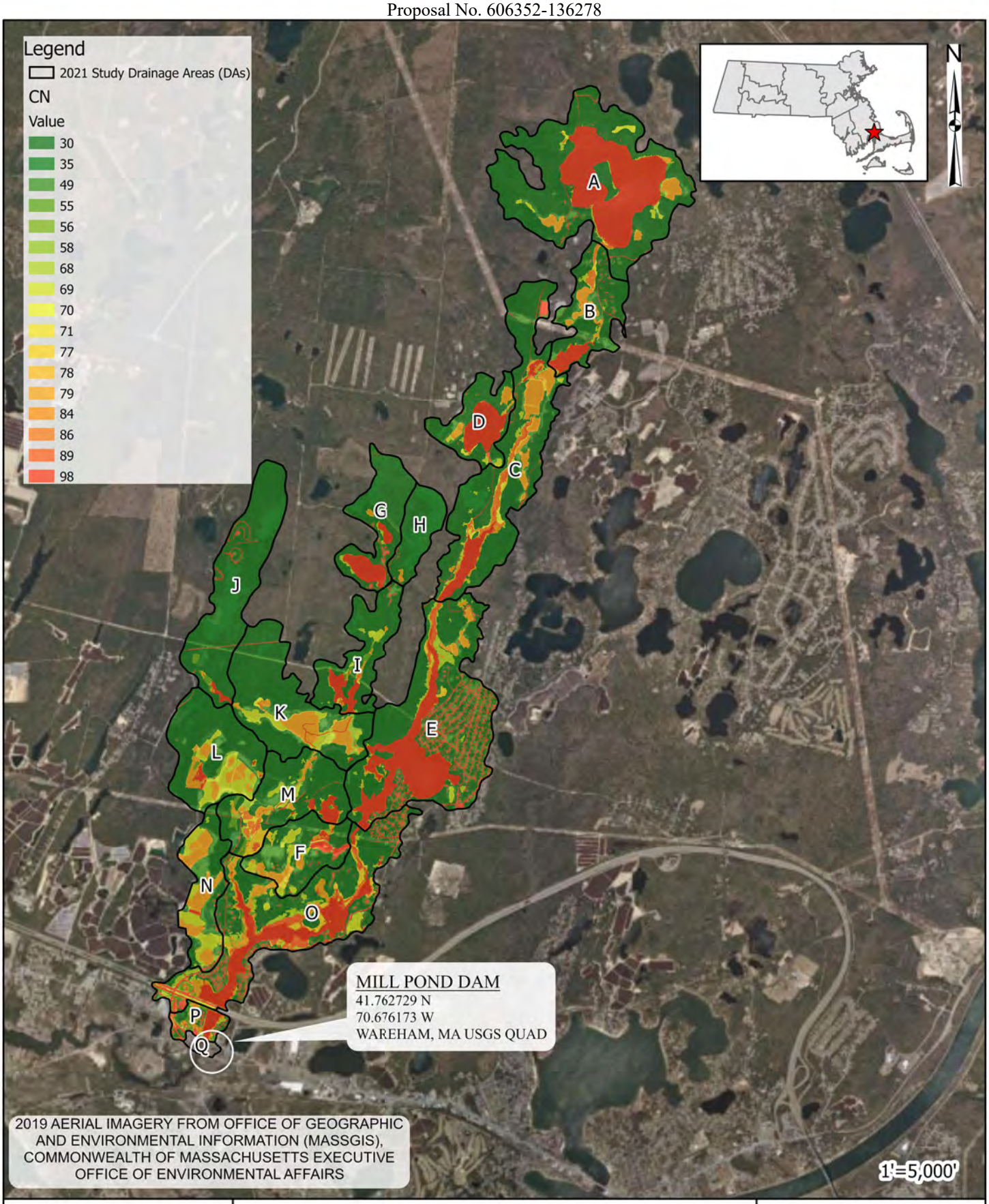
MILL POND DAM

MA00027 / 7-12-310-3
WAREHAM, MASSACHUSETTS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION - HIGHWAY

DRAINAGE AREA PLAN

DECEMBER 2021 FIGURE 3



PARE CORPORATION
CELEBRATING 50 YEARS

MILL POND DAM

MA00027 / 7-12-310-3
WAREHAM, MASSACHUSETTS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION - HIGHWAY

HYDROLOGY MAP

DECEMBER 2021 FIGURE 4

APPENDIX A
Report Limitations

Cranberry Highway (Route 28)/Mill Pond Dam over the Agawam River
Wareham, Massachusetts

LIMITATIONS

Use of Report

1. This report has been prepared for the exclusive use of the MassDOT for specific application to the Cranberry Highway (Route 28)/Mill Pond Dam over the Agawam River project in accordance with generally accepted engineering practices. No other warranty, expressed or implied, is made.

2. The material in this report reflects Pare's judgment in light of the information available to it at the time of preparation. Any use, reliance on, or decisions made based on this report, its findings or conclusions by any third party are the sole responsibility of such third parties.

3. Pare Corporation accepts no responsibility for damages, if any, suffered by any third party as a result of their use of, decisions made or actions taken based on this report.

4. This report was prepared under the direction of a Professional Civil Engineer licensed in the Commonwealth of Massachusetts for use by the MassDOT for evaluation of the subject dam rehabilitation and bridge replacement project.

Hydrologic & Hydraulic Model Limitations

1. The H&H results discussed herein as well as the conclusions that have been drawn from those results are based on the assumed model conditions and H&H processes and procedures that were used. Some of the processes involved with H&H analyses are theoretical and subject to engineering judgment and estimation.

2. Variations between the assumed model conditions and actual event conditions (rainfall, ground surface conditions, debris clogging, etc.) are likely; as such, deviations between model results and actual conditions are likely.

APPENDIX B
Previous Reports and References

Cranberry Highway (Route 28)/Mill Pond Dam over the Agawam River
Wareham, Massachusetts

REFERENCES & SOFTWARE

The following references and software programs were utilized during the preparation of this report and the development of the recommendations presented herein:

References

1. MassDOT Structural Type Selection Study Worksheet "Cranberry Highway (Route 28) Mill Pond Dam over Agawam River." Prepared by Pare Corporation May 2015.
2. Topographic Survey completed by CCR ASSOCIATES of Quincy, MA entitled "TOPOGRAPHIC PLAN OF LAND ROUTE 28, AGAWAM MILL POND IN THE TOWN OF WAREHAM, MASSACHUSETTS" Dated January 30, 2009, provided to Pare form the MASS HIGHWAY DEPARTMENT
3. Phase II Inspection / Evaluation Report for Mill Pond (Route 28) Dam in Wareham, MA. Prepared By PARE Corporation in April 2009.
4. Wareham, MA, USGS Topographic Maps, Scale 1:25,000
5. Cranberry Highway (Bridge No. W-06-020 (BM1)), prepared by Pare Corporation, dated 04/12/2021
6. MassDOT LRFD Bridge Manual, January 2020 Revision
7. USGS Stream Stats: https://streamstats.usgs.gov/ss/
8. NOAA Atlas 14 Rainfall data: https://hdsc.nws.noaa.gov/hdsc/pfds/
9. LiDAR Terrain Data – 2010 FEMA Narragansett River, December 8-10, 2010: https://www.fisheries.noaa.gov/inport/item/49841
10. 2016 Land Cover/Land Use developed by MassGIS, NOAA, and OCM, released in May 2019: https://docs.digital.mass.gov/dataset/massgis-data-2016-land-coverland-use
11. Gridded Soil Survey Geographic (gSSURGO) Database for Massachusetts, Soil Survey Staff, USDA-NRCS, 20150203 (FY2015 official release): http://datagateway.nrcs.usda.gov/

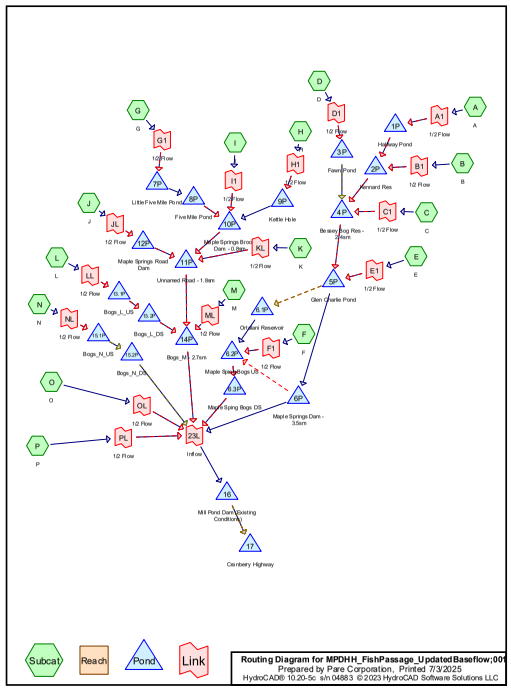
Software Programs Utilized

1. HEC-RAS 6.1.0
2. HydroCAD 10.10-5a
3. ArcGIS Pro 2.6
4. AutoDesk Civil 3D 2020

APPENDIX C
HydroCAD Report

Cranberry Highway (Route 28)/Mill Pond Dam over the Agawam River
Wareham, Massachusetts

Proposal No. 606352-136278



Project Notes

Copied 10 events from NOAA14_Wareham 24-hr S1 storm

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr	NOAA14_Wareham 24-hr S1	1-yr	Default	24.00	1	2.91	2
2	2-yr	NOAA14_Wareham 24-hr S1	2-yr	Default	24.00	1	3.44	2
3	5-yr	NOAA14_Wareham 24-hr S1	5-yr	Default	24.00	1	4.31	2
4	10-yr	NOAA14_Wareham 24-hr S1	10-yr	Default	24.00	1	5.03	2
5	25-yr	NOAA14_Wareham 24-hr S1	25-yr	Default	24.00	1	6.02	2
6	50-yr	NOAA14_Wareham 24-hr S1	50-yr	Default	24.00	1	6.77	2
7	100-yr	NOAA14_Wareham 24-hr S1	100-yr	Default	24.00	1	7.55	2
8	200-yr	NOAA14_Wareham 24-hr S1	200-yr	Default	24.00	1	8.41	2
9	500-yr	NOAA14_Wareham 24-hr S1	500-yr	Default	24.00	1	9.63	2
10	1000-yr	NOAA14_Wareham 24-hr S1	1000-yr	Default	24.00	1	10.60	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
354.000	42	"0.83% imp" (K)
104.000	34	"1.27% imp" (H)
504.000	47	"10.54% imp" (C)
191.000	42	"15.34% imp" (I)
191.000	49	"18.54% imp" (B)
189.000	45	"19.09% imp" (G)
279.000	45	"2.43% imp" (L)
334.000	34	"2.83% imp" (J)
179.000	57	"3.17% imp" (N)
576.000	62	"31.1% imp" (O)
158.000	57	"31.94% imp" (D)
711.000	56	"33.99% imp" (A)
672.000	59	"35.91% imp" (E)
54.000	71	"38.05% imp" (P)
182.000	50	"6.11% imp" (F)
266.000	47	"8.14% imp" (M)
4,944.000	**51**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
4,944.000	Other	A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P
4,944.000		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	354.000	354.000	"0.83% imp"	K
0.000	0.000	0.000	0.000	104.000	104.000	"1.27% imp"	H
0.000	0.000	0.000	0.000	504.000	504.000	"10.54% imp"	C
0.000	0.000	0.000	0.000	191.000	191.000	"15.34% imp"	I
0.000	0.000	0.000	0.000	191.000	191.000	"18.54% imp"	B
0.000	0.000	0.000	0.000	189.000	189.000	"19.09% imp"	G
0.000	0.000	0.000	0.000	279.000	279.000	"2.43% imp"	L
0.000	0.000	0.000	0.000	334.000	334.000	"2.83% imp"	J
0.000	0.000	0.000	0.000	179.000	179.000	"3.17% imp"	N
0.000	0.000	0.000	0.000	576.000	576.000	"31.1% imp"	O
0.000	0.000	0.000	0.000	158.000	158.000	"31.94% imp"	D
0.000	0.000	0.000	0.000	711.000	711.000	"33.99% imp"	A
0.000	0.000	0.000	0.000	672.000	672.000	"35.91% imp"	E
0.000	0.000	0.000	0.000	54.000	54.000	"38.05% imp"	P
0.000	0.000	0.000	0.000	182.000	182.000	"6.11% imp"	F
0.000	0.000	0.000	0.000	266.000	266.000	"8.14% imp"	M
0.000	**0.000**	**0.000**	**0.000**	**4,944.000**	**4,944.000**	**TOTAL AREA**	

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Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	1P	64.00	63.50	20.0	0.0250	0.025	36.0	36.0	0.0	
2	3P	59.50	59.00	40.0	0.0125	0.025	0.0	30.0	0.0	
3	6P	20.50	20.30	30.0	0.0067	0.035	36.0	36.0	0.0	
4	8P	51.90	51.30	30.0	0.0200	0.035	0.0	24.0	0.0	
5	11P	21.00	20.50	30.0	0.0167	0.035	96.0	72.0	0.0	
6	14P	15.20	15.00	90.0	0.0022	0.035	120.0	96.0	0.0	
7	17	-0.50	-1.00	150.0	0.0033	0.020	264.0	126.0	0.0	

Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=0.91"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=97.85 cfs 53.946 af

SubcatchmentB: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=0.50"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=17.66 cfs 7.905 af

SubcatchmentC: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=0.28"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=16.97 cfs 11.861 af

SubcatchmentD: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=0.86"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=28.96 cfs 11.265 af

SubcatchmentE: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=0.96"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=116.80 cfs 53.867 af

SubcatchmentF: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=0.20"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=3.02 cfs 2.994 af

SubcatchmentG: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=0.51"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=11.03 cfs 8.054 af

SubcatchmentH: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=0.03"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=0.28 cfs 0.295 af

SubcatchmentI: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=0.41"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=10.56 cfs 6.540 af

SubcatchmentJ: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=0.08"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=2.94 cfs 2.110 af

SubcatchmentK: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=0.02"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=0.86 cfs 0.702 af

SubcatchmentL: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=0.07"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=1.43 cfs 1.744 af

SubcatchmentM: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=0.22"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=6.46 cfs 4.865 af

SubcatchmentN: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=0.27"
Tc=300.0 min CN=56/98 Runoff=4.17 cfs 4.081 af

SubcatchmentO: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=0.85"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=77.46 cfs 40.837 af

SubcatchmentP: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=1.11"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=10.30 cfs 5.004 af

Pond 1P: Halfway Pond Peak Elev=64.57' Storage=422.245 af Inflow=100.05 cfs 69.219 af
Primary=4.20 cfs 25.702 af Secondary=0.00 cfs 0.000 af Outflow=4.20 cfs 25.702 af

Pond 2P: Kennard Res Peak Elev=57.53' Storage=8.634 af Inflow=20.99 cfs 37.771 af
Primary=8.36 cfs 36.029 af Secondary=0.00 cfs 0.000 af Outflow=8.36 cfs 36.029 af

Pond 3P: Fawn Pond Peak Elev=59.96' Storage=38.519 af Inflow=29.46 cfs 14.736 af
Primary=0.96 cfs 5.839 af Tertiary=0.00 cfs 0.000 af Outflow=0.96 cfs 5.839 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=47.06' Storage=20.011 af Inflow=27.36 cfs 64.836 af
Primary=13.52 cfs 61.361 af Secondary=0.00 cfs 0.000 af Outflow=13.52 cfs 61.361 af

Pond 5P: Glen Charlie Pond Peak Elev=34.27' Storage=67.307 af Inflow=125.57 cfs 129.806 af
Primary=26.56 cfs 117.901 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=26.56 cfs 117.901 af

Pond 6.1P: Ortalani Reservoir Peak Elev=34.20' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=22.83' Storage=2.227 af Inflow=3.02 cfs 2.994 af
Primary=0.74 cfs 2.225 af Secondary=0.00 cfs 0.000 af Outflow=0.74 cfs 2.225 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=17.12' Storage=0.249 af Inflow=0.74 cfs 2.225 af
Primary=0.70 cfs 2.129 af Secondary=0.00 cfs 0.000 af Outflow=0.70 cfs 2.129 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=20.94' Storage=1.495 af Inflow=26.56 cfs 117.901 af
Primary=26.55 cfs 117.463 af Secondary=0.00 cfs 0.000 af Outflow=26.55 cfs 117.463 af

Pond 7P: Little Five Mile Pond Peak Elev=59.66' Storage=23.252 af Inflow=11.62 cfs 12.150 af
Outflow=10.96 cfs 12.099 af

Pond 8P: Five Mile Pond Peak Elev=52.27' Storage=9.703 af Inflow=10.96 cfs 12.099 af
Primary=0.49 cfs 2.395 af Secondary=0.00 cfs 0.000 af Outflow=0.49 cfs 2.395 af

Pond 9P: Kettle Hole Peak Elev=55.00' Storage=8.998 af Inflow=0.58 cfs 2.377 af
Outflow=0.54 cfs 2.386 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=29.87' Storage=5.544 af Inflow=11.56 cfs 15.487 af
Primary=4.39 cfs 14.377 af Secondary=0.00 cfs 0.000 af Outflow=4.39 cfs 14.377 af

Pond 11P: UnnamedRoad - 1.8sm Peak Elev=21.49' Storage=4.659 af Inflow=8.48 cfs 31.768 af
Primary=7.52 cfs 31.395 af Secondary=0.00 cfs 0.000 af Outflow=7.52 cfs 31.395 af

Pond 12P: Maple Springs Road Dam Peak Elev=38.83' Storage=1.982 af Inflow=3.94 cfs 9.052 af
Primary=2.49 cfs 9.052 af Secondary=0.00 cfs 0.000 af Outflow=2.49 cfs 9.052 af

Pond 13.1P: Bogs_L_US Peak Elev=29.78' Storage=0.098 af Inflow=2.33 cfs 7.992 af
Primary=2.32 cfs 7.993 af Secondary=0.00 cfs 0.000 af Outflow=2.32 cfs 7.993 af

Pond 13.2P: Bogs_L_DS Peak Elev=25.87' Storage=0.137 af Inflow=2.32 cfs 7.993 af
Primary=2.31 cfs 7.995 af Secondary=0.00 cfs 0.000 af Outflow=2.31 cfs 7.995 af

Pond 14P: Bogs_M - 2.7sm Peak Elev=16.15' Storage=1.721 af Inflow=13.88 cfs 49.809 af
Primary=13.70 cfs 49.753 af Secondary=0.00 cfs 0.000 af Outflow=13.70 cfs 49.753 af

Pond 15.1P: Bogs_N_US Peak Elev=25.39' Storage=1.263 af Inflow=4.77 cfs 8.246 af
Primary=3.98 cfs 8.241 af Tertiary=0.00 cfs 0.000 af Outflow=3.98 cfs 8.241 af

Pond 15.2P: Bogs_N_DS Peak Elev=20.23' Storage=5.331 af Inflow=3.98 cfs 8.241 af
Primary=1.75 cfs 7.612 af Tertiary=0.00 cfs 0.000 af Outflow=1.75 cfs 7.612 af

Pond 16: Mill Pond Dam (Existing Peak Elev=14.88' Storage=559.491 af Inflow=144.05 cfs 444.949 af
Primary=40.16 cfs 235.524 af Secondary=12.16 cfs 70.268 af Tertiary=13.10 cfs 71.329 af Outflow=65.41 cfs 377.121 af

Pond 17: Cranberry Highway Peak Elev=2.10' Storage=0.613 af Inflow=65.41 cfs 377.121 af
Primary=238.80 cfs 377.595 af Secondary=0.00 cfs 0.000 af Outflow=238.80 cfs 377.595 af

Link 23L: Inflow Inflow=112.05 cfs 222.798 af
Primary=112.05 cfs 222.798 af

Link A1: 1/2 Flow x 0.50 Inflow=97.85 cfs 53.946 af
Primary=48.92 cfs 26.973 af Secondary=48.92 cfs 26.973 af

Link B1: 1/2 Flow x 0.50 Inflow=17.66 cfs 7.905 af
Primary=8.83 cfs 3.952 af Secondary=8.83 cfs 3.952 af

Link C1: 1/2 Flow x 0.50 Inflow=16.97 cfs 11.861 af
Primary=8.49 cfs 5.930 af Secondary=8.49 cfs 5.930 af

Link D1: 1/2 Flow x 0.50 Inflow=28.96 cfs 11.265 af
Primary=14.48 cfs 5.632 af Secondary=14.48 cfs 5.632 af

Link E1: 1/2 Flow x 0.50 Inflow=116.80 cfs 53.867 af
Primary=58.40 cfs 26.933 af Secondary=58.40 cfs 26.933 af

Link F1: 1/2 Flow x 0.50 Inflow=3.02 cfs 2.994 af
Primary=1.51 cfs 1.497 af Secondary=1.51 cfs 1.497 af

Link G1: 1/2 Flow x 0.50 Inflow=11.03 cfs 8.054 af
Primary=5.52 cfs 4.027 af Secondary=5.52 cfs 4.027 af

Link H1: 1/2 Flow x 0.50 Inflow=0.28 cfs 0.295 af
Primary=0.14 cfs 0.147 af Secondary=0.14 cfs 0.147 af

Link I1: 1/2 Flow x 0.50 Inflow=10.56 cfs 6.540 af
Primary=5.28 cfs 3.270 af Secondary=5.28 cfs 3.270 af

Link JL: 1/2 Flow x 0.50 Inflow=2.94 cfs 2.110 af
Primary=1.47 cfs 1.055 af Secondary=1.47 cfs 1.055 af

Link KL: 1/2 Flow x 0.50 Inflow=0.86 cfs 0.702 af
Primary=0.43 cfs 0.351 af Secondary=0.43 cfs 0.351 af

Link LL: 1/2 Flow x 0.50 Inflow=1.43 cfs 1.744 af
Primary=0.71 cfs 0.872 af Secondary=0.71 cfs 0.872 af

Link ML: 1/2 Flow x 0.50 Inflow=6.46 cfs 4.865 af
Primary=3.23 cfs 2.433 af Secondary=3.23 cfs 2.433 af

Link NL: 1/2 Flow x 0.50 Inflow=4.17 cfs 4.081 af
Primary=2.09 cfs 2.040 af Secondary=2.09 cfs 2.040 af

Link OL: 1/2 Flow x 0.50 Inflow=77.46 cfs 40.837 af
Primary=38.73 cfs 20.418 af Secondary=38.73 cfs 20.418 af

Link PL: 1/2 Flow x 0.50 Inflow=10.30 cfs 5.004 af
Primary=5.15 cfs 2.502 af Secondary=5.15 cfs 2.502 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 216.067 af Average Runoff Depth = 0.52"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

Summary for Subcatchment A: A

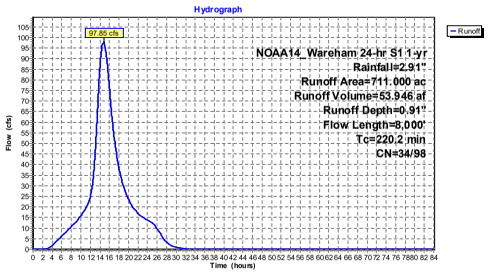
Runoff = 97.85 cfs @ 14.92 hrs, Volume= 53.946 af, Depth= 0.91"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00'
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 711.000	56	"33.99% imp"
469.331	34	66.01% Pervious Area
241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



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Summary for Subcatchment B: B

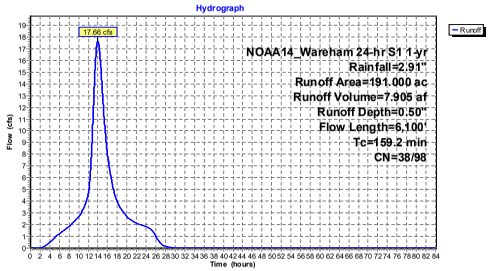
Runoff = 17.66 cfs @ 13.97 hrs, Volume= 7.905 af, Depth= 0.50"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 191.000	49	"18.54% imp"
155.589	38	81.46% Pervious Area
35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



Summary for Subcatchment C: C

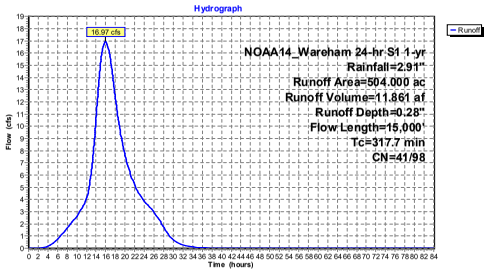
Runoff = 16.97 cfs @ 15.89 hrs, Volume= 11.861 af, Depth= 0.28"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 504.000	47	"10.54% imp"
450.878	41	89.46% Pervious Area
53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



Summary for Subcatchment D: D

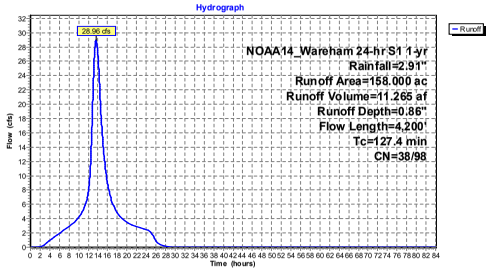
Runoff = 28.96 cfs @ 13.59 hrs, Volume= 11.265 af, Depth= 0.86"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 158.000	57	"31.94% imp"
107.535	38	68.06% Pervious Area
50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



Summary for Subcatchment E: E

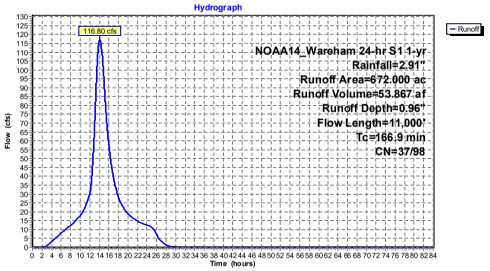
Runoff = 116.80 cfs @ 14.09 hrs, Volume= 53.867 af, Depth= 0.96"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 672.000	59	"35.91% imp"
430.685	37	64.09% Pervious Area
241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



Summary for Subcatchment F: F

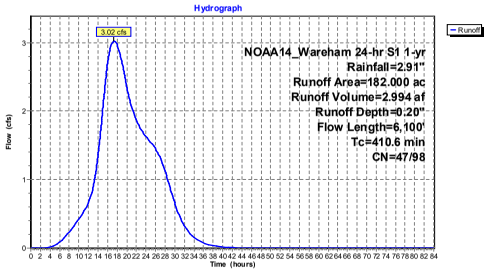
Runoff = 3.02 cfs @ 17.34 hrs, Volume= 2.994 af, Depth= 0.20"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 182.000	50	"6.11% imp"
170.880	47	93.89% Pervious Area
11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



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Summary for Subcatchment G: G

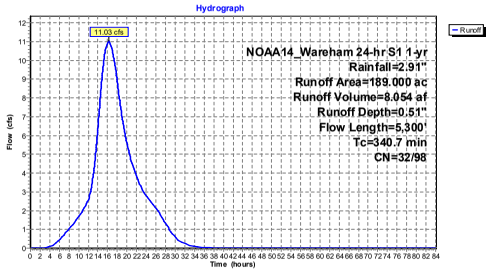
Runoff = 11.03 cfs @ 16.28 hrs, Volume= 8.054 af, Depth= 0.51"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 189.000	45	"19.09% imp"
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



Summary for Subcatchment H: H

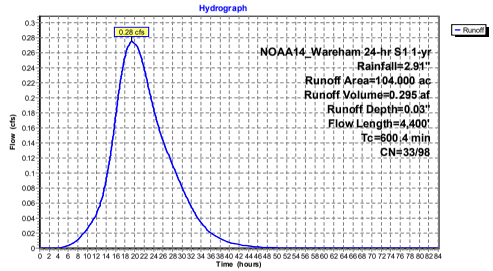
Runoff = 0.28 cfs @ 19.35 hrs, Volume= 0.295 af, Depth= 0.03"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 104.000	34	"1.27% imp"
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

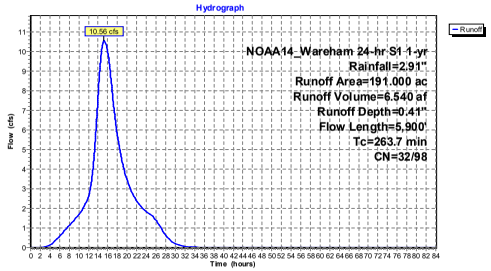
Runoff = 10.56 cfs @ 15.24 hrs, Volume= 6.540 af, Depth= 0.41"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 191.000	42	"15.34% imp"
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



Summary for Subcatchment J: J

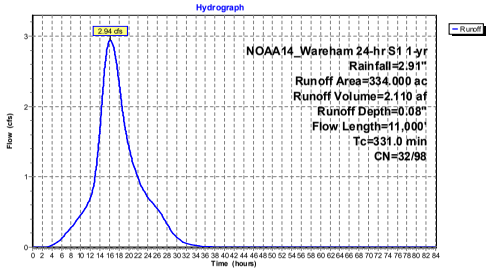
Runoff = 2.94 cfs @ 16.18 hrs, Volume= 2.110 af, Depth= 0.08"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 334.000	34	"2.83% imp"
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Summary for Subcatchment K: K

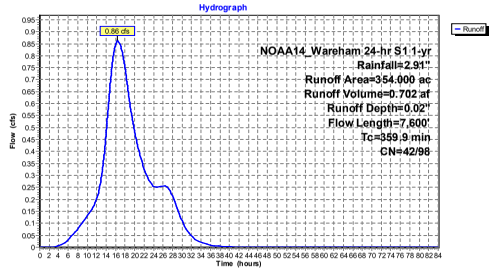
Runoff = 0.86 cfs @ 16.40 hrs, Volume= 0.702 af, Depth= 0.02"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 354.000	42	"0.83% imp"
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



Summary for Subcatchment L: L

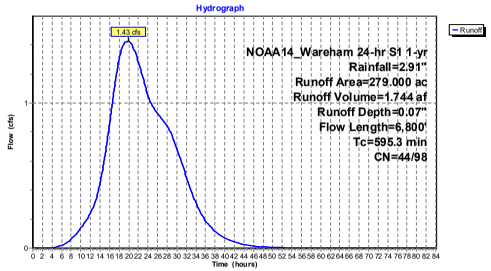
Runoff = 1.43 cfs @ 19.84 hrs, Volume= 1.744 af, Depth= 0.07"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 279.000	45	"2.43% imp"
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



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Summary for Subcatchment M: M

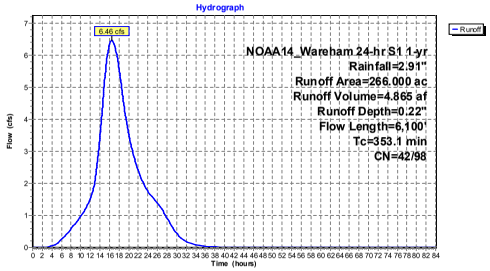
Runoff = 6.46 cfs @ 16.48 hrs, Volume= 4.865 af, Depth= 0.22"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 266.000	47	"8.14% imp"
244.348	42	91.86% Pervious Area
21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



Summary for Subcatchment N: N

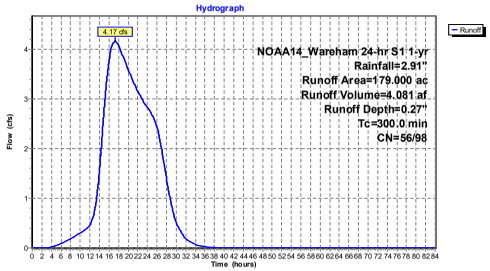
Runoff = 4.17 cfs @ 17.33 hrs, Volume= 4.081 af, Depth= 0.27"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 179.000	57	"3.17% imp"
173.326	56	96.83% Pervious Area
5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

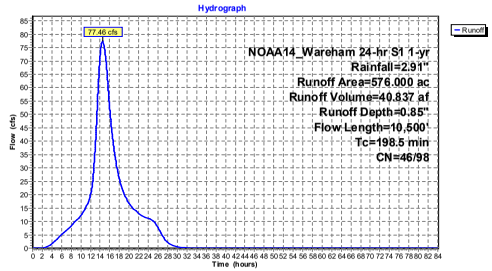
Runoff = 77.46 cfs @ 14.56 hrs, Volume= 40.837 af, Depth= 0.85"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 576.000	62	"31.1% imp"
396.864	46	68.90% Pervious Area
179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



Summary for Subcatchment P: P

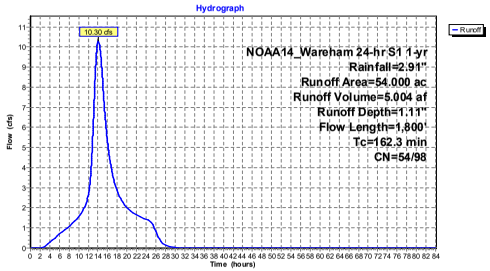
Runoff = 10.30 cfs @ 14.07 hrs, Volume= 5.004 af, Depth= 1.11"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.00
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 54.000	71	"38.05% imp"
33.453	54	61.95% Pervious Area
20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Summary for Pond 1P: Halfway Pond

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth > 1.17" for 1-yr event
Inflow = 100.05 cfs @ 14.92 hrs, Volume= 69.219 af, Incl. 2.20 cfs Base Flow
Outflow = 4.20 cfs @ 28.71 hrs, Volume= 25.702 af, Atten= 96%, Lag= 827.5 min
Primary = 4.20 cfs @ 28.71 hrs, Volume= 25.702 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 64.57' @ 28.71 hrs Storage= 422.245 af (51.635 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,380.5 min (2,685.7 - 1,305.2)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool**Listed below

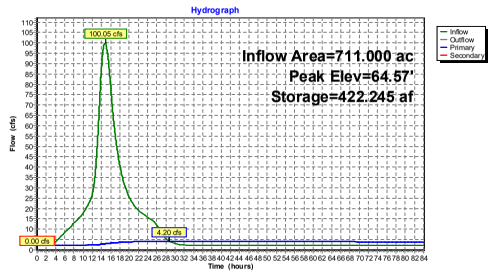
Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=4.19 cfs @ 28.71 hrs HW=64.57' TW=57.48' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 4.19 cfs @ 2.43 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 1P: Halfway Pond



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Summary for Pond 2P: Kennard Res

Inflow Area = 902.000 ac, 30.72% Impervious, Inflow Depth > 0.50" for 1-yr event
Inflow = 20.99 cfs @ 13.97 hrs, Volume= 37.771 af, Incl. 0.60 cfs Base Flow
Outflow = 8.36 cfs @ 17.90 hrs, Volume= 36.029 af, Atten= 60%, Lag= 235.8 min
Primary = 8.36 cfs @ 17.90 hrs, Volume= 36.029 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 57.53' @ 17.90 hrs Storage= 8.634 af (4.634 af above start)

Plug-Flow detention time= 835.8 min calculated for 32.029 af (85% of inflow)
Center-of-Mass det. time= 179.3 min (2,473.8 - 2,294.5)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

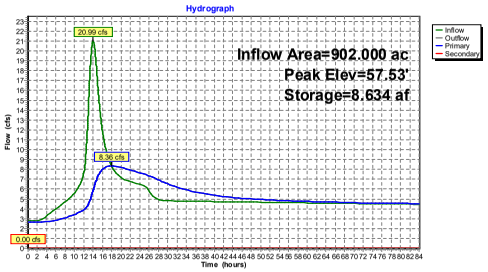
Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=8.33 cfs @ 17.90 hrs HW=57.53' TW=46.99' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 8.33 cfs @ 2.16 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.30' TW=46.77' (Dynamic Tailwater)
└**1=TOD** (Controls 0.00 cfs)

Pond 2P: Kennard Res



Summary for Pond 3P: Fawn Pond

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth > 1.12" for 1-yr event
Inflow = 29.46 cfs @ 13.59 hrs, Volume= 14.736 af, Incl. 0.50 cfs Base Flow
Outflow = 0.96 cfs @ 26.61 hrs, Volume= 5.839 af, Atten= 97%, Lag= 781.3 min
Primary = 0.96 cfs @ 26.61 hrs, Volume= 5.839 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 59.96' @ 26.61 hrs Storage= 38.519 af (10.799 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,402.5 min (2,665.3 - 1,262.8)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

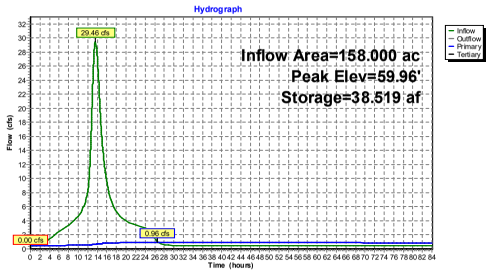
Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=0.95 cfs @ 26.61 hrs HW=59.96' TW=47.05' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.95 cfs @ 2.34 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=59.83' TW=46.77' (Dynamic Tailwater)
└**2=TOD South** (Controls 0.00 cfs)

Pond 3P: Fawn Pond



Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow Area = 1,564.000 ac, 24.34% Impervious, Inflow Depth > 0.50" for 1-yr event
Inflow = 27.36 cfs @ 15.89 hrs, Volume= 64.836 af, Incl. 1.60 cfs Base Flow
Outflow = 13.52 cfs @ 24.90 hrs, Volume= 61.361 af, Atten= 51%, Lag= 540.7 min
Primary = 13.52 cfs @ 24.90 hrs, Volume= 61.361 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 47.06' @ 24.90 hrs Storage= 20.011 af (10.291 af above start)

Plug-Flow detention time= 1,155.5 min calculated for 51.641 af (80% of inflow)
Center-of-Mass det. time= 267.7 min (2,506.3 - 2,238.6)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

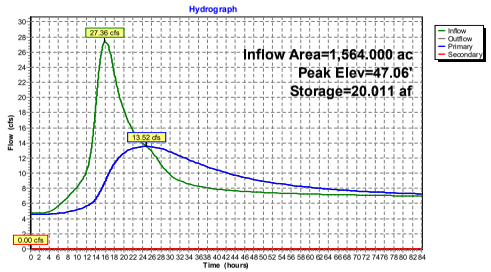
Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=13.49 cfs @ 24.90 hrs HW=47.06' TW=34.27' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 13.49 cfs @ 2.45 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=46.77' TW=33.99' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 4P: Bessey Bog Res - 2.4sm



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Summary for Pond 5P: Glen Charlie Pond

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 0.70" for 1-yr event
Inflow = 125.57 cfs @ 14.09 hrs, Volume= 129.806 af, Incl. 2.10 cfs Base Flow
Outflow = 26.56 cfs @ 25.10 hrs, Volume= 117.901 af, Atten= 79%, Lag= 660.3 min
Primary = 26.56 cfs @ 25.10 hrs, Volume= 117.901 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 34.27' @ 25.10 hrs Storage= 67.307 af (41.182 af above start)

Plug-Flow detention time= 1,816.6 min calculated for 91.774 af (71% of inflow)
Center-of-Mass det. time= 617.7 min (2,464.0 - 1,846.3)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00

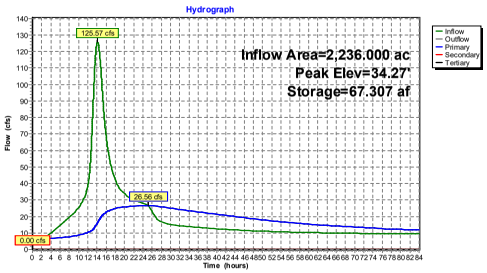
			Elev. (feet)	41.00 40.00 39.00 37.70 37.70 41.00
#6	Tertiary	34.50'	**24.0" W x 12.0" H Vert. NE Culvert** C= 0.600 Limited to weir flow at low heads	

Primary OutFlow Max=26.46 cfs @ 25.10 hrs HW=34.27' TW=20.94' (Dynamic Tailwater)
└─**1=Spillway** (Weir Controls 26.46 cfs @ 2.37 fps)
└─**2=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
└─**3=SE Dike** (Controls 0.00 cfs)
└─**4=SE Culvert** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
└─**5=NE Dike** (Controls 0.00 cfs)
└─**6=NE Culvert** (Controls 0.00 cfs)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 34.20' @ 0.00 hrs Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

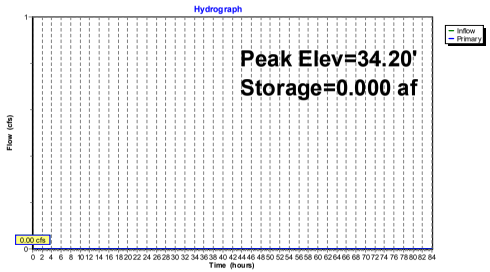
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=34.20' TW=22.70' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Controls 0.00 cfs)
└─**2=TOD** (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



Summary for Pond 6.2P: Maple Sping Bogs US

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 0.20" for 1-yr event
Inflow = 3.02 cfs @ 17.34 hrs, Volume= 2.994 af
Outflow = 0.74 cfs @ 29.61 hrs, Volume= 2.225 af, Atten= 75%, Lag= 736.4 min
Primary = 0.74 cfs @ 29.61 hrs, Volume= 2.225 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 22.83' @ 29.61 hrs Storage= 2.227 af

Plug-Flow detention time= 1,498.3 min calculated for 2.225 af (74% of inflow)
Center-of-Mass det. time= 1,342.1 min (2,556.3 - 1,214.2)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data**Listed below

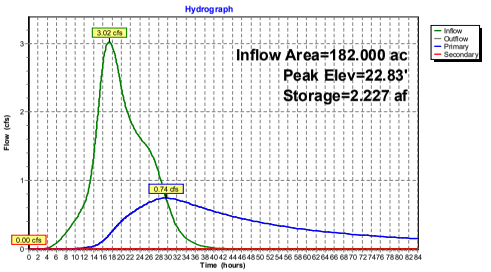
Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=0.74 cfs @ 29.61 hrs HW=22.83' TW=17.12' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 0.74 cfs @ 1.15 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.70' TW=17.00' (Dynamic Tailwater)
└─**2=TOD** (Controls 0.00 cfs)

Pond 6.2P: Maple Sping Bogs US



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Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 0.15" for 1-yr event
Inflow = 0.74 cfs @ 29.61 hrs, Volume= 2.225 af
Outflow = 0.70 cfs @ 32.72 hrs, Volume= 2.129 af, Atten= 6%, Lag= 186.4 min
Primary = 0.70 cfs @ 32.72 hrs, Volume= 2.129 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 17.12' @ 32.72 hrs Storage= 0.249 af

Plug-Flow detention time= 296.7 min calculated for 2.129 af (96% of inflow)
Center-of-Mass det. time= 195.0 min (2,751.4 - 2,556.3)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data**Listed below

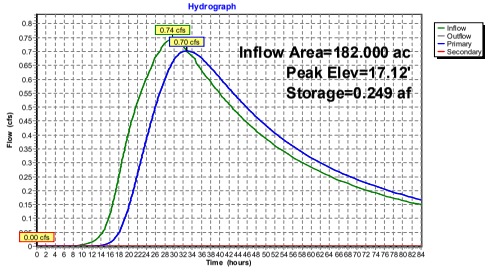
Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=0.70 cfs @ 32.72 hrs HW=17.12' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 0.70 cfs @ 1.13 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 0.63" for 1-yr event
Inflow = 26.56 cfs @ 25.10 hrs, Volume= 117.901 af
Outflow = 26.55 cfs @ 25.45 hrs, Volume= 117.463 af, Atten= 0%, Lag= 21.1 min
Primary = 26.55 cfs @ 25.45 hrs, Volume= 117.463 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 20.94' @ 25.45 hrs Storage= 1.495 af (1.048 af above start)

Plug-Flow detention time= 47.1 min calculated for 117.016 af (99% of inflow)
Center-of-Mass det. time= 18.4 min (2,482.4 - 2,464.0)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data**Listed below

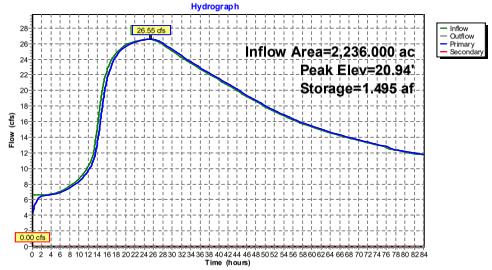
Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

Primary OutFlow Max=26.55 cfs @ 25.45 hrs HW=20.94' TW=0.00' (Dynamic Tailwater)
└**1=Bridge/Spillway** (Weir Controls 26.55 cfs @ 2.81 fps)
└**3=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.49' TW=22.70' (Dynamic Tailwater)
└**2=Culvert to Bogs** (Controls 0.00 cfs)
└**4=TOD_Bogs** (Controls 0.00 cfs)

Pond 6P: Maple Springs Dam - 3.5sm



Summary for Pond 7P: Little Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 0.77" for 1-yr event
Inflow = 11.62 cfs @ 16.28 hrs, Volume= 12.150 af, Incl. 0.59 cfs Base Flow
Outflow = 10.96 cfs @ 17.10 hrs, Volume= 12.099 af, Atten= 6%, Lag= 49.4 min
Primary = 10.96 cfs @ 17.10 hrs, Volume= 12.099 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 59.66' @ 17.10 hrs Storage= 23.252 af (1.092 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 67.6 min (1,627.3 - 1,559.7)

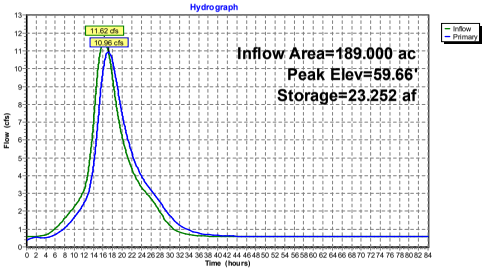
Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=10.96 cfs @ 17.10 hrs HW=59.66' TW=52.04' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 10.96 cfs @ 0.57 fps)

Pond 7P: Little Five Mile Pond



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A00840 - 465

Summary for Pond 8P: Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 0.77" for 1-yr event
Inflow = 10.96 cfs @ 17.10 hrs, Volume= 12.099 af
Outflow = 0.49 cfs @ 84.00 hrs, Volume= 2.395 af, Atten= 95%, Lag= 4,014.0 min
Primary = 0.49 cfs @ 84.00 hrs, Volume= 2.395 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 52.27' @ 84.00 hrs Storage= 9.703 af

Plug-Flow detention time= 2,491.5 min calculated for 2.395 af (20% of inflow)
Center-of-Mass det. time= 1,564.4 min (3,191.6 - 1,627.3)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data**Listed below

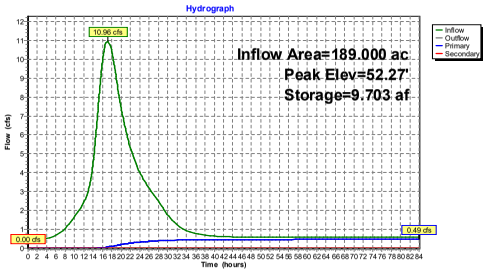
Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=0.49 cfs @ 84.00 hrs HW=52.27' TW=0.00' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 0.49 cfs @ 1.87 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=51.90' TW=29.60' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 8P: Five Mile Pond



Summary for Pond 9P: Kettle Hole

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth > 0.27" for 1-yr event
Inflow = 0.58 cfs @ 19.35 hrs, Volume= 2.377 af, Incl. 0.30 cfs Base Flow
Outflow = 0.54 cfs @ 21.96 hrs, Volume= 2.386 af, Atten= 6%, Lag= 156.7 min
Primary = 0.54 cfs @ 21.96 hrs, Volume= 2.386 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.00' @ 21.96 hrs Storage= 8.998 af (0.048 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 17.7 min (2,387.8 - 2,370.0)

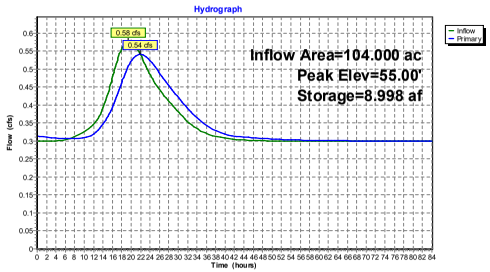
Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=0.54 cfs @ 21.96 hrs HW=55.00' TW=29.87' (Dynamic Tailwater)
↳**1=Relief** (Weir Controls 0.54 cfs @ 0.33 fps)

Pond 9P: Kettle Hole



Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow Area = 484.000 ac, 13.78% Impervious, Inflow Depth > 0.38" for 1-yr event
Inflow = 11.56 cfs @ 15.53 hrs, Volume= 15.487 af, Incl. 0.60 cfs Base Flow
Outflow = 4.39 cfs @ 20.60 hrs, Volume= 14.377 af, Atten= 62%, Lag= 304.5 min
Primary = 4.39 cfs @ 20.60 hrs, Volume= 14.377 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1.500 af
Peak Elev= 29.87' @ 20.60 hrs Storage= 5.544 af (4.044 af above start)

Plug-Flow detention time= 1,066.4 min calculated for 12.877 af (83% of inflow)
Center-of-Mass det. time= 380.6 min (2,342.9 - 1,962.4)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data**Listed below
#2	29.50'	15.000 af	**NP to LiDAR**Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
35.00	115.000
36.50	160.000
40.00	300.000

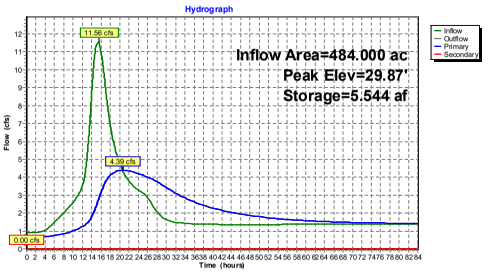
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=4.39 cfs @ 20.60 hrs HW=29.87' TW=21.46' (Dynamic Tailwater)
↳**1=Drop Inlet Spillway** (Weir Controls 4.39 cfs @ 2.01 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.60' TW=21.26' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 10P: Maple Springs Brook Dam - 0.8sm



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A00840 - 466

Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow Area = 1,172.000 ac, 6.75% Impervious, Inflow Depth > 0.33" for 1-yr event
Inflow = 8.48 cfs @ 19.30 hrs, Volume= 31.768 af, Incl. 1.10 cfs Base Flow
Outflow = 7.52 cfs @ 25.61 hrs, Volume= 31.395 af, Atten= 11%, Lag= 378.6 min
Primary = 7.52 cfs @ 25.61 hrs, Volume= 31.395 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 21.49' @ 25.61 hrs Storage= 4.659 af (1.949 af above start)

Plug-Flow detention time= 543.8 min calculated for 28.684 af (90% of inflow)
Center-of-Mass det. time= 91.4 min (2,434.6 - 2,343.2)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

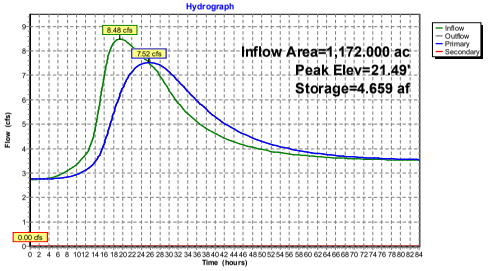
Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=7.52 cfs @ 25.61 hrs HW=21.49' TW=16.07' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 7.52 cfs @ 2.56 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.26' TW=15.71' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 11P: Unnamed Road - 1.8sm

Hydrograph



Summary for Pond 12P: Maple Springs Road Dam

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth > 0.33" for 1-yr event
Inflow = 3.94 cfs @ 16.18 hrs, Volume= 9.052 af, Incl. 1.00 cfs Base Flow
Outflow = 2.49 cfs @ 19.84 hrs, Volume= 9.052 af, Atten= 37%, Lag= 219.5 min
Primary = 2.49 cfs @ 19.84 hrs, Volume= 9.052 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 38.83' @ 19.84 hrs Storage= 1.982 af (0.902 af above start)

Plug-Flow detention time= 699.9 min calculated for 7.972 af (88% of inflow)
Center-of-Mass det. time= 107.6 min (2,288.5 - 2,180.9)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

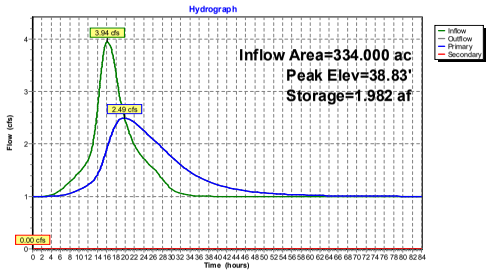
Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=2.49 cfs @ 19.84 hrs HW=38.83' TW=21.44' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 2.49 cfs @ 1.92 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=38.68' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 12P: Maple Springs Road Dam

Hydrograph



Summary for Pond 13.1P: Bogs_L_US

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 0.34" for 1-yr event
Inflow = 2.33 cfs @ 19.84 hrs, Volume= 7.992 af, Incl. 0.90 cfs Base Flow
Outflow = 2.32 cfs @ 20.05 hrs, Volume= 7.993 af, Atten= 0%, Lag= 12.3 min
Primary = 2.32 cfs @ 20.05 hrs, Volume= 7.993 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 29.78' @ 20.05 hrs Storage= 0.098 af (0.045 af above start)

Plug-Flow detention time= 38.4 min calculated for 7.939 af (99% of inflow)
Center-of-Mass det. time= 5.1 min (2,276.9 - 2,271.8)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

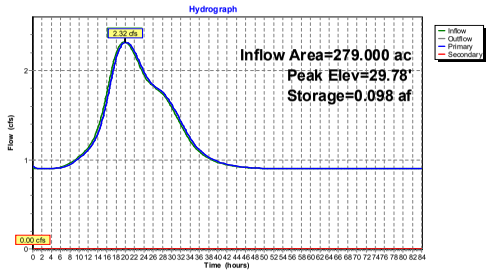
Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=2.32 cfs @ 20.05 hrs HW=29.78' TW=25.87' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 2.32 cfs @ 1.68 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.65' TW=25.75' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.1P: Bogs_L_US

Hydrograph



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Summary for Pond 13.2P: Bogs_L_DS

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 0.34" for 1-yr event
Inflow = 2.32 cfs @ 20.05 hrs, Volume= 7.993 af
Outflow = 2.31 cfs @ 20.64 hrs, Volume= 7.995 af, Atten= 0%, Lag= 35.7 min
Primary = 2.31 cfs @ 20.64 hrs, Volume= 7.995 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 25.87' @ 20.64 hrs Storage= 0.137 af (0.062 af above start)

Plug-Flow detention time= 53.7 min calculated for 7.920 af (99% of inflow)
Center-of-Mass det. time= 7.1 min (2,283.9 - 2,276.9)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data**Listed below

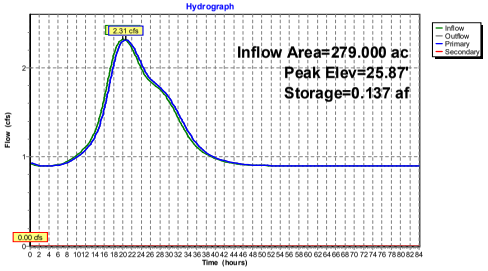
Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=2.31 cfs @ 20.64 hrs HW=25.87' TW=16.13' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 2.31 cfs @ 1.68 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 13.2P: Bogs_L_DS



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow Area = 1,717.000 ac, 6.26% Impervious, Inflow Depth > 0.35" for 1-yr event
Inflow = 13.88 cfs @ 17.77 hrs, Volume= 49.809 af, Incl. 0.80 cfs Base Flow
Outflow = 13.70 cfs @ 18.50 hrs, Volume= 49.753 af, Atten= 1%, Lag= 43.6 min
Primary = 13.70 cfs @ 18.50 hrs, Volume= 49.753 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 16.15' @ 18.50 hrs Storage= 1.721 af (0.656 af above start)

Plug-Flow detention time= 127.4 min calculated for 48.687 af (98% of inflow)
Center-of-Mass det. time= 17.3 min (2,305.9 - 2,288.6)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data**Listed below

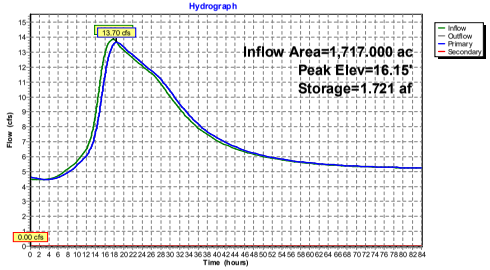
Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

Primary OutFlow Max=13.70 cfs @ 18.50 hrs HW=16.15' TW=0.00' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 13.70 cfs @ 1.93 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.71' TW=0.00' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 14P: Bogs_M - 2.7sm



Summary for Pond 15.1P: Bogs_N_US

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 0.55" for 1-yr event
Inflow = 4.77 cfs @ 17.33 hrs, Volume= 8.246 af, Incl. 0.60 cfs Base Flow
Outflow = 3.98 cfs @ 20.90 hrs, Volume= 8.241 af, Atten= 17%, Lag= 214.3 min
Primary = 3.98 cfs @ 20.90 hrs, Volume= 8.241 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 25.39' @ 20.90 hrs Storage= 1.263 af (0.911 af above start)

Plug-Flow detention time= 318.2 min calculated for 7.889 af (96% of inflow)
Center-of-Mass det. time= 105.8 min (1,983.8 - 1,877.9)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data**Listed below

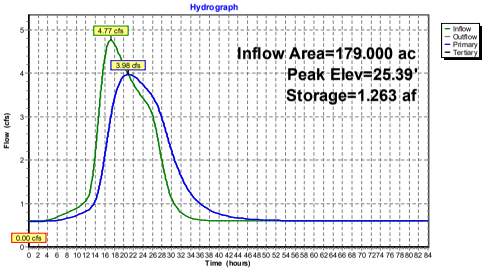
Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=3.98 cfs @ 20.90 hrs HW=25.39' TW=20.16' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 3.98 cfs @ 2.02 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.11' TW=20.11' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 15.1P: Bogs_N_US



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Summary for Pond 15.2P: Bogs_N_DS

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 0.55" for 1-yr event
Inflow = 3.98 cfs @ 20.90 hrs, Volume= 8.241 af
Outflow = 1.75 cfs @ 31.51 hrs, Volume= 7.612 af, Atten= 56%, Lag= 636.4 min
Primary = 1.75 cfs @ 31.51 hrs, Volume= 7.612 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 20.23' @ 31.51 hrs Storage= 5.331 af (2.764 af above start)

Plug-Flow detention time= 2,067.5 min calculated for 5.045 af (61% of inflow)
Center-of-Mass det. time= 593.9 min (2,577.7 - 1,983.8)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

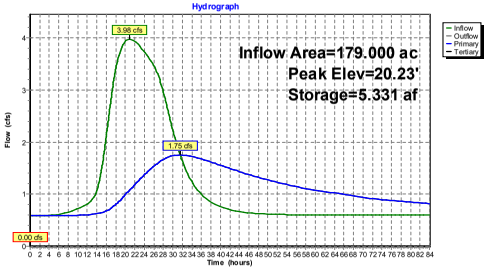
Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=1.75 cfs @ 31.51 hrs HW=20.23' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 1.75 cfs @ 1.53 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS

Hydrograph



Summary for Pond 16: Mill Pond Dam (Existing Conditions)

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.08" for 1-yr event
Inflow = 144.05 cfs @ 14.61 hrs, Volume= 444.949 af, Incl. 32.00 cfs Base Flow
Outflow = 65.41 cfs @ 36.10 hrs, Volume= 377.121 af, Atten= 55%, Lag= 1,289.5 min
Primary = 40.16 cfs @ 36.10 hrs, Volume= 235.524 af
Routed to Pond 17 : Cranberry Highway
Secondary = 12.16 cfs @ 36.10 hrs, Volume= 70.268 af
Routed to Pond 17 : Cranberry Highway
Tertiary = 13.10 cfs @ 36.10 hrs, Volume= 71.329 af
Routed to Pond 17 : Cranberry Highway

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 472.595 af
Peak Elev= 14.88' @ 36.10 hrs Storage= 559.491 af (86.896 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 402.0 min (2,728.4 - 2,326.4)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,944.000 af	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.470
5.00	4.600
6.00	9.700
7.00	17.300
8.00	35.800
9.00	61.550
10.00	95.500
11.00	143.900
12.00	216.000
13.00	316.000
14.00	427.850
15.00	577.000
16.00	773.500
17.00	996.500
18.00	1,274.360
19.00	1,595.000
20.00	1,944.000

Device	Routing	Invert	Outlet Devices
#1	Primary	13.60'	**4.9' long x 2.90' rise PS Stop Logs - Lt Bay** 2 End Contraction(s) 6.8' Crest Height
#2	Primary	13.80'	**4.9' long x 2.90' rise PS Stop Logs - RT Bay** 2 End Contraction(s) 6.8' Crest Height
#3	Tertiary	14.06'	**5.4' long x 5.00' rise Aux Spillway Stop Logs - Normal Height** 2 End Contraction(s) 4.0' Crest Height
#4	Secondary	18.00'	**TOD, C= 2.60** Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00 Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 7	12.10'	**3.0' long x 8.0' breadth Fish Ladder** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#7	Secondary	13.70'	**FL CHaqnnel XS 1, C= 2.00** Offset (feet) 0.00 0.00 4.00 6.00 Elev. (feet) 15.00 13.70 13.70 15.00

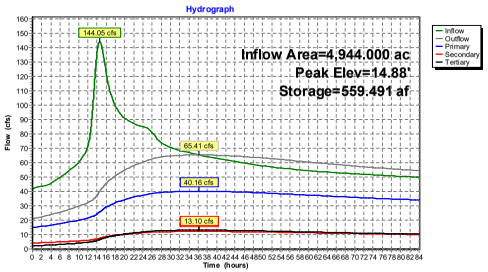
Primary OutFlow Max=40.15 cfs @ 36.10 hrs HW=14.88' TW=0.61' (Dynamic Tailwater)
└**1=PS Stop Logs - Lt Bay** (Weir Controls 22.57 cfs @ 3.79 fps)
└**2=PS Stop Logs - RT Bay** (Weir Controls 17.59 cfs @ 3.47 fps)

Secondary OutFlow Max=12.16 cfs @ 36.10 hrs HW=14.88' TW=0.61' (Dynamic Tailwater)
└**4=TOD** (Controls 0.00 cfs)
└**7=FL CHaqnnel XS 1** (Weir Controls 12.16 cfs @ 1.77 fps)
└**6=Fish Ladder** (Passes 12.16 cfs of 29.60 cfs potential flow)

Tertiary OutFlow Max=13.09 cfs @ 36.10 hrs HW=14.88' TW=0.61' (Dynamic Tailwater)
└**3=Aux Spillway Stop Logs - Normal Height**(Weir Controls 13.09 cfs @ 3.04 fps)
└**5=US Relief - Bypasses Dam** (Controls 0.00 cfs)

Pond 16: Mill Pond Dam (Existing Conditions)

Hydrograph



Summary for Pond 17: Cranberry Highway

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 0.92" for 1-yr event
Inflow = 65.41 cfs @ 36.10 hrs, Volume= 377.121 af
Outflow = 238.80 cfs @ 0.00 hrs, Volume= 377.595 af, Atten= 0%, Lag= 0.0 min
Primary = 238.80 cfs @ 0.00 hrs, Volume= 377.595 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 2.10' Storage= 0.612 af
Peak Elev= 2.10' @ 0.00 hrs Storage= 0.613 af (0.001 af above start)

Plug-Flow detention time= 1.9 min calculated for 376.981 af (100% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	-1.00'	220.000 af	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (acre-feet)
-1.00	0.000
1.00	0.200
5.00	1.700
7.00	4.000
10.00	13.000
11.50	18.000
13.50	31.000
15.00	45.000
20.00	100.000
30.00	220.000

Device	Routing	Invert	Outlet Devices
#1	Primary	-0.50'	**264.0" W x 126.0" H Box Culvert** L= 150.0' Ke= 0.500 Inlet / Outlet Invert= -0.50' / -1.00' S= 0.0033 '/' Cc= 0.900 n= 0.020, Flow Area= 231.00 sf
#2	Secondary	15.90'	**Relief, C= 1.80** Offset (feet) 0.00 35.00 420.00 460.00 Elev. (feet) 19.00 15.90 15.90 19.00

Primary OutFlow Max=238.80 cfs @ 0.00 hrs HW=2.10' (Free Discharge)
└**1=Culvert** (Barrel Controls 238.80 cfs @ 5.56 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.10' (Free Discharge)
└**2=Relief** (Controls 0.00 cfs)

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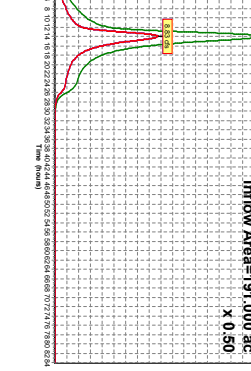
Pond 17: Cranberry Highway

Hydrograph



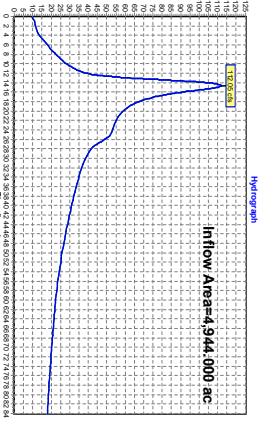
Summary for Link 23L: Inflow

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 0.54" for 1-yr event
Inflow = 112.05 cfs @ 14.61 hrs, Volume= 222.788 af, Atten= 0%, Lag= 0.0 min
Primary = 112.05 cfs @ 14.61 hrs, Volume= 222.788 af
Routed to Pond 16 : Mill Pond Dam (Existing Conditions)

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow

Hydrograph



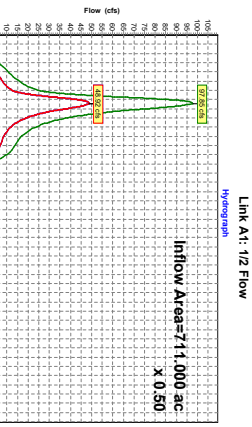
Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 0.91" for 1-yr event
Inflow = 48.92 cfs @ 14.92 hrs, Volume= 53.973 af
Primary = 48.92 cfs @ 14.92 hrs, Volume= 28.973 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 1P : Halfway Pond
Secondary = 48.92 cfs @ 14.92 hrs, Volume= 28.973 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow

Hydrograph



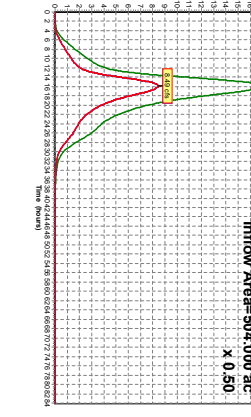
Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 0.50" for 1-yr event
Inflow = 17.66 cfs @ 13.97 hrs, Volume= 7.905 af
Primary = 8.83 cfs @ 13.97 hrs, Volume= 3.952 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 2P : Kennard Res
Secondary = 8.83 cfs @ 13.97 hrs, Volume= 3.952 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

Hydrograph



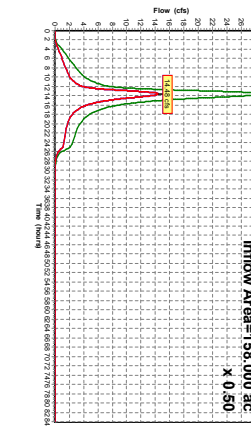
Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth = 0.28" for 1-yr event
Inflow = 16.97 cfs @ 15.89 hrs, Volume= 11.861 af
Primary = 8.49 cfs @ 15.89 hrs, Volume= 5.930 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 8.49 cfs @ 15.89 hrs, Volume= 5.930 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

Hydrograph



Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 0.86" for 1-yr event
Inflow = 28.96 cfs @ 13.59 hrs, Volume= 11.265 af
Primary = 14.48 cfs @ 13.59 hrs, Volume= 5.632 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 3P : Fawn Pond
Secondary = 14.48 cfs @ 13.59 hrs, Volume= 5.632 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow

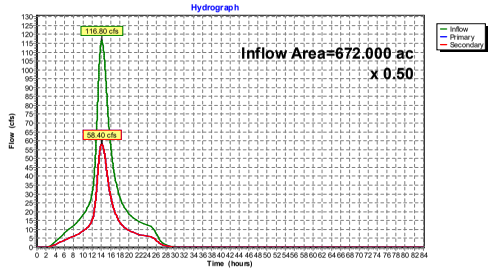
Hydrograph

Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 0.96" for 1-yr event
Inflow = 116.80 cfs @ 14.09 hrs, Volume= 53.867 af
Primary = 58.40 cfs @ 14.09 hrs, Volume= 26.933 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 5P : Glen Charlie Pond
Secondary = 58.40 cfs @ 14.09 hrs, Volume= 26.933 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow

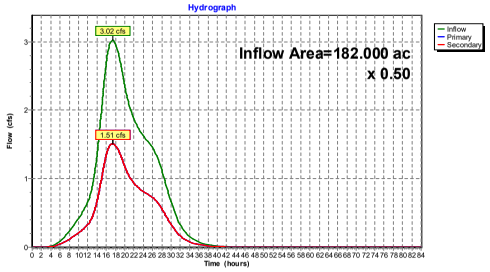


Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 0.20" for 1-yr event
Inflow = 3.02 cfs @ 17.34 hrs, Volume= 2.994 af
Primary = 1.51 cfs @ 17.34 hrs, Volume= 1.497 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 6.2P : Maple Sping Bogs US
Secondary = 1.51 cfs @ 17.34 hrs, Volume= 1.497 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow

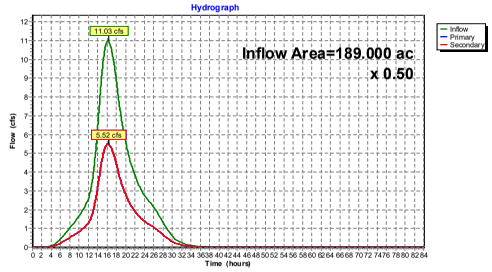


Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth = 0.51" for 1-yr event
Inflow = 11.03 cfs @ 16.28 hrs, Volume= 8.054 af
Primary = 5.52 cfs @ 16.28 hrs, Volume= 4.027 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 7P : Little Five Mile Pond
Secondary = 5.52 cfs @ 16.28 hrs, Volume= 4.027 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow

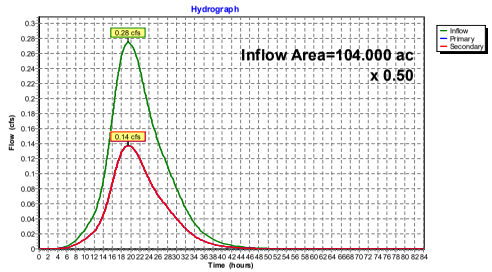


Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth = 0.03" for 1-yr event
Inflow = 0.28 cfs @ 19.35 hrs, Volume= 0.295 af
Primary = 0.14 cfs @ 19.35 hrs, Volume= 0.147 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 9P : Kettle Hole
Secondary = 0.14 cfs @ 19.35 hrs, Volume= 0.147 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow

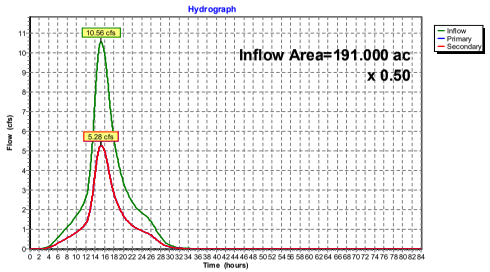


Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth = 0.41" for 1-yr event
Inflow = 10.56 cfs @ 15.24 hrs, Volume= 6.540 af
Primary = 5.28 cfs @ 15.24 hrs, Volume= 3.270 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 5.28 cfs @ 15.24 hrs, Volume= 3.270 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

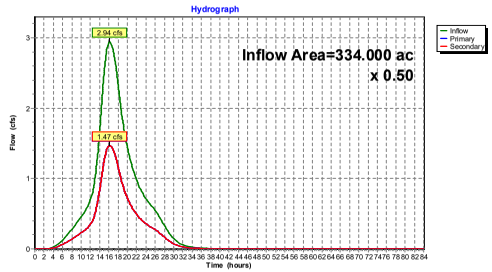


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth = 0.08" for 1-yr event
Inflow = 2.94 cfs @ 16.18 hrs, Volume= 2.110 af
Primary = 1.47 cfs @ 16.18 hrs, Volume= 1.055 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 12P : Maple Springs Road Dam
Secondary = 1.47 cfs @ 16.18 hrs, Volume= 1.055 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow



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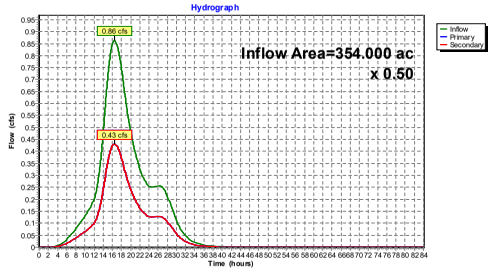
Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth = 0.02" for 1-yr event
Inflow = 0.86 cfs @ 16.40 hrs, Volume= 0.702 af
Primary = 0.43 cfs @ 16.40 hrs, Volume= 0.351 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.43 cfs @ 16.40 hrs, Volume= 0.351 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow

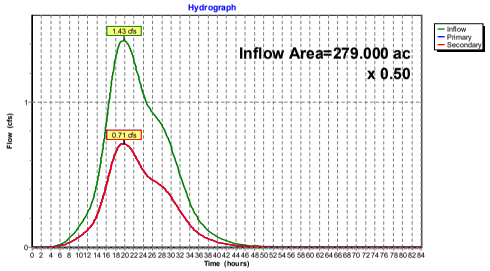


Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth = 0.07" for 1-yr event
Inflow = 1.43 cfs @ 19.84 hrs, Volume= 1.744 af
Primary = 0.71 cfs @ 19.84 hrs, Volume= 0.872 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 13.1P : Bogs_L_US
Secondary = 0.71 cfs @ 19.84 hrs, Volume= 0.872 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow

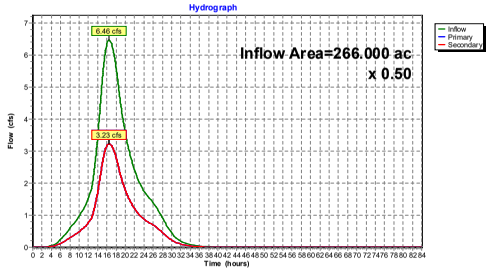


Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth = 0.22" for 1-yr event
Inflow = 6.46 cfs @ 16.48 hrs, Volume= 4.865 af
Primary = 3.23 cfs @ 16.48 hrs, Volume= 2.433 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 3.23 cfs @ 16.48 hrs, Volume= 2.433 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow

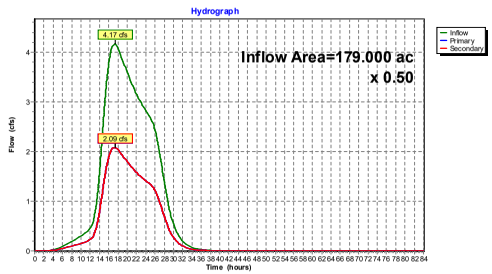


Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth = 0.27" for 1-yr event
Inflow = 4.17 cfs @ 17.33 hrs, Volume= 4.081 af
Primary = 2.09 cfs @ 17.33 hrs, Volume= 2.040 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 15.1P : Bogs_N_US
Secondary = 2.09 cfs @ 17.33 hrs, Volume= 2.040 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow



Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

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Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

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Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., U Is Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

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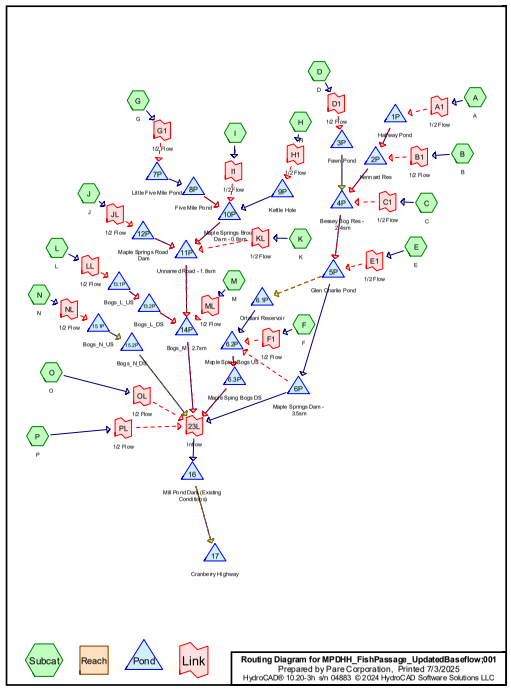

Project Notes

Copied 10 events from NOAA14_Wareham 24-hr S1 storm

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	PMP24hour	PMP-24hourWareham		Default	24.00	1	33.30	2
2	PMP72hour	PMP-72hourWareham		Default	72.00	1	39.12	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
354.000	42	"0.83% imp" (K)
104.000	34	"1.27% imp" (H)
504.000	47	"10.54% imp" (C)
191.000	42	"15.34% imp" (I)
191.000	49	"18.54% imp" (B)
189.000	45	"19.09% imp" (G)
279.000	45	"2.43% imp" (L)
334.000	34	"2.83% imp" (J)
179.000	57	"3.17% imp" (N)
576.000	62	"31.1% imp" (O)
158.000	57	"31.94% imp" (D)
711.000	56	"33.99% imp" (A)
672.000	59	"35.91% imp" (E)
54.000	71	"38.05% imp" (P)
182.000	50	"6.11% imp" (F)
266.000	47	"8.14% imp" (M)
4,944.000	**51**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
4,944.000	Other	A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P
4,944.000		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	354.000	354.000	"0.83% imp"	K
0.000	0.000	0.000	0.000	104.000	104.000	"1.27% imp"	H
0.000	0.000	0.000	0.000	504.000	504.000	"10.54% imp"	C
0.000	0.000	0.000	0.000	191.000	191.000	"15.34% imp"	I
0.000	0.000	0.000	0.000	191.000	191.000	"18.54% imp"	B
0.000	0.000	0.000	0.000	189.000	189.000	"19.09% imp"	G
0.000	0.000	0.000	0.000	279.000	279.000	"2.43% imp"	L
0.000	0.000	0.000	0.000	334.000	334.000	"2.83% imp"	J
0.000	0.000	0.000	0.000	179.000	179.000	"3.17% imp"	N
0.000	0.000	0.000	0.000	576.000	576.000	"31.1% imp"	O
0.000	0.000	0.000	0.000	158.000	158.000	"31.94% imp"	D
0.000	0.000	0.000	0.000	711.000	711.000	"33.99% imp"	A
0.000	0.000	0.000	0.000	672.000	672.000	"35.91% imp"	E
0.000	0.000	0.000	0.000	54.000	54.000	"38.05% imp"	P
0.000	0.000	0.000	0.000	182.000	182.000	"6.11% imp"	F
0.000	0.000	0.000	0.000	266.000	266.000	"8.14% imp"	M
0.000	**0.000**	**0.000**	**0.000**	**4,944.000**	**4,944.000**	**TOTAL AREA**	

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Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	1P	64.00	63.50	20.0	0.0250	0.025	36.0	36.0	0.0	
2	3P	59.50	59.00	40.0	0.0125	0.025	0.0	30.0	0.0	
3	6P	20.50	20.30	30.0	0.0067	0.035	36.0	36.0	0.0	
4	8P	51.90	51.30	30.0	0.0200	0.035	0.0	24.0	0.0	
5	11P	21.00	20.50	30.0	0.0167	0.035	96.0	72.0	0.0	
6	14P	15.20	15.00	90.0	0.0022	0.035	120.0	96.0	0.0	
7	17	-0.50	-1.00	150.0	0.0033	0.020	264.0	126.0	0.0	

Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=22.93"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=2,869.55 cfs 1,358.883 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=21.98"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=892.46 cfs 349.914 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=21.96"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=1,663.71 cfs 922.324 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=23.81"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=860.07 cfs 313.439 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=24.08"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=3,236.36 cfs 1,348.332 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=23.40"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=539.07 cfs 354.916 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=19.89"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=536.08 cfs 313.189 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=17.46"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=177.40 cfs 151.298 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=19.27"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=618.94 cfs 306.787 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=17.24"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=871.90 cfs 479.793 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=21.13"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=1,058.71 cfs 623.293 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=22.03"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=597.64 cfs 512.134 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=22.01"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=829.68 cfs 487.840 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=25.67"
Tc=300.0 min CN=56/98 Runoff=704.28 cfs 382.951 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=25.74"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=2,738.42 cfs 1,235.635 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=28.00"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=299.30 cfs 125.979 af

Pond 1P: Halfway Pond Peak Elev=66.86' Storage=1,016.671 af Inflow=1,436.98 cfs 694.714 af
Primary=40.94 cfs 199.747 af Secondary=0.00 cfs 0.000 af Outflow=40.94 cfs 199.747 af

Pond 2P: Kennard Res Peak Elev=60.01' Storage=70.351 af Inflow=460.21 cfs 378.869 af
Primary=137.18 cfs 299.593 af Secondary=250.68 cfs 61.254 af Outflow=387.86 cfs 360.847 af

Pond 3P: Fawn Pond Peak Elev=62.01' Storage=160.533 af Inflow=430.54 cfs 160.190 af
Primary=21.07 cfs 77.959 af Tertiary=30.54 cfs 23.822 af Outflow=51.61 cfs 101.781 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=51.05' Storage=223.550 af Inflow=1,223.09 cfs 934.897 af
Primary=146.64 cfs 500.119 af Secondary=916.28 cfs 398.109 af Outflow=1,062.92 cfs 898.228 af

Pond 5P: Glen Charlie Pond Peak Elev=37.42' Storage=628.921 af Inflow=1,819.87 cfs 1,586.973 af
,060.65 cfs 1,434.928 af Secondary=40.25 cfs 29.251 af Tertiary=14.70 cfs 15.364 af Outflow=1,115.51 cfs 1,479.543 af

Pond 6.1P: Ortalani Reservoir Peak Elev=36.00' Storage=29.930 af Inflow=54.86 cfs 44.615 af
Outflow=15.45 cfs 36.606 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=24.98' Storage=39.584 af Inflow=356.30 cfs 247.076 af
Primary=31.98 cfs 83.040 af Secondary=321.87 cfs 157.758 af Outflow=353.84 cfs 240.798 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=22.26' Storage=39.448 af Inflow=353.84 cfs 240.798 af
Primary=191.47 cfs 212.834 af Secondary=127.81 cfs 27.216 af Outflow=319.28 cfs 240.050 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=25.53' Storage=16.637 af Inflow=1,060.65 cfs 1,434.928 af
Primary=960.80 cfs 1,399.687 af Secondary=99.62 cfs 33.011 af Outflow=1,060.42 cfs 1,432.698 af

Pond 7P: Little Five Mile Pond Peak Elev=60.36' Storage=28.855 af Inflow=268.63 cfs 160.691 af
Outflow=267.24 cfs 160.640 af

Pond 8P: Five Mile Pond Peak Elev=55.57' Storage=105.709 af Inflow=267.24 cfs 160.640 af
Primary=18.50 cfs 69.652 af Secondary=100.13 cfs 49.254 af Outflow=118.63 cfs 118.906 af

Pond 9P: Kettle Hole Peak Elev=55.72' Storage=11.525 af Inflow=89.00 cfs 77.732 af
Outflow=88.63 cfs 77.740 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=32.68' Storage=63.423 af Inflow=352.05 cfs 354.205 af
Primary=107.42 cfs 231.519 af Secondary=232.98 cfs 114.865 af Outflow=340.40 cfs 346.384 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=28.76' Storage=408.683 af Inflow=1,305.20 cfs 912.499 af
Primary=430.49 cfs 858.620 af Secondary=138.15 cfs 50.216 af Outflow=568.64 cfs 908.836 af

Pond 12P: Maple Springs Road Dam Peak Elev=41.80' Storage=20.606 af Inflow=436.95 cfs 246.839 af
Primary=78.72 cfs 90.924 af Secondary=357.89 cfs 155.907 af Outflow=436.61 cfs 246.831 af

Pond 13.1P: Bogs_L_US Peak Elev=35.10' Storage=54.747 af Inflow=299.72 cfs 262.315 af
Primary=144.86 cfs 219.399 af Secondary=120.02 cfs 42.918 af Outflow=264.57 cfs 262.316 af

Pond 13.2P: Bogs_L_DS Peak Elev=30.60' Storage=65.942 af Inflow=264.57 cfs 262.316 af
Primary=134.02 cfs 262.318 af Secondary=0.00 cfs 0.000 af Outflow=134.02 cfs 262.318 af

Pond 14P: Bogs_M - 2.7sm Peak Elev=24.61' Storage=282.903 af Inflow=831.58 cfs 1,420.628 af
Primary=600.70 cfs 1,419.687 af Secondary=1.60 cfs 0.223 af Outflow=601.40 cfs 1,419.910 af

Pond 15.1P: Bogs_N_US Peak Elev=29.41' Storage=76.764 af Inflow=352.74 cfs 195.641 af
Primary=121.84 cfs 163.323 af Tertiary=138.94 cfs 32.312 af Outflow=260.78 cfs 195.635 af

Pond 15.2P: Bogs_N_DS Peak Elev=23.36' Storage=89.606 af Inflow=260.78 cfs 195.635 af
Primary=95.24 cfs 190.818 af Tertiary=0.00 cfs 0.000 af Outflow=95.24 cfs 190.818 af

Pond 16: Mill Pond Dam (Existing Peak Elev=18.78' Storage=1,525.443 af Inflow=2,067.05 cfs 4,153.424 af
cfs 1,231.477 af Secondary=487.97 cfs 675.301 af Tertiary=1,015.33 cfs 1,785.496 af Outflow=1,757.20 cfs 3,692.274 af

Pond 17: Cranberry Highway Peak Elev=9.57' Storage=11.696 af Inflow=1,757.20 cfs 3,692.274 af
Primary=1,755.75 cfs 3,692.229 af Secondary=0.00 cfs 0.000 af Outflow=1,755.75 cfs 3,692.229 af

Link 23L: Inflow Inflow=2,035.05 cfs 3,931.272 af
Primary=2,035.05 cfs 3,931.272 af

Link A1: 1/2 Flow x 0.50 Inflow=2,869.55 cfs 1,358.883 af
Primary=1,434.78 cfs 679.441 af Secondary=1,434.78 cfs 679.441 af

Link B1: 1/2 Flow x 0.50 Inflow=892.46 cfs 349.914 af
Primary=446.23 cfs 174.957 af Secondary=446.23 cfs 174.957 af

Link C1: 1/2 Flow x 0.50 Inflow=1,663.71 cfs 922.324 af
Primary=831.85 cfs 461.162 af Secondary=831.85 cfs 461.162 af

Link D1: 1/2 Flow x 0.50 Inflow=860.07 cfs 313.439 af
Primary=430.04 cfs 156.719 af Secondary=430.04 cfs 156.719 af

Link E1: 1/2 Flow x 0.50 Inflow=3,236.36 cfs 1,348.332 af
Primary=1,618.18 cfs 674.166 af Secondary=1,618.18 cfs 674.166 af

Link F1: 1/2 Flow x 0.50 Inflow=539.07 cfs 354.916 af
Primary=269.54 cfs 177.458 af Secondary=269.54 cfs 177.458 af

Link G1: 1/2 Flow x 0.50 Inflow=536.08 cfs 313.189 af
Primary=268.04 cfs 156.595 af Secondary=268.04 cfs 156.595 af

Link H1: 1/2 Flow x 0.50 Inflow=177.40 cfs 151.298 af
Primary=88.70 cfs 75.649 af Secondary=88.70 cfs 75.649 af

Link I1: 1/2 Flow x 0.50 Inflow=618.94 cfs 306.787 af
Primary=309.47 cfs 153.394 af Secondary=309.47 cfs 153.394 af

Link JL: 1/2 Flow x 0.50 Inflow=871.90 cfs 479.793 af
Primary=435.95 cfs 239.897 af Secondary=435.95 cfs 239.897 af

Link KL: 1/2 Flow x 0.50 Inflow=1,058.71 cfs 623.293 af
Primary=529.36 cfs 311.647 af Secondary=529.36 cfs 311.647 af

Link LL: 1/2 Flow x 0.50 Inflow=597.64 cfs 512.134 af
Primary=298.82 cfs 256.067 af Secondary=298.82 cfs 256.067 af

Link ML: 1/2 Flow x 0.50 Inflow=829.68 cfs 487.840 af
Primary=414.84 cfs 243.920 af Secondary=414.84 cfs 243.920 af

Link NL: 1/2 Flow x 0.50 Inflow=704.28 cfs 382.951 af
Primary=352.14 cfs 191.475 af Secondary=352.14 cfs 191.475 af

Link OL: 1/2 Flow x 0.50 Inflow=2,738.42 cfs 1,235.635 af
Primary=1,369.21 cfs 617.818 af Secondary=1,369.21 cfs 617.818 af

Link PL: 1/2 Flow x 0.50 Inflow=299.30 cfs 125.979 af
Primary=149.65 cfs 62.989 af Secondary=149.65 cfs 62.989 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 9,266.705 af Average Runoff Depth = 22.49"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

Summary for Subcatchment A: A

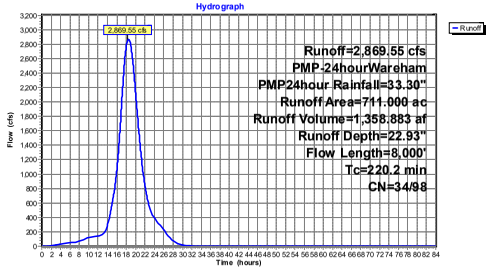
Runoff = 2,869.55 cfs @ 18.35 hrs, Volume= 1,358.883 af, Depth=22.93"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

	Area (ac)	CN	Description
*	711.000	56	"33.99% imp"
	469.331	34	66.01% Pervious Area
	241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



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Summary for Subcatchment B: B

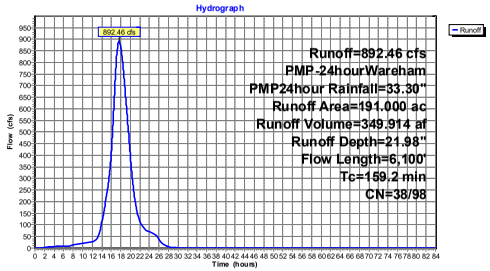
Runoff = 892.46 cfs @ 17.69 hrs, Volume= 349.914 af, Depth=21.98"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

	Area (ac)	CN	Description
*	191.000	49	"18.54% imp"
	155.589	38	81.46% Pervious Area
	35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



Summary for Subcatchment C: C

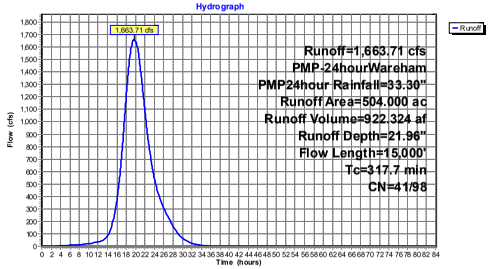
Runoff = 1,663.71 cfs @ 19.77 hrs, Volume= 922.324 af, Depth=21.96"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

	Area (ac)	CN	Description
*	504.000	47	"10.54% imp"
	450.878	41	89.46% Pervious Area
	53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



Summary for Subcatchment D: D

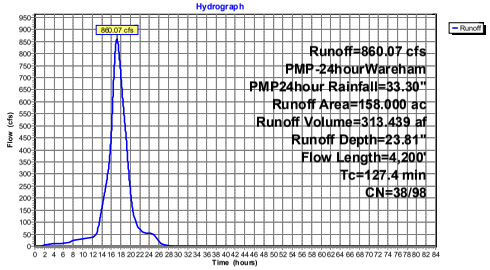
Runoff = 860.07 cfs @ 17.13 hrs, Volume= 313.439 af, Depth=23.81"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

	Area (ac)	CN	Description
*	158.000	57	"31.94% imp"
	107.535	38	68.06% Pervious Area
	50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



Summary for Subcatchment E: E

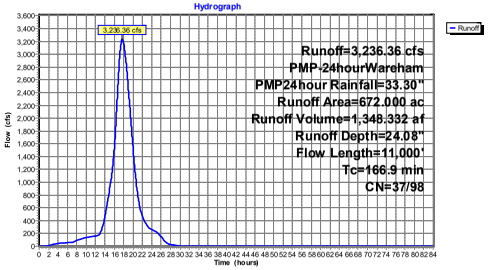
Runoff = 3,236.36 cfs @ 17.62 hrs, Volume= 1,348.332 af, Depth=24.08"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

	Area (ac)	CN	Description
*	672.000	59	"35.91% imp"
	430.685	37	64.09% Pervious Area
	241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



Summary for Subcatchment F: F

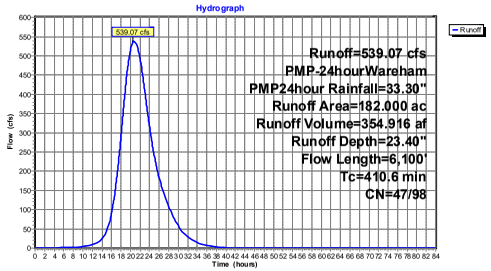
Runoff = 539.07 cfs @ 20.53 hrs, Volume= 354.916 af, Depth=23.40"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

	Area (ac)	CN	Description
*	182.000	50	"6.11% imp"
	170.880	47	93.89% Pervious Area
	11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



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Summary for Subcatchment G: G

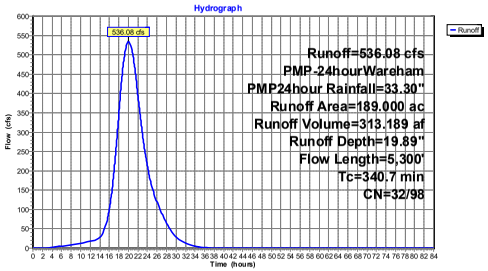
Runoff = 536.08 cfs @ 20.06 hrs, Volume= 313.189 af, Depth=19.89"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 189.000	45	"19.09% imp"
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



Summary for Subcatchment H: H

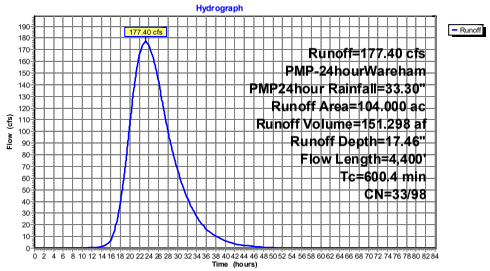
Runoff = 177.40 cfs @ 23.35 hrs, Volume= 151.298 af, Depth=17.46"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 104.000	34	"1.27% imp"
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

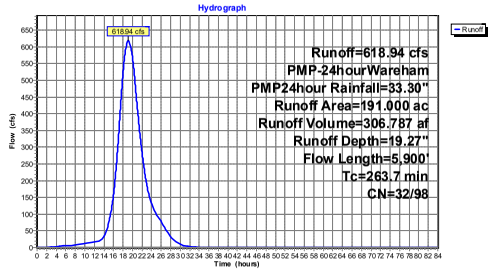
Runoff = 618.94 cfs @ 19.05 hrs, Volume= 306.787 af, Depth=19.27"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 191.000	42	"15.34% imp"
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



Summary for Subcatchment J: J

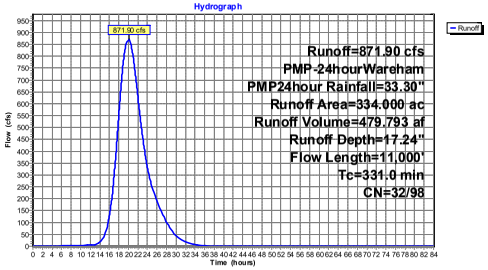
Runoff = 871.90 cfs @ 20.23 hrs, Volume= 479.793 af, Depth=17.24"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 334.000	34	"2.83% imp"
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Summary for Subcatchment K: K

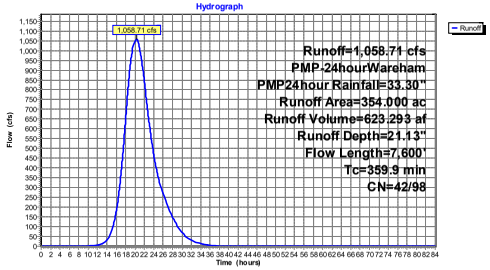
Runoff = 1,058.71 cfs @ 20.39 hrs, Volume= 623.293 af, Depth=21.13"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 354.000	42	"0.83% imp"
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



Summary for Subcatchment L: L

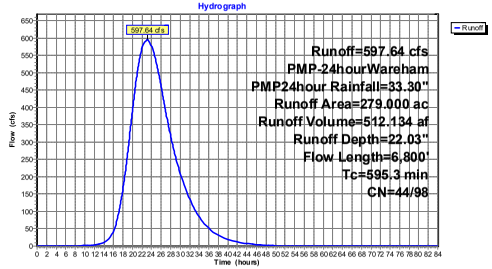
Runoff = 597.64 cfs @ 23.15 hrs, Volume= 512.134 af, Depth=22.03"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 279.000	45	"2.43% imp"
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



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Summary for Subcatchment M: M

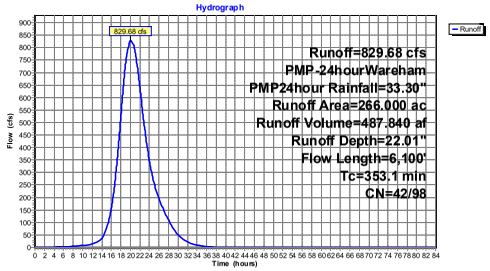
Runoff = 829.68 cfs @ 20.01 hrs, Volume= 487.840 af, Depth=22.01"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 266.000	47	"8.14% imp"
244.348	42	91.86% Pervious Area
21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



Summary for Subcatchment N: N

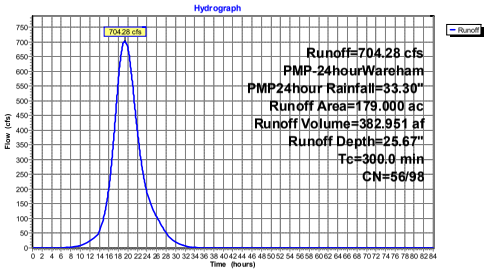
Runoff = 704.28 cfs @ 19.33 hrs, Volume= 382.951 af, Depth=25.67"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 179.000	57	"3.17% imp"
173.326	56	96.83% Pervious Area
5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

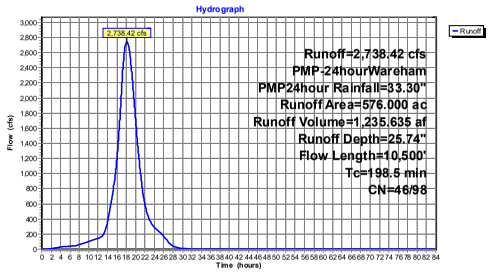
Runoff = 2,738.42 cfs @ 18.09 hrs, Volume= 1,235.635 af, Depth=25.74"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 576.000	62	"31.1% imp"
396.864	46	68.90% Pervious Area
179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



Summary for Subcatchment P: P

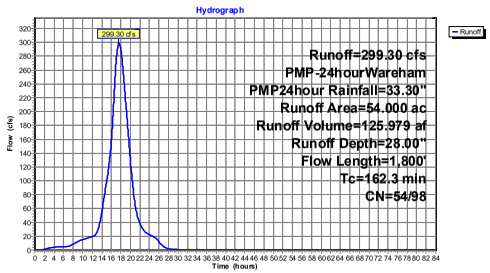
Runoff = 299.30 cfs @ 17.49 hrs, Volume= 125.979 af, Depth=28.00"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 54.000	71	"38.05% imp"
33.453	54	61.95% Pervious Area
20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Summary for Pond 1P: Halfway Pond

Inflow = 1,436.98 cfs @ 18.35 hrs, Volume= 694.714 af, Incl. 2.20 cfs Base Flow
Outflow = 40.94 cfs @ 27.89 hrs, Volume= 199.747 af, Atten= 97%, Lag= 572.2 min
Primary = 40.94 cfs @ 27.89 hrs, Volume= 199.747 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 66.86' @ 27.89 hrs Storage= 1,016.671 af (646.061 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,786.1 min (2,938.5 - 1,152.4)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

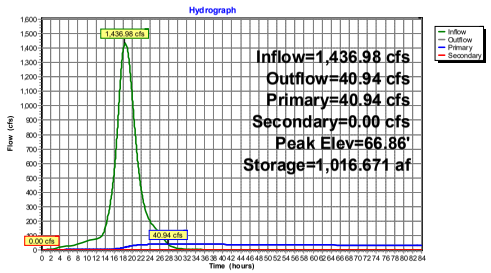
Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=40.94 cfs @ 27.89 hrs HW=66.86' TW=59.03' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 40.94 cfs @ 6.36 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 1P: Halfway Pond



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Summary for Pond 2P: Kennard Res

Inflow = 460.21 cfs @ 17.69 hrs, Volume= 378.869 af, Incl. 0.60 cfs Base Flow
Outflow = 387.86 cfs @ 18.68 hrs, Volume= 360.847 af, Atten= 16%, Lag= 59.2 min
Primary = 137.18 cfs @ 18.68 hrs, Volume= 299.593 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 250.68 cfs @ 18.68 hrs, Volume= 61.254 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 60.01' @ 18.68 hrs Storage= 70.351 af (66.351 af above start)

Plug-Flow detention time= 348.3 min calculated for 356.846 af (94% of inflow)
Center-of-Mass det. time= 160.5 min (2,237.0 - 2,076.5)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

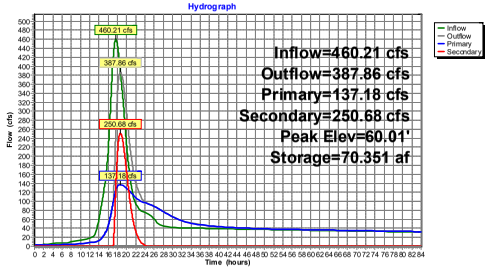
Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=137.18 cfs @ 18.68 hrs HW=60.01' TW=50.14' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Orifice Controls 137.18 cfs @ 6.46 fps)

Secondary OutFlow Max=250.65 cfs @ 18.68 hrs HW=60.01' TW=50.14' (Dynamic Tailwater)
└**1=TOD** (Weir Controls 250.65 cfs @ 1.81 fps)

Pond 2P: Kennard Res

Hydrograph



Summary for Pond 3P: Fawn Pond

Inflow = 430.54 cfs @ 17.13 hrs, Volume= 160.190 af, Incl. 0.50 cfs Base Flow
Outflow = 51.61 cfs @ 21.10 hrs, Volume= 101.781 af, Atten= 88%, Lag= 238.4 min
Primary = 21.07 cfs @ 21.10 hrs, Volume= 77.959 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 30.54 cfs @ 21.10 hrs, Volume= 23.822 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 62.01' @ 21.10 hrs Storage= 160.533 af (132.813 af above start)

Plug-Flow detention time= 1,949.4 min calculated for 74.060 af (46% of inflow)
Center-of-Mass det. time= 1,346.0 min (2,414.8 - 1,068.7)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

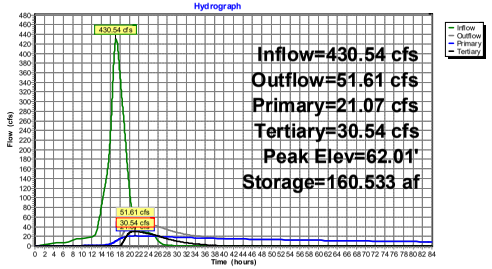
Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=21.07 cfs @ 21.10 hrs HW=62.01' TW=51.02' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 21.07 cfs @ 5.32 fps)

Tertiary OutFlow Max=30.53 cfs @ 21.10 hrs HW=62.01' TW=51.02' (Dynamic Tailwater)
└**2=TOD South** (Weir Controls 30.53 cfs @ 1.54 fps)

Pond 3P: Fawn Pond

Hydrograph



Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow = 1,223.09 cfs @ 19.41 hrs, Volume= 934.897 af, Incl. 1.60 cfs Base Flow
Outflow = 1,062.92 cfs @ 20.60 hrs, Volume= 898.228 af, Atten= 13%, Lag= 71.1 min
Primary = 146.64 cfs @ 20.60 hrs, Volume= 500.119 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 916.28 cfs @ 20.60 hrs, Volume= 398.109 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 51.05' @ 20.60 hrs Storage= 223.550 af (213.830 af above start)

Plug-Flow detention time= 441.2 min calculated for 888.498 af (95% of inflow)
Center-of-Mass det. time= 274.5 min (2,040.6 - 1,766.1)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

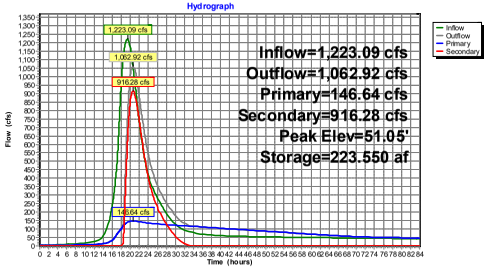
Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=146.64 cfs @ 20.60 hrs HW=51.05' TW=37.24' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Orifice Controls 146.64 cfs @ 10.08 fps)

Secondary OutFlow Max=915.81 cfs @ 20.60 hrs HW=51.05' TW=37.24' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 915.81 cfs @ 2.58 fps)

Pond 4P: Bessey Bog Res - 2.4sm

Hydrograph



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Summary for Pond 5P: Glen Charlie Pond

Inflow = 1,819.87 cfs @ 19.57 hrs, Volume= 1,586.973 af, Incl. 2.10 cfs Base Flow
Outflow = 1,115.51 cfs @ 22.00 hrs, Volume= 1,479.543 af, Atten= 39%, Lag= 145.7 min
Primary = 1,060.65 cfs @ 22.00 hrs, Volume= 1,434.928 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 40.25 cfs @ 22.00 hrs, Volume= 29.251 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 14.70 cfs @ 21.49 hrs, Volume= 15.364 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 37.42' @ 22.00 hrs Storage= 628.921 af (602.796 af above start)

Plug-Flow detention time= 724.3 min calculated for 1,453.418 af (92% of inflow)
Center-of-Mass det. time= 467.7 min (2,100.0 - 1,632.3)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00 Elev. (feet) 41.00 40.00 39.00 37.70 37.70 41.00

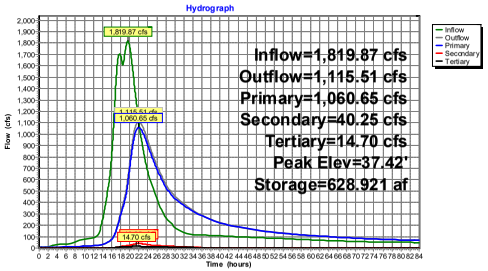
#6	Tertiary	34.50'	**24.0" W x 12.0" H Vert. NE Culvert** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1,059.44 cfs @ 22.00 hrs HW=37.42' TW=25.53' (Dynamic Tailwater)
└─**1=Spillway** (Weir Controls 707.76 cfs @ 8.97 fps)
└─**2=TOD** (Weir Controls 351.68 cfs @ 1.49 fps)

Secondary OutFlow Max=39.88 cfs @ 22.00 hrs HW=37.42' TW=34.97' (Dynamic Tailwater)
└─**3=SE Dike** (Weir Controls 13.30 cfs @ 0.67 fps)
└─**4=SE Culvert** (Orifice Controls 26.58 cfs @ 6.64 fps)

Tertiary OutFlow Max=14.70 cfs @ 21.49 hrs HW=37.40' TW=34.85' (Dynamic Tailwater)
└─**5=NE Dike** (Controls 0.00 cfs)
└─**6=NE Culvert** (Orifice Controls 14.70 cfs @ 7.35 fps)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 54.86 cfs @ 21.97 hrs, Volume= 44.615 af
Outflow = 15.45 cfs @ 31.92 hrs, Volume= 36.606 af, Atten= 72%, Lag= 597.2 min
Primary = 15.45 cfs @ 31.92 hrs, Volume= 36.606 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 36.00' @ 31.92 hrs Storage= 29.930 af

Plug-Flow detention time= 1,178.6 min calculated for 36.606 af (82% of inflow)
Center-of-Mass det. time= 1,040.6 min (2,572.8 - 1,532.2)

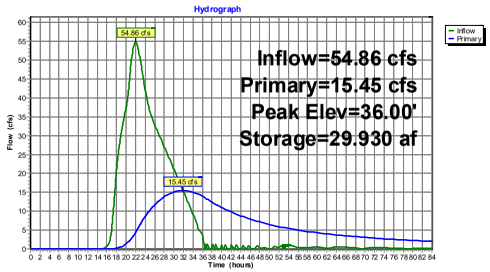
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=15.45 cfs @ 31.92 hrs HW=36.00' TW=24.28' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 15.45 cfs @ 4.30 fps)
└─**2=TOD** (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



Summary for Pond 6.2P: Maple Sping Bogs US

Inflow = 356.30 cfs @ 21.58 hrs, Volume= 247.076 af
Outflow = 353.84 cfs @ 21.86 hrs, Volume= 240.798 af, Atten= 1%, Lag= 16.9 min
Primary = 31.98 cfs @ 21.86 hrs, Volume= 83.040 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 321.87 cfs @ 21.86 hrs, Volume= 157.758 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 24.98' @ 21.86 hrs Storage= 39.584 af

Plug-Flow detention time= 280.2 min calculated for 240.798 af (97% of inflow)
Center-of-Mass det. time= 210.6 min (1,725.7 - 1,515.1)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

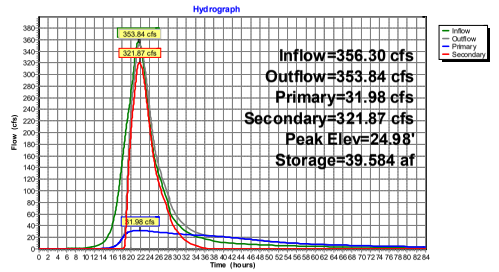
Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=31.98 cfs @ 21.86 hrs HW=24.98' TW=22.07' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 31.98 cfs @ 6.40 fps)

Secondary OutFlow Max=321.87 cfs @ 21.86 hrs HW=24.98' TW=22.07' (Dynamic Tailwater)
└─**2=TOD** (Weir Controls 321.87 cfs @ 1.28 fps)

Pond 6.2P: Maple Sping Bogs US



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Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow = 353.84 cfs @ 21.86 hrs, Volume= 240.798 af
Outflow = 319.28 cfs @ 22.86 hrs, Volume= 240.050 af, Atten= 10%, Lag= 60.0 min
Primary = 191.47 cfs @ 22.86 hrs, Volume= 212.834 af
Routed to Link 23L : Inflow
Secondary = 127.81 cfs @ 22.86 hrs, Volume= 27.216 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 22.26' @ 22.86 hrs Storage= 39.448 af

Plug-Flow detention time= 101.4 min calculated for 240.047 af (100% of inflow)
Center-of-Mass det. time= 91.3 min (1,817.0 - 1,725.7)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

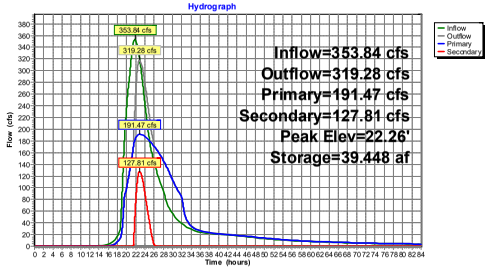
Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=191.47 cfs @ 22.86 hrs HW=22.26' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 191.47 cfs @ 7.66 fps)

Secondary OutFlow Max=127.81 cfs @ 22.86 hrs HW=22.26' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 127.81 cfs @ 1.65 fps)

Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow = 1,060.65 cfs @ 22.00 hrs, Volume= 1,434.928 af
Outflow = 1,060.42 cfs @ 22.06 hrs, Volume= 1,432.698 af, Atten= 0%, Lag= 3.6 min
Primary = 960.80 cfs @ 22.06 hrs, Volume= 1,399.687 af
Routed to Link 23L : Inflow
Secondary = 99.62 cfs @ 22.07 hrs, Volume= 33.011 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 25.53' @ 22.06 hrs Storage= 16.637 af (16.190 af above start)

Plug-Flow detention time= 18.3 min calculated for 1,432.251 af (100% of inflow)
Center-of-Mass det. time= 12.2 min (2,129.8 - 2,117.6)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

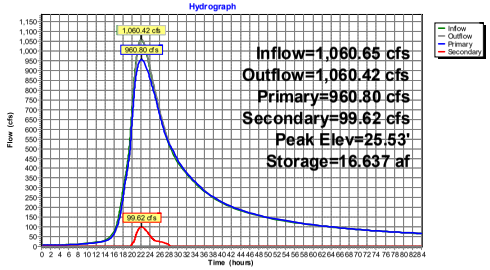
Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

Primary OutFlow Max=960.80 cfs @ 22.06 hrs HW=25.53' TW=0.00' (Dynamic Tailwater)
└**1=Bridge/Spillway** (Orifice Controls 666.01 cfs @ 15.42 fps)
└**3=TOD** (Weir Controls 294.79 cfs @ 1.88 fps)

Secondary OutFlow Max=99.62 cfs @ 22.07 hrs HW=25.53' TW=24.97' (Dynamic Tailwater)
└**2=Culvert to Bogs** (Outlet Controls 30.62 cfs @ 3.40 fps)
└**4=TOD_Bogs** (Weir Controls 69.01 cfs @ 1.46 fps)

Pond 6P: Maple Springs Dam - 3.5sm



Summary for Pond 7P: Little Five Mile Pond

Inflow = 268.63 cfs @ 20.06 hrs, Volume= 160.691 af, Incl. 0.59 cfs Base Flow
Outflow = 267.24 cfs @ 20.18 hrs, Volume= 160.640 af, Atten= 1%, Lag= 7.1 min
Primary = 267.24 cfs @ 20.18 hrs, Volume= 160.640 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 60.36' @ 20.18 hrs Storage= 28.855 af (6.695 af above start)

Plug-Flow detention time= 180.4 min calculated for 138.478 af (86% of inflow)
Center-of-Mass det. time= 27.3 min (1,313.3 - 1,286.0)

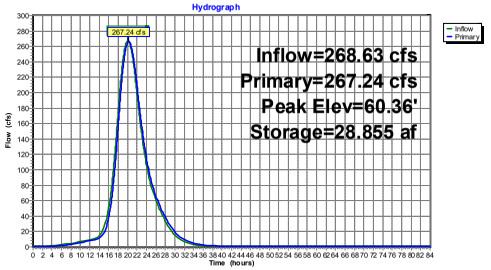
Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=267.24 cfs @ 20.18 hrs HW=60.36' TW=54.07' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 267.24 cfs @ 1.18 fps)

Pond 7P: Little Five Mile Pond



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Summary for Pond 8P: Five Mile Pond

Inflow = 267.24 cfs @ 20.18 hrs, Volume= 160.640 af
Outflow = 118.63 cfs @ 23.89 hrs, Volume= 160.632 af, Atten= 56%, Lag= 222.4 min
Primary = 18.50 cfs @ 23.89 hrs, Volume= 68.852 af
Secondary = 100.13 cfs @ 23.89 hrs, Volume= 49.254 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 55.57' @ 23.89 hrs Storage= 105.709 af

Plug-Flow detention time= 1,118.9 min calculated for 118.904 af (74% of inflow)
Center-of-Mass det. time= 983.5 min (2,296.8 - 1,313.3)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

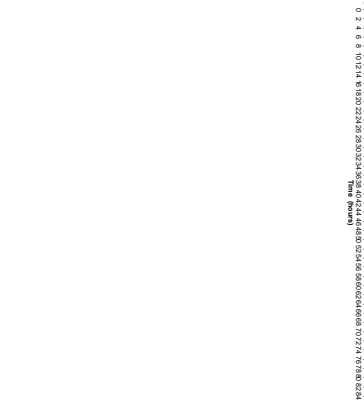
Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 400.00 (all) 60.00

Primary OutFlow Max=18.50 cfs @ 23.89 hrs HW=55.57' TW=32.64' (Dynamic Tailwater)
1=Culvert (Barrel Controls 18.50 cfs @ 5.88 fps)

Secondary OutFlow Max=100.13 cfs @ 23.89 hrs HW=55.57' TW=32.64' (Dynamic Tailwater)
2=TOD (Weir Controls 100.13 cfs @ 1.37 fps)

Pond 8P: Five Mile Pond

Hydrograph



Summary for Pond 9P: Kettle Hole

Inflow = 89.00 cfs @ 23.35 hrs, Volume= 77.792 af, Incl. 0.30 cfs Base Flow
Outflow = 88.63 cfs @ 23.47 hrs, Volume= 77.740 af, Atten= 0%, Lag= 7.0 min
Primary = 88.63 cfs @ 23.47 hrs, Volume= 77.740 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.72' @ 23.47 hrs Storage= 11.525 af (2.575 af above start)

Plug-Flow detention time= 191.9 min calculated for 68.790 af (88% of inflow)
Center-of-Mass det. time= 30.2 min (1,578.9 - 1,548.7)

Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	45.000
65.00	56.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.98'	**Rehabilitated C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=88.63 cfs @ 23.47 hrs HW=55.72' TW=32.64' (Dynamic Tailwater)
1=Relief (Weir Controls 88.63 cfs @ 1.48 fps)

Pond 9P: Kettle Hole

Hydrograph

Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow = 352.05 cfs @ 19.63 hrs, Volume= 354.205 af, Incl. 0.60 cfs Base Flow
Outflow = 340.40 cfs @ 20.10 hrs, Volume= 346.394 af, Atten= 3%, Lag= 27.9 min
Primary = 107.42 cfs @ 20.10 hrs, Volume= 231.519 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 232.98 cfs @ 20.10 hrs, Volume= 114.865 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.50' Storage= 1,500 af
Peak Elev= 32.68' @ 20.10 hrs Storage= 63.423 af (61.923 af above start)

Plug-Flow detention time= 316.5 min calculated for 344.884 af (97% of inflow)
Center-of-Mass det. time= 229.6 min (1,891.3 - 1,661.8)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LIDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
36.00	115.000
36.50	160.000
40.00	300.000

Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

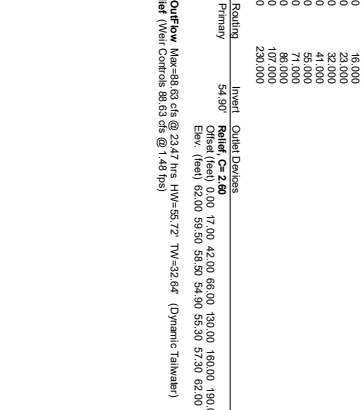
Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=107.42 cfs @ 20.10 hrs HW=32.68' TW=26.17' (Dynamic Tailwater)
1=Drop Inlet Spillway (Weir Controls 107.42 cfs @ 6.29 fps)

Secondary OutFlow Max=232.98 cfs @ 20.10 hrs HW=32.68' TW=26.17' (Dynamic Tailwater)
2=TOD (Weir Controls 232.98 cfs @ 1.37 fps)

Pond 10P: Maple Springs Brook Dam - 0.8sm

Hydrograph



Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow = 1,305.20 cfs @ 20.19 hrs, Volume= 912.499 af, Incl. 1.10 cfs Base Flow
Outflow = 568.64 cfs @ 24.92 hrs, Volume= 908.836 af, Atten= 56%, Lag= 283.8 min
Primary = 430.49 cfs @ 24.92 hrs, Volume= 858.620 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 138.15 cfs @ 24.92 hrs, Volume= 50.216 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 28.76' @ 24.92 hrs Storage= 408.683 af (405.973 af above start)

Plug-Flow detention time= 573.4 min calculated for 906.115 af (99% of inflow)
Center-of-Mass det. time= 545.0 min (2,096.6 - 1,551.7)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

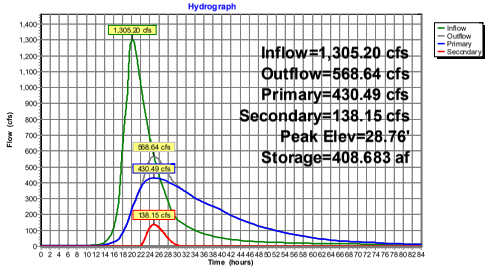
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=430.47 cfs @ 24.92 hrs HW=28.76' TW=23.99' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 430.47 cfs @ 9.24 fps)

Secondary OutFlow Max=136.53 cfs @ 24.92 hrs HW=28.76' TW=23.99' (Dynamic Tailwater)
└**2=TOR** (Weir Controls 136.53 cfs @ 1.02 fps)

Pond 11P: Unnamed Road - 1.8sm



Summary for Pond 12P: Maple Springs Road Dam

Inflow = 436.95 cfs @ 20.23 hrs, Volume= 246.839 af, Incl. 1.00 cfs Base Flow
Outflow = 436.61 cfs @ 20.24 hrs, Volume= 246.831 af, Atten= 0%, Lag= 0.7 min
Primary = 78.72 cfs @ 20.24 hrs, Volume= 90.924 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 357.89 cfs @ 20.24 hrs, Volume= 155.907 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 41.80' @ 20.24 hrs Storage= 20.606 af (19.526 af above start)

Plug-Flow detention time= 91.3 min calculated for 245.748 af (100% of inflow)
Center-of-Mass det. time= 72.1 min (1,380.1 - 1,308.0)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

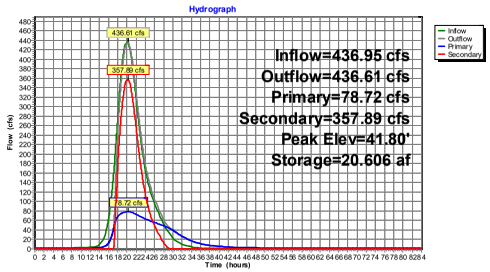
Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=78.72 cfs @ 20.24 hrs HW=41.80' TW=26.32' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 78.72 cfs @ 7.14 fps)

Secondary OutFlow Max=357.85 cfs @ 20.24 hrs HW=41.80' TW=26.32' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 357.85 cfs @ 1.98 fps)

Pond 12P: Maple Springs Road Dam



Summary for Pond 13.1P: Bogs_L_US

Inflow = 299.72 cfs @ 23.15 hrs, Volume= 262.315 af, Incl. 0.90 cfs Base Flow
Outflow = 264.57 cfs @ 25.00 hrs, Volume= 262.316 af, Atten= 12%, Lag= 110.8 min
Primary = 144.86 cfs @ 24.43 hrs, Volume= 219.399 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 120.02 cfs @ 25.01 hrs, Volume= 42.918 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 35.10' @ 25.01 hrs Storage= 54.747 af (54.693 af above start)

Plug-Flow detention time= 146.1 min calculated for 262.263 af (100% of inflow)
Center-of-Mass det. time= 145.1 min (1,668.1 - 1,523.1)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

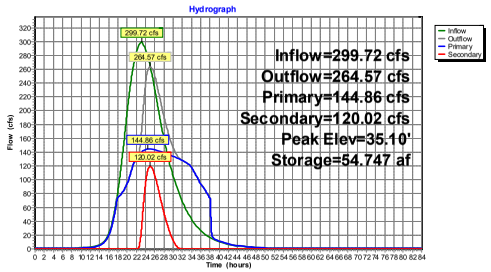
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=144.86 cfs @ 24.43 hrs HW=35.08' TW=29.77' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 144.86 cfs @ 9.66 fps)

Secondary OutFlow Max=120.02 cfs @ 25.01 hrs HW=35.10' TW=30.06' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 120.02 cfs @ 0.87 fps)

Pond 13.1P: Bogs_L_US



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Summary for Pond 13.2P: Bogs_L_DS

Inflow = 264.57 cfs @ 25.00 hrs, Volume= 262.316 af
Outflow = 134.02 cfs @ 30.98 hrs, Volume= 262.318 af, Atten= 49%, Lag= 359.2 min
Primary = 134.02 cfs @ 30.98 hrs, Volume= 262.318 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 30.60' @ 30.98 hrs Storage= 65.942 af (65.867 af above start)

Plug-Flow detention time= 231.8 min calculated for 262.243 af (100% of inflow)
Center-of-Mass det. time= 230.3 min (1,898.5 - 1,668.1)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

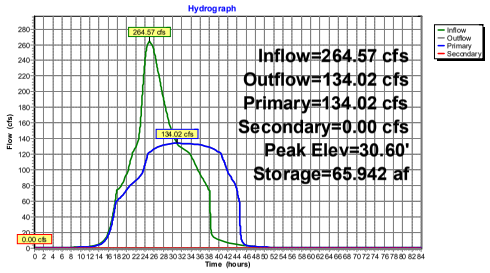
Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=134.03 cfs @ 30.98 hrs HW=30.60' TW=24.50' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 134.03 cfs @ 8.94 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 13.2P: Bogs_L_DS



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow = 831.58 cfs @ 24.49 hrs, Volume= 1,420.628 af, Incl. 0.80 cfs Base Flow
Outflow = 601.40 cfs @ 28.76 hrs, Volume= 1,419.910 af, Atten= 28%, Lag= 256.2 min
Primary = 600.70 cfs @ 28.76 hrs, Volume= 1,419.687 af
Routed to Link 23L : Inflow
Secondary = 1.60 cfs @ 29.91 hrs, Volume= 0.223 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 24.61' @ 28.76 hrs Storage= 282.903 af (281.838 af above start)

Plug-Flow detention time= 277.8 min calculated for 1,418.828 af (100% of inflow)
Center-of-Mass det. time= 272.3 min (2,192.3 - 1,920.0)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

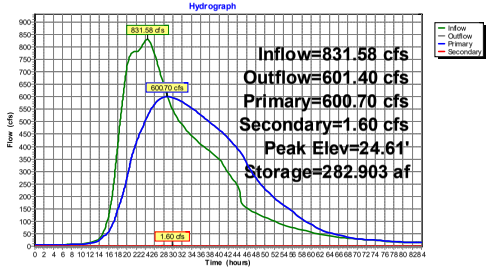
Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

Primary OutFlow Max=600.70 cfs @ 28.76 hrs HW=24.61' TW=0.00' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 600.70 cfs @ 8.51 fps)

Secondary OutFlow Max=0.28 cfs @ 29.91 hrs HW=24.58' TW=0.00' (Dynamic Tailwater)
↳**2=TOD** (Weir Controls 0.28 cfs @ 0.29 fps)

Pond 14P: Bogs_M - 2.7sm



Summary for Pond 15.1P: Bogs_N_US

Inflow = 352.74 cfs @ 19.33 hrs, Volume= 195.641 af, Incl. 0.60 cfs Base Flow
Outflow = 260.78 cfs @ 21.19 hrs, Volume= 195.635 af, Atten= 26%, Lag= 111.3 min
Primary = 121.84 cfs @ 21.19 hrs, Volume= 163.323 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 138.94 cfs @ 21.19 hrs, Volume= 32.312 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 29.41' @ 21.19 hrs Storage= 76.764 af (76.412 af above start)

Plug-Flow detention time= 285.1 min calculated for 195.283 af (100% of inflow)
Center-of-Mass det. time= 276.2 min (1,512.0 - 1,235.8)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

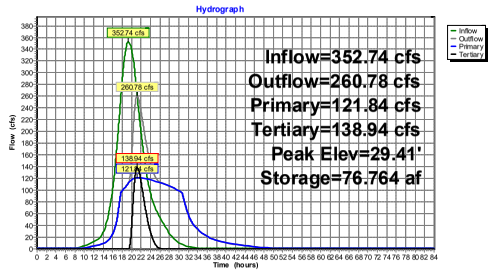
Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=121.84 cfs @ 21.19 hrs HW=29.41' TW=22.14' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 121.84 cfs @ 8.12 fps)

Tertiary OutFlow Max=138.94 cfs @ 21.19 hrs HW=29.41' TW=22.14' (Dynamic Tailwater)
↳**2=TOD** (Weir Controls 138.94 cfs @ 0.67 fps)

Pond 15.1P: Bogs_N_US



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Summary for Pond 15.2P: Bogs_N_DS

Inflow = 260.78 cfs @ 21.19 hrs, Volume= 195.635 af
Outflow = 95.24 cfs @ 30.68 hrs, Volume= 190.818 af, Atten= 63%, Lag= 569.6 min
Primary = 95.24 cfs @ 30.68 hrs, Volume= 190.818 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 23.36' @ 30.68 hrs Storage= 89.606 af (87.040 af above start)

Plug-Flow detention time= 693.1 min calculated for 188.252 af (96% of inflow)
Center-of-Mass det. time= 621.3 min (2,133.4 - 1,512.0)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

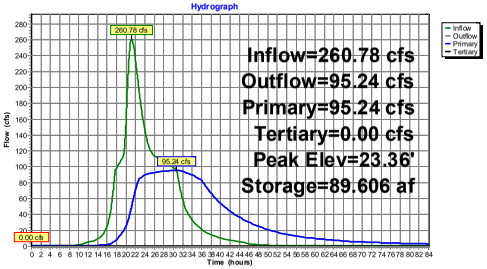
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=95.28 cfs @ 30.68 hrs HW=23.36' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 95.28 cfs @ 6.35 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS



Summary for Pond 16: Mill Pond Dam (Existing Conditions)

Inflow = 2,067.05 cfs @ 22.37 hrs, Volume= 4,153.424 af, Incl. 32.00 cfs Base Flow
Outflow = 1,757.20 cfs @ 25.22 hrs, Volume= 3,692.274 af, Atten= 15%, Lag= 170.7 min
Primary = 253.90 cfs @ 25.22 hrs, Volume= 1,231.477 af
Routed to Pond 17 : Cranberry Highway
Secondary = 487.97 cfs @ 25.22 hrs, Volume= 675.301 af
Routed to Pond 17 : Cranberry Highway
Tertiary = 1,015.33 cfs @ 25.22 hrs, Volume= 1,785.496 af
Routed to Pond 17 : Cranberry Highway

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 472.595 af
Peak Elev= 18.78' @ 25.22 hrs Storage= 1,525.443 af (1,052.848 af above start)

Plug-Flow detention time= 1,089.9 min calculated for 3,219.678 af (78% of inflow)
Center-of-Mass det. time= 494.0 min (2,484.4 - 1,990.4)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,944.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.470
5.00	4.600
6.00	9.700
7.00	17.300
8.00	35.800
9.00	61.550
10.00	95.500
11.00	143.900
12.00	216.000
13.00	316.000
14.00	427.850
15.00	577.000
16.00	773.500
17.00	996.500
18.00	1,274.360
19.00	1,595.000
20.00	1,944.000

Device	Routing	Invert	Outlet Devices
#1	Primary	13.60'	**4.9' long x 2.90' rise PS Stop Logs - Lt Bay** 2 End Contraction(s) 6.8' Crest Height
#2	Primary	13.80'	**4.9' long x 2.90' rise PS Stop Logs - RT Bay** 2 End Contraction(s) 6.8' Crest Height
#3	Tertiary	14.06'	**5.4' long x 5.00' rise Aux Spillway Stop Logs - Normal Height** 2 End Contraction(s) 4.0' Crest Height
#4	Secondary	18.00'	**TOD, C= 2.60**

Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 960.00 1,090.00
Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00

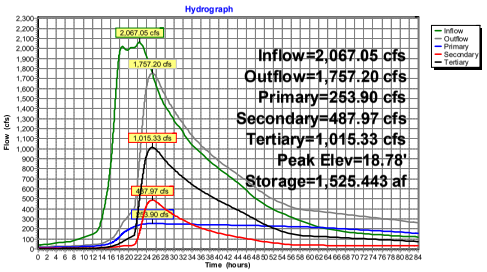
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 7	12.10'	**3.0' long x 8.0' breadth Fish Ladder** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#7	Secondary	13.70'	**FL CHaqnnel XS 1, C= 2.00** Offset (feet) 0.00 0.00 4.00 6.00 Elev. (feet) 15.00 13.70 13.70 15.00

Primary OutFlow Max=253.90 cfs @ 25.22 hrs HW=18.78' TW=9.56' (Dynamic Tailwater)
└**1=PS Stop Logs - Lt Bay** (Orifice Controls 128.96 cfs @ 10.29 fps)
└**2=PS Stop Logs - RT Bay** (Orifice Controls 124.94 cfs @ 9.97 fps)

Secondary OutFlow Max=487.97 cfs @ 25.22 hrs HW=18.78' TW=9.56' (Dynamic Tailwater)
└**4=TOD** (Weir Controls 447.15 cfs @ 1.27 fps)
└**7=FL CHaqnnel XS 1** (Weir Controls 40.82 cfs @ 5.23 fps)
└**6=Fish Ladder** (Passes 40.82 cfs of 135.36 cfs potential flow)

Tertiary OutFlow Max=1,015.33 cfs @ 25.22 hrs HW=18.78' TW=9.56' (Dynamic Tailwater)
└**3=Aux Spillway Stop Logs - Normal Height** (Weir Controls 171.14 cfs @ 8.13 fps)
└**5=US Relief - Bypasses Dam** (Weir Controls 844.18 cfs @ 1.35 fps)

Pond 16: Mill Pond Dam (Existing Conditions)



Summary for Pond 17: Cranberry Highway

Inflow = 1,757.20 cfs @ 25.22 hrs, Volume= 3,692.274 af
Outflow = 1,755.75 cfs @ 25.36 hrs, Volume= 3,692.229 af, Atten= 0%, Lag= 8.9 min
Primary = 1,755.75 cfs @ 25.36 hrs, Volume= 3,692.229 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 2.10' Storage= 0.612 af
Peak Elev= 9.57' @ 25.36 hrs Storage= 11.696 af (11.084 af above start)

Plug-Flow detention time= 2.7 min calculated for 3,691.571 af (100% of inflow)
Center-of-Mass det. time= 1.8 min (2,486.3 - 2,484.4)

Volume	Invert	Avail.Storage	Storage Description
#1	-1.00'	220.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
-1.00	0.000
1.00	0.200
5.00	1.700
7.00	4.000
10.00	13.000
11.50	18.000
13.50	31.000
15.00	45.000
20.00	100.000
30.00	220.000

Device	Routing	Invert	Outlet Devices
#1	Primary	-0.50'	**264.0" W x 126.0" H Box Culvert** L= 150.0' Ke= 0.500 Inlet / Outlet Invert= -0.50' / -1.00' S= 0.0033 '/' Cc= 0.900 n= 0.020, Flow Area= 231.00 sf
#2	Secondary	15.90'	**Relief, C= 1.80** Offset (feet) 0.00 35.00 420.00 460.00 Elev. (feet) 19.00 15.90 15.90 19.00

Primary OutFlow Max=1,755.70 cfs @ 25.36 hrs HW=9.57' (Free Discharge)
└**1=Culvert** (Barrel Controls 1,755.70 cfs @ 10.57 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.10' (Free Discharge)
└**2=Relief** (Controls 0.00 cfs)

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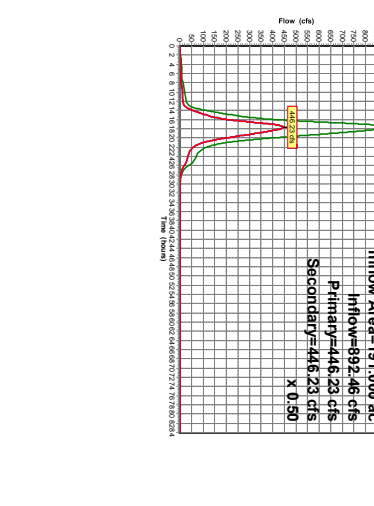
Pond 17: Cranberry Highway



Summary for Link 23L: Inflow

Inflow = 2,035.05 cfs @ 22.37 hrs, Volume= 3,931,272 af
Primary = 2,035.05 cfs @ 22.37 hrs, Volume= 3,931,272 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16 : Mill Pond Dam (Existing Conditions)

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

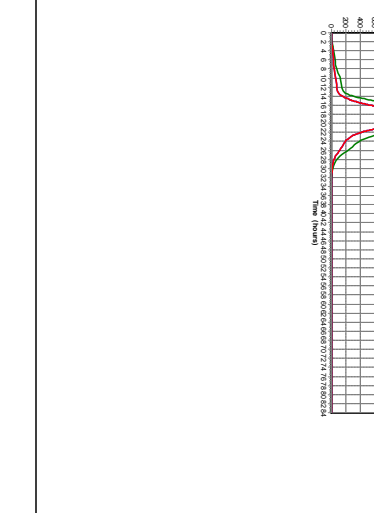
Link 23L: Inflow

Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 22.93" for PMP24hour event
Inflow = 2,869.55 cfs @ 18.35 hrs, Volume= 1,358,553 af
Primary = 1,434.78 cfs @ 18.35 hrs, Volume= 679,441 af, Atten= 50%, Lag= 0.0 min
Secondary = 1,434.78 cfs @ 18.35 hrs, Volume= 679,441 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow

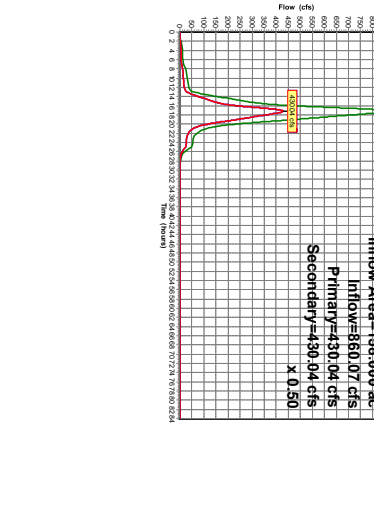


Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 21.98" for PMP24hour event
Inflow = 892.46 cfs @ 17.69 hrs, Volume= 349,914 af
Primary = 446.23 cfs @ 17.69 hrs, Volume= 174,957 af, Atten= 50%, Lag= 0.0 min
Secondary = 446.23 cfs @ 17.69 hrs, Volume= 174,957 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

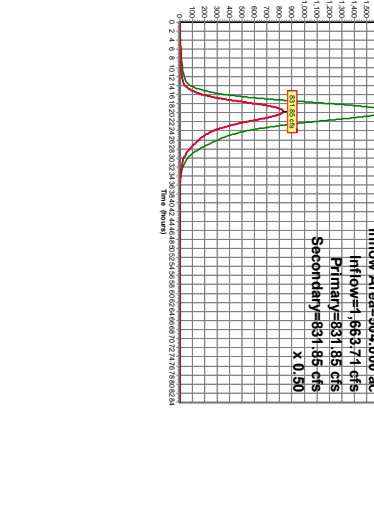


Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth = 21.96" for PMP24hour event
Inflow = 1,663.71 cfs @ 19.77 hrs, Volume= 922,324 af
Primary = 831.85 cfs @ 19.77 hrs, Volume= 461,162 af, Atten= 50%, Lag= 0.0 min
Secondary = 831.85 cfs @ 19.77 hrs, Volume= 461,162 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow



Summary for Link D1: 1/2 Flow

Inflow Area = 168.000 ac, 31.94% Impervious, Inflow Depth = 23.81" for PMP24hour event
Inflow = 860.07 cfs @ 17.13 hrs, Volume= 313,439 af
Primary = 430.04 cfs @ 17.13 hrs, Volume= 156,719 af, Atten= 50%, Lag= 0.0 min
Secondary = 430.04 cfs @ 17.13 hrs, Volume= 156,719 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

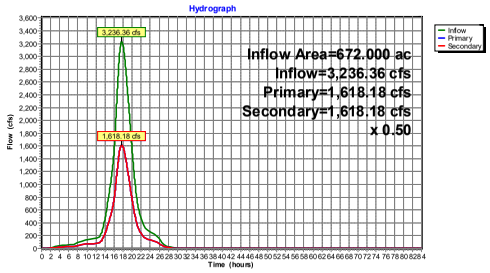
Link D1: 1/2 Flow

Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 24.08" for PMP24hour event
Inflow = 3,236.36 cfs @ 17.62 hrs, Volume= 1,348.332 af
Primary = 1,618.18 cfs @ 17.62 hrs, Volume= 674.166 af, Atten= 50%, Lag= 0.0 min
Secondary = 1,618.18 cfs @ 17.62 hrs, Volume= 674.166 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow

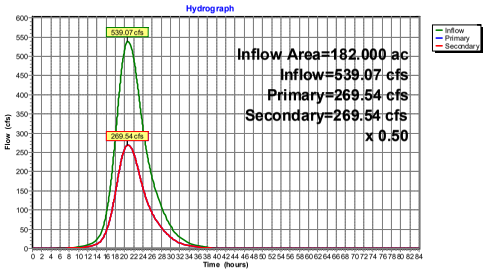


Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 23.40" for PMP24hour event
Inflow = 539.07 cfs @ 20.53 hrs, Volume= 354.916 af
Primary = 269.54 cfs @ 20.53 hrs, Volume= 177.458 af, Atten= 50%, Lag= 0.0 min
Secondary = 269.54 cfs @ 20.53 hrs, Volume= 177.458 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow

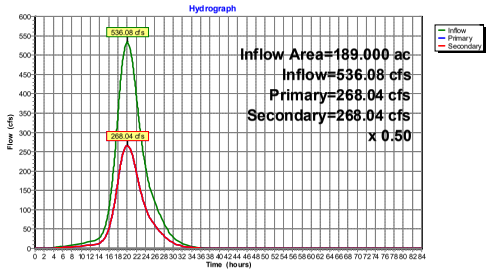


Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth = 19.89" for PMP24hour event
Inflow = 536.08 cfs @ 20.06 hrs, Volume= 313.189 af
Primary = 268.04 cfs @ 20.06 hrs, Volume= 156.595 af, Atten= 50%, Lag= 0.0 min
Secondary = 268.04 cfs @ 20.06 hrs, Volume= 156.595 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow

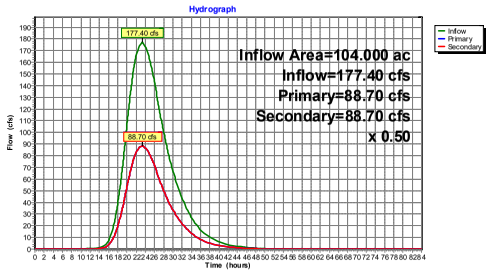


Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth = 17.46" for PMP24hour event
Inflow = 177.40 cfs @ 23.35 hrs, Volume= 151.298 af
Primary = 88.70 cfs @ 23.35 hrs, Volume= 75.649 af, Atten= 50%, Lag= 0.0 min
Secondary = 88.70 cfs @ 23.35 hrs, Volume= 75.649 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow

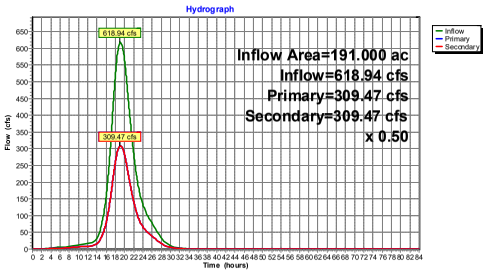


Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth = 19.27" for PMP24hour event
Inflow = 618.94 cfs @ 19.05 hrs, Volume= 306.787 af
Primary = 309.47 cfs @ 19.05 hrs, Volume= 153.394 af, Atten= 50%, Lag= 0.0 min
Secondary = 309.47 cfs @ 19.05 hrs, Volume= 153.394 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

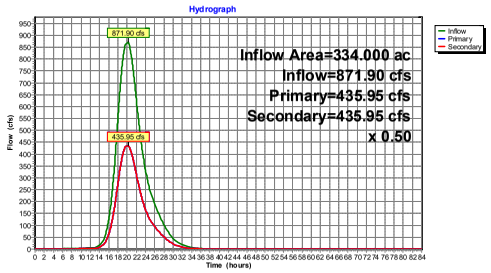


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth = 17.24" for PMP24hour event
Inflow = 871.90 cfs @ 20.23 hrs, Volume= 479.793 af
Primary = 435.95 cfs @ 20.23 hrs, Volume= 239.897 af, Atten= 50%, Lag= 0.0 min
Secondary = 435.95 cfs @ 20.23 hrs, Volume= 239.897 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow



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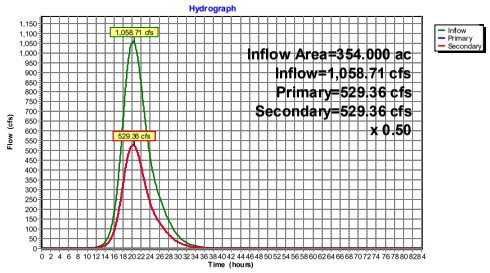
Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth = 21.13" for PMP24hour event
Inflow = 1,058.71 cfs @ 20.39 hrs, Volume= 623.293 af
Primary = 529.36 cfs @ 20.39 hrs, Volume= 311.647 af, Atten= 50%, Lag= 0.0 min
Secondary = 529.36 cfs @ 20.39 hrs, Volume= 311.647 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow

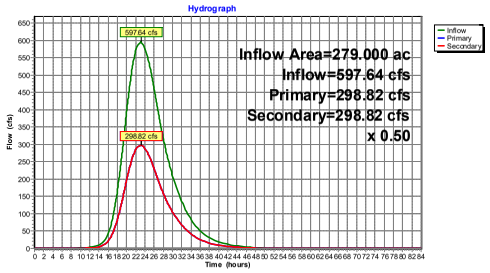


Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth = 22.03" for PMP24hour event
Inflow = 597.64 cfs @ 23.15 hrs, Volume= 512.134 af
Primary = 298.82 cfs @ 23.15 hrs, Volume= 256.067 af, Atten= 50%, Lag= 0.0 min
Secondary = 298.82 cfs @ 23.15 hrs, Volume= 256.067 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow

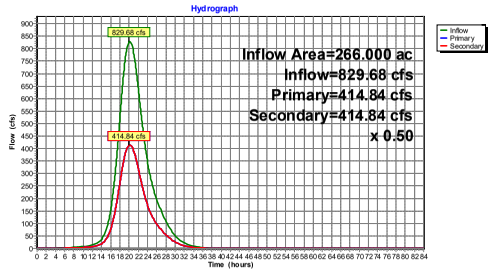


Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth = 22.01" for PMP24hour event
Inflow = 829.68 cfs @ 20.01 hrs, Volume= 487.840 af
Primary = 414.84 cfs @ 20.01 hrs, Volume= 243.920 af, Atten= 50%, Lag= 0.0 min
Secondary = 414.84 cfs @ 20.01 hrs, Volume= 243.920 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow

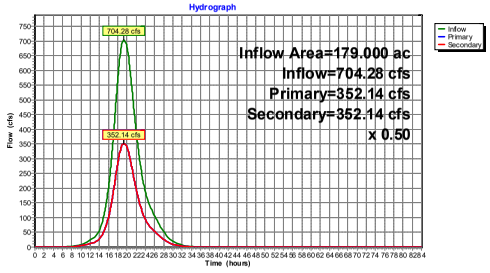


Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth = 25.67" for PMP24hour event
Inflow = 704.28 cfs @ 19.33 hrs, Volume= 382.951 af
Primary = 352.14 cfs @ 19.33 hrs, Volume= 191.475 af, Atten= 50%, Lag= 0.0 min
Secondary = 352.14 cfs @ 19.33 hrs, Volume= 191.475 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow

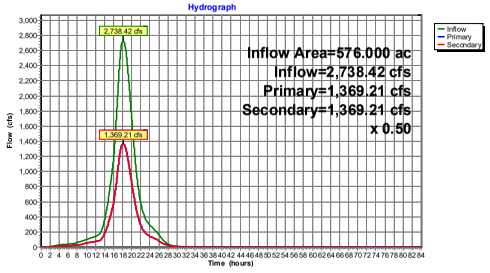


Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 25.74" for PMP24hour event
Inflow = 2,738.42 cfs @ 18.09 hrs, Volume= 1,235.635 af
Primary = 1,369.21 cfs @ 18.09 hrs, Volume= 617.818 af, Atten= 50%, Lag= 0.0 min
Secondary = 1,369.21 cfs @ 18.09 hrs, Volume= 617.818 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow

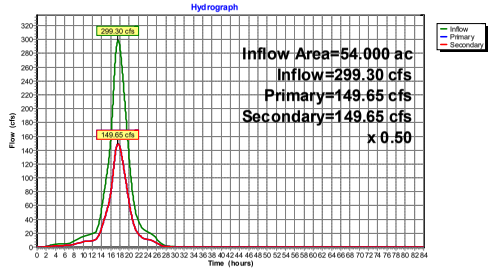


Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 28.00" for PMP24hour event
Inflow = 299.30 cfs @ 17.49 hrs, Volume= 125.979 af
Primary = 149.65 cfs @ 17.49 hrs, Volume= 62.989 af, Atten= 50%, Lag= 0.0 min
Secondary = 149.65 cfs @ 17.49 hrs, Volume= 62.989 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



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Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=28.21"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=2,426.71 cfs 1,671.571 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=27.28"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=691.53 cfs 434.241 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth>27.30"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=1,538.32 cfs 1,146.691 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=29.19"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=602.39 cfs 384.327 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=29.46"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=2,493.41 cfs 1,649.777 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth>28.86"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=521.73 cfs 437.759 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth>24.95"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=508.30 cfs 392.919 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth>22.29"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=188.58 cfs 193.195 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth>24.31"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=561.73 cfs 386.870 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth>22.15"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=845.68 cfs 616.506 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth>26.45"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=1,011.02 cfs 780.185 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth>27.29"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=614.50 cfs 634.520 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth>27.36"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=780.36 cfs 606.555 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth>31.30"
Tc=300.0 min CN=56/98 Runoff=630.13 cfs 466.852 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=31.30"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=2,193.48 cfs 1,502.185 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=33.67"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=220.77 cfs 151.529 af

Pond 1P: Halfway Pond Peak Elev=67.26' Storage=1,128.037 af Inflow=1,215.55 cfs 851.058 af
Primary=48.83 cfs 127.705 af Secondary=0.00 cfs 0.000 af Outflow=48.83 cfs 127.705 af

Pond 2P: Kennard Res Peak Elev=59.96' Storage=68.671 af Inflow=370.04 cfs 348.991 af
Primary=134.63 cfs 251.821 af Secondary=221.05 cfs 71.140 af Outflow=355.68 cfs 322.961 af

Pond 3P: Fawn Pond Peak Elev=62.15' Storage=170.253 af Inflow=301.69 cfs 195.634 af
Primary=22.61 cfs 52.742 af Tertiary=45.55 cfs 45.569 af Outflow=68.16 cfs 98.311 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=51.07' Storage=224.848 af Inflow=1,164.87 cfs 1,005.725 af
Primary=147.03 cfs 367.917 af Secondary=936.77 cfs 526.201 af Outflow=1,083.80 cfs 894.118 af

Pond 5P: Glen Charlie Pond Peak Elev=37.57' Storage=658.304 af Inflow=2,037.30 cfs 1,733.585 af
,239.92 cfs 1,435.372 af Secondary=57.38 cfs 37.563 af Tertiary=15.04 cfs 16.157 af Outflow=1,312.09 cfs 1,489.092 af

Pond 6.1P: Ortalani Reservoir Peak Elev=36.19' Storage=33.768 af Inflow=72.19 cfs 53.720 af
Outflow=17.97 cfs 32.203 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=25.04' Storage=40.864 af Inflow=415.72 cfs 312.391 af
Primary=32.51 cfs 71.356 af Secondary=379.72 cfs 220.027 af Outflow=412.24 cfs 291.382 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=22.40' Storage=42.467 af Inflow=412.24 cfs 291.382 af
Primary=197.47 cfs 235.734 af Secondary=194.90 cfs 53.300 af Outflow=392.38 cfs 289.034 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=25.69' Storage=17.442 af Inflow=1,239.92 cfs 1,435.372 af
Primary=1,079.95 cfs 1,368.798 af Secondary=159.76 cfs 61.308 af Outflow=1,239.71 cfs 1,430.106 af

Pond 7P: Little Five Mile Pond Peak Elev=60.33' Storage=28.677 af Inflow=254.74 cfs 200.556 af
Outflow=254.14 cfs 200.371 af

Pond 8P: Five Mile Pond Peak Elev=55.68' Storage=109.571 af Inflow=254.14 cfs 200.371 af
Primary=18.97 cfs 41.502 af Secondary=140.28 cfs 80.049 af Outflow=159.25 cfs 121.551 af

Pond 9P: Kettle Hole Peak Elev=55.75' Storage=11.614 af Inflow=94.59 cfs 98.680 af
Outflow=94.24 cfs 98.313 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=32.70' Storage=63.918 af Inflow=368.42 cfs 417.464 af
Primary=108.43 cfs 225.957 af Secondary=258.99 cfs 167.795 af Outflow=367.42 cfs 393.752 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=29.11' Storage=442.283 af Inflow=1,272.15 cfs 1,104.372 af
Primary=449.61 cfs 836.390 af Secondary=295.50 cfs 133.785 af Outflow=733.01 cfs 970.176 af

Pond 12P: Maple Springs Road Dam Peak Elev=41.78' Storage=20.473 af Inflow=423.84 cfs 315.195 af
Primary=78.05 cfs 123.238 af Secondary=344.67 cfs 189.653 af Outflow=422.73 cfs 312.891 af

Pond 13.1P: Bogs_L_US Peak Elev=35.14' Storage=55.817 af Inflow=308.15 cfs 323.508 af
Primary=145.31 cfs 264.413 af Secondary=140.46 cfs 58.956 af Outflow=285.52 cfs 323.369 af

Pond 13.2P: Bogs_L_DS Peak Elev=30.84' Storage=80.586 af Inflow=285.52 cfs 323.369 af
Primary=138.76 cfs 319.117 af Secondary=0.00 cfs 0.000 af Outflow=138.76 cfs 319.117 af

Pond 14P: Bogs_M - 2.7sm Peak Elev=25.34' Storage=337.482 af Inflow=1,039.37 cfs 1,598.124 af
Primary=674.63 cfs 1,401.365 af Secondary=107.40 cfs 44.958 af Outflow=782.03 cfs 1,446.324 af

Pond 15.1P: Bogs_N_US Peak Elev=29.41' Storage=76.615 af Inflow=315.66 cfs 237.592 af
Primary=121.77 cfs 199.469 af Tertiary=136.35 cfs 36.328 af Outflow=258.12 cfs 235.798 af

Pond 15.2P: Bogs_N_DS Peak Elev=23.51' Storage=98.204 af Inflow=258.12 cfs 235.798 af
Primary=99.75 cfs 198.393 af Tertiary=0.00 cfs 0.000 af Outflow=99.75 cfs 198.393 af

Pond 16: Mill Pond Dam (Existing Peak Elev=18.89' Storage=1,559.601 af Inflow=2,401.52 cfs 4,351.557 af
5 cfs 755.092 af Secondary=655.25 cfs 828.684 af Tertiary=1,250.50 cfs 1,844.767 af Outflow=2,163.91 cfs 3,428.543 af

Pond 17: Cranberry Highway Peak Elev=11.10' Storage=16.653 af Inflow=2,163.91 cfs 3,428.543 af
Primary=2,162.44 cfs 3,427.202 af Secondary=0.00 cfs 0.000 af Outflow=2,162.44 cfs 3,427.202 af

Link 23L: Inflow Inflow=2,369.52 cfs 4,129.405 af
Primary=2,369.52 cfs 4,129.405 af

Link A1: 1/2 Flow x 0.50 Inflow=2,426.71 cfs 1,671.571 af
Primary=1,213.35 cfs 835.785 af Secondary=1,213.35 cfs 835.785 af

Link B1: 1/2 Flow x 0.50 Inflow=691.53 cfs 434.241 af
Primary=345.77 cfs 217.121 af Secondary=345.77 cfs 217.121 af

Link C1: 1/2 Flow x 0.50 Inflow=1,538.32 cfs 1,146.691 af
Primary=769.16 cfs 573.345 af Secondary=769.16 cfs 573.345 af

Link D1: 1/2 Flow x 0.50 Inflow=602.39 cfs 384.327 af
Primary=301.19 cfs 192.163 af Secondary=301.19 cfs 192.163 af

Link E1: 1/2 Flow x 0.50 Inflow=2,493.41 cfs 1,649.777 af
Primary=1,246.70 cfs 824.889 af Secondary=1,246.70 cfs 824.889 af

Link F1: 1/2 Flow x 0.50 Inflow=521.73 cfs 437.759 af
Primary=260.87 cfs 218.880 af Secondary=260.87 cfs 218.880 af

Link G1: 1/2 Flow x 0.50 Inflow=508.30 cfs 392.919 af
Primary=254.15 cfs 196.460 af Secondary=254.15 cfs 196.460 af

Link H1: 1/2 Flow x 0.50 Inflow=188.58 cfs 193.195 af
Primary=94.29 cfs 96.597 af Secondary=94.29 cfs 96.597 af

Link I1: 1/2 Flow x 0.50 Inflow=561.73 cfs 386.870 af
Primary=280.86 cfs 193.435 af Secondary=280.86 cfs 193.435 af

Link JL: 1/2 Flow x 0.50 Inflow=845.68 cfs 616.506 af
Primary=422.84 cfs 308.253 af Secondary=422.84 cfs 308.253 af

Link KL: 1/2 Flow x 0.50 Inflow=1,011.02 cfs 780.185 af
Primary=505.51 cfs 390.093 af Secondary=505.51 cfs 390.093 af

Link LL: 1/2 Flow x 0.50 Inflow=614.50 cfs 634.520 af
Primary=307.25 cfs 317.260 af Secondary=307.25 cfs 317.260 af

Link ML: 1/2 Flow x 0.50 Inflow=780.36 cfs 606.555 af
Primary=390.18 cfs 303.278 af Secondary=390.18 cfs 303.278 af

Link NL: 1/2 Flow x 0.50 Inflow=630.13 cfs 466.852 af
Primary=315.06 cfs 233.426 af Secondary=315.06 cfs 233.426 af

Link OL: 1/2 Flow x 0.50 Inflow=2,193.48 cfs 1,502.185 af
Primary=1,096.74 cfs 751.092 af Secondary=1,096.74 cfs 751.092 af

Link PL: 1/2 Flow x 0.50 Inflow=220.77 cfs 151.529 af
Primary=110.38 cfs 75.765 af Secondary=110.38 cfs 75.765 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 11,455.683 af Average Runoff Depth = 27.81"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

Summary for Subcatchment A: A

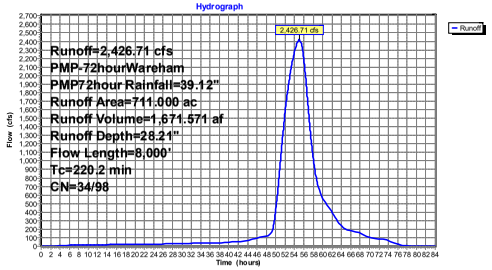
Runoff = 2,426.71 cfs @ 55.05 hrs, Volume= 1,671.571 af, Depth=28.21"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

	Area (ac)	CN	Description
*	711.000	56	"33.99% imp"
	469.331	34	66.01% Pervious Area
	241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



Summary for Subcatchment B: B

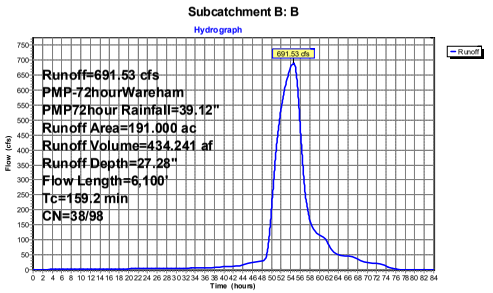
Runoff = 691.53 cfs @ 54.66 hrs, Volume= 434.241 af, Depth=27.28"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

	Area (ac)	CN	Description
*	191.000	49	"18.54% imp"
	155.589	38	81.46% Pervious Area
	35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



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Summary for Subcatchment C: C

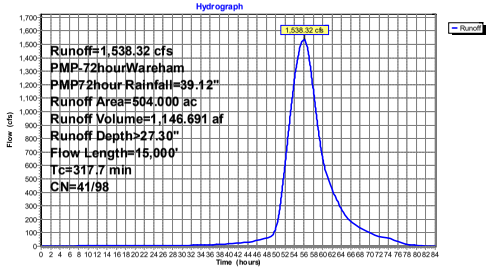
Runoff = 1,538.32 cfs @ 56.13 hrs, Volume= 1,146.691 af, Depth>27.30"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

	Area (ac)	CN	Description
*	504.000	47	"10.54% imp"
	450.878	41	89.46% Pervious Area
	53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



Summary for Subcatchment D: D

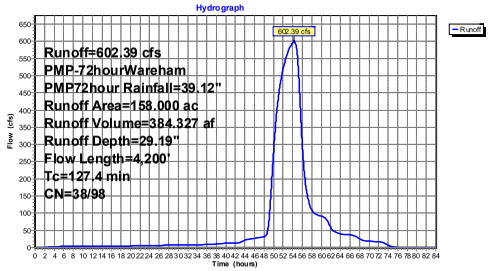
Runoff = 602.39 cfs @ 54.36 hrs, Volume= 384.327 af, Depth=29.19"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

	Area (ac)	CN	Description
*	158.000	57	"31.94% imp"
	107.535	38	68.06% Pervious Area
	50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



Summary for Subcatchment E: E

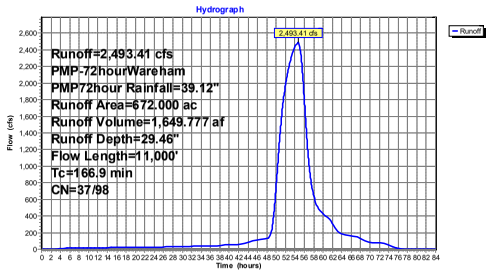
Runoff = 2,493.41 cfs @ 54.71 hrs, Volume= 1,649.777 af, Depth=29.46"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

	Area (ac)	CN	Description
*	672.000	59	"35.91% imp"
	430.685	37	64.09% Pervious Area
	241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



Summary for Subcatchment F: F

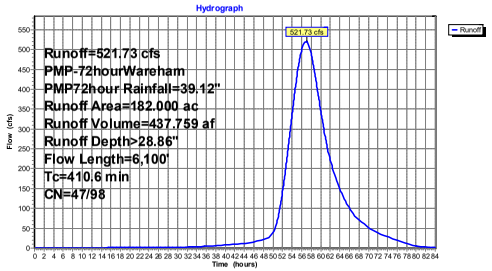
Runoff = 521.73 cfs @ 57.03 hrs, Volume= 437.759 af, Depth>28.86"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

	Area (ac)	CN	Description
*	182.000	50	"6.11% imp"
	170.880	47	93.89% Pervious Area
	11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



Summary for Subcatchment G: G

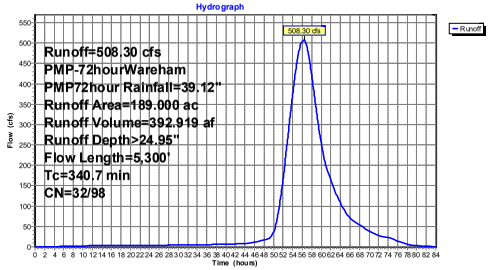
Runoff = 508.30 cfs @ 56.40 hrs, Volume= 392.919 af, Depth>24.95"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

	Area (ac)	CN	Description
*	189.000	45	"19.09% imp"
	152.920	32	80.91% Pervious Area
	36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



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Summary for Subcatchment H: H

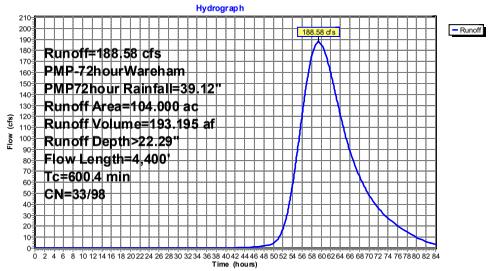
Runoff = 188.58 cfs @ 59.37 hrs, Volume= 193.195 af, Depth>22.29"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 104.000	34	*1.27% imp*
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

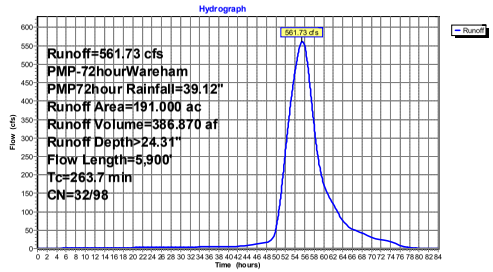
Runoff = 561.73 cfs @ 55.38 hrs, Volume= 386.870 af, Depth>24.31"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 191.000	42	*15.34% imp*
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



Summary for Subcatchment J: J

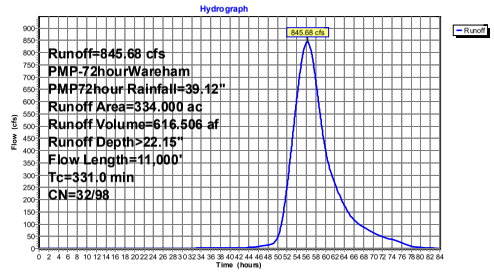
Runoff = 845.68 cfs @ 56.27 hrs, Volume= 616.506 af, Depth>22.15"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 334.000	34	*2.83% imp*
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Summary for Subcatchment K: K

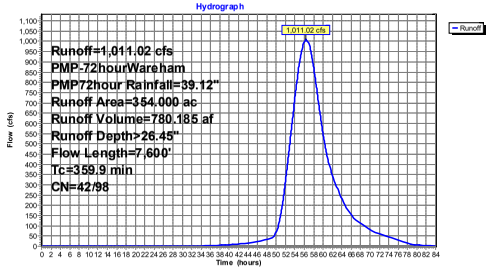
Runoff = 1,011.02 cfs @ 56.38 hrs, Volume= 780.185 af, Depth>26.45"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 354.000	42	*0.83% imp*
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



Summary for Subcatchment L: L

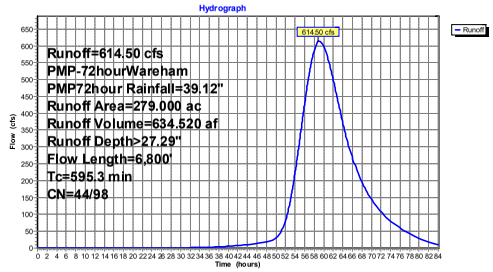
Runoff = 614.50 cfs @ 58.87 hrs, Volume= 634.520 af, Depth>27.29"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 279.000	45	*2.43% imp*
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



Summary for Subcatchment M: M

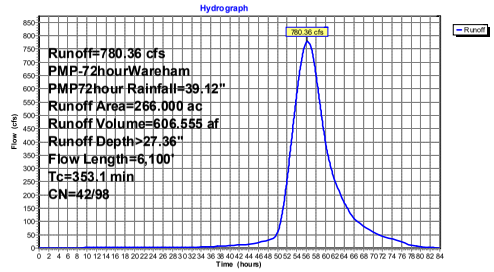
Runoff = 780.36 cfs @ 56.11 hrs, Volume= 606.555 af, Depth>27.36"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 266.000	47	*8.14% imp*
244.348	42	91.86% Pervious Area
21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



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Summary for Subcatchment N: N

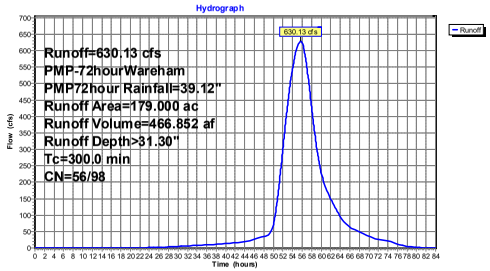
Runoff = 630.13 cfs @ 55.67 hrs, Volume= 466.852 af, Depth>31.30"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 179.000	57	"3.17% imp"
173.326	56	96.83% Pervious Area
5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

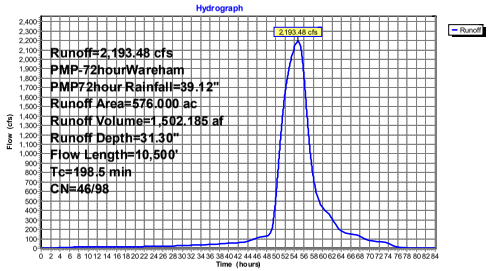
Runoff = 2,193.48 cfs @ 54.70 hrs, Volume= 1,502.185 af, Depth=31.30"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 576.000	62	"31.1% imp"
396.864	46	68.90% Pervious Area
179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



Summary for Subcatchment P: P

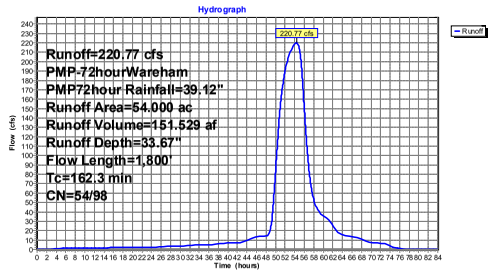
Runoff = 220.77 cfs @ 54.46 hrs, Volume= 151.529 af, Depth=33.67"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 54.000	71	"38.05% imp"
33.453	54	61.95% Pervious Area
20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Summary for Pond 1P: Halfway Pond

Inflow = 1,215.55 cfs @ 55.05 hrs, Volume= 851.058 af, Incl. 2.20 cfs Base Flow
Outflow = 48.83 cfs @ 70.77 hrs, Volume= 127.705 af, Atten= 96%, Lag= 943.3 min
Primary = 48.83 cfs @ 70.77 hrs, Volume= 127.705 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 67.26' @ 70.77 hrs Storage= 1,128.037 af (757.427 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 658.6 min (3,919.2 - 3,260.6)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

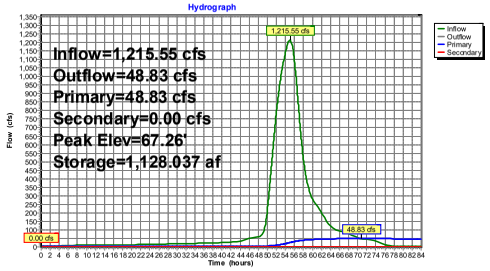
Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=48.83 cfs @ 70.77 hrs HW=67.26' TW=58.96' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 48.83 cfs @ 6.67 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 1P: Halfway Pond



Summary for Pond 2P: Kennard Res

Inflow = 370.04 cfs @ 54.66 hrs, Volume= 348.991 af, Incl. 0.60 cfs Base Flow
Outflow = 355.68 cfs @ 55.16 hrs, Volume= 322.961 af, Atten= 4%, Lag= 30.2 min
Primary = 134.63 cfs @ 55.16 hrs, Volume= 251.821 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 221.05 cfs @ 55.16 hrs, Volume= 71.140 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 59.96' @ 55.16 hrs Storage= 68.671 af (64.671 af above start)

Plug-Flow detention time= 308.4 min calculated for 318.961 af (91% of inflow)
Center-of-Mass det. time= 144.9 min (3,637.0 - 3,492.1)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=134.64 cfs @ 55.16 hrs HW=59.96' TW=50.81' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Orifice Controls 134.64 cfs @ 6.34 fps)

Secondary OutFlow Max=220.90 cfs @ 55.16 hrs HW=59.96' TW=50.81' (Dynamic Tailwater)
└**1=TOD** (Weir Controls 220.90 cfs @ 1.73 fps)

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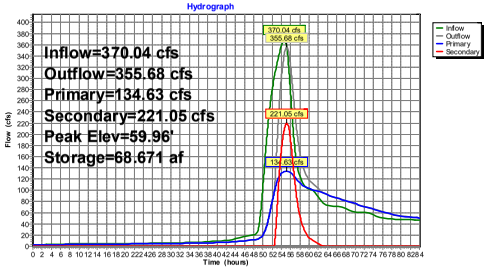
Pond 2P: Kennard Res



Summary for Pond 3P: Fawn Pond

Inflow = 301.69 cfs @ 54.36 hrs, Volume= 195.634 af, Incl. 0.50 cfs Base Flow
Outflow = 68.16 cfs @ 57.32 hrs, Volume= 98.311 af, Atten= 77%, Lag= 178.0 min
Primary = 22.61 cfs @ 57.32 hrs, Volume= 52.742 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 45.55 cfs @ 57.32 hrs, Volume= 45.569 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 62.15' @ 57.32 hrs Storage= 170.253 af (142.533 af above start)

Plug-Flow detention time= 1,302.0 min calculated for 70.591 af (36% of inflow)
Center-of-Mass det. time= 660.0 min (3,839.1 - 3,179.1)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

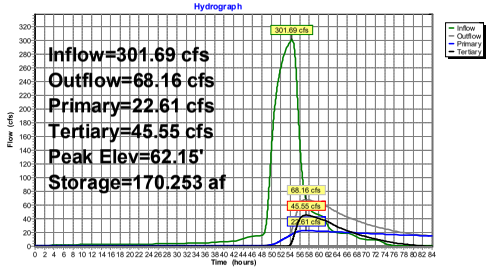
Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=22.62 cfs @ 57.32 hrs HW=62.15' TW=51.03' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 22.62 cfs @ 5.41 fps)

Tertiary OutFlow Max=45.53 cfs @ 57.32 hrs HW=62.15' TW=51.03' (Dynamic Tailwater)
└**2=TOD South** (Weir Controls 45.53 cfs @ 1.67 fps)

Pond 3P: Fawn Pond



Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow = 1,164.87 cfs @ 55.66 hrs, Volume= 1,005.725 af, Incl. 1.60 cfs Base Flow
Outflow = 1,083.80 cfs @ 56.58 hrs, Volume= 894.118 af, Atten= 7%, Lag= 55.7 min
Primary = 147.03 cfs @ 56.58 hrs, Volume= 367.917 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 936.77 cfs @ 56.58 hrs, Volume= 526.201 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 51.07' @ 56.58 hrs Storage= 224.848 af (215.128 af above start)

Plug-Flow detention time= 324.8 min calculated for 884.397 af (88% of inflow)
Center-of-Mass det. time= 152.5 min (3,676.4 - 3,523.9)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

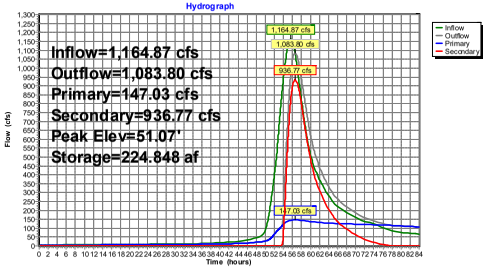
Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=147.03 cfs @ 56.58 hrs HW=51.07' TW=37.43' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Orifice Controls 147.03 cfs @ 10.11 fps)

Secondary OutFlow Max=936.42 cfs @ 56.58 hrs HW=51.07' TW=37.43' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 936.42 cfs @ 2.60 fps)

Pond 4P: Bessey Bog Res - 2.4sm



Summary for Pond 5P: Glen Charlie Pond

Inflow = 2,037.30 cfs @ 55.45 hrs, Volume= 1,733.585 af, Incl. 2.10 cfs Base Flow
Outflow = 1,312.09 cfs @ 57.83 hrs, Volume= 1,489.092 af, Atten= 36%, Lag= 142.7 min
Primary = 1,239.92 cfs @ 57.83 hrs, Volume= 1,435.372 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 57.38 cfs @ 57.81 hrs, Volume= 37.563 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 15.04 cfs @ 57.12 hrs, Volume= 16.157 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 37.57' @ 57.83 hrs Storage= 658.304 af (632.179 af above start)

Plug-Flow detention time= 541.6 min calculated for 1,462.967 af (84% of inflow)
Center-of-Mass det. time= 323.3 min (3,771.7 - 3,448.5)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00 Elev. (feet) 41.00 40.00 39.00 37.70 37.70 41.00

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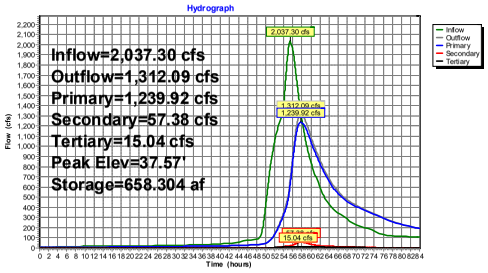
#6	Tertiary	34.50'	**24.0" W x 12.0" H Vert. NE Culvert** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1,238.53 cfs @ 57.83 hrs HW=37.57' TW=25.69' (Dynamic Tailwater)
└─**1=Spillway** (Weir Controls 760.29 cfs @ 9.28 fps)
└─**2=TOD** (Weir Controls 478.23 cfs @ 1.55 fps)

Secondary OutFlow Max=56.92 cfs @ 57.81 hrs HW=37.57' TW=35.14' (Dynamic Tailwater)
└─**3=SE Dike** (Weir Controls 29.34 cfs @ 0.79 fps)
└─**4=SE Culvert** (Orifice Controls 27.58 cfs @ 6.89 fps)

Tertiary OutFlow Max=15.04 cfs @ 57.12 hrs HW=37.53' TW=34.92' (Dynamic Tailwater)
└─**5=NE Dike** (Controls 0.00 cfs)
└─**6=NE Culvert** (Orifice Controls 15.04 cfs @ 7.52 fps)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 72.19 cfs @ 57.78 hrs, Volume= 53.720 af
Outflow = 17.97 cfs @ 67.99 hrs, Volume= 32.203 af, Atten= 75%, Lag= 612.4 min
Primary = 17.97 cfs @ 67.99 hrs, Volume= 32.203 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 36.19' @ 67.99 hrs Storage= 33.768 af

Plug-Flow detention time= 761.3 min calculated for 32.203 af (60% of inflow)
Center-of-Mass det. time= 549.2 min (4,208.4 - 3,659.2)

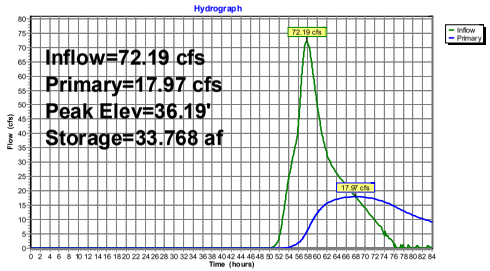
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=18.00 cfs @ 67.99 hrs HW=36.19' TW=24.40' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 18.00 cfs @ 4.53 fps)
└─**2=TOD** (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



Summary for Pond 6.2P: Maple Sping Bogs US

Inflow = 415.72 cfs @ 57.60 hrs, Volume= 312.391 af
Outflow = 412.24 cfs @ 57.94 hrs, Volume= 291.382 af, Atten= 1%, Lag= 20.4 min
Primary = 32.51 cfs @ 57.94 hrs, Volume= 71.356 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 379.72 cfs @ 57.94 hrs, Volume= 220.027 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 25.04' @ 57.94 hrs Storage= 40.864 af

Plug-Flow detention time= 179.1 min calculated for 291.382 af (93% of inflow)
Center-of-Mass det. time= 107.2 min (3,697.0 - 3,589.7)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

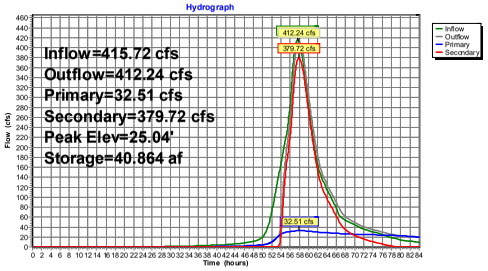
Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=32.51 cfs @ 57.94 hrs HW=25.04' TW=22.33' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 32.51 cfs @ 6.50 fps)

Secondary OutFlow Max=379.68 cfs @ 57.94 hrs HW=25.04' TW=22.33' (Dynamic Tailwater)
└─**2=TOD** (Weir Controls 379.68 cfs @ 1.37 fps)

Pond 6.2P: Maple Sping Bogs US



Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow = 412.24 cfs @ 57.94 hrs, Volume= 291.382 af
Outflow = 392.38 cfs @ 58.67 hrs, Volume= 289.034 af, Atten= 5%, Lag= 43.8 min
Primary = 197.47 cfs @ 58.67 hrs, Volume= 235.734 af
Routed to Link 23L : Inflow
Secondary = 194.90 cfs @ 58.67 hrs, Volume= 53.300 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 22.40' @ 58.67 hrs Storage= 42.467 af

Plug-Flow detention time= 95.2 min calculated for 289.034 af (99% of inflow)
Center-of-Mass det. time= 84.7 min (3,781.6 - 3,697.0)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=197.47 cfs @ 58.67 hrs HW=22.40' TW=0.00' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 197.47 cfs @ 7.90 fps)

Secondary OutFlow Max=194.90 cfs @ 58.67 hrs HW=22.40' TW=0.00' (Dynamic Tailwater)
└─**2=TOD** (Weir Controls 194.90 cfs @ 1.86 fps)

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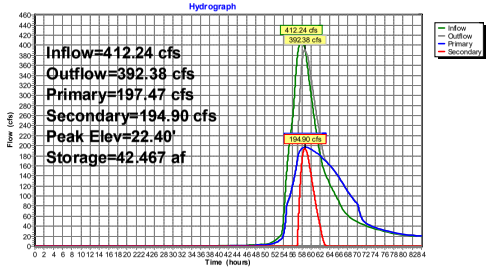
Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow = 1,239.92 cfs @ 57.83 hrs, Volume= 1,435.372 af
Outflow = 1,239.71 cfs @ 57.88 hrs, Volume= 1,430.106 af, Atten= 0%, Lag= 3.1 min
Primary = 1,079.95 cfs @ 57.88 hrs, Volume= 1,368.798 af
Routed to Link 23L : Inflow
Secondary = 159.76 cfs @ 57.88 hrs, Volume= 61.308 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 25.69' @ 57.88 hrs Storage= 17.442 af (16.995 af above start)

Plug-Flow detention time= 16.5 min calculated for 1,429.642 af (100% of inflow)
Center-of-Mass det. time= 10.3 min (3,786.2 - 3,775.9)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

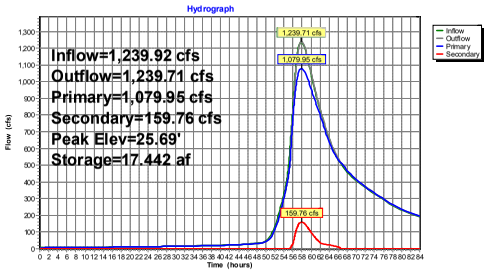
Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

Primary OutFlow Max=1,079.95 cfs @ 57.88 hrs HW=25.69' TW=0.00' (Dynamic Tailwater)
└**1=Bridge/Spillway** (Orifice Controls 688.81 cfs @ 15.94 fps)
└**3=TOD** (Weir Controls 391.13 cfs @ 2.01 fps)

Secondary OutFlow Max=159.76 cfs @ 57.88 hrs HW=25.69' TW=25.04' (Dynamic Tailwater)
└**2=Culvert to Bogs** (Outlet Controls 33.26 cfs @ 3.70 fps)
└**4=TOD_Bogs** (Weir Controls 126.50 cfs @ 1.77 fps)

Pond 6P: Maple Springs Dam - 3.5sm



Summary for Pond 7P: Little Five Mile Pond

Inflow = 254.74 cfs @ 56.40 hrs, Volume= 200.556 af, Incl. 0.59 cfs Base Flow
Outflow = 254.14 cfs @ 56.45 hrs, Volume= 200.371 af, Atten= 0%, Lag= 2.8 min
Primary = 254.14 cfs @ 56.45 hrs, Volume= 200.371 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 60.33' @ 56.45 hrs Storage= 28.677 af (6.517 af above start)

Plug-Flow detention time= 237.2 min calculated for 178.211 af (89% of inflow)
Center-of-Mass det. time= 30.4 min (3,446.0 - 3,415.6)

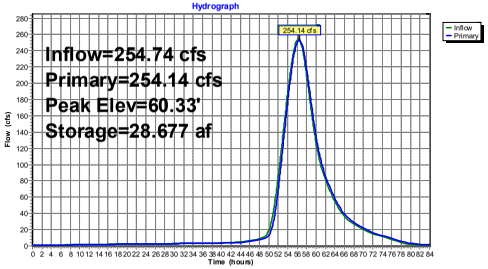
Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=254.14 cfs @ 56.45 hrs HW=60.33' TW=54.74' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 254.14 cfs @ 1.17 fps)

Pond 7P: Little Five Mile Pond



Summary for Pond 8P: Five Mile Pond

Inflow = 254.14 cfs @ 56.45 hrs, Volume= 200.371 af
Outflow = 159.25 cfs @ 59.36 hrs, Volume= 121.551 af, Atten= 37%, Lag= 174.7 min
Primary = 18.97 cfs @ 59.36 hrs, Volume= 41.502 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 140.28 cfs @ 59.36 hrs, Volume= 80.049 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 55.68' @ 59.36 hrs Storage= 109.571 af

Plug-Flow detention time= 667.8 min calculated for 121.550 af (61% of inflow)
Center-of-Mass det. time= 424.5 min (3,870.5 - 3,446.0)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=18.97 cfs @ 59.36 hrs HW=55.68' TW=32.70' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 18.97 cfs @ 6.04 fps)

Secondary OutFlow Max=140.28 cfs @ 59.36 hrs HW=55.68' TW=32.70' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 140.28 cfs @ 1.42 fps)

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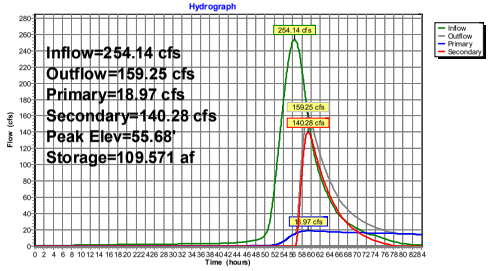
Pond 8P: Five Mile Pond



Summary for Pond 9P: Kettle Hole

Inflow = 94.59 cfs @ 59.37 hrs, Volume= 98.680 af, Incl. 0.30 cfs Base Flow
Outflow = 94.24 cfs @ 59.54 hrs, Volume= 98.313 af, Atten= 0%, Lag= 9.8 min
Primary = 94.24 cfs @ 59.54 hrs, Volume= 98.313 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.75' @ 59.54 hrs Storage= 11.614 af (2.664 af above start)

Plug-Flow detention time= 187.7 min calculated for 89.363 af (91% of inflow)
Center-of-Mass det. time= 24.4 min (3,735.5 - 3,711.1)

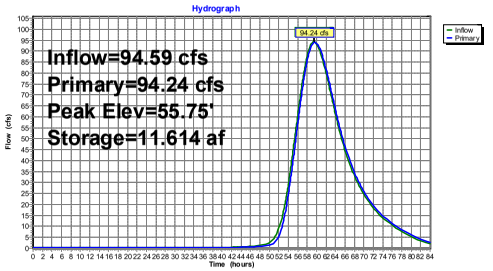
Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=94.24 cfs @ 59.54 hrs HW=55.75' TW=32.70' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 94.24 cfs @ 1.52 fps)

Pond 9P: Kettle Hole



Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow = 368.42 cfs @ 58.70 hrs, Volume= 417.464 af, Incl. 0.60 cfs Base Flow
Outflow = 367.42 cfs @ 58.86 hrs, Volume= 393.752 af, Atten= 0%, Lag= 9.6 min
Primary = 108.43 cfs @ 58.86 hrs, Volume= 225.957 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 258.99 cfs @ 58.86 hrs, Volume= 167.795 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1.500 af
Peak Elev= 32.70' @ 58.86 hrs Storage= 63.918 af (62.418 af above start)

Plug-Flow detention time= 244.9 min calculated for 392.252 af (94% of inflow)
Center-of-Mass det. time= 164.6 min (3,761.0 - 3,596.5)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LiDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
35.00	115.000
36.50	160.000
40.00	300.000

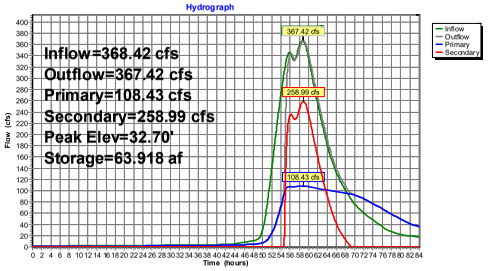
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=108.43 cfs @ 58.86 hrs HW=32.70' TW=28.83' (Dynamic Tailwater)
└**1=Drop Inlet Spillway** (Weir Controls 108.43 cfs @ 6.31 fps)

Secondary OutFlow Max=258.99 cfs @ 58.86 hrs HW=32.70' TW=28.83' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 258.99 cfs @ 1.41 fps)

Pond 10P: Maple Springs Brook Dam - 0.8sm



Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow = 1,272.15 cfs @ 56.37 hrs, Volume= 1,104.372 af, Incl. 1.10 cfs Base Flow
Outflow = 733.01 cfs @ 60.66 hrs, Volume= 970.176 af, Atten= 42%, Lag= 257.6 min
Primary = 449.61 cfs @ 59.40 hrs, Volume= 836.390 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 295.50 cfs @ 60.66 hrs, Volume= 133.785 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 29.11' @ 60.66 hrs Storage= 442.283 af (439.573 af above start)

Plug-Flow detention time= 487.7 min calculated for 967.465 af (88% of inflow)
Center-of-Mass det. time= 354.6 min (3,948.5 - 3,594.0)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=449.61 cfs @ 59.40 hrs HW=29.00' TW=23.85' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 449.61 cfs @ 9.37 fps)

Secondary OutFlow Max=295.50 cfs @ 60.66 hrs HW=29.11' TW=24.57' (Dynamic Tailwater)
└**2=TOR** (Weir Controls 295.50 cfs @ 1.19 fps)

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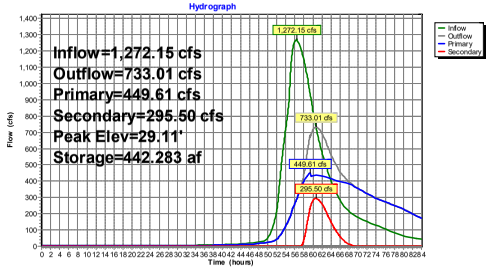
Pond 11P: Unnamed Road - 1.8sm



Summary for Pond 12P: Maple Springs Road Dam

Inflow = 423.84 cfs @ 56.27 hrs, Volume= 315.195 af, Incl. 1.00 cfs Base Flow
Outflow = 422.73 cfs @ 56.34 hrs, Volume= 312.891 af, Atten= 0%, Lag= 4.5 min
Primary = 78.05 cfs @ 56.34 hrs, Volume= 123.238 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 344.67 cfs @ 56.34 hrs, Volume= 189.653 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 41.78' @ 56.34 hrs Storage= 20.473 af (19.393 af above start)

Plug-Flow detention time= 90.6 min calculated for 311.807 af (99% of inflow)
Center-of-Mass det. time= 66.4 min (3,535.6 - 3,469.2)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

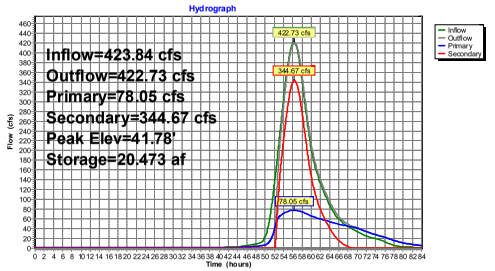
Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=78.05 cfs @ 56.34 hrs HW=41.78' TW=26.84' (Dynamic Tailwater)
↳**1=Sharp-Crested Rectangular Weir** (Weir Controls 78.05 cfs @ 7.11 fps)

Secondary OutFlow Max=344.67 cfs @ 56.34 hrs HW=41.78' TW=26.84' (Dynamic Tailwater)
↳**2=TOD** (Weir Controls 344.67 cfs @ 1.96 fps)

Pond 12P: Maple Springs Road Dam



Summary for Pond 13.1P: Bogs_L_US

Inflow = 308.15 cfs @ 58.87 hrs, Volume= 323.508 af, Incl. 0.90 cfs Base Flow
Outflow = 285.52 cfs @ 60.72 hrs, Volume= 323.369 af, Atten= 7%, Lag= 110.8 min
Primary = 145.31 cfs @ 60.01 hrs, Volume= 264.413 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 140.46 cfs @ 60.73 hrs, Volume= 58.956 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 35.14' @ 60.73 hrs Storage= 55.817 af (55.763 af above start)

Plug-Flow detention time= 143.2 min calculated for 323.312 af (100% of inflow)
Center-of-Mass det. time= 141.8 min (3,811.7 - 3,670.0)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

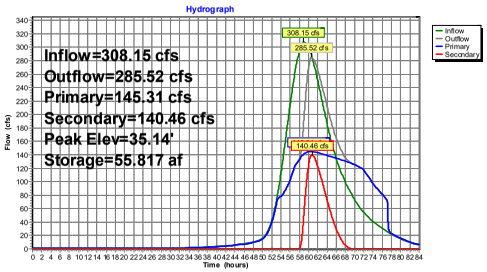
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=145.31 cfs @ 60.01 hrs HW=35.11' TW=29.82' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 145.31 cfs @ 9.69 fps)

Secondary OutFlow Max=140.45 cfs @ 60.73 hrs HW=35.14' TW=30.12' (Dynamic Tailwater)
↳**2=TOD** (Weir Controls 140.45 cfs @ 0.87 fps)

Pond 13.1P: Bogs_L_US



Summary for Pond 13.2P: Bogs_L_DS

Inflow = 285.52 cfs @ 60.72 hrs, Volume= 323.369 af
Outflow = 138.76 cfs @ 67.73 hrs, Volume= 319.117 af, Atten= 51%, Lag= 421.1 min
Primary = 138.76 cfs @ 67.73 hrs, Volume= 319.117 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 30.84' @ 67.73 hrs Storage= 80.586 af (80.511 af above start)

Plug-Flow detention time= 272.6 min calculated for 319.038 af (99% of inflow)
Center-of-Mass det. time= 257.2 min (4,068.9 - 3,811.7)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=138.77 cfs @ 67.73 hrs HW=30.84' TW=25.06' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 138.77 cfs @ 9.25 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

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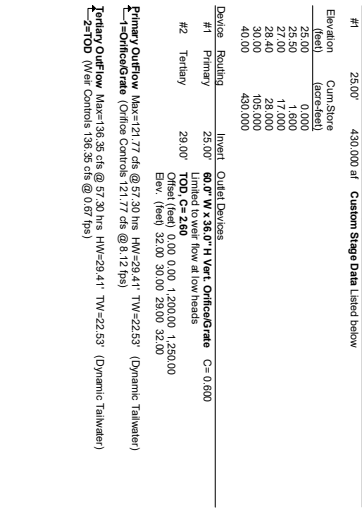
Pond 13.2P: Bogs_L_DS



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow = 1,039.37 cfs @ 60.20 hrs, Volume= 1,598.124 af, Incl. 0.80 cfs Base Flow
Outflow = 782.03 cfs @ 64.03 hrs, Volume= 1,445.324 af, Atten= 25%, Lag= 228.6 min
Primary = 674.63 cfs @ 64.03 hrs, Volume= 1,401.365 af
Secondary = 107.40 cfs @ 64.03 hrs, Volume= 44.958 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.17' Storage= 337.482 af (336.417 af above start)
Peak Elev= 25.34' @ 64.03 hrs Storage= 337.482 af (336.417 af above start)

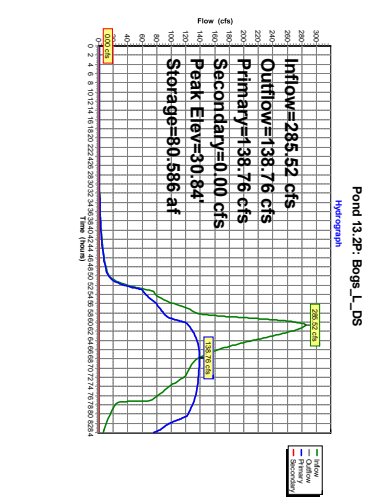
Plug-Flow detention time= 286.6 min calculated for 1,445.241 af (90% of inflow)
Center-of-Mass det. time= 180.1 min (4,055.5 - 3,875.4)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	65.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0' W x 96.0' H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.013, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

Pond 14P: Bogs_M - 2.7sm



Primary OutFlow Max=674.63 cfs @ 64.03 hrs HW=25.34' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 674.63 cfs @ 8.87 fps)

Secondary OutFlow Max=107.40 cfs @ 64.03 hrs HW=25.34' TW=0.00' (Dynamic Tailwater)
2=TOD (Weir Controls 107.40 cfs @ 0.99 fps)

Summary for Pond 15.1P: Bogs_N_US

Inflow = 315.66 cfs @ 55.67 hrs, Volume= 237.592 af, Incl. 0.60 cfs Base Flow
Outflow = 258.12 cfs @ 57.30 hrs, Volume= 235.798 af, Atten= 18%, Lag= 98.2 min
Primary = 121.77 cfs @ 57.30 hrs, Volume= 198.469 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 136.35 cfs @ 57.30 hrs, Volume= 36.328 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 29.41' @ 57.30 hrs Storage= 76.615 af (76.263 af above start)

Plug-Flow detention time= 281.2 min calculated for 235.443 af (99% of inflow)
Center-of-Mass det. time= 264.5 min (3,636.5 - 3,371.9)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

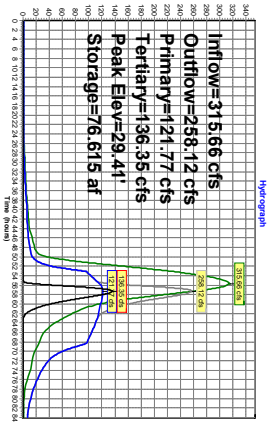
Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0' W x 36.0' H Vert. OrificeGrate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=121.77 cfs @ 57.30 hrs HW=29.41' TW=22.53' (Dynamic Tailwater)
1=OrificeGrate (Orifice Controls 121.77 cfs @ 8.12 fps)

Tertiary OutFlow Max=136.35 cfs @ 57.30 hrs HW=29.41' TW=22.53' (Dynamic Tailwater)
2=TOD (Weir Controls 136.35 cfs @ 0.67 fps)

Pond 15.1P: Bogs_N_US



Summary for Pond 15.2P: Bogs_N_DS

Inflow = 258.12 cfs @ 57.30 hrs, Volume= 235.798 af
Outflow = 99.75 cfs @ 67.43 hrs, Volume= 198.393 af, Atten= 61%, Lag= 607.3 min
Primary = 99.75 cfs @ 67.43 hrs, Volume= 198.393 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.587 af
Peak Elev= 23.51' @ 67.43 hrs Storage= 98.204 af (95.638 af above start)

Plug-Flow detention time= 592.8 min calculated for 195.826 af (83% of inflow)
Center-of-Mass det. time= 411.5 min (4,048.0 - 3,636.5)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

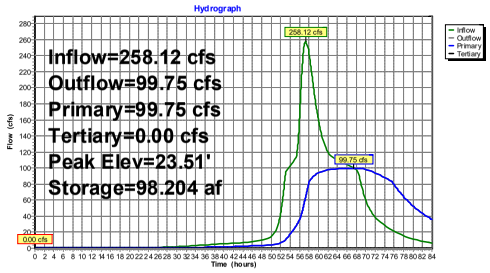
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0' W x 36.0' H Vert. OrificeGrate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=99.78 cfs @ 67.43 hrs HW=23.51' TW=0.00' (Dynamic Tailwater)
1=OrificeGrate (Orifice Controls 99.78 cfs @ 6.65 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
2=TOD (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS



Summary for Pond 16: Mill Pond Dam (Existing Conditions)

Inflow = 2,401.52 cfs @ 58.06 hrs, Volume= 4,351.557 af, Incl. 32.00 cfs Base Flow
Outflow = 2,163.91 cfs @ 60.40 hrs, Volume= 3,428.543 af, Atten= 10%, Lag= 140.7 min
Primary = 258.15 cfs @ 60.40 hrs, Volume= 755.092 af
Routed to Pond 17 : Cranberry Highway
Secondary = 655.25 cfs @ 60.40 hrs, Volume= 828.684 af
Routed to Pond 17 : Cranberry Highway
Tertiary = 1,250.50 cfs @ 60.40 hrs, Volume= 1,844.767 af
Routed to Pond 17 : Cranberry Highway

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 472.595 af
Peak Elev= 18.89' @ 60.40 hrs Storage= 1,559.601 af (1,087.006 af above start)

Plug-Flow detention time= 770.1 min calculated for 2,955.946 af (68% of inflow)
Center-of-Mass det. time= 220.7 min (3,943.7 - 3,723.1)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,944.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.470
5.00	4.600
6.00	9.700
7.00	17.300
8.00	35.800
9.00	61.550
10.00	95.500
11.00	143.900
12.00	216.000
13.00	316.000
14.00	427.850
15.00	577.000
16.00	773.500
17.00	996.500
18.00	1,274.360
19.00	1,595.000
20.00	1,944.000

Device	Routing	Invert	Outlet Devices
#1	Primary	13.60'	**4.9' long x 2.90' rise PS Stop Logs - Lt Bay** 2 End Contraction(s) 6.8' Crest Height
#2	Primary	13.80'	**4.9' long x 2.90' rise PS Stop Logs - RT Bay** 2 End Contraction(s) 6.8' Crest Height
#3	Tertiary	14.06'	**5.4' long x 5.00' rise Aux Spillway Stop Logs - Normal Height** 2 End Contraction(s) 4.0' Crest Height
#4	Secondary	18.00'	**TOD, C= 2.60**

Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00
Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00

#5 Tertiary 18.00' **US Relief - Bypasses Dam, C= 1.80**
Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00
Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00

#6 Device 7 12.10' **3.0' long x 8.0' breadth Fish Ladder**
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

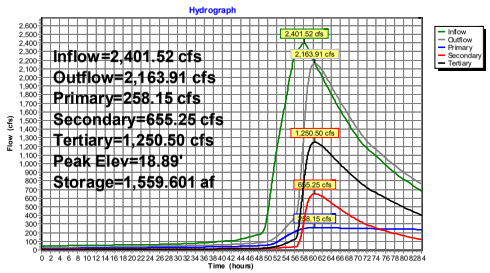
#7 Secondary 13.70' **FL CHaqnnel XS 1, C= 2.00**
Offset (feet) 0.00 0.00 4.00 6.00
Elev. (feet) 15.00 13.70 13.70 15.00

Primary OutFlow Max=258.15 cfs @ 60.40 hrs HW=18.89' TW=11.09' (Dynamic Tailwater)
└─**1=PS Stop Logs - Lt Bay** (Orifice Controls 131.06 cfs @ 10.46 fps)
└─**2=PS Stop Logs - RT Bay** (Orifice Controls 127.09 cfs @ 10.14 fps)

Secondary OutFlow Max=655.25 cfs @ 60.40 hrs HW=18.89' TW=11.09' (Dynamic Tailwater)
└─**4=TOD** (Weir Controls 613.94 cfs @ 1.43 fps)
└─**7=FL CHaqnnel XS 1** (Weir Controls 41.31 cfs @ 5.30 fps)
└─**6=Fish Ladder** (Passes 41.31 cfs of 138.78 cfs potential flow)

Tertiary OutFlow Max=1,250.50 cfs @ 60.40 hrs HW=18.89' TW=11.09' (Dynamic Tailwater)
└─**3=Aux Spillway Stop Logs - Normal Height** (Weir Controls 176.62 cfs @ 8.25 fps)
└─**5=US Relief - Bypasses Dam** (Weir Controls 1,073.88 cfs @ 1.43 fps)

Pond 16: Mill Pond Dam (Existing Conditions)



Summary for Pond 17: Cranberry Highway

Inflow = 2,163.91 cfs @ 60.40 hrs, Volume= 3,428.543 af
Outflow = 2,162.44 cfs @ 60.56 hrs, Volume= 3,427.202 af, Atten= 0%, Lag= 9.8 min
Primary = 2,162.44 cfs @ 60.56 hrs, Volume= 3,427.202 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 2.10' Storage= 0.612 af
Peak Elev= 11.10' @ 60.56 hrs Storage= 16.653 af (16.040 af above start)

Plug-Flow detention time= 3.8 min calculated for 3,426.588 af (100% of inflow)
Center-of-Mass det. time= 2.5 min (3,946.2 - 3,943.7)

Volume	Invert	Avail.Storage	Storage Description
#1	-1.00'	220.000 af	**Custom Stage Data** Listed below

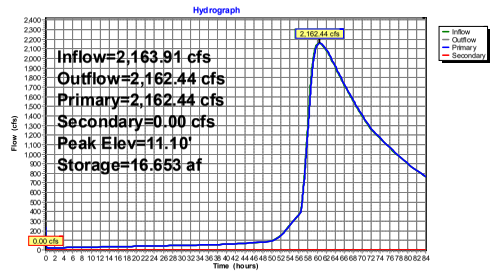
Elevation (feet)	Cum.Store (acre-feet)
-1.00	0.000
1.00	0.200
5.00	1.700
7.00	4.000
10.00	13.000
11.50	18.000
13.50	31.000
15.00	45.000
20.00	100.000
30.00	220.000

Device	Routing	Invert	Outlet Devices
#1	Primary	-0.50'	**264.0" W x 126.0" H Box Culvert** L= 150.0' Ke= 0.500 Inlet / Outlet Invert= -0.50' / -1.00' S= 0.0033 '/' Cc= 0.900 n= 0.020, Flow Area= 231.00 sf
#2	Secondary	15.90'	**Relief, C= 1.80** Offset (feet) 0.00 35.00 420.00 460.00 Elev. (feet) 19.00 15.90 15.90 19.00

Primary OutFlow Max=2,162.43 cfs @ 60.56 hrs HW=11.10' (Free Discharge)
└─**1=Culvert** (Barrel Controls 2,162.43 cfs @ 11.30 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.10' (Free Discharge)
└─**2=Relief** (Controls 0.00 cfs)

Pond 17: Cranberry Highway



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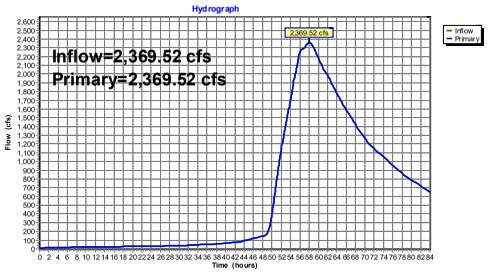
Summary for Link 23L: Inflow

Inflow = 2,369.52 cfs @ 58.06 hrs, Volume= 4,129.405 af
Primary = 2,369.52 cfs @ 58.06 hrs, Volume= 4,129.405 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16 : Mill Pond Dam (Existing Conditions)

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow

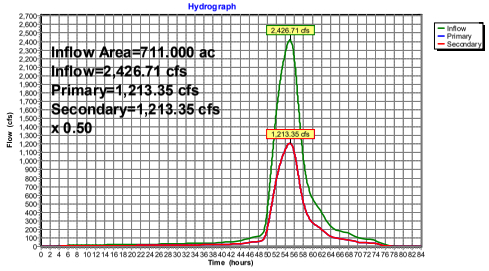


Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 28.21" for PMP72hour event
Inflow = 2,426.71 cfs @ 55.05 hrs, Volume= 1,671.571 af
Primary = 1,213.35 cfs @ 55.05 hrs, Volume= 835.785 af, Atten= 50%, Lag= 0.0 min
Secondary = 1,213.35 cfs @ 55.05 hrs, Volume= 835.785 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow

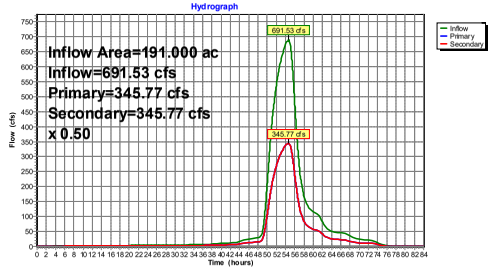


Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 27.28" for PMP72hour event
Inflow = 691.53 cfs @ 54.66 hrs, Volume= 434.241 af
Primary = 345.77 cfs @ 54.66 hrs, Volume= 217.121 af, Atten= 50%, Lag= 0.0 min
Secondary = 345.77 cfs @ 54.66 hrs, Volume= 217.121 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

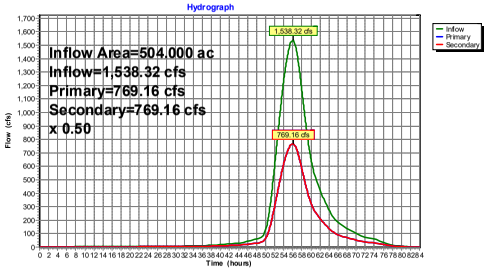


Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth > 27.30" for PMP72hour event
Inflow = 1,538.32 cfs @ 56.13 hrs, Volume= 1,146.691 af
Primary = 769.16 cfs @ 56.13 hrs, Volume= 573.345 af, Atten= 50%, Lag= 0.0 min
Secondary = 769.16 cfs @ 56.13 hrs, Volume= 573.345 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

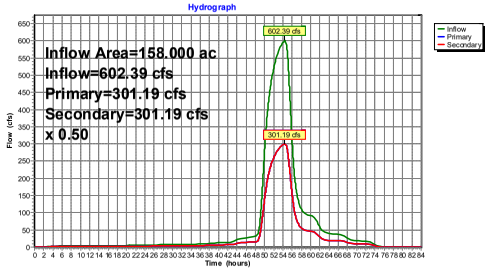


Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 29.19" for PMP72hour event
Inflow = 602.39 cfs @ 54.36 hrs, Volume= 384.327 af
Primary = 301.19 cfs @ 54.36 hrs, Volume= 192.163 af, Atten= 50%, Lag= 0.0 min
Secondary = 301.19 cfs @ 54.36 hrs, Volume= 192.163 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow

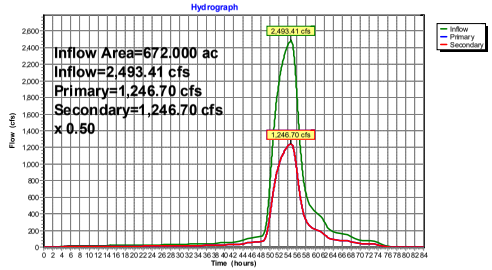


Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 29.46" for PMP72hour event
Inflow = 2,493.41 cfs @ 54.71 hrs, Volume= 1,649.777 af
Primary = 1,246.70 cfs @ 54.71 hrs, Volume= 824.889 af, Atten= 50%, Lag= 0.0 min
Secondary = 1,246.70 cfs @ 54.71 hrs, Volume= 824.889 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow



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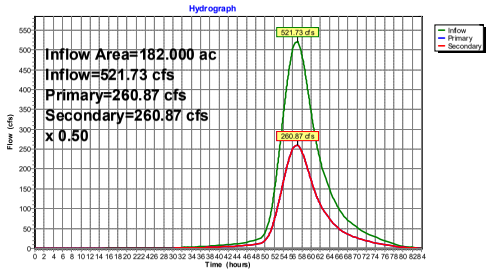
Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 28.86" for PMP72hour event
Inflow = 521.73 cfs @ 57.03 hrs, Volume= 437.759 af
Primary = 260.87 cfs @ 57.03 hrs, Volume= 218.880 af, Atten= 50%, Lag= 0.0 min
Secondary = 260.87 cfs @ 57.03 hrs, Volume= 218.880 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow

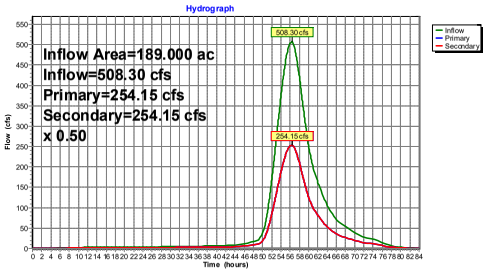


Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 24.95" for PMP72hour event
Inflow = 508.30 cfs @ 56.40 hrs, Volume= 392.919 af
Primary = 254.15 cfs @ 56.40 hrs, Volume= 196.460 af, Atten= 50%, Lag= 0.0 min
Secondary = 254.15 cfs @ 56.40 hrs, Volume= 196.460 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow

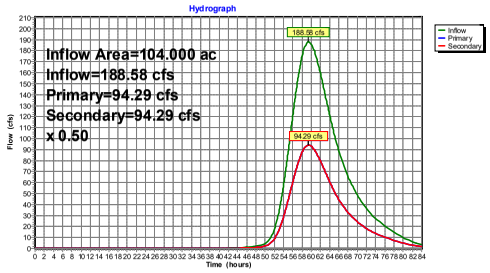


Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth > 22.29" for PMP72hour event
Inflow = 188.58 cfs @ 59.37 hrs, Volume= 193.195 af
Primary = 94.29 cfs @ 59.37 hrs, Volume= 96.597 af, Atten= 50%, Lag= 0.0 min
Secondary = 94.29 cfs @ 59.37 hrs, Volume= 96.597 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow

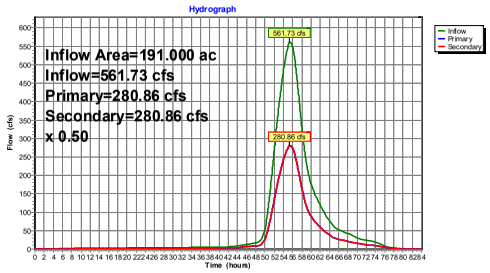


Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth > 24.31" for PMP72hour event
Inflow = 561.73 cfs @ 55.38 hrs, Volume= 386.870 af
Primary = 280.86 cfs @ 55.38 hrs, Volume= 193.435 af, Atten= 50%, Lag= 0.0 min
Secondary = 280.86 cfs @ 55.38 hrs, Volume= 193.435 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

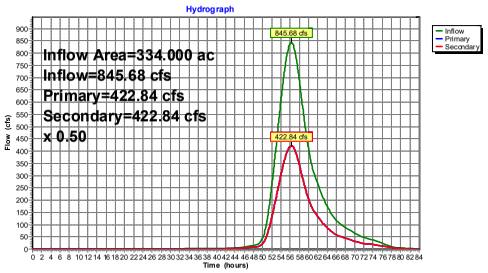


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth > 22.15" for PMP72hour event
Inflow = 845.68 cfs @ 56.27 hrs, Volume= 616.506 af
Primary = 422.84 cfs @ 56.27 hrs, Volume= 308.253 af, Atten= 50%, Lag= 0.0 min
Secondary = 422.84 cfs @ 56.27 hrs, Volume= 308.253 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow

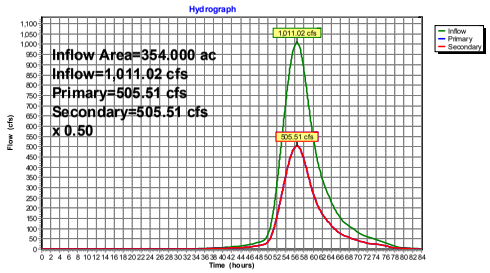


Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth > 26.45" for PMP72hour event
Inflow = 1,011.02 cfs @ 56.38 hrs, Volume= 780.185 af
Primary = 505.51 cfs @ 56.38 hrs, Volume= 390.093 af, Atten= 50%, Lag= 0.0 min
Secondary = 505.51 cfs @ 56.38 hrs, Volume= 390.093 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow



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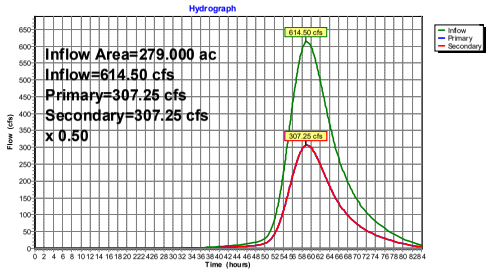
Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 27.29" for PMP72hour event
Inflow = 614.50 cfs @ 58.87 hrs, Volume= 634.520 af
Primary = 307.25 cfs @ 58.87 hrs, Volume= 317.260 af, Atten= 50%, Lag= 0.0 min
Secondary = 307.25 cfs @ 58.87 hrs, Volume= 317.260 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow

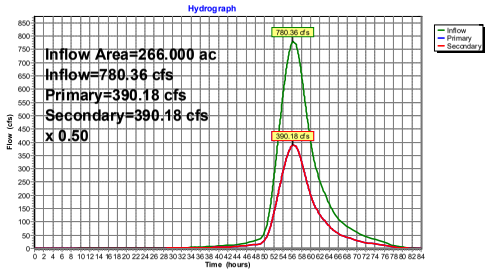


Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth > 27.36" for PMP72hour event
Inflow = 780.36 cfs @ 56.11 hrs, Volume= 606.555 af
Primary = 390.18 cfs @ 56.11 hrs, Volume= 303.278 af, Atten= 50%, Lag= 0.0 min
Secondary = 390.18 cfs @ 56.11 hrs, Volume= 303.278 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow

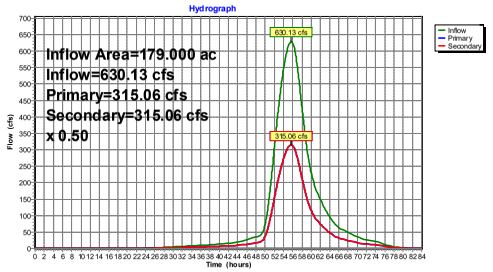


Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 31.30" for PMP72hour event
Inflow = 630.13 cfs @ 55.67 hrs, Volume= 466.852 af
Primary = 315.06 cfs @ 55.67 hrs, Volume= 233.426 af, Atten= 50%, Lag= 0.0 min
Secondary = 315.06 cfs @ 55.67 hrs, Volume= 233.426 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow

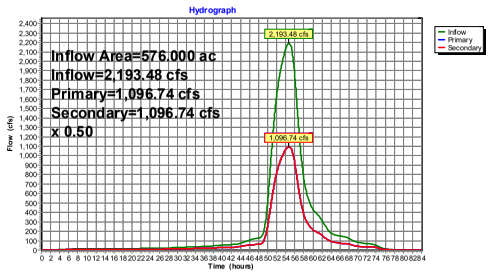


Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 31.30" for PMP72hour event
Inflow = 2,193.48 cfs @ 54.70 hrs, Volume= 1,502.185 af
Primary = 1,096.74 cfs @ 54.70 hrs, Volume= 751.092 af, Atten= 50%, Lag= 0.0 min
Secondary = 1,096.74 cfs @ 54.70 hrs, Volume= 751.092 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow

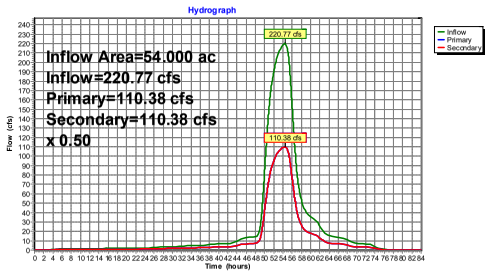


Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 33.67" for PMP72hour event
Inflow = 220.77 cfs @ 54.46 hrs, Volume= 151.529 af
Primary = 110.38 cfs @ 54.46 hrs, Volume= 75.765 af, Atten= 50%, Lag= 0.0 min
Secondary = 110.38 cfs @ 54.46 hrs, Volume= 75.765 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



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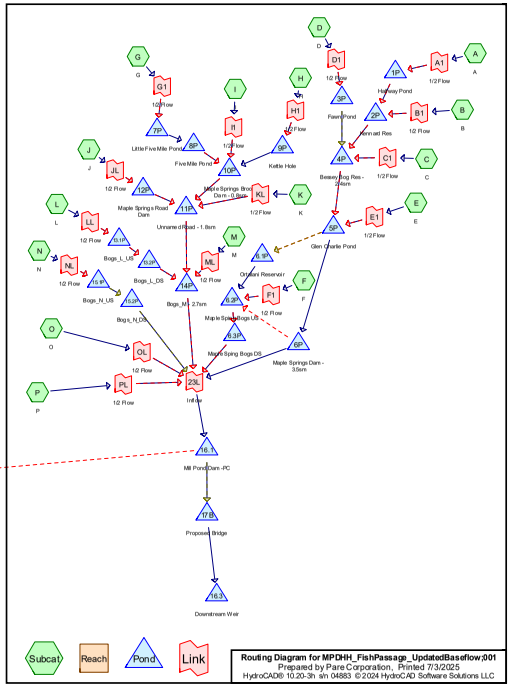

Project Notes

Copied 10 events from NOAA14_Wareham 24-hr S1 storm

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr	NOAA14_Wareham 24-hr S1	1-yr	Default	24.00	1	2.91	2
2	2-yr	NOAA14_Wareham 24-hr S1	2-yr	Default	24.00	1	3.44	2
3	5-yr	NOAA14_Wareham 24-hr S1	5-yr	Default	24.00	1	4.31	2
4	10-yr	NOAA14_Wareham 24-hr S1	10-yr	Default	24.00	1	5.03	2
5	25-yr	NOAA14_Wareham 24-hr S1	25-yr	Default	24.00	1	6.02	2
6	50-yr	NOAA14_Wareham 24-hr S1	50-yr	Default	24.00	1	6.77	2
7	100-yr	NOAA14_Wareham 24-hr S1	100-yr	Default	24.00	1	7.55	2
8	200-yr	NOAA14_Wareham 24-hr S1	200-yr	Default	24.00	1	8.41	2
9	500-yr	NOAA14_Wareham 24-hr S1	500-yr	Default	24.00	1	9.63	2
10	1000-yr	NOAA14_Wareham 24-hr S1	1000-yr	Default	24.00	1	10.60	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
354.000	42	"0.83% imp" (K)
104.000	34	"1.27% imp" (H)
504.000	47	"10.54% imp" (C)
191.000	42	"15.34% imp" (I)
191.000	49	"18.54% imp" (B)
189.000	45	"19.09% imp" (G)
279.000	45	"2.43% imp" (L)
334.000	34	"2.83% imp" (J)
179.000	57	"3.17% imp" (N)
576.000	62	"31.1% imp" (O)
158.000	57	"31.94% imp" (D)
711.000	56	"33.99% imp" (A)
672.000	59	"35.91% imp" (E)
54.000	71	"38.05% imp" (P)
182.000	50	"6.11% imp" (F)
266.000	47	"8.14% imp" (M)
4,944.000	**51**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
4,944.000	Other	A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P
4,944.000		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	354.000	354.000	"0.83% imp"	K
0.000	0.000	0.000	0.000	104.000	104.000	"1.27% imp"	H
0.000	0.000	0.000	0.000	504.000	504.000	"10.54% imp"	C
0.000	0.000	0.000	0.000	191.000	191.000	"15.34% imp"	I
0.000	0.000	0.000	0.000	191.000	191.000	"18.54% imp"	B
0.000	0.000	0.000	0.000	189.000	189.000	"19.09% imp"	G
0.000	0.000	0.000	0.000	279.000	279.000	"2.43% imp"	L
0.000	0.000	0.000	0.000	334.000	334.000	"2.83% imp"	J
0.000	0.000	0.000	0.000	179.000	179.000	"3.17% imp"	N
0.000	0.000	0.000	0.000	576.000	576.000	"31.1% imp"	O
0.000	0.000	0.000	0.000	158.000	158.000	"31.94% imp"	D
0.000	0.000	0.000	0.000	711.000	711.000	"33.99% imp"	A
0.000	0.000	0.000	0.000	672.000	672.000	"35.91% imp"	E
0.000	0.000	0.000	0.000	54.000	54.000	"38.05% imp"	P
0.000	0.000	0.000	0.000	182.000	182.000	"6.11% imp"	F
0.000	0.000	0.000	0.000	266.000	266.000	"8.14% imp"	M
0.000	**0.000**	**0.000**	**0.000**	**4,944.000**	**4,944.000**	**TOTAL AREA**	

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Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	1P	64.00	63.50	20.0	0.0250	0.025	36.0	36.0	0.0	
2	3P	59.50	59.00	40.0	0.0125	0.025	0.0	30.0	0.0	
3	6P	20.50	20.30	30.0	0.0067	0.035	36.0	36.0	0.0	
4	8P	51.90	51.30	30.0	0.0200	0.035	0.0	24.0	0.0	
5	11P	21.00	20.50	30.0	0.0167	0.035	96.0	72.0	0.0	
6	14P	15.20	15.00	90.0	0.0022	0.035	120.0	96.0	0.0	
7	16.1	4.00	4.00	20.0	0.0000	0.011	96.0	48.0	0.0	
8	17B	4.00	4.00	60.0	0.0000	0.013	518.0	127.0	0.0	

Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=0.91"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=97.85 cfs 53.946 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=0.50"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=17.66 cfs 7.905 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=0.28"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=16.97 cfs 11.861 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=0.86"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=28.96 cfs 11.265 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=0.96"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=116.80 cfs 53.867 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=0.20"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=3.02 cfs 2.994 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=0.51"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=11.03 cfs 8.054 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=0.03"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=0.28 cfs 0.295 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=0.41"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=10.56 cfs 6.540 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=0.08"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=2.94 cfs 2.110 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=0.02"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=0.86 cfs 0.702 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=0.07"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=1.43 cfs 1.744 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=0.22"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=6.46 cfs 4.865 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=0.27"
Tc=300.0 min CN=56/98 Runoff=4.17 cfs 4.081 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=0.85"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=77.46 cfs 40.837 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=1.11"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=10.30 cfs 5.004 af

Pond 1P: Halfway Pond Peak Elev=64.57' Storage=422.245 af Inflow=100.05 cfs 69.219 af
Primary=4.20 cfs 25.702 af Secondary=0.00 cfs 0.000 af Outflow=4.20 cfs 25.702 af

Pond 2P: Kennard Res Peak Elev=57.53' Storage=8.634 af Inflow=20.99 cfs 37.771 af
Primary=8.36 cfs 36.029 af Secondary=0.00 cfs 0.000 af Outflow=8.36 cfs 36.029 af

Pond 3P: Fawn Pond Peak Elev=59.96' Storage=38.519 af Inflow=29.46 cfs 14.736 af
Primary=0.96 cfs 5.839 af Tertiary=0.00 cfs 0.000 af Outflow=0.96 cfs 5.839 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=47.06' Storage=20.011 af Inflow=27.36 cfs 64.836 af
Primary=13.52 cfs 61.361 af Secondary=0.00 cfs 0.000 af Outflow=13.52 cfs 61.361 af

Pond 5P: Glen Charlie Pond Peak Elev=34.27' Storage=67.307 af Inflow=125.57 cfs 129.806 af
Primary=26.56 cfs 117.901 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=26.56 cfs 117.901 af

Pond 6.1P: Ortalani Reservoir Peak Elev=34.20' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=22.83' Storage=2.227 af Inflow=3.02 cfs 2.994 af
Primary=0.74 cfs 2.225 af Secondary=0.00 cfs 0.000 af Outflow=0.74 cfs 2.225 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=17.12' Storage=0.249 af Inflow=0.74 cfs 2.225 af
Primary=0.70 cfs 2.129 af Secondary=0.00 cfs 0.000 af Outflow=0.70 cfs 2.129 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=20.94' Storage=1.495 af Inflow=26.56 cfs 117.901 af
Primary=26.55 cfs 117.463 af Secondary=0.00 cfs 0.000 af Outflow=26.55 cfs 117.463 af

Pond 7P: Little Five Mile Pond Peak Elev=59.66' Storage=23.252 af Inflow=11.62 cfs 12.150 af
Outflow=10.96 cfs 12.099 af

Pond 8P: Five Mile Pond Peak Elev=52.27' Storage=9.703 af Inflow=10.96 cfs 12.099 af
Primary=0.49 cfs 2.395 af Secondary=0.00 cfs 0.000 af Outflow=0.49 cfs 2.395 af

Pond 9P: Kettle Hole Peak Elev=55.00' Storage=8.998 af Inflow=0.58 cfs 2.377 af
Outflow=0.54 cfs 2.386 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=29.87' Storage=5.544 af Inflow=11.56 cfs 15.487 af
Primary=4.39 cfs 14.377 af Secondary=0.00 cfs 0.000 af Outflow=4.39 cfs 14.377 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=21.49' Storage=4.659 af Inflow=8.48 cfs 31.768 af
Primary=7.52 cfs 31.395 af Secondary=0.00 cfs 0.000 af Outflow=7.52 cfs 31.395 af

Pond 12P: Maple Springs Road Dam Peak Elev=38.83' Storage=1.982 af Inflow=3.94 cfs 9.052 af
Primary=2.49 cfs 9.052 af Secondary=0.00 cfs 0.000 af Outflow=2.49 cfs 9.052 af

Pond 13.1P: Bogs_L_US Peak Elev=29.78' Storage=0.098 af Inflow=2.33 cfs 7.992 af
Primary=2.32 cfs 7.993 af Secondary=0.00 cfs 0.000 af Outflow=2.32 cfs 7.993 af

Pond 13.2P: Bogs_L_DS Peak Elev=25.87' Storage=0.137 af Inflow=2.32 cfs 7.993 af
Primary=2.31 cfs 7.995 af Secondary=0.00 cfs 0.000 af Outflow=2.31 cfs 7.995 af

Pond 14P: Bogs_M - 2.7sm Peak Elev=16.15' Storage=1.721 af Inflow=13.88 cfs 49.809 af
Primary=13.70 cfs 49.753 af Secondary=0.00 cfs 0.000 af Outflow=13.70 cfs 49.753 af

Pond 15.1P: Bogs_N_US Peak Elev=25.39' Storage=1.263 af Inflow=4.77 cfs 8.246 af
Primary=3.98 cfs 8.241 af Tertiary=0.00 cfs 0.000 af Outflow=3.98 cfs 8.241 af

Pond 15.2P: Bogs_N_DS Peak Elev=20.23' Storage=5.331 af Inflow=3.98 cfs 8.241 af
Primary=1.75 cfs 7.612 af Tertiary=0.00 cfs 0.000 af Outflow=1.75 cfs 7.612 af

Pond 16.1: Mill Pond Dam -PC Peak Elev=14.65' Storage=523.812 af Inflow=144.05 cfs 444.949 af
Primary=49.17 cfs 278.339 af Secondary=21.99 cfs 142.538 af Tertiary=0.00 cfs 0.000 af Outflow=71.16 cfs 420.877 af

Pond 16.3: Downstream Weir Peak Elev=8.72' Storage=9,439 cf Inflow=83.34 cfs 278.334 af
Outflow=49.17 cfs 278.330 af

Pond 17B: Proposed Bridge Peak Elev=8.72' Storage=9,444 cf Inflow=49.17 cfs 278.339 af
518.0" x 127.0" Box Culvert n=0.013 L=60.0' S=0.0000 '/' Outflow=83.34 cfs 278.334 af

Link 23L: Inflow Inflow=112.05 cfs 222.798 af
Primary=112.05 cfs 222.798 af

Link A1: 1/2 Flow x 0.50 Inflow=97.85 cfs 53.946 af
Primary=48.92 cfs 26.973 af Secondary=48.92 cfs 26.973 af

Link B1: 1/2 Flow x 0.50 Inflow=17.66 cfs 7.905 af
Primary=8.83 cfs 3.952 af Secondary=8.83 cfs 3.952 af

Link C1: 1/2 Flow x 0.50 Inflow=16.97 cfs 11.861 af
Primary=8.49 cfs 5.930 af Secondary=8.49 cfs 5.930 af

Link D1: 1/2 Flow x 0.50 Inflow=28.96 cfs 11.265 af
Primary=14.48 cfs 5.632 af Secondary=14.48 cfs 5.632 af

Link E1: 1/2 Flow x 0.50 Inflow=116.80 cfs 53.867 af
Primary=58.40 cfs 26.933 af Secondary=58.40 cfs 26.933 af

Link F1: 1/2 Flow x 0.50 Inflow=3.02 cfs 2.994 af
Primary=1.51 cfs 1.497 af Secondary=1.51 cfs 1.497 af

Link G1: 1/2 Flow x 0.50 Inflow=11.03 cfs 8.054 af
Primary=5.52 cfs 4.027 af Secondary=5.52 cfs 4.027 af

Link H1: 1/2 Flow x 0.50 Inflow=0.28 cfs 0.295 af
Primary=0.14 cfs 0.147 af Secondary=0.14 cfs 0.147 af

Link I1: 1/2 Flow x 0.50 Inflow=10.56 cfs 6.540 af
Primary=5.28 cfs 3.270 af Secondary=5.28 cfs 3.270 af

Link JL: 1/2 Flow x 0.50 Inflow=2.94 cfs 2.110 af
Primary=1.47 cfs 1.055 af Secondary=1.47 cfs 1.055 af

Link KL: 1/2 Flow x 0.50 Inflow=0.86 cfs 0.702 af
Primary=0.43 cfs 0.351 af Secondary=0.43 cfs 0.351 af

Link LL: 1/2 Flow x 0.50 Inflow=1.43 cfs 1.744 af
Primary=0.71 cfs 0.872 af Secondary=0.71 cfs 0.872 af

Link ML: 1/2 Flow x 0.50 Inflow=6.46 cfs 4.865 af
Primary=3.23 cfs 2.433 af Secondary=3.23 cfs 2.433 af

Link NL: 1/2 Flow x 0.50 Inflow=4.17 cfs 4.081 af
Primary=2.09 cfs 2.040 af Secondary=2.09 cfs 2.040 af

Link OL: 1/2 Flow x 0.50 Inflow=77.46 cfs 40.837 af
Primary=38.73 cfs 20.418 af Secondary=38.73 cfs 20.418 af

Link PL: 1/2 Flow x 0.50 Inflow=10.30 cfs 5.004 af
Primary=5.15 cfs 2.502 af Secondary=5.15 cfs 2.502 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 216.067 af Average Runoff Depth = 0.52"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

Summary for Subcatchment A: A

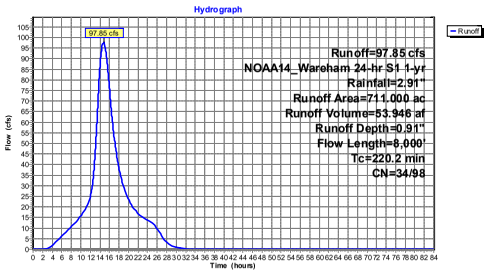
Runoff = 97.85 cfs @ 14.92 hrs, Volume= 53.946 af, Depth= 0.91"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

	Area (ac)	CN	Description
*	711.000	56	"33.99% imp"
	469.331	34	66.01% Pervious Area
	241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



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Summary for Subcatchment B: B

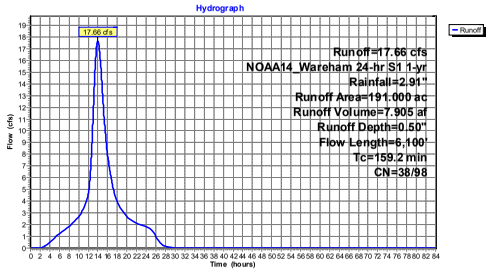
Runoff = 17.66 cfs @ 13.97 hrs, Volume= 7.905 af, Depth= 0.50"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

	Area (ac)	CN	Description
*	191.000	49	"18.54% imp"
	155.589	38	81.46% Pervious Area
	35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



Summary for Subcatchment C: C

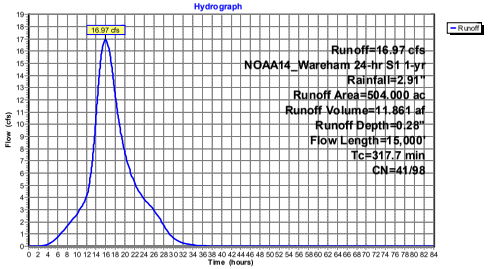
Runoff = 16.97 cfs @ 15.89 hrs, Volume= 11.861 af, Depth= 0.28"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

	Area (ac)	CN	Description
*	504.000	47	"10.54% imp"
	450.878	41	89.46% Pervious Area
	53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



Summary for Subcatchment D: D

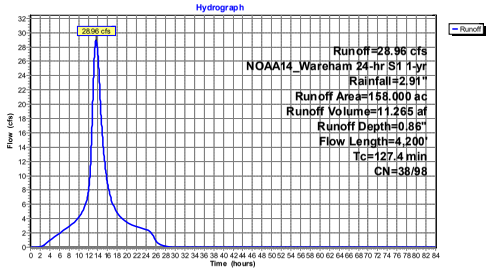
Runoff = 28.96 cfs @ 13.59 hrs, Volume= 11.265 af, Depth= 0.86"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

	Area (ac)	CN	Description
*	158.000	57	"31.94% imp"
	107.535	38	68.06% Pervious Area
	50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



Summary for Subcatchment E: E

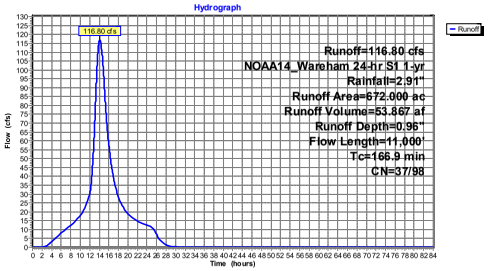
Runoff = 116.80 cfs @ 14.09 hrs, Volume= 53.867 af, Depth= 0.96"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

	Area (ac)	CN	Description
*	672.000	59	"35.91% imp"
	430.685	37	64.09% Pervious Area
	241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



Summary for Subcatchment F: F

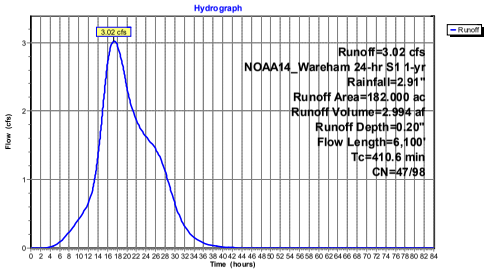
Runoff = 3.02 cfs @ 17.34 hrs, Volume= 2.994 af, Depth= 0.20"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

	Area (ac)	CN	Description
*	182.000	50	"6.11% imp"
	170.880	47	93.89% Pervious Area
	11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



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Summary for Subcatchment G: G

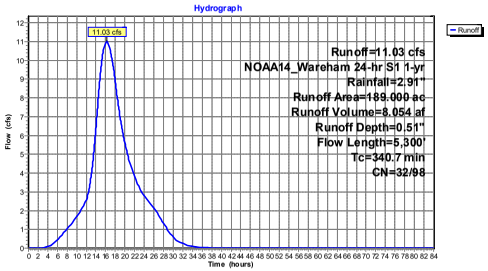
Runoff = 11.03 cfs @ 16.28 hrs, Volume= 8.054 af, Depth= 0.51"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 189.000	45	"19.09% imp"
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



Summary for Subcatchment H: H

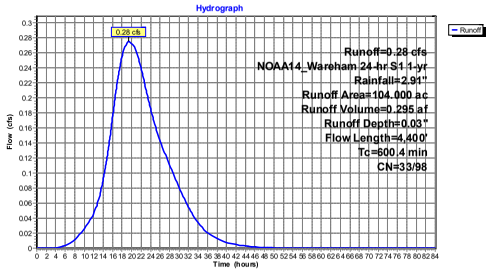
Runoff = 0.28 cfs @ 19.35 hrs, Volume= 0.295 af, Depth= 0.03"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 104.000	34	"1.27% imp"
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

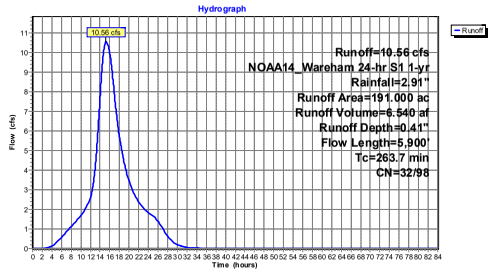
Runoff = 10.56 cfs @ 15.24 hrs, Volume= 6.540 af, Depth= 0.41"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 191.000	42	"15.34% imp"
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



Summary for Subcatchment J: J

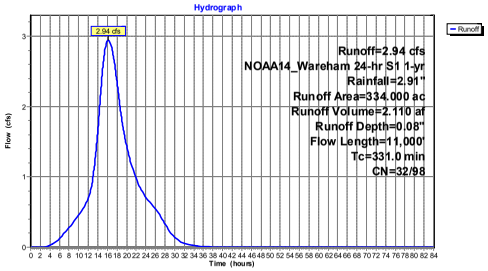
Runoff = 2.94 cfs @ 16.18 hrs, Volume= 2.110 af, Depth= 0.08"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 334.000	34	"2.83% imp"
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Summary for Subcatchment K: K

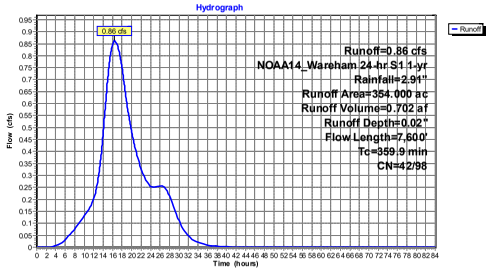
Runoff = 0.86 cfs @ 16.40 hrs, Volume= 0.702 af, Depth= 0.02"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 354.000	42	"0.83% imp"
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



Summary for Subcatchment L: L

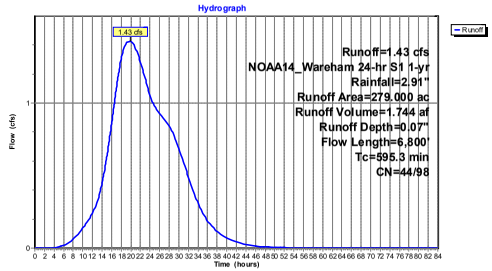
Runoff = 1.43 cfs @ 19.84 hrs, Volume= 1.744 af, Depth= 0.07"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 279.000	45	"2.43% imp"
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



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Summary for Subcatchment M: M

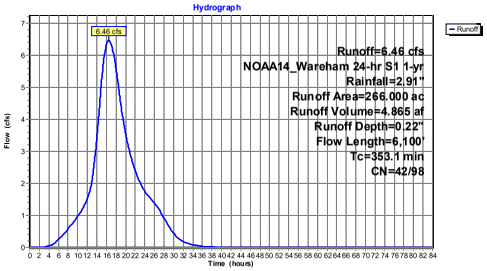
Runoff = 6.46 cfs @ 16.48 hrs, Volume= 4.865 af, Depth= 0.22"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 266.000	47	"8.14% imp"
244.348	42	91.86% Pervious Area
21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



Summary for Subcatchment N: N

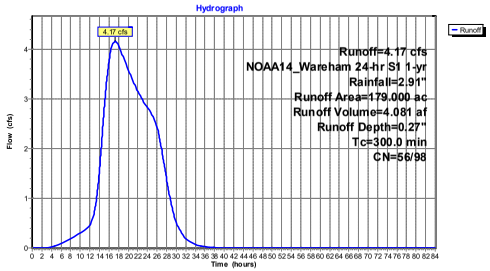
Runoff = 4.17 cfs @ 17.33 hrs, Volume= 4.081 af, Depth= 0.27"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 179.000	57	"3.17% imp"
173.326	56	96.83% Pervious Area
5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

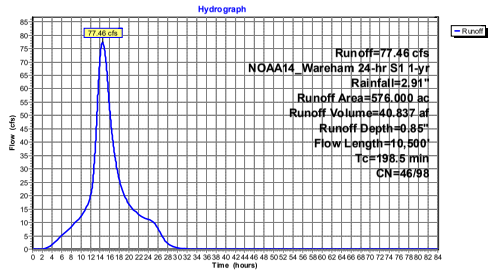
Runoff = 77.46 cfs @ 14.56 hrs, Volume= 40.837 af, Depth= 0.85"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 576.000	62	"31.1% imp"
396.864	46	68.90% Pervious Area
179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



Summary for Subcatchment P: P

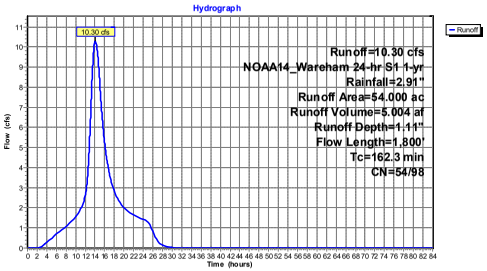
Runoff = 10.30 cfs @ 14.07 hrs, Volume= 5.004 af, Depth= 1.11"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1-yr Rainfall=2.91"

Area (ac)	CN	Description
* 54.000	71	"38.05% imp"
33.453	54	61.95% Pervious Area
20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Summary for Pond 1P: Halfway Pond

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth > 1.17" for 1-yr event
Inflow = 100.05 cfs @ 14.92 hrs, Volume= 69.219 af, Incl. 2.20 cfs Base Flow
Outflow = 4.20 cfs @ 28.71 hrs, Volume= 25.702 af, Atten= 96%, Lag= 827.5 min
Primary = 4.20 cfs @ 28.71 hrs, Volume= 25.702 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 64.57' @ 28.71 hrs Storage= 422.245 af (51.635 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,380.5 min (2,685.7 - 1,305.2)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

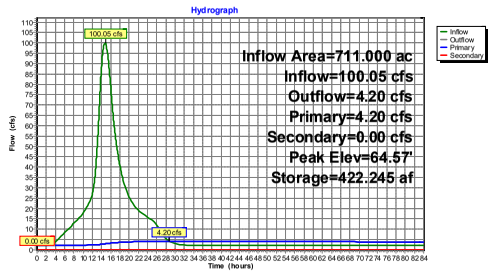
Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=4.19 cfs @ 28.71 hrs HW=64.57' TW=57.48' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 4.19 cfs @ 2.43 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 1P: Halfway Pond



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Summary for Pond 2P: Kennard Res

Inflow Area = 902.000 ac, 30.72% Impervious, Inflow Depth > 0.50" for 1-yr event
Inflow = 20.99 cfs @ 13.97 hrs, Volume= 37.771 af, Incl. 0.60 cfs Base Flow
Outflow = 8.36 cfs @ 17.90 hrs, Volume= 36.029 af, Atten= 60%, Lag= 235.8 min
Primary = 8.36 cfs @ 17.90 hrs, Volume= 36.029 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 57.53' @ 17.90 hrs Storage= 8.634 af (4.634 af above start)

Plug-Flow detention time= 835.8 min calculated for 32.029 af (85% of inflow)
Center-of-Mass det. time= 179.3 min (2,473.8 - 2,294.5)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

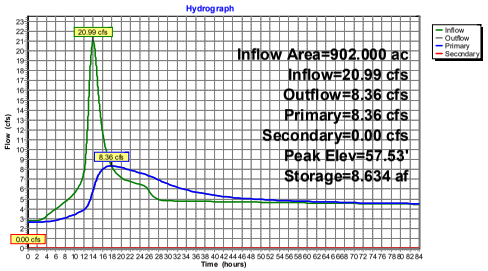
Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=8.33 cfs @ 17.90 hrs HW=57.53' TW=46.99' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 8.33 cfs @ 2.16 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.30' TW=46.77' (Dynamic Tailwater)
└**1=TOD** (Controls 0.00 cfs)

Pond 2P: Kennard Res



Summary for Pond 3P: Fawn Pond

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth > 1.12" for 1-yr event
Inflow = 29.46 cfs @ 13.59 hrs, Volume= 14.736 af, Incl. 0.50 cfs Base Flow
Outflow = 0.96 cfs @ 26.61 hrs, Volume= 5.839 af, Atten= 97%, Lag= 781.3 min
Primary = 0.96 cfs @ 26.61 hrs, Volume= 5.839 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 59.96' @ 26.61 hrs Storage= 38.519 af (10.799 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,402.5 min (2,665.3 - 1,262.8)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

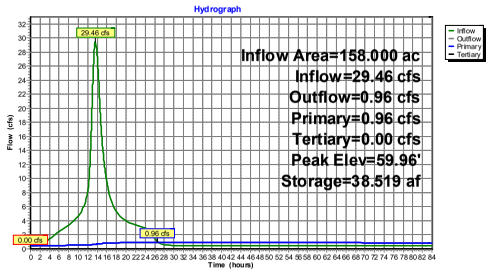
Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=0.95 cfs @ 26.61 hrs HW=59.96' TW=47.05' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.95 cfs @ 2.34 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=59.83' TW=46.77' (Dynamic Tailwater)
└**2=TOD South** (Controls 0.00 cfs)

Pond 3P: Fawn Pond



Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow Area = 1,564.000 ac, 24.34% Impervious, Inflow Depth > 0.50" for 1-yr event
Inflow = 27.36 cfs @ 15.89 hrs, Volume= 64.836 af, Incl. 1.60 cfs Base Flow
Outflow = 13.52 cfs @ 24.90 hrs, Volume= 61.361 af, Atten= 51%, Lag= 540.7 min
Primary = 13.52 cfs @ 24.90 hrs, Volume= 61.361 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 47.06' @ 24.90 hrs Storage= 20.011 af (10.291 af above start)

Plug-Flow detention time= 1,155.5 min calculated for 51.641 af (80% of inflow)
Center-of-Mass det. time= 267.7 min (2,506.3 - 2,238.6)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

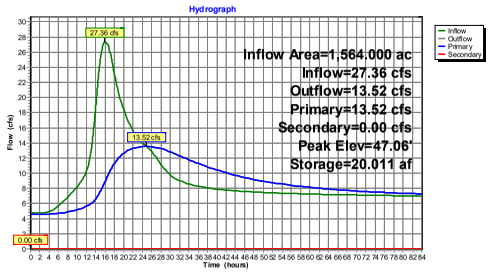
Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=13.49 cfs @ 24.90 hrs HW=47.06' TW=34.27' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 13.49 cfs @ 2.45 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=46.77' TW=33.99' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 4P: Bessey Bog Res - 2.4sm



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A00840 - 509

Summary for Pond 5P: Glen Charlie Pond

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 0.70" for 1-yr event
Inflow = 125.57 cfs @ 14.09 hrs, Volume= 129.806 af, Incl. 2.10 cfs Base Flow
Outflow = 26.56 cfs @ 25.10 hrs, Volume= 117.901 af, Atten= 79%, Lag= 660.3 min
Primary = 26.56 cfs @ 25.10 hrs, Volume= 117.901 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 34.27' @ 25.10 hrs Storage= 67.307 af (41.182 af above start)

Plug-Flow detention time= 1,816.6 min calculated for 91.774 af (71% of inflow)
Center-of-Mass det. time= 617.7 min (2,464.0 - 1,846.3)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00

Elev. (feet)	41.00	40.00	39.00	37.70	37.70	41.00

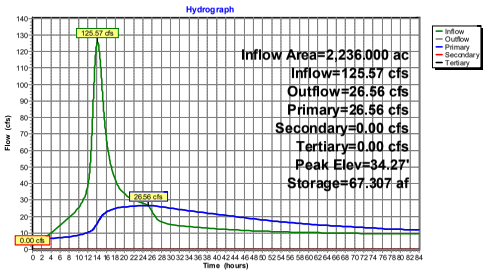
#6 Tertiary 34.50' **24.0" W x 12.0" H Vert. NE Culvert** C= 0.600
Limited to weir flow at low heads

Primary OutFlow Max=26.46 cfs @ 25.10 hrs HW=34.27' TW=20.94' (Dynamic Tailwater)
1=**Spillway** (Weir Controls 26.46 cfs @ 2.37 fps)
2=**TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
3=**SE Dike** (Controls 0.00 cfs)
4=**SE Culvert** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
5=**NE Dike** (Controls 0.00 cfs)
6=**NE Culvert** (Controls 0.00 cfs)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 34.20' @ 0.00 hrs Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

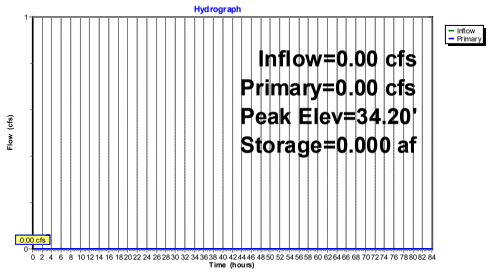
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=34.20' TW=22.70' (Dynamic Tailwater)
1=**Orifice/Grate** (Controls 0.00 cfs)
2=**TOD** (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



Summary for Pond 6.2P: Maple Sping Bogs US

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 0.20" for 1-yr event
Inflow = 3.02 cfs @ 17.34 hrs, Volume= 2.994 af
Outflow = 0.74 cfs @ 29.61 hrs, Volume= 2.225 af, Atten= 75%, Lag= 736.4 min
Primary = 0.74 cfs @ 29.61 hrs, Volume= 2.225 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 22.83' @ 29.61 hrs Storage= 2.227 af

Plug-Flow detention time= 1,498.3 min calculated for 2.225 af (74% of inflow)
Center-of-Mass det. time= 1,342.1 min (2,556.3 - 1,214.2)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

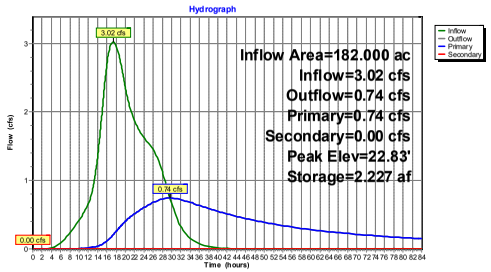
Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=0.74 cfs @ 29.61 hrs HW=22.83' TW=17.12' (Dynamic Tailwater)
1=**Orifice/Grate** (Orifice Controls 0.74 cfs @ 1.15 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.70' TW=17.00' (Dynamic Tailwater)
2=**TOD** (Controls 0.00 cfs)

Pond 6.2P: Maple Sping Bogs US



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Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 0.15" for 1-yr event
Inflow = 0.74 cfs @ 29.61 hrs, Volume= 2.225 af
Outflow = 0.70 cfs @ 32.72 hrs, Volume= 2.129 af, Atten= 6%, Lag= 186.4 min
Primary = 0.70 cfs @ 32.72 hrs, Volume= 2.129 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 17.12' @ 32.72 hrs Storage= 0.249 af

Plug-Flow detention time= 296.7 min calculated for 2.129 af (96% of inflow)
Center-of-Mass det. time= 195.0 min (2,751.4 - 2,556.3)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

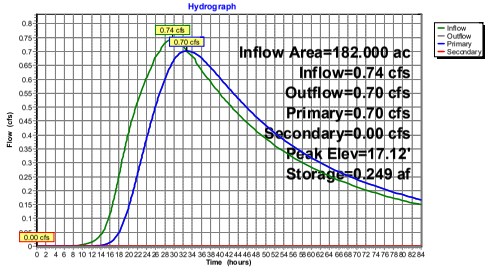
Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=0.70 cfs @ 32.72 hrs HW=17.12' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 0.70 cfs @ 1.13 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 0.63" for 1-yr event
Inflow = 26.56 cfs @ 25.10 hrs, Volume= 117.901 af
Outflow = 26.55 cfs @ 25.45 hrs, Volume= 117.463 af, Atten= 0%, Lag= 21.1 min
Primary = 26.55 cfs @ 25.45 hrs, Volume= 117.463 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 20.94' @ 25.45 hrs Storage= 1.495 af (1.048 af above start)

Plug-Flow detention time= 47.1 min calculated for 117.016 af (99% of inflow)
Center-of-Mass det. time= 18.4 min (2,482.4 - 2,464.0)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

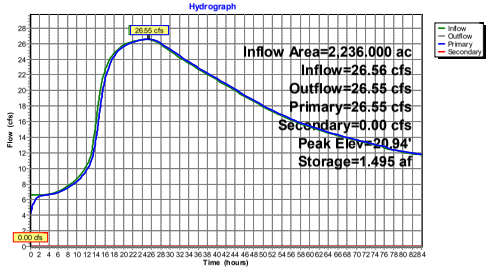
Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

Primary OutFlow Max=26.55 cfs @ 25.45 hrs HW=20.94' TW=0.00' (Dynamic Tailwater)
└**1=Bridge/Spillway** (Weir Controls 26.55 cfs @ 2.81 fps)
└**3=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.49' TW=22.70' (Dynamic Tailwater)
└**2=Culvert to Bogs** (Controls 0.00 cfs)
└**4=TOD_Bogs** (Controls 0.00 cfs)

Pond 6P: Maple Springs Dam - 3.5sm



Summary for Pond 7P: Little Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 0.77" for 1-yr event
Inflow = 11.62 cfs @ 16.28 hrs, Volume= 12.150 af, Incl. 0.59 cfs Base Flow
Outflow = 10.96 cfs @ 17.10 hrs, Volume= 12.099 af, Atten= 6%, Lag= 49.4 min
Primary = 10.96 cfs @ 17.10 hrs, Volume= 12.099 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 59.66' @ 17.10 hrs Storage= 23.252 af (1.092 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 67.6 min (1,627.3 - 1,559.7)

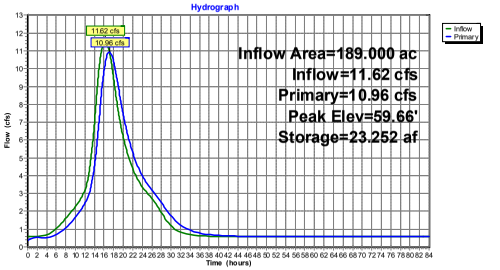
Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=10.96 cfs @ 17.10 hrs HW=59.66' TW=52.04' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 10.96 cfs @ 0.57 fps)

Pond 7P: Little Five Mile Pond



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Summary for Pond 8P: Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 0.77" for 1-yr event
Inflow = 10.96 cfs @ 17.10 hrs, Volume= 12.099 af
Outflow = 0.49 cfs @ 84.00 hrs, Volume= 2.395 af, Atten= 95%, Lag= 4,014.0 min
Primary = 0.49 cfs @ 84.00 hrs, Volume= 2.395 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 52.27' @ 84.00 hrs Storage= 9.703 af

Plug-Flow detention time= 2,491.5 min calculated for 2.395 af (20% of inflow)
Center-of-Mass det. time= 1,564.4 min (3,191.6 - 1,627.3)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

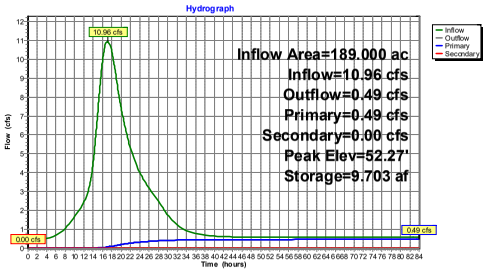
Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=0.49 cfs @ 84.00 hrs HW=52.27' TW=0.00' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 0.49 cfs @ 1.87 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=51.90' TW=29.60' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 8P: Five Mile Pond



Summary for Pond 9P: Kettle Hole

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth > 0.27" for 1-yr event
Inflow = 0.58 cfs @ 19.35 hrs, Volume= 2.377 af, Incl. 0.30 cfs Base Flow
Outflow = 0.54 cfs @ 21.96 hrs, Volume= 2.386 af, Atten= 6%, Lag= 156.7 min
Primary = 0.54 cfs @ 21.96 hrs, Volume= 2.386 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.00' @ 21.96 hrs Storage= 8.998 af (0.048 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 17.7 min (2,387.8 - 2,370.0)

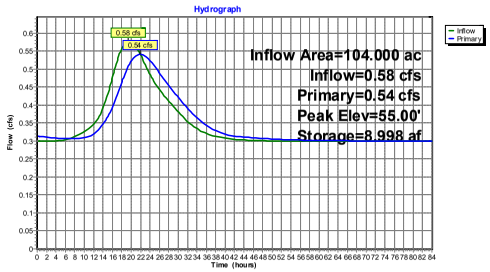
Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=0.54 cfs @ 21.96 hrs HW=55.00' TW=29.87' (Dynamic Tailwater)
↳**1=Relief** (Weir Controls 0.54 cfs @ 0.33 fps)

Pond 9P: Kettle Hole



Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow Area = 484.000 ac, 13.78% Impervious, Inflow Depth > 0.38" for 1-yr event
Inflow = 11.56 cfs @ 15.53 hrs, Volume= 15.487 af, Incl. 0.60 cfs Base Flow
Outflow = 4.39 cfs @ 20.60 hrs, Volume= 14.377 af, Atten= 62%, Lag= 304.5 min
Primary = 4.39 cfs @ 20.60 hrs, Volume= 14.377 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1,500 af
Peak Elev= 29.87' @ 20.60 hrs Storage= 5.544 af (4.044 af above start)

Plug-Flow detention time= 1,066.4 min calculated for 12.877 af (83% of inflow)
Center-of-Mass det. time= 380.6 min (2,342.9 - 1,962.4)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LiDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
35.00	115.000
36.50	160.000
40.00	300.000

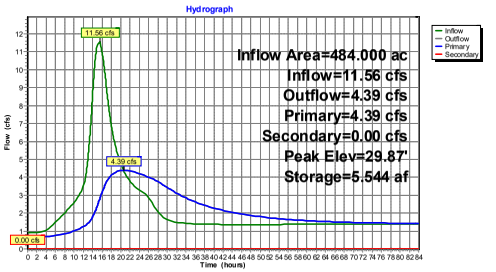
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=4.39 cfs @ 20.60 hrs HW=29.87' TW=21.46' (Dynamic Tailwater)
↳**1=Drop Inlet Spillway** (Weir Controls 4.39 cfs @ 2.01 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.60' TW=21.26' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 10P: Maple Springs Brook Dam - 0.8sm



Proposal No. 606352-136278
A00840 - 512

Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow Area = 1,172.000 ac, 6.75% Impervious, Inflow Depth > 0.33" for 1-yr event
Inflow = 8.48 cfs @ 19.30 hrs, Volume= 31.768 af, Incl. 1.10 cfs Base Flow
Outflow = 7.52 cfs @ 25.61 hrs, Volume= 31.395 af, Atten= 11%, Lag= 378.6 min
Primary = 7.52 cfs @ 25.61 hrs, Volume= 31.395 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 21.49' @ 25.61 hrs Storage= 4.659 af (1.949 af above start)

Plug-Flow detention time= 543.8 min calculated for 28.684 af (90% of inflow)
Center-of-Mass det. time= 91.4 min (2,434.6 - 2,343.2)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

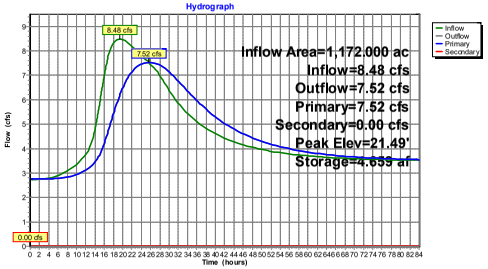
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=7.52 cfs @ 25.61 hrs HW=21.49' TW=16.07' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 7.52 cfs @ 2.56 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.26' TW=15.71' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 11P: Unnamed Road - 1.8sm



Summary for Pond 12P: Maple Springs Road Dam

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth > 0.33" for 1-yr event
Inflow = 3.94 cfs @ 16.18 hrs, Volume= 9.052 af, Incl. 1.00 cfs Base Flow
Outflow = 2.49 cfs @ 19.84 hrs, Volume= 9.052 af, Atten= 37%, Lag= 219.5 min
Primary = 2.49 cfs @ 19.84 hrs, Volume= 9.052 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 38.83' @ 19.84 hrs Storage= 1.982 af (0.902 af above start)

Plug-Flow detention time= 699.9 min calculated for 7.972 af (88% of inflow)
Center-of-Mass det. time= 107.6 min (2,288.5 - 2,180.9)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

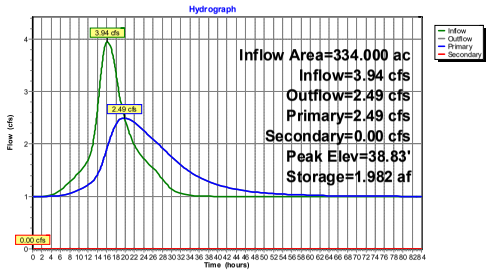
Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=2.49 cfs @ 19.84 hrs HW=38.83' TW=21.44' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 2.49 cfs @ 1.92 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=38.68' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 12P: Maple Springs Road Dam



Summary for Pond 13.1P: Bogs_L_US

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 0.34" for 1-yr event
Inflow = 2.33 cfs @ 19.84 hrs, Volume= 7.992 af, Incl. 0.90 cfs Base Flow
Outflow = 2.32 cfs @ 20.05 hrs, Volume= 7.993 af, Atten= 0%, Lag= 12.3 min
Primary = 2.32 cfs @ 20.05 hrs, Volume= 7.993 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 29.78' @ 20.05 hrs Storage= 0.098 af (0.045 af above start)

Plug-Flow detention time= 38.4 min calculated for 7.939 af (99% of inflow)
Center-of-Mass det. time= 5.1 min (2,276.9 - 2,271.8)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

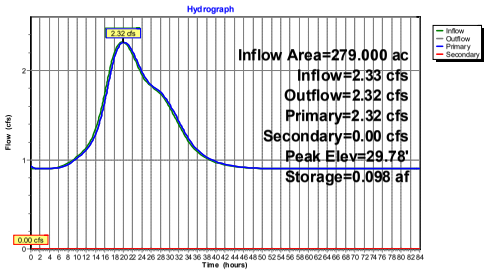
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=2.32 cfs @ 20.05 hrs HW=29.78' TW=25.87' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 2.32 cfs @ 1.68 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.65' TW=25.75' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.1P: Bogs_L_US



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A00840 - 513

Summary for Pond 13.2P: Bogs_L_DS

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 0.34" for 1-yr event
Inflow = 2.32 cfs @ 20.05 hrs, Volume= 7.993 af
Outflow = 2.31 cfs @ 20.64 hrs, Volume= 7.995 af, Atten= 0%, Lag= 35.7 min
Primary = 2.31 cfs @ 20.64 hrs, Volume= 7.995 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 25.87' @ 20.64 hrs Storage= 0.137 af (0.062 af above start)

Plug-Flow detention time= 53.7 min calculated for 7.920 af (99% of inflow)
Center-of-Mass det. time= 7.1 min (2,283.9 - 2,276.9)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

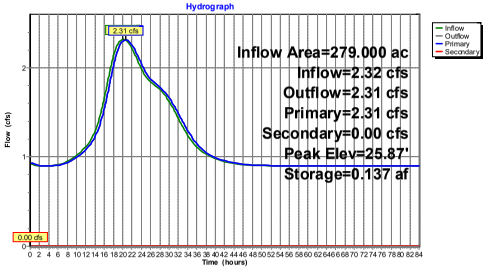
Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=2.31 cfs @ 20.64 hrs HW=25.87' TW=16.13' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 2.31 cfs @ 1.68 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 13.2P: Bogs_L_DS



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow Area = 1,717.000 ac, 6.26% Impervious, Inflow Depth > 0.35" for 1-yr event
Inflow = 13.88 cfs @ 17.77 hrs, Volume= 49.809 af, Incl. 0.80 cfs Base Flow
Outflow = 13.70 cfs @ 18.50 hrs, Volume= 49.753 af, Atten= 1%, Lag= 43.6 min
Primary = 13.70 cfs @ 18.50 hrs, Volume= 49.753 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 16.15' @ 18.50 hrs Storage= 1.721 af (0.656 af above start)

Plug-Flow detention time= 127.4 min calculated for 48.687 af (98% of inflow)
Center-of-Mass det. time= 17.3 min (2,305.9 - 2,288.6)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

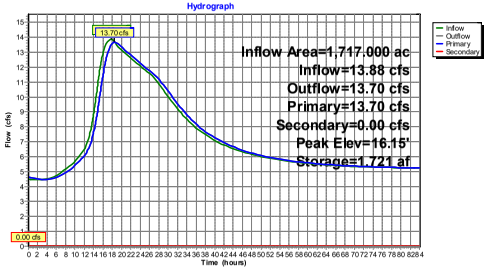
Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

Primary OutFlow Max=13.70 cfs @ 18.50 hrs HW=16.15' TW=0.00' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 13.70 cfs @ 1.93 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.71' TW=0.00' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 14P: Bogs_M - 2.7sm



Summary for Pond 15.1P: Bogs_N_US

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 0.55" for 1-yr event
Inflow = 4.77 cfs @ 17.33 hrs, Volume= 8.246 af, Incl. 0.60 cfs Base Flow
Outflow = 3.98 cfs @ 20.90 hrs, Volume= 8.241 af, Atten= 17%, Lag= 214.3 min
Primary = 3.98 cfs @ 20.90 hrs, Volume= 8.241 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 25.39' @ 20.90 hrs Storage= 1.263 af (0.911 af above start)

Plug-Flow detention time= 318.2 min calculated for 7.889 af (96% of inflow)
Center-of-Mass det. time= 105.8 min (1,983.8 - 1,877.9)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

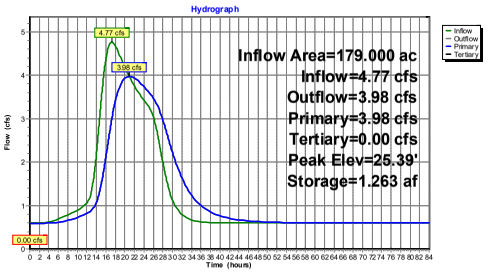
Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=3.98 cfs @ 20.90 hrs HW=25.39' TW=20.16' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 3.98 cfs @ 2.02 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.11' TW=20.11' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 15.1P: Bogs_N_US



Proposal No. 606352-136278
A00840 - 514

Summary for Pond 15.2P: Bogs_N_DS

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 0.55" for 1-yr event
Inflow = 3.98 cfs @ 20.90 hrs, Volume= 8.241 af
Outflow = 1.75 cfs @ 31.51 hrs, Volume= 7.612 af, Atten= 56%, Lag= 636.4 min
Primary = 1.75 cfs @ 31.51 hrs, Volume= 7.612 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 20.23' @ 31.51 hrs Storage= 5.331 af (2.764 af above start)

Plug-Flow detention time= 2,067.5 min calculated for 5.045 af (61% of inflow)
Center-of-Mass det. time= 593.9 min (2,577.7 - 1,983.8)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

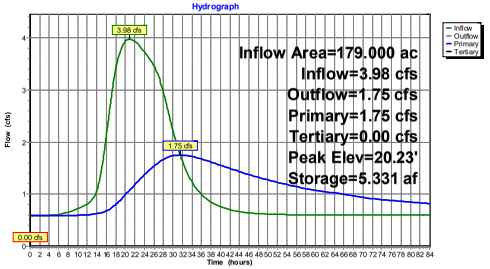
Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=1.75 cfs @ 31.51 hrs HW=20.23' TW=0.00' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 1.75 cfs @ 1.53 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
└─**2=TOD** (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS

Hydrograph



Summary for Pond 16.1: Mill Pond Dam -PC

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.08" for 1-yr event
Inflow = 144.05 cfs @ 14.61 hrs, Volume= 444.949 af, Incl. 32.00 cfs Base Flow
Outflow = 71.16 cfs @ 29.50 hrs, Volume= 420.877 af, Atten= 51%, Lag= 893.6 min
Primary = 49.17 cfs @ 29.50 hrs, Volume= 278.339 af
Routed to Pond 17B : Proposed Bridge
Secondary = 21.99 cfs @ 29.50 hrs, Volume= 142.538 af
Routed to Pond Wr 24 :
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 17B : Proposed Bridge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 470.969 af
Peak Elev= 14.65' @ 29.50 hrs Storage= 523.812 af (52.843 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 249.9 min (2,576.3 - 2,326.4)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,941.850 af	**Storage** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.130
5.00	4.140
6.00	9.110
7.00	16.590
8.00	34.960
9.00	60.590
10.00	94.410
11.00	142.690
12.00	214.660
13.00	314.540
13.80	403.920
14.00	426.260
15.00	575.290
16.00	771.680
17.00	994.600
18.30	1,368.590
19.00	1,592.930
20.00	1,941.850

Device	Routing	Invert	Outlet Devices
#1	Primary	15.50'	**110.0' long x 1.5' breadth Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32
#2	Primary	13.60'	**15.0' long x 1.0' breadth Notch as SW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#3	Secondary	12.50'	**3.3' long x 1.0' breadth 3.25' Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#4	Tertiary	18.00'	**TOD, C= 2.60** Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00 Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 8	5.20'	**48.0" W x 48.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#7	Device 8	15.50'	**6.0' long x 20.00' rise MLO DownwardOpGate** 2 End Contraction(s) 5.0' Crest Height
#8	Tertiary	4.00'	**96.0" W x 48.0" H Box Culvert X 0.00** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 32.00 sf

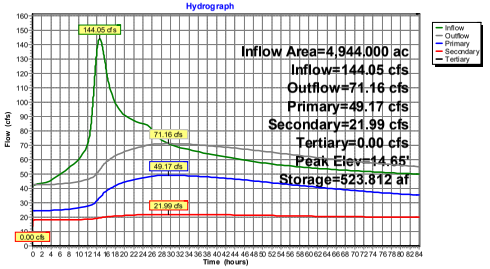
Primary OutFlow Max=48.85 cfs @ 29.50 hrs HW=14.65' TW=8.72' (Dynamic Tailwater)
├─**1=Spillway** (Controls 0.00 cfs)
└─**2=Notch as SW** (Weir Controls 48.85 cfs @ 3.09 fps)

Secondary OutFlow Max=22.06 cfs @ 29.50 hrs HW=14.65' TW=14.18' (Dynamic Tailwater)
└─**3=3.25' Weir** (Weir Controls 22.06 cfs @ 3.10 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.30' TW=8.48' (Dynamic Tailwater)
├─**4=TOD** (Controls 0.00 cfs)
├─**5=US Relief - Bypasses Dam** (Controls 0.00 cfs)
└─**8=Culvert** (Controls 0.00 cfs)
  ├─**6=Orifice/Grate** (Controls 0.00 cfs)
  └─**7=MLO DownwardOpGate** (Controls 0.00 cfs)

Pond 16.1: Mill Pond Dam -PC

Hydrograph



Summary for Pond 16.3: Downstream Weir

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 0.68" for 1-yr event
Inflow = 83.34 cfs @ 0.01 hrs, Volume= 278.334 af
Outflow = 49.17 cfs @ 29.51 hrs, Volume= 278.330 af, Atten= 41%, Lag= 1,769.8 min
Primary = 49.17 cfs @ 29.51 hrs, Volume= 278.330 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 8.72' @ 29.51 hrs Surf.Area= 2,000 sf Storage= 9,439 cf (479 cf above start)

Plug-Flow detention time= 3.8 min calculated for 278.123 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,593.1 - 2,593.1)

Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	8.00'	**DS Weir, C= 2.60** Offset (feet) 0.00 0.00 23.00 23.00 Elev. (feet) 17.00 10.00 8.00 17.00
#2	Primary	8.00'	**27.0' long x 1.5' breadth El 8 Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32

Primary OutFlow Max=49.17 cfs @ 29.51 hrs HW=8.72' (Free Discharge)
├─**1=DS Weir** (Weir Controls 5.25 cfs @ 0.88 fps)
└─**2=El 8 Weir** (Weir Controls 43.91 cfs @ 2.26 fps)

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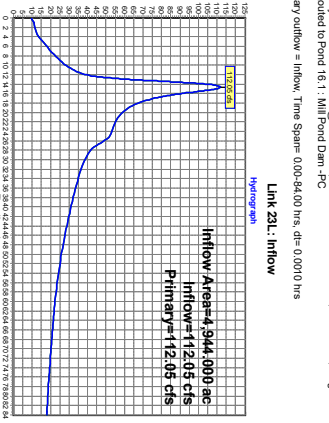
Pond 16.3: Downstream Weir



Summary for Pond 17B: Proposed Bridge

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 0.68" for 1-yr event
Inflow = 83.34 cfs @ 12.01 hrs, Volume= 278.334 af
Outflow = 83.34 cfs @ 12.01 hrs, Volume= 278.334 af, Atten= 0%, Lag= 0.0 min
Primary = 83.34 cfs @ 12.01 hrs, Volume= 278.334 af
Routed to Pond 16.3 : Downstream Weir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 8.72' @ 29.51 hrs Surf.Area= 2,000 sf Storage= 9,444 cf (484 cf above start)

Plug-Flow detention time= 3.9 min calculated for 278.128 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,593.1 - 2,593.0)

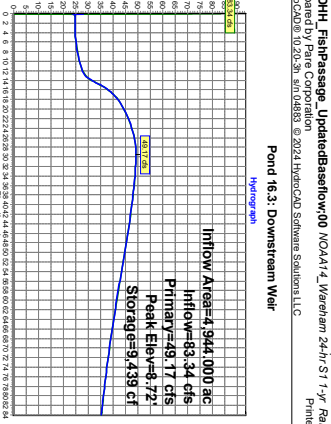
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	4.00'	**518.0" W x 127.0" H Box Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 456.85 sf

Primary OutFlow Max=0.00 cfs @ 0.01 hrs HW=8.46' TW=8.48' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond 17B: Proposed Bridge

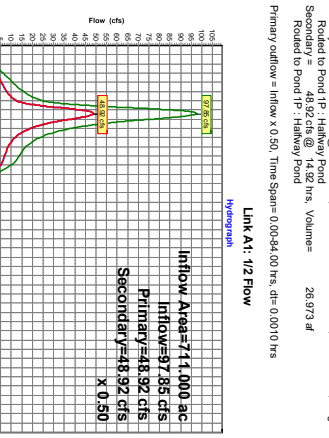


Summary for Link 23L: Inflow

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 0.54" for 1-yr event
Inflow = 112.05 cfs @ 14.61 hrs, Volume= 222.798 af
Primary = 112.05 cfs @ 14.61 hrs, Volume= 222.798 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16.1 : Mill Pond Dam +PC

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow

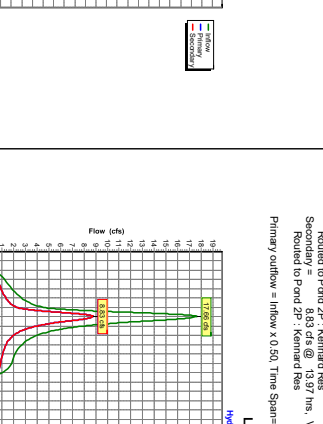


Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 0.91" for 1-yr event
Inflow = 97.85 cfs @ 14.92 hrs, Volume= 53.946 af
Primary = 48.92 cfs @ 14.92 hrs, Volume= 26.973 af, Atten= 50%, Lag= 0.0 min
Secondary = 48.92 cfs @ 14.92 hrs, Volume= 26.973 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow

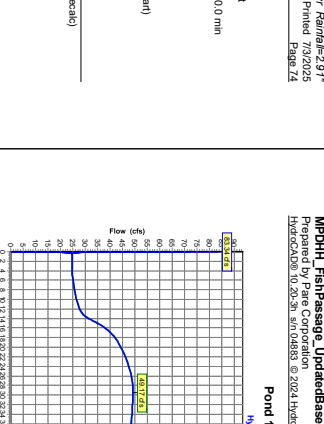


Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 0.50" for 1-yr event
Inflow = 17.66 cfs @ 13.97 hrs, Volume= 7.905 af
Primary = 8.83 cfs @ 13.97 hrs, Volume= 3.952 af, Atten= 50%, Lag= 0.0 min
Secondary = 8.83 cfs @ 13.97 hrs, Volume= 3.952 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

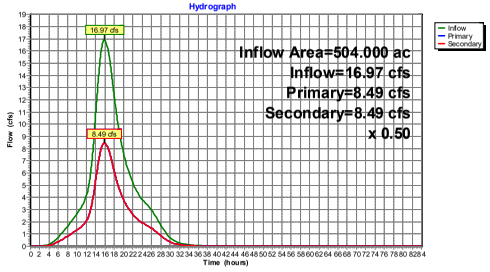


Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth = 0.28" for 1-yr event
Inflow = 16.97 cfs @ 15.89 hrs, Volume= 11.861 af
Primary = 8.49 cfs @ 15.89 hrs, Volume= 5.930 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 8.49 cfs @ 15.89 hrs, Volume= 5.930 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

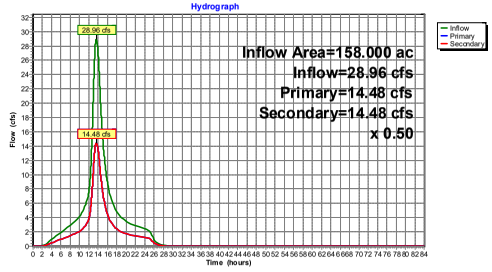


Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 0.86" for 1-yr event
Inflow = 28.96 cfs @ 13.59 hrs, Volume= 11.265 af
Primary = 14.48 cfs @ 13.59 hrs, Volume= 5.632 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 3P : Fawn Pond
Secondary = 14.48 cfs @ 13.59 hrs, Volume= 5.632 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow

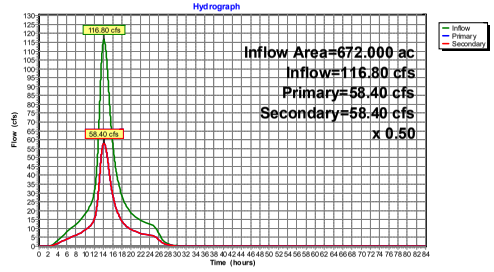


Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 0.96" for 1-yr event
Inflow = 116.80 cfs @ 14.09 hrs, Volume= 53.867 af
Primary = 58.40 cfs @ 14.09 hrs, Volume= 26.933 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 5P : Glen Charlie Pond
Secondary = 58.40 cfs @ 14.09 hrs, Volume= 26.933 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow

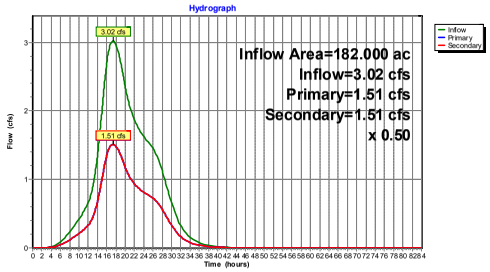


Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 0.20" for 1-yr event
Inflow = 3.02 cfs @ 17.34 hrs, Volume= 2.994 af
Primary = 1.51 cfs @ 17.34 hrs, Volume= 1.497 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 6.2P : Maple Sping Bogs US
Secondary = 1.51 cfs @ 17.34 hrs, Volume= 1.497 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow

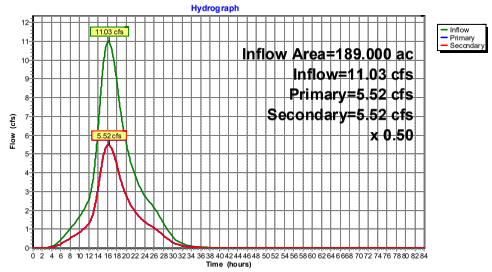


Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth = 0.51" for 1-yr event
Inflow = 11.03 cfs @ 16.28 hrs, Volume= 8.054 af
Primary = 5.52 cfs @ 16.28 hrs, Volume= 4.027 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 7P : Little Five Mile Pond
Secondary = 5.52 cfs @ 16.28 hrs, Volume= 4.027 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow

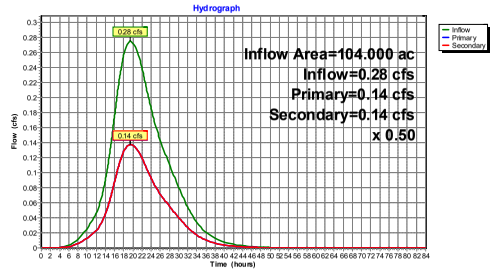


Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth = 0.03" for 1-yr event
Inflow = 0.28 cfs @ 19.35 hrs, Volume= 0.295 af
Primary = 0.14 cfs @ 19.35 hrs, Volume= 0.147 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 9P : Kettle Hole
Secondary = 0.14 cfs @ 19.35 hrs, Volume= 0.147 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow



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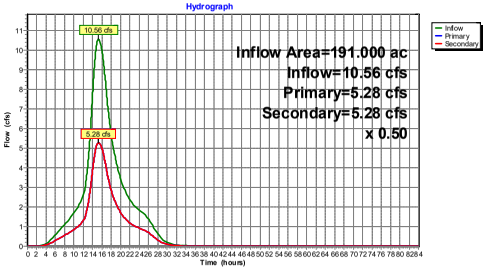
Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth = 0.41" for 1-yr event
Inflow = 10.56 cfs @ 15.24 hrs, Volume= 6.540 af
Primary = 5.28 cfs @ 15.24 hrs, Volume= 3.270 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 5.28 cfs @ 15.24 hrs, Volume= 3.270 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

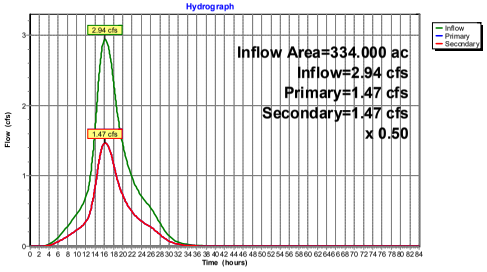


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth = 0.08" for 1-yr event
Inflow = 2.94 cfs @ 16.18 hrs, Volume= 2.110 af
Primary = 1.47 cfs @ 16.18 hrs, Volume= 1.055 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 12P : Maple Springs Road Dam
Secondary = 1.47 cfs @ 16.18 hrs, Volume= 1.055 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow

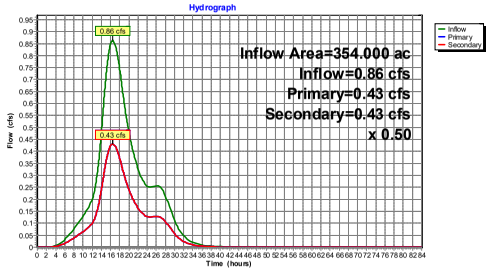


Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth = 0.02" for 1-yr event
Inflow = 0.86 cfs @ 16.40 hrs, Volume= 0.702 af
Primary = 0.43 cfs @ 16.40 hrs, Volume= 0.351 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.43 cfs @ 16.40 hrs, Volume= 0.351 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow

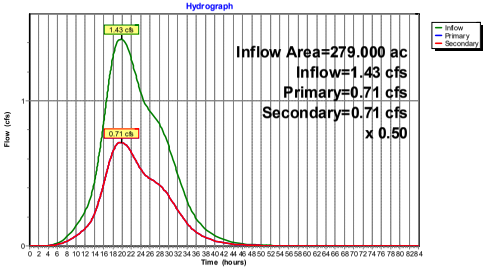


Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth = 0.07" for 1-yr event
Inflow = 1.43 cfs @ 19.84 hrs, Volume= 1.744 af
Primary = 0.71 cfs @ 19.84 hrs, Volume= 0.872 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 13.1P : Bogs_L_US
Secondary = 0.71 cfs @ 19.84 hrs, Volume= 0.872 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow

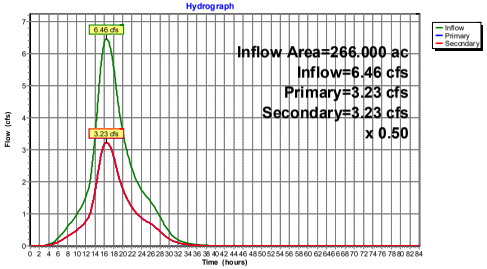


Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth = 0.22" for 1-yr event
Inflow = 6.46 cfs @ 16.48 hrs, Volume= 4.865 af
Primary = 3.23 cfs @ 16.48 hrs, Volume= 2.433 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 3.23 cfs @ 16.48 hrs, Volume= 2.433 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow

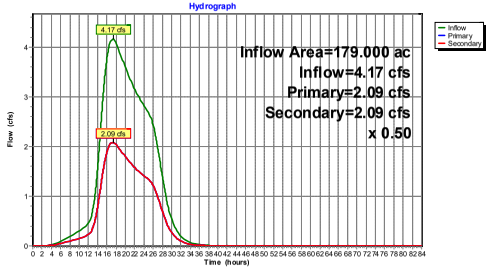


Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth = 0.27" for 1-yr event
Inflow = 4.17 cfs @ 17.33 hrs, Volume= 4.081 af
Primary = 2.09 cfs @ 17.33 hrs, Volume= 2.040 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 15.1P : Bogs_N_US
Secondary = 2.09 cfs @ 17.33 hrs, Volume= 2.040 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow



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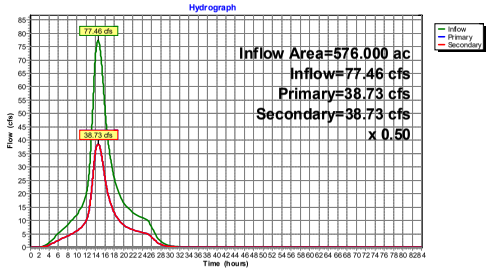
Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 0.85" for 1-yr event
Inflow = 77.46 cfs @ 14.56 hrs, Volume= 40.837 af
Primary = 38.73 cfs @ 14.56 hrs, Volume= 20.418 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 38.73 cfs @ 14.56 hrs, Volume= 20.418 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow

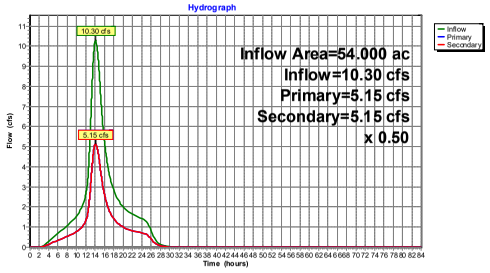


Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 1.11" for 1-yr event
Inflow = 10.30 cfs @ 14.07 hrs, Volume= 5.004 af
Primary = 5.15 cfs @ 14.07 hrs, Volume= 2.502 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 5.15 cfs @ 14.07 hrs, Volume= 2.502 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=1.09"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=119.59 cfs 64.579 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=0.60"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=21.67 cfs 9.487 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=0.36"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=20.67 cfs 14.989 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=1.03"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=35.63 cfs 13.502 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=1.15"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=143.26 cfs 64.487 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=0.30"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=4.29 cfs 4.575 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=0.61"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=13.42 cfs 9.641 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=0.04"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=0.33 cfs 0.353 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=0.49"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=12.89 cfs 7.829 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=0.09"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=3.58 cfs 2.526 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=0.06"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=1.52 cfs 1.714 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=0.14"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=2.18 cfs 3.144 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=0.29"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=7.86 cfs 6.432 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=0.45"
Tc=300.0 min CN=56/98 Runoff=7.81 cfs 6.702 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=1.06"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=95.14 cfs 50.944 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=1.40"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=13.23 cfs 6.310 af

Pond 1P: Halfway Pond Peak Elev=64.61' Storage=432.372 af Inflow=121.79 cfs 79.852 af
Primary=4.64 cfs 27.960 af Secondary=0.00 cfs 0.000 af Outflow=4.64 cfs 27.960 af

Pond 2P: Kennard Res Peak Elev=57.58' Storage=9.530 af Inflow=25.12 cfs 41.613 af
Primary=9.66 cfs 39.576 af Secondary=0.00 cfs 0.000 af Outflow=9.66 cfs 39.576 af

Pond 3P: Fawn Pond Peak Elev=59.98' Storage=40.641 af Inflow=36.13 cfs 16.974 af
Primary=1.07 cfs 6.409 af Tertiary=0.00 cfs 0.000 af Outflow=1.07 cfs 6.409 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=47.12' Storage=22.242 af Inflow=32.40 cfs 72.081 af
Primary=15.82 cfs 68.002 af Secondary=0.00 cfs 0.000 af Outflow=15.82 cfs 68.002 af

Pond 5P: Glen Charlie Pond Peak Elev=34.32' Storage=75.407 af Inflow=152.48 cfs 147.068 af
Primary=30.73 cfs 133.178 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=30.73 cfs 133.178 af

Pond 6.1P: Ortalani Reservoir Peak Elev=34.20' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=22.89' Storage=3.282 af Inflow=4.29 cfs 4.575 af
Primary=1.32 cfs 3.620 af Secondary=0.00 cfs 0.000 af Outflow=1.32 cfs 3.620 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=17.18' Storage=0.367 af Inflow=1.32 cfs 3.620 af
Primary=1.26 cfs 3.502 af Secondary=0.00 cfs 0.000 af Outflow=1.26 cfs 3.502 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=21.00' Storage=1.641 af Inflow=30.73 cfs 133.178 af
Primary=30.73 cfs 132.686 af Secondary=0.00 cfs 0.000 af Outflow=30.73 cfs 132.686 af

Pond 7P: Little Five Mile Pond Peak Elev=59.67' Storage=23.397 af Inflow=14.01 cfs 13.737 af
Outflow=13.30 cfs 13.686 af

Pond 8P: Five Mile Pond Peak Elev=52.30' Storage=10.612 af Inflow=13.30 cfs 13.686 af
Primary=0.61 cfs 3.126 af Secondary=0.00 cfs 0.000 af Outflow=0.61 cfs 3.126 af

Pond 9P: Kettle Hole Peak Elev=55.00' Storage=9.007 af Inflow=0.63 cfs 2.436 af
Outflow=0.60 cfs 2.444 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=29.92' Storage=6.258 af Inflow=13.90 cfs 17.565 af
Primary=5.27 cfs 16.302 af Secondary=0.00 cfs 0.000 af Outflow=5.27 cfs 16.302 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=21.57' Storage=5.307 af Inflow=10.20 cfs 35.120 af
Primary=9.42 cfs 34.687 af Secondary=0.00 cfs 0.000 af Outflow=9.42 cfs 34.687 af

Pond 12P: Maple Springs Road Dam Peak Elev=38.86' Storage=2.158 af Inflow=4.58 cfs 9.468 af
Primary=2.83 cfs 9.468 af Secondary=0.00 cfs 0.000 af Outflow=2.83 cfs 9.468 af

Pond 13.1P: Bogs_L_US Peak Elev=29.83' Storage=0.119 af Inflow=3.08 cfs 9.392 af
Primary=3.08 cfs 9.394 af Secondary=0.00 cfs 0.000 af Outflow=3.08 cfs 9.394 af

Pond 13.2P: Bogs_L_DS Peak Elev=25.93' Storage=0.166 af Inflow=3.08 cfs 9.394 af
Primary=3.08 cfs 9.395 af Secondary=0.00 cfs 0.000 af Outflow=3.08 cfs 9.395 af

Pond 14P: Bogs_M - 2.7sm Peak Elev=16.23' Storage=1.848 af Inflow=16.03 cfs 56.068 af
Primary=15.88 cfs 56.001 af Secondary=0.00 cfs 0.000 af Outflow=15.88 cfs 56.001 af

Pond 15.1P: Bogs_N_US Peak Elev=25.53' Storage=1.910 af Inflow=8.41 cfs 10.867 af
Primary=6.20 cfs 10.862 af Tertiary=0.00 cfs 0.000 af Outflow=6.20 cfs 10.862 af

Pond 15.2P: Bogs_N_DS Peak Elev=20.30' Storage=7.047 af Inflow=6.20 cfs 10.862 af
Primary=2.67 cfs 9.964 af Tertiary=0.00 cfs 0.000 af Outflow=2.67 cfs 9.964 af

Pond 16.1: Mill Pond Dam -PC Peak Elev=14.74' Storage=537.213 af Inflow=167.80 cfs 481.557 af
Primary=56.45 cfs 305.737 af Secondary=23.07 cfs 146.869 af Tertiary=0.00 cfs 0.000 af Outflow=79.52 cfs 452.606 af

Pond 16.3: Downstream Weir Peak Elev=8.78' Storage=9,564 cf Inflow=83.34 cfs 305.731 af
Outflow=56.45 cfs 305.726 af

Pond 17B: Proposed Bridge Peak Elev=8.79' Storage=9,571 cf Inflow=56.45 cfs 305.737 af
518.0" x 127.0" Box Culvert n=0.013 L=60.0' S=0.0000 '/' Outflow=83.34 cfs 305.731 af

Link 23L: Inflow Inflow=135.80 cfs 259.406 af
Primary=135.80 cfs 259.406 af

Link A1: 1/2 Flow x 0.50 Inflow=119.59 cfs 64.579 af
Primary=59.79 cfs 32.290 af Secondary=59.79 cfs 32.290 af

Link B1: 1/2 Flow x 0.50 Inflow=21.67 cfs 9.487 af
Primary=10.83 cfs 4.744 af Secondary=10.83 cfs 4.744 af

Link C1: 1/2 Flow x 0.50 Inflow=20.67 cfs 14.989 af
Primary=10.33 cfs 7.494 af Secondary=10.33 cfs 7.494 af

Link D1: 1/2 Flow x 0.50 Inflow=35.63 cfs 13.502 af
Primary=17.81 cfs 6.751 af Secondary=17.81 cfs 6.751 af

Link E1: 1/2 Flow x 0.50 Inflow=143.26 cfs 64.487 af
Primary=71.63 cfs 32.244 af Secondary=71.63 cfs 32.244 af

Link F1: 1/2 Flow x 0.50 Inflow=4.29 cfs 4.575 af
Primary=2.15 cfs 2.288 af Secondary=2.15 cfs 2.288 af

Link G1: 1/2 Flow x 0.50 Inflow=13.42 cfs 9.641 af
Primary=6.71 cfs 4.821 af Secondary=6.71 cfs 4.821 af

Link H1: 1/2 Flow x 0.50 Inflow=0.33 cfs 0.353 af
Primary=0.17 cfs 0.176 af Secondary=0.17 cfs 0.176 af

Link I1: 1/2 Flow x 0.50 Inflow=12.89 cfs 7.829 af
Primary=6.44 cfs 3.915 af Secondary=6.44 cfs 3.915 af

Link JL: 1/2 Flow x 0.50 Inflow=3.58 cfs 2.526 af
Primary=1.79 cfs 1.263 af Secondary=1.79 cfs 1.263 af

Link KL: 1/2 Flow x 0.50 Inflow=1.52 cfs 1.714 af
Primary=0.76 cfs 0.857 af Secondary=0.76 cfs 0.857 af

Link LL: 1/2 Flow x 0.50 Inflow=2.18 cfs 3.144 af
Primary=1.09 cfs 1.572 af Secondary=1.09 cfs 1.572 af

Link ML: 1/2 Flow x 0.50 Inflow=7.86 cfs 6.432 af
Primary=3.93 cfs 3.216 af Secondary=3.93 cfs 3.216 af

Link NL: 1/2 Flow x 0.50 Inflow=7.81 cfs 6.702 af
Primary=3.90 cfs 3.351 af Secondary=3.90 cfs 3.351 af

Link OL: 1/2 Flow x 0.50 Inflow=95.14 cfs 50.944 af
Primary=47.57 cfs 25.472 af Secondary=47.57 cfs 25.472 af

Link PL: 1/2 Flow x 0.50 Inflow=13.23 cfs 6.310 af
Primary=6.61 cfs 3.155 af Secondary=6.61 cfs 3.155 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 267.215 af Average Runoff Depth = 0.65"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

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Summary for Subcatchment A: A

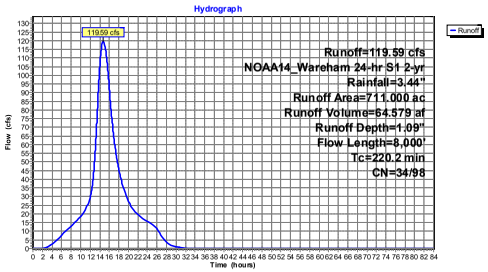
Runoff = 119.59 cfs @ 14.68 hrs, Volume= 64.579 af, Depth= 1.09"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 711.000	56	"33.99% imp"
469.331	34	66.01% Pervious Area
241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



Summary for Subcatchment B: B

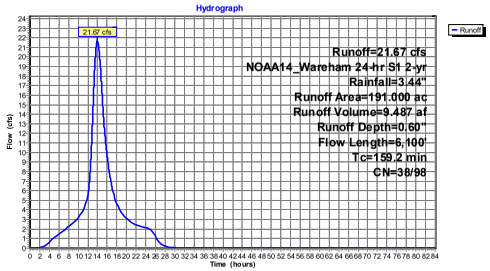
Runoff = 21.67 cfs @ 13.97 hrs, Volume= 9.487 af, Depth= 0.60"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 191.000	49	"18.54% imp"
155.589	38	81.46% Pervious Area
35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



Summary for Subcatchment C: C

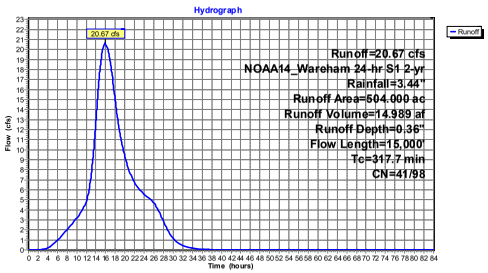
Runoff = 20.67 cfs @ 15.89 hrs, Volume= 14.989 af, Depth= 0.36"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 504.000	47	"10.54% imp"
450.878	41	89.46% Pervious Area
53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



Summary for Subcatchment D: D

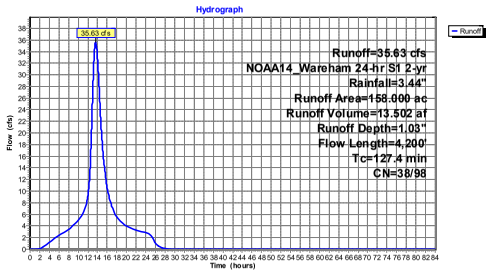
Runoff = 35.63 cfs @ 13.59 hrs, Volume= 13.502 af, Depth= 1.03"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 158.000	57	"31.94% imp"
107.535	38	68.06% Pervious Area
50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



Summary for Subcatchment E: E

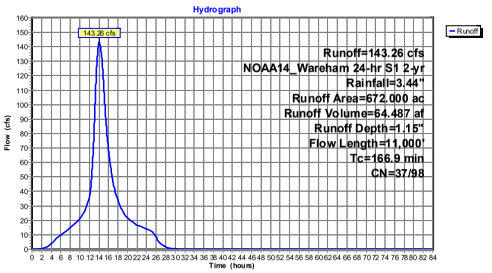
Runoff = 143.26 cfs @ 14.09 hrs, Volume= 64.487 af, Depth= 1.15"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 672.000	59	"35.91% imp"
430.685	37	64.09% Pervious Area
241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



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Summary for Subcatchment F: F

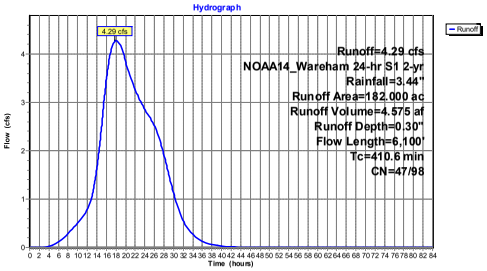
Runoff = 4.29 cfs @ 17.79 hrs, Volume= 4.575 af, Depth= 0.30"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 182.000	50	*6.11% imp*
170.880	47	93.89% Pervious Area
11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



Summary for Subcatchment G: G

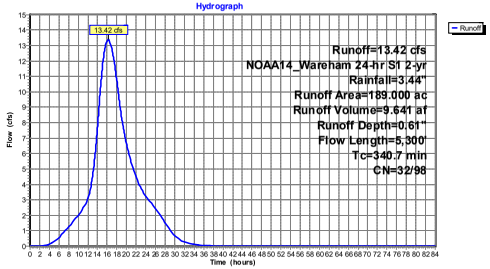
Runoff = 13.42 cfs @ 16.28 hrs, Volume= 9.641 af, Depth= 0.61"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 189.000	45	*19.09% imp*
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



Summary for Subcatchment H: H

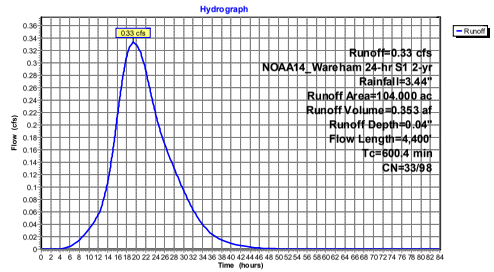
Runoff = 0.33 cfs @ 19.35 hrs, Volume= 0.353 af, Depth= 0.04"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 104.000	34	*1.27% imp*
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

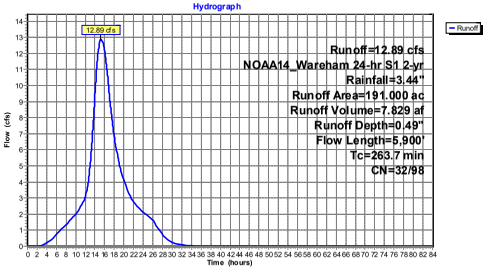
Runoff = 12.89 cfs @ 15.24 hrs, Volume= 7.829 af, Depth= 0.49"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 191.000	42	*15.34% imp*
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



Summary for Subcatchment J: J

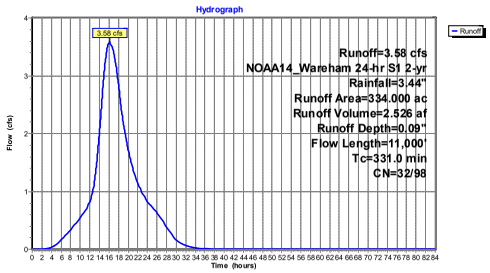
Runoff = 3.58 cfs @ 16.18 hrs, Volume= 2.526 af, Depth= 0.09"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 334.000	34	*2.83% imp*
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Summary for Subcatchment K: K

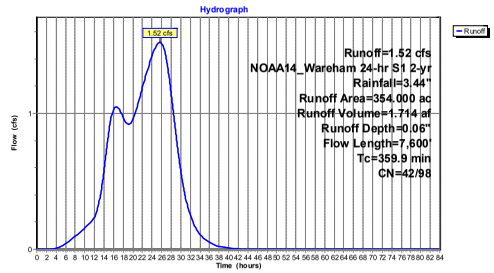
Runoff = 1.52 cfs @ 25.59 hrs, Volume= 1.714 af, Depth= 0.06"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 354.000	42	*0.83% imp*
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



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Summary for Subcatchment L: L

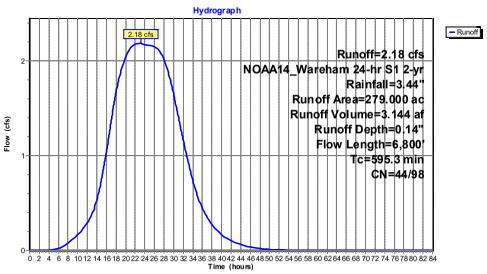
Runoff = 2.18 cfs @ 23.15 hrs, Volume= 3.144 af, Depth= 0.14"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 279.000	45	"2.43% imp"
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



Summary for Subcatchment M: M

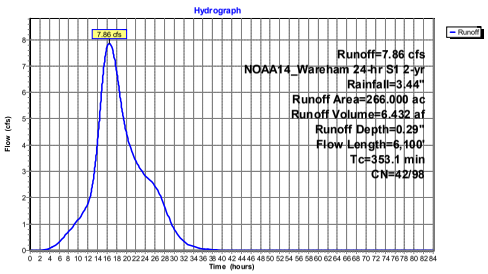
Runoff = 7.86 cfs @ 16.48 hrs, Volume= 6.432 af, Depth= 0.29"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 266.000	47	"8.14% imp"
244.348	42	91.86% Pervious Area
21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



Summary for Subcatchment N: N

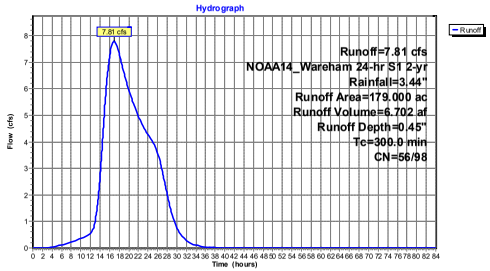
Runoff = 7.81 cfs @ 17.00 hrs, Volume= 6.702 af, Depth= 0.45"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 179.000	57	"3.17% imp"
173.326	56	96.83% Pervious Area
5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

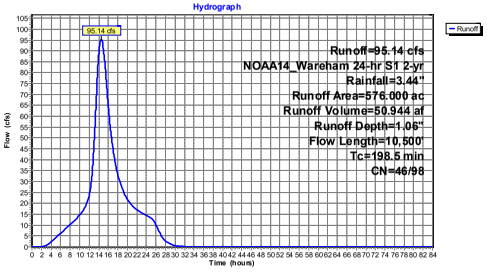
Runoff = 95.14 cfs @ 14.56 hrs, Volume= 50.944 af, Depth= 1.06"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 576.000	62	"31.1% imp"
396.864	46	68.90% Pervious Area
179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



Summary for Subcatchment P: P

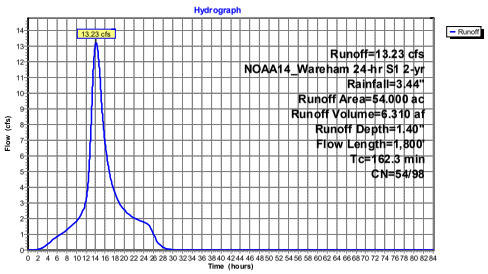
Runoff = 13.23 cfs @ 14.07 hrs, Volume= 6.310 af, Depth= 1.40"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 2-yr Rainfall=3.44"

Area (ac)	CN	Description
* 54.000	71	"38.05% imp"
33.453	54	61.95% Pervious Area
20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Summary for Pond 1P: Halfway Pond

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth > 1.35" for 2-yr event
Inflow = 121.79 cfs @ 14.68 hrs, Volume= 79.852 af, Incl. 2.20 cfs Base Flow
Outflow = 4.64 cfs @ 28.61 hrs, Volume= 27.960 af, Atten= 96%, Lag= 835.7 min
Primary = 4.64 cfs @ 28.61 hrs, Volume= 27.960 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 64.61' @ 28.61 hrs Storage= 432.372 af (61.762 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,446.5 min (2,702.1 - 1,255.6)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=4.63 cfs @ 28.61 hrs HW=64.61' TW=57.51' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 4.63 cfs @ 2.52 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

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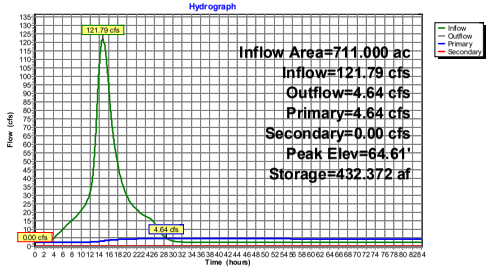
Pond 1P: Halfway Pond



Summary for Pond 2P: Kennard Res

Inflow Area = 902.000 ac, 30.72% Impervious, Inflow Depth > 0.55" for 2-yr event
Inflow = 25.12 cfs @ 13.97 hrs, Volume= 41.613 af, Incl. 0.60 cfs Base Flow
Outflow = 9.66 cfs @ 17.68 hrs, Volume= 39.576 af, Atten= 62%, Lag= 222.5 min
Primary = 9.66 cfs @ 17.68 hrs, Volume= 39.576 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 57.58' @ 17.68 hrs Storage= 9.530 af (5.530 af above start)

Plug-Flow detention time= 806.8 min calculated for 35.576 af (85% of inflow)
Center-of-Mass det. time= 191.6 min (2,464.8 - 2,273.2)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

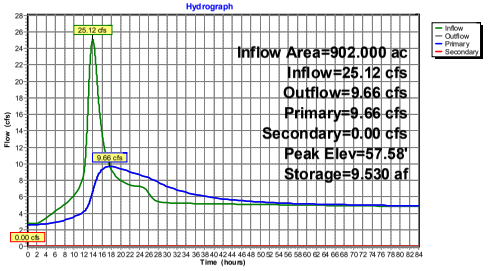
Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=9.66 cfs @ 17.68 hrs HW=57.58' TW=47.03' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 9.66 cfs @ 2.28 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.30' TW=46.77' (Dynamic Tailwater)
└**1=TOD** (Controls 0.00 cfs)

Pond 2P: Kennard Res



Summary for Pond 3P: Fawn Pond

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth > 1.29" for 2-yr event
Inflow = 36.13 cfs @ 13.59 hrs, Volume= 16.974 af, Incl. 0.50 cfs Base Flow
Outflow = 1.07 cfs @ 26.57 hrs, Volume= 6.409 af, Atten= 97%, Lag= 778.9 min
Primary = 1.07 cfs @ 26.57 hrs, Volume= 6.409 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 59.98' @ 26.57 hrs Storage= 40.641 af (12.921 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,473.0 min (2,681.6 - 1,208.6)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

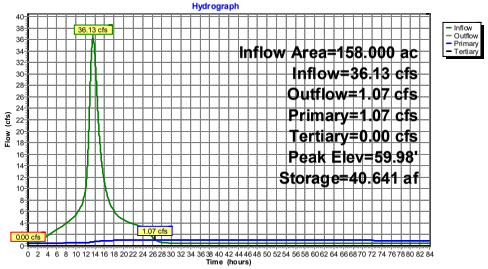
Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=1.06 cfs @ 26.57 hrs HW=59.98' TW=47.12' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 1.06 cfs @ 2.42 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=59.83' TW=46.77' (Dynamic Tailwater)
└**2=TOD South** (Controls 0.00 cfs)

Pond 3P: Fawn Pond



Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow Area = 1,564.000 ac, 24.34% Impervious, Inflow Depth > 0.55" for 2-yr event
Inflow = 32.40 cfs @ 15.89 hrs, Volume= 72.081 af, Incl. 1.60 cfs Base Flow
Outflow = 15.82 cfs @ 25.81 hrs, Volume= 68.002 af, Atten= 51%, Lag= 595.2 min
Primary = 15.82 cfs @ 25.81 hrs, Volume= 68.002 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 47.12' @ 25.81 hrs Storage= 22.242 af (12.522 af above start)

Plug-Flow detention time= 1,109.7 min calculated for 58.281 af (81% of inflow)
Center-of-Mass det. time= 290.0 min (2,492.9 - 2,202.8)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=15.80 cfs @ 25.81 hrs HW=47.12' TW=34.32' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 15.80 cfs @ 2.59 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=46.77' TW=33.99' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

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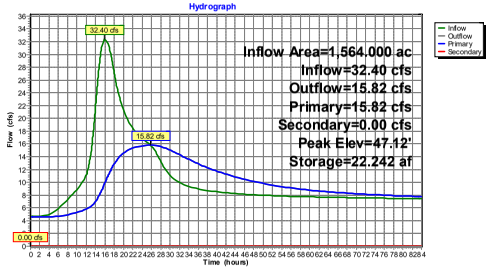
Pond 4P: Bessey Bog Res - 2.4sm



Summary for Pond 5P: Glen Charlie Pond

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 0.79" for 2-yr event
Inflow = 152.48 cfs @ 14.09 hrs, Volume= 147.068 af, Incl. 2.10 cfs Base Flow
Outflow = 30.73 cfs @ 24.98 hrs, Volume= 133.178 af, Atten= 80%, Lag= 653.0 min
Primary = 30.73 cfs @ 24.98 hrs, Volume= 133.178 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 34.32' @ 24.98 hrs Storage= 75.407 af (49.282 af above start)

Plug-Flow detention time= 1,747.0 min calculated for 107.053 af (73% of inflow)
Center-of-Mass det. time= 658.5 min (2,458.9 - 1,800.4)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00

Elev. (feet)	41.00	40.00	39.00	37.70	37.70	41.00

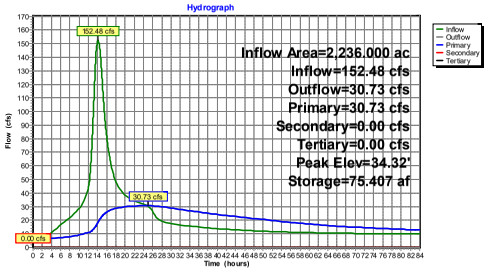
#6 Tertiary 34.50' **24.0" W x 12.0" H Vert. NE Culvert** C= 0.600
Limited to weir flow at low heads

Primary OutFlow Max=30.58 cfs @ 24.98 hrs HW=34.32' TW=21.00' (Dynamic Tailwater)
└**1=Spillway** (Weir Controls 30.58 cfs @ 2.50 fps)
└**2=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
└**3=SE Dike** (Controls 0.00 cfs)
└**4=SE Culvert** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
└**5=NE Dike** (Controls 0.00 cfs)
└**6=NE Culvert** (Controls 0.00 cfs)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 34.20' @ 0.00 hrs Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

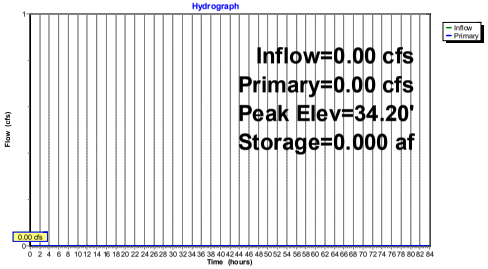
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=34.20' TW=22.70' (Dynamic Tailwater)
└**1=Orifice/Grate** (Controls 0.00 cfs)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



Summary for Pond 6.2P: Maple Sping Bogs US

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 0.30" for 2-yr event
Inflow = 4.29 cfs @ 17.79 hrs, Volume= 4.575 af
Outflow = 1.32 cfs @ 29.48 hrs, Volume= 3.620 af, Atten= 69%, Lag= 701.2 min
Primary = 1.32 cfs @ 29.48 hrs, Volume= 3.620 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 22.89' @ 29.48 hrs Storage= 3.282 af

Plug-Flow detention time= 1,372.4 min calculated for 3.620 af (79% of inflow)
Center-of-Mass det. time= 1,245.9 min (2,499.7 - 1,253.8)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=1.32 cfs @ 29.48 hrs HW=22.89' TW=17.18' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 1.32 cfs @ 1.39 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.70' TW=17.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

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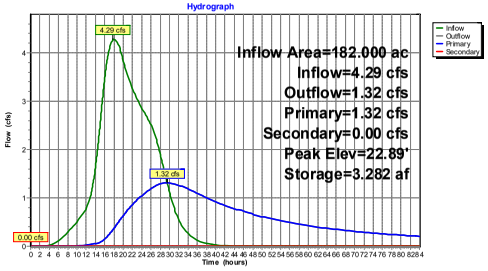
Pond 6.2P: Maple Sping Bogs US



Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 0.24" for 2-yr event
Inflow = 1.32 cfs @ 29.48 hrs, Volume= 3.620 af
Outflow = 1.26 cfs @ 32.10 hrs, Volume= 3.502 af, Atten= 4%, Lag= 157.3 min
Primary = 1.26 cfs @ 32.10 hrs, Volume= 3.502 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 17.18' @ 32.10 hrs Storage= 0.367 af

Plug-Flow detention time= 251.0 min calculated for 3.501 af (97% of inflow)
Center-of-Mass det. time= 171.6 min (2,671.3 - 2,499.7)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

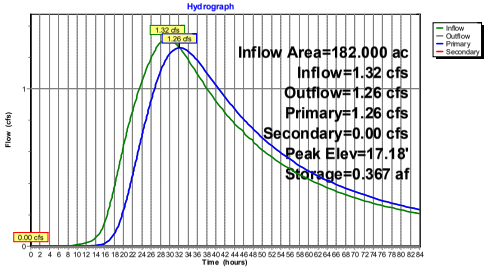
Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=1.26 cfs @ 32.10 hrs HW=17.18' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 1.26 cfs @ 1.37 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 0.71" for 2-yr event
Inflow = 30.73 cfs @ 24.98 hrs, Volume= 133.178 af
Outflow = 30.73 cfs @ 25.31 hrs, Volume= 132.686 af, Atten= 0%, Lag= 19.8 min
Primary = 30.73 cfs @ 25.31 hrs, Volume= 132.686 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 21.00' @ 25.31 hrs Storage= 1.641 af (1.194 af above start)

Plug-Flow detention time= 44.9 min calculated for 132.238 af (99% of inflow)
Center-of-Mass det. time= 18.5 min (2,477.4 - 2,458.9)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

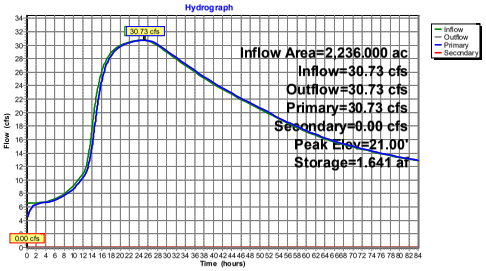
Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

Primary OutFlow Max=30.73 cfs @ 25.31 hrs HW=21.00' TW=0.00' (Dynamic Tailwater)
└**1=Bridge/Spillway** (Weir Controls 30.73 cfs @ 2.96 fps)
└**3=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.49' TW=22.70' (Dynamic Tailwater)
└**2=Culvert to Bogs** (Controls 0.00 cfs)
└**4=TOD_Bogs** (Controls 0.00 cfs)

Pond 6P: Maple Springs Dam - 3.5sm



Summary for Pond 7P: Little Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 0.87" for 2-yr event
Inflow = 14.01 cfs @ 16.28 hrs, Volume= 13.737 af, Incl. 0.59 cfs Base Flow
Outflow = 13.30 cfs @ 17.02 hrs, Volume= 13.686 af, Atten= 5%, Lag= 44.3 min
Primary = 13.30 cfs @ 17.02 hrs, Volume= 13.686 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 59.67' @ 17.02 hrs Storage= 23.397 af (1.237 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 66.9 min (1,566.7 - 1,499.9)

Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=13.30 cfs @ 17.02 hrs HW=59.67' TW=52.06' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 13.30 cfs @ 0.58 fps)

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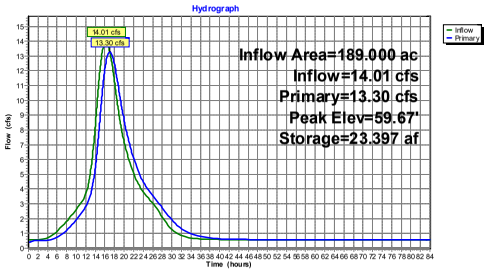
Pond 7P: Little Five Mile Pond



Summary for Pond 8P: Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 0.87" for 2-yr event
Inflow = 13.30 cfs @ 17.02 hrs, Volume= 13.686 af
Outflow = 0.61 cfs @ 43.02 hrs, Volume= 3.126 af, Atten= 95%, Lag= 1,560.3 min
Primary = 0.61 cfs @ 43.02 hrs, Volume= 3.126 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 52.30' @ 43.02 hrs Storage= 10.612 af

Plug-Flow detention time= 2,419.1 min calculated for 3.126 af (23% of inflow)
Center-of-Mass det. time= 1,589.6 min (3,156.3 - 1,566.7)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

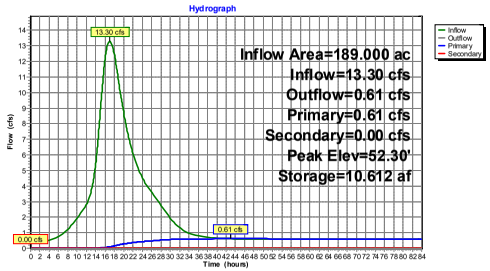
Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=0.59 cfs @ 43.02 hrs HW=52.30' TW=29.74' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.59 cfs @ 1.98 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=51.90' TW=29.60' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 8P: Five Mile Pond



Summary for Pond 9P: Kettle Hole

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth > 0.28" for 2-yr event
Inflow = 0.63 cfs @ 19.35 hrs, Volume= 2.436 af, Incl. 0.30 cfs Base Flow
Outflow = 0.60 cfs @ 21.56 hrs, Volume= 2.444 af, Atten= 5%, Lag= 132.7 min
Primary = 0.60 cfs @ 21.56 hrs, Volume= 2.444 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.00' @ 21.56 hrs Storage= 9.007 af (0.057 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 20.9 min (2,364.9 - 2,344.0)

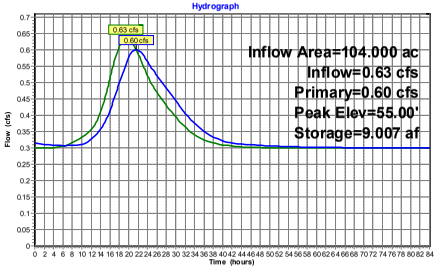
Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=0.58 cfs @ 21.56 hrs HW=55.00' TW=29.91' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 0.58 cfs @ 0.33 fps)

Pond 9P: Kettle Hole



Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow Area = 484.000 ac, 13.78% Impervious, Inflow Depth > 0.44" for 2-yr event
Inflow = 13.90 cfs @ 15.24 hrs, Volume= 17.565 af, Incl. 0.60 cfs Base Flow
Outflow = 5.27 cfs @ 20.32 hrs, Volume= 16.302 af, Atten= 62%, Lag= 304.7 min
Primary = 5.27 cfs @ 20.32 hrs, Volume= 16.302 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1.500 af
Peak Elev= 29.92' @ 20.32 hrs Storage= 6.258 af (4.758 af above start)

Plug-Flow detention time= 1,016.8 min calculated for 14.802 af (84% of inflow)
Center-of-Mass det. time= 387.7 min (2,320.5 - 1,932.8)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LiDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
35.00	115.000
36.50	160.000
40.00	300.000

Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=5.27 cfs @ 20.32 hrs HW=29.92' TW=21.50' (Dynamic Tailwater)
└**1=Drop Inlet Spillway** (Weir Controls 5.27 cfs @ 2.13 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.60' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

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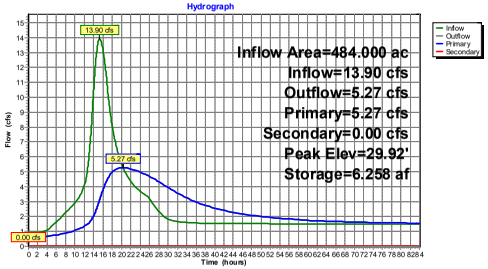
Pond 10P: Maple Springs Brook Dam - 0.8sm



Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow Area = 1,172.000 ac, 6.75% Impervious, Inflow Depth > 0.36" for 2-yr event
Inflow = 10.20 cfs @ 21.24 hrs, Volume= 35.120 af, Incl. 1.10 cfs Base Flow
Outflow = 9.42 cfs @ 26.51 hrs, Volume= 34.687 af, Atten= 8%, Lag= 316.4 min
Primary = 9.42 cfs @ 26.51 hrs, Volume= 34.687 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 21.57' @ 26.51 hrs Storage= 5.307 af (2.597 af above start)

Plug-Flow detention time= 515.9 min calculated for 31.976 af (91% of inflow)
Center-of-Mass det. time= 103.3 min (2,400.5 - 2,297.2)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

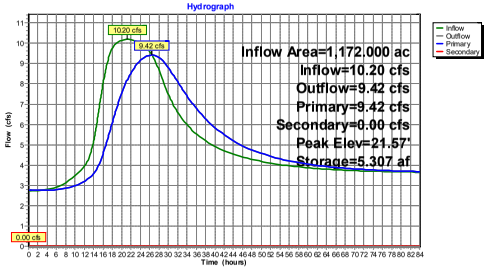
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=9.42 cfs @ 26.51 hrs HW=21.57' TW=16.23' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 9.42 cfs @ 2.78 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.26' TW=15.71' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 11P: Unnamed Road - 1.8sm



Summary for Pond 12P: Maple Springs Road Dam

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth > 0.34" for 2-yr event
Inflow = 4.58 cfs @ 16.18 hrs, Volume= 9.468 af, Incl. 1.00 cfs Base Flow
Outflow = 2.83 cfs @ 19.71 hrs, Volume= 9.468 af, Atten= 38%, Lag= 211.7 min
Primary = 2.83 cfs @ 19.71 hrs, Volume= 9.468 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 38.86' @ 19.71 hrs Storage= 2.158 af (1.078 af above start)

Plug-Flow detention time= 685.8 min calculated for 8.388 af (89% of inflow)
Center-of-Mass det. time= 121.0 min (2,251.6 - 2,130.6)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

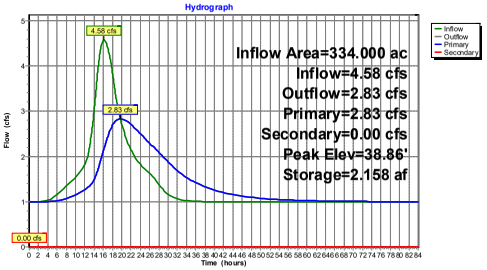
Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=2.83 cfs @ 19.71 hrs HW=38.86' TW=21.48' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 2.83 cfs @ 2.00 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=38.68' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 12P: Maple Springs Road Dam



Summary for Pond 13.1P: Bogs_L_US

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 0.40" for 2-yr event
Inflow = 3.08 cfs @ 23.15 hrs, Volume= 9.392 af, Incl. 0.90 cfs Base Flow
Outflow = 3.08 cfs @ 23.20 hrs, Volume= 9.394 af, Atten= 0%, Lag= 3.1 min
Primary = 3.08 cfs @ 23.20 hrs, Volume= 9.394 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 29.83' @ 23.20 hrs Storage= 0.119 af (0.065 af above start)

Plug-Flow detention time= 35.8 min calculated for 9.340 af (99% of inflow)
Center-of-Mass det. time= 7.5 min (2,178.5 - 2,171.0)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=3.08 cfs @ 23.20 hrs HW=29.83' TW=25.93' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 3.08 cfs @ 1.85 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.65' TW=25.75' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

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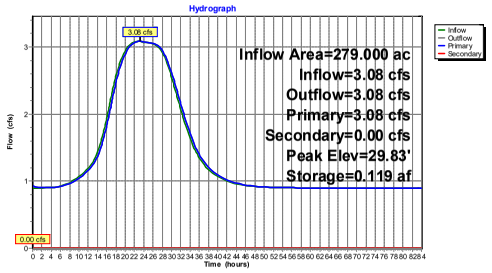
Pond 13.1P: Bogs_L_US



Summary for Pond 13.2P: Bogs_L_DS

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 0.40" for 2-yr event
Inflow = 3.08 cfs @ 23.20 hrs, Volume= 9.394 af
Outflow = 3.08 cfs @ 23.54 hrs, Volume= 9.395 af, Atten= 0%, Lag= 20.5 min
Primary = 3.08 cfs @ 23.54 hrs, Volume= 9.395 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 25.93' @ 23.54 hrs Storage= 0.166 af (0.091 af above start)

Plug-Flow detention time= 50.2 min calculated for 9.320 af (99% of inflow)
Center-of-Mass det. time= 10.5 min (2,189.0 - 2,178.5)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

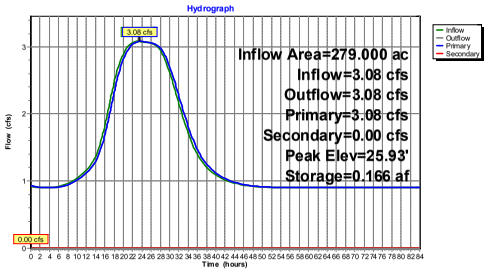
Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=3.08 cfs @ 23.54 hrs HW=25.93' TW=16.23' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 3.08 cfs @ 1.85 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.2P: Bogs_L_DS



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow Area = 1,717.000 ac, 6.26% Impervious, Inflow Depth > 0.39" for 2-yr event
Inflow = 16.03 cfs @ 17.95 hrs, Volume= 56.068 af, Incl. 0.80 cfs Base Flow
Outflow = 15.88 cfs @ 18.65 hrs, Volume= 56.001 af, Atten= 1%, Lag= 42.5 min
Primary = 15.88 cfs @ 18.65 hrs, Volume= 56.001 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 16.23' @ 18.65 hrs Storage= 1.848 af (0.783 af above start)

Plug-Flow detention time= 118.4 min calculated for 54.935 af (98% of inflow)
Center-of-Mass det. time= 20.0 min (2,250.9 - 2,230.8)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

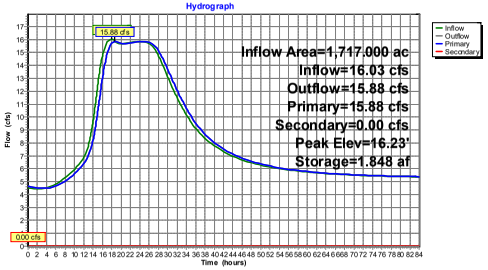
Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

Primary OutFlow Max=15.88 cfs @ 18.65 hrs HW=16.23' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 15.88 cfs @ 2.05 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.71' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 14P: Bogs_M - 2.7sm



Summary for Pond 15.1P: Bogs_N_US

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 0.73" for 2-yr event
Inflow = 8.41 cfs @ 17.00 hrs, Volume= 10.867 af, Incl. 0.60 cfs Base Flow
Outflow = 6.20 cfs @ 20.63 hrs, Volume= 10.862 af, Atten= 26%, Lag= 218.0 min
Primary = 6.20 cfs @ 20.63 hrs, Volume= 10.862 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 25.53' @ 20.63 hrs Storage= 1.910 af (1.558 af above start)

Plug-Flow detention time= 284.4 min calculated for 10.510 af (97% of inflow)
Center-of-Mass det. time= 124.2 min (1,835.2 - 1,711.0)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=6.20 cfs @ 20.63 hrs HW=25.53' TW=20.20' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 6.20 cfs @ 2.34 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.11' TW=20.11' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

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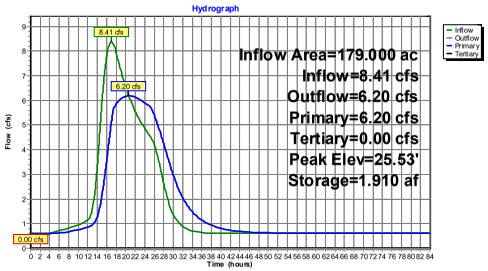
Pond 15.1P: Bogs_N_US



Summary for Pond 15.2P: Bogs_N_DS

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 0.73" for 2-yr event
Inflow = 6.20 cfs @ 20.63 hrs, Volume= 10.862 af
Outflow = 2.67 cfs @ 30.58 hrs, Volume= 9.964 af, Atten= 57%, Lag= 596.6 min
Primary = 2.67 cfs @ 30.58 hrs, Volume= 9.964 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 20.30' @ 30.58 hrs Storage= 7.047 af (4.480 af above start)

Plug-Flow detention time= 1,809.0 min calculated for 7.398 af (68% of inflow)
Center-of-Mass det. time= 715.5 min (2,550.7 - 1,835.2)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

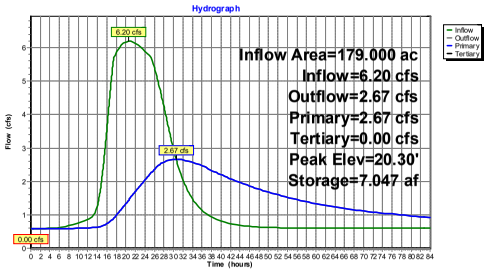
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=2.66 cfs @ 30.58 hrs HW=20.30' TW=0.00' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 2.66 cfs @ 1.76 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
└─**2=TOD** (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS



Summary for Pond 16.1: Mill Pond Dam -PC

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.17" for 2-yr event
Inflow = 167.80 cfs @ 14.61 hrs, Volume= 481.557 af, Incl. 32.00 cfs Base Flow
Outflow = 79.52 cfs @ 29.94 hrs, Volume= 452.606 af, Atten= 53%, Lag= 919.7 min
Primary = 56.45 cfs @ 29.94 hrs, Volume= 305.737 af
Routed to Pond 17B : Proposed Bridge
Secondary = 23.07 cfs @ 29.93 hrs, Volume= 146.869 af
Routed to Pond Wr 24 :
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 17B : Proposed Bridge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 470.969 af
Peak Elev= 14.74' @ 29.94 hrs Storage= 537.213 af (66.244 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 289.2 min (2,582.0 - 2,292.8)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,941.850 af	**Storage** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.130
5.00	4.140
6.00	9.110
7.00	16.590
8.00	34.960
9.00	60.590
10.00	94.410
11.00	142.690
12.00	214.660
13.00	314.540
13.80	403.920
14.00	426.260
15.00	575.290
16.00	771.680
17.00	994.600
18.30	1,368.590
19.00	1,592.930
20.00	1,941.850

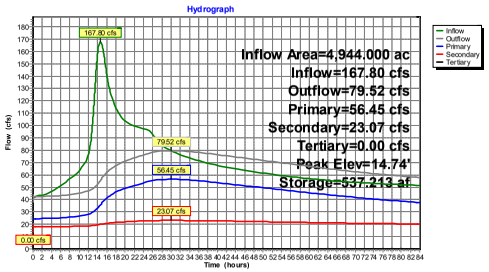
Device	Routing	Invert	Outlet Devices
#1	Primary	15.50'	**110.0' long x 1.5' breadth Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32
#2	Primary	13.60'	**15.0' long x 1.0' breadth Notch as SW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#3	Secondary	12.50'	**3.3' long x 1.0' breadth 3.25' Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#4	Tertiary	18.00'	**TOD, C= 2.60** Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00 Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 8	5.20'	**48.0" W x 48.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#7	Device 8	15.50'	**6.0' long x 20.00' rise MLO DownwardOpGate** 2 End Contraction(s) 5.0' Crest Height
#8	Tertiary	4.00'	**96.0" W x 48.0" H Box Culvert X 0.00** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 32.00 sf

Primary OutFlow Max=56.06 cfs @ 29.94 hrs HW=14.74' TW=8.79' (Dynamic Tailwater)
├─**1=Spillway** (Controls 0.00 cfs)
└─**2=Notch as SW** (Weir Controls 56.06 cfs @ 3.27 fps)

Secondary OutFlow Max=23.09 cfs @ 29.93 hrs HW=14.74' TW=14.27' (Dynamic Tailwater)
└─**3=3.25' Weir** (Weir Controls 23.09 cfs @ 3.12 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.30' TW=8.48' (Dynamic Tailwater)
├─**4=TOD** (Controls 0.00 cfs)
├─**5=US Relief - Bypasses Dam** (Controls 0.00 cfs)
└─**8=Culvert** (Controls 0.00 cfs)
└─**6=Orifice/Grate** (Controls 0.00 cfs)
└─**7=MLO DownwardOpGate** (Controls 0.00 cfs)

Pond 16.1: Mill Pond Dam -PC



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Summary for Pond 16.3: Downstream Weir

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 0.74" for 2-yr event
Inflow = 83.34 cfs @ 0.01 hrs, Volume= 305.731 af
Outflow = 56.45 cfs @ 29.95 hrs, Volume= 305.726 af, Atten= 32%, Lag= 1,795.9 min
Primary = 56.45 cfs @ 29.95 hrs, Volume= 305.726 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 8.78' @ 29.95 hrs Surf.Area= 2,000 sf Storage= 9,564 cf (604 cf above start)

Plug-Flow detention time= 3.5 min calculated for 305.516 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,598.9 - 2,598.9)

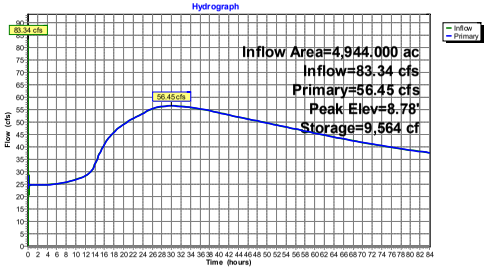
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	8.00'	**DS Weir, C= 2.60** Offset (feet) 0.00 0.00 23.00 23.00 Elev. (feet) 17.00 10.00 8.00 17.00
#2	Primary	8.00'	**27.0' long x 1.5' breadth El 8 Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32

Primary OutFlow Max=56.45 cfs @ 29.95 hrs HW=8.78' (Free Discharge)
└**1=DS Weir** (Weir Controls 6.47 cfs @ 0.92 fps)
└**2=El 8 Weir** (Weir Controls 49.98 cfs @ 2.37 fps)

Pond 16.3: Downstream Weir



Summary for Pond 17B: Proposed Bridge

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 0.74" for 2-yr event
Inflow = 56.45 cfs @ 29.94 hrs, Volume= 305.737 af
Outflow = 83.34 cfs @ 0.01 hrs, Volume= 305.731 af, Atten= 0%, Lag= 0.0 min
Primary = 83.34 cfs @ 0.01 hrs, Volume= 305.731 af
Routed to Pond 16.3 : Downstream Weir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 8.79' @ 29.95 hrs Surf.Area= 2,000 sf Storage= 9,571 cf (611 cf above start)

Plug-Flow detention time= 3.5 min calculated for 305.525 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,598.9 - 2,598.8)

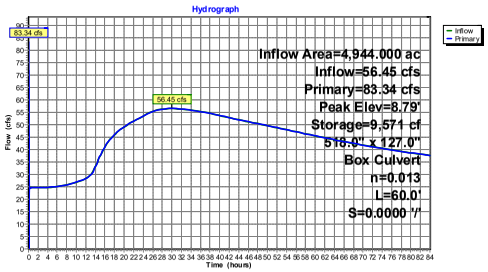
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	4.00'	**518.0" W x 127.0" H Box Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 456.85 sf

Primary OutFlow Max=0.00 cfs @ 0.01 hrs HW=8.46' TW=8.48' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)

Pond 17B: Proposed Bridge

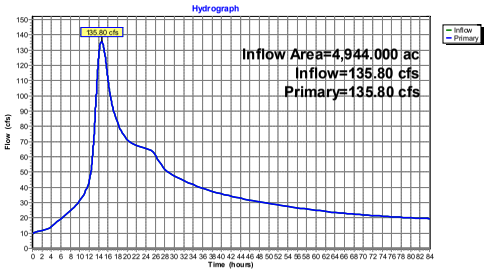


Summary for Link 23L: Inflow

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 0.63" for 2-yr event
Inflow = 135.80 cfs @ 14.61 hrs, Volume= 259.406 af
Primary = 135.80 cfs @ 14.61 hrs, Volume= 259.406 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16.1 : Mill Pond Dam -PC

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow

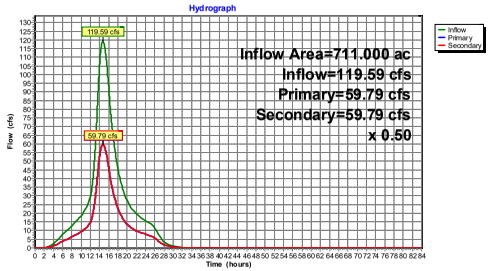


Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 1.09" for 2-yr event
Inflow = 119.59 cfs @ 14.68 hrs, Volume= 64.579 af
Primary = 59.79 cfs @ 14.68 hrs, Volume= 32.290 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 1P : Halfway Pond
Secondary = 59.79 cfs @ 14.68 hrs, Volume= 32.290 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow



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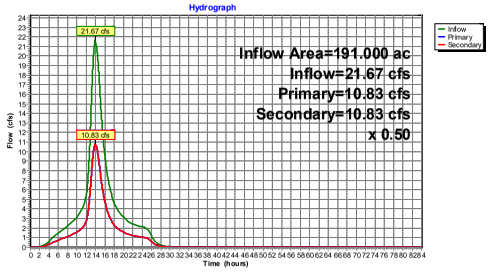
Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 0.60" for 2-yr event
Inflow = 21.67 cfs @ 13.97 hrs, Volume= 9.487 af
Primary = 10.83 cfs @ 13.97 hrs, Volume= 4.744 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 2P : Kennard Res
Secondary = 10.83 cfs @ 13.97 hrs, Volume= 4.744 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

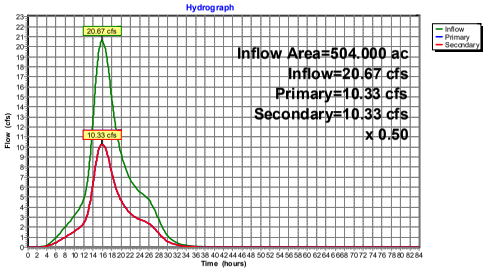


Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth = 0.36" for 2-yr event
Inflow = 20.67 cfs @ 15.89 hrs, Volume= 14.989 af
Primary = 10.33 cfs @ 15.89 hrs, Volume= 7.494 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 10.33 cfs @ 15.89 hrs, Volume= 7.494 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

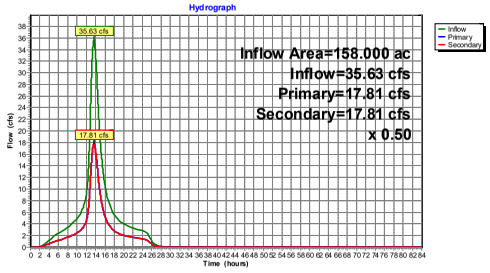


Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 1.03" for 2-yr event
Inflow = 35.63 cfs @ 13.59 hrs, Volume= 13.502 af
Primary = 17.81 cfs @ 13.59 hrs, Volume= 6.751 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 3P : Fawn Pond
Secondary = 17.81 cfs @ 13.59 hrs, Volume= 6.751 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow

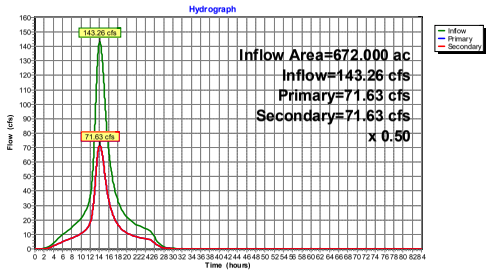


Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 1.15" for 2-yr event
Inflow = 143.26 cfs @ 14.09 hrs, Volume= 64.487 af
Primary = 71.63 cfs @ 14.09 hrs, Volume= 32.244 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 5P : Glen Charlie Pond
Secondary = 71.63 cfs @ 14.09 hrs, Volume= 32.244 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow

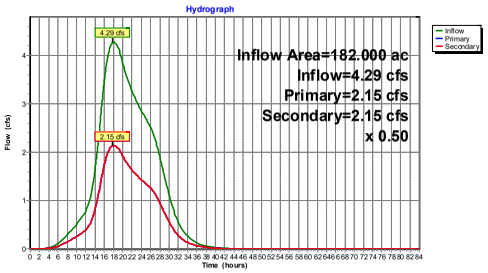


Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 0.30" for 2-yr event
Inflow = 4.29 cfs @ 17.79 hrs, Volume= 4.575 af
Primary = 2.15 cfs @ 17.79 hrs, Volume= 2.288 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 6.2P : Maple Sping Bogs US
Secondary = 2.15 cfs @ 17.79 hrs, Volume= 2.288 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow

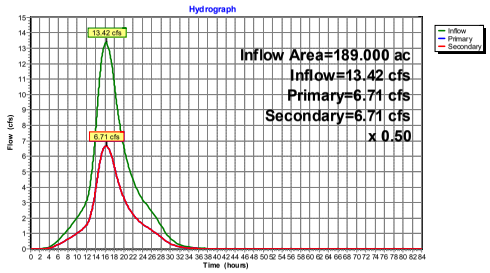


Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth = 0.61" for 2-yr event
Inflow = 13.42 cfs @ 16.28 hrs, Volume= 9.641 af
Primary = 6.71 cfs @ 16.28 hrs, Volume= 4.821 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 7P : Little Five Mile Pond
Secondary = 6.71 cfs @ 16.28 hrs, Volume= 4.821 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow



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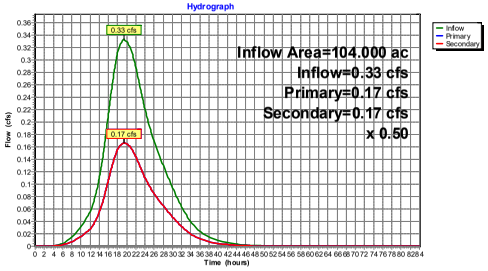
Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth = 0.04" for 2-yr event
Inflow = 0.33 cfs @ 19.35 hrs, Volume= 0.353 af
Primary = 0.17 cfs @ 19.35 hrs, Volume= 0.176 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 9P : Kettle Hole
Secondary = 0.17 cfs @ 19.35 hrs, Volume= 0.176 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow

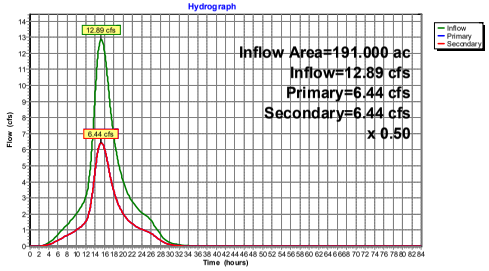


Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth = 0.49" for 2-yr event
Inflow = 12.89 cfs @ 15.24 hrs, Volume= 7.829 af
Primary = 6.44 cfs @ 15.24 hrs, Volume= 3.915 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 6.44 cfs @ 15.24 hrs, Volume= 3.915 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

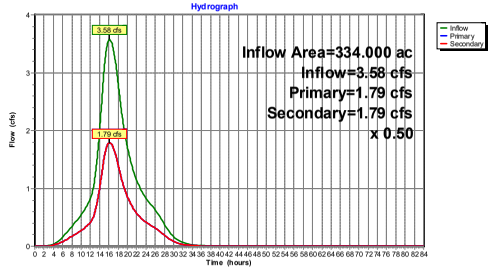


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth = 0.09" for 2-yr event
Inflow = 3.58 cfs @ 16.18 hrs, Volume= 2.526 af
Primary = 1.79 cfs @ 16.18 hrs, Volume= 1.263 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 12P : Maple Springs Road Dam
Secondary = 1.79 cfs @ 16.18 hrs, Volume= 1.263 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow

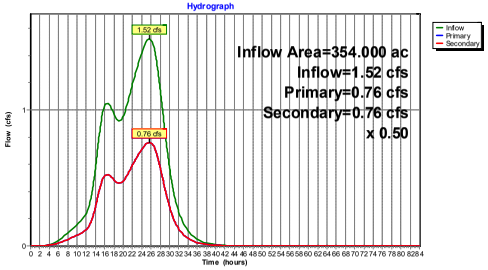


Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth = 0.06" for 2-yr event
Inflow = 1.52 cfs @ 25.59 hrs, Volume= 1.714 af
Primary = 0.76 cfs @ 25.59 hrs, Volume= 0.857 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.76 cfs @ 25.59 hrs, Volume= 0.857 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow

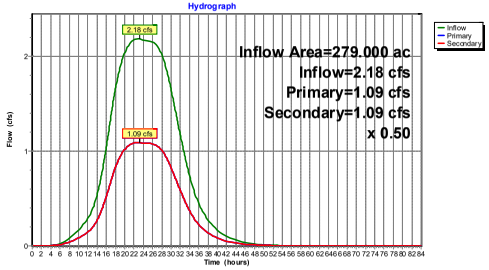


Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth = 0.14" for 2-yr event
Inflow = 2.18 cfs @ 23.15 hrs, Volume= 3.144 af
Primary = 1.09 cfs @ 23.15 hrs, Volume= 1.572 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 13.1P : Bogs_L_US
Secondary = 1.09 cfs @ 23.15 hrs, Volume= 1.572 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow

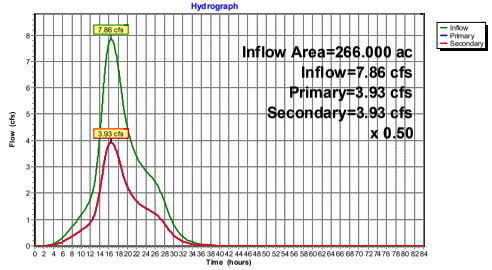


Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth = 0.29" for 2-yr event
Inflow = 7.86 cfs @ 16.48 hrs, Volume= 6.432 af
Primary = 3.93 cfs @ 16.48 hrs, Volume= 3.216 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 3.93 cfs @ 16.48 hrs, Volume= 3.216 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow



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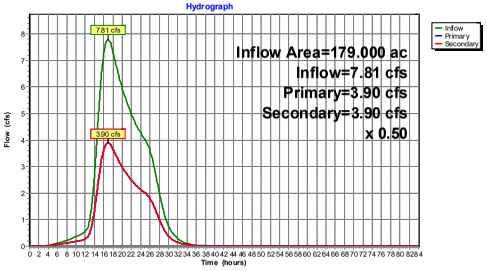
Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth = 0.45" for 2-yr event
Inflow = 7.81 cfs @ 17.00 hrs, Volume= 6.702 af
Primary = 3.90 cfs @ 17.00 hrs, Volume= 3.351 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 15.1P : Bogs_N_US
Secondary = 3.90 cfs @ 17.00 hrs, Volume= 3.351 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow

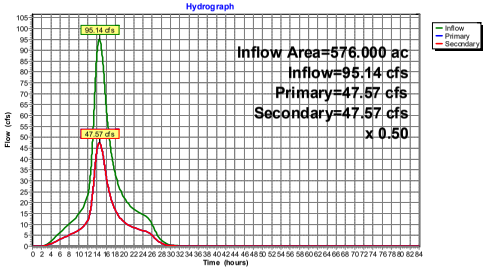


Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 1.06" for 2-yr event
Inflow = 95.14 cfs @ 14.56 hrs, Volume= 50.944 af
Primary = 47.57 cfs @ 14.56 hrs, Volume= 25.472 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 47.57 cfs @ 14.56 hrs, Volume= 25.472 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow

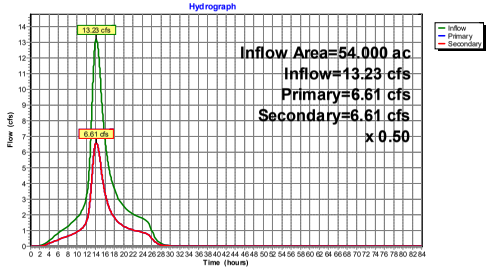


Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 1.40" for 2-yr event
Inflow = 13.23 cfs @ 14.07 hrs, Volume= 6.310 af
Primary = 6.61 cfs @ 14.07 hrs, Volume= 3.155 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 6.61 cfs @ 14.07 hrs, Volume= 3.155 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=1.39"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=155.46 cfs 82.415 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=0.81"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=28.28 cfs 12.842 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=0.55"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=27.95 cfs 22.906 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=1.34"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=46.64 cfs 17.700 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=1.49"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=186.90 cfs 83.573 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=0.55"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=8.31 cfs 8.285 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=0.78"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=17.35 cfs 12.253 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=0.05"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=0.43 cfs 0.474 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=0.63"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=16.72 cfs 9.950 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=0.12"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=4.63 cfs 3.214 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=0.19"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=5.06 cfs 5.563 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=0.31"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=5.69 cfs 7.176 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=0.48"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=11.57 cfs 10.529 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=0.81"
Tc=300.0 min CN=56/98 Runoff=16.02 cfs 12.150 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=1.46"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=130.55 cfs 70.116 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=1.93"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=18.94 cfs 8.679 af

Pond 1P: Halfway Pond Peak Elev=64.68' Storage=449.303 af Inflow=157.66 cfs 97.688 af
Primary=5.43 cfs 32.001 af Secondary=0.00 cfs 0.000 af Outflow=5.43 cfs 32.001 af

Pond 2P: Kennard Res Peak Elev=57.65' Storage=11.042 af Inflow=31.93 cfs 49.008 af
Primary=12.04 cfs 46.453 af Secondary=0.00 cfs 0.000 af Outflow=12.04 cfs 46.453 af

Pond 3P: Fawn Pond Peak Elev=60.05' Storage=44.571 af Inflow=47.14 cfs 21.171 af
Primary=1.40 cfs 7.693 af Tertiary=0.00 cfs 0.000 af Outflow=1.40 cfs 7.693 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=47.27' Storage=27.672 af Inflow=42.28 cfs 88.159 af
Primary=21.91 cfs 83.010 af Secondary=0.00 cfs 0.000 af Outflow=21.91 cfs 83.010 af

Pond 5P: Glen Charlie Pond Peak Elev=34.40' Storage=90.598 af Inflow=196.87 cfs 181.161 af
Primary=39.05 cfs 163.215 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=39.05 cfs 163.215 af

Pond 6.1P: Ortalani Reservoir Peak Elev=34.20' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=23.02' Storage=5.553 af Inflow=8.31 cfs 8.285 af
Primary=2.90 cfs 7.053 af Secondary=0.00 cfs 0.000 af Outflow=2.90 cfs 7.053 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=17.31' Storage=0.627 af Inflow=2.90 cfs 7.053 af
Primary=2.82 cfs 6.900 af Secondary=0.00 cfs 0.000 af Outflow=2.82 cfs 6.900 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=21.11' Storage=1.911 af Inflow=39.05 cfs 163.215 af
Primary=39.03 cfs 162.633 af Secondary=0.00 cfs 0.000 af Outflow=39.03 cfs 162.633 af

Pond 7P: Little Five Mile Pond Peak Elev=59.70' Storage=23.610 af Inflow=17.94 cfs 16.349 af
Outflow=17.18 cfs 16.298 af

Pond 8P: Five Mile Pond Peak Elev=52.39' Storage=12.796 af Inflow=17.18 cfs 16.298 af
Primary=0.89 cfs 4.395 af Secondary=0.00 cfs 0.000 af Outflow=0.89 cfs 4.395 af

Pond 9P: Kettle Hole Peak Elev=55.01' Storage=9.028 af Inflow=0.73 cfs 2.557 af
Outflow=0.66 cfs 2.566 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=29.99' Storage=7.408 af Inflow=17.77 cfs 21.076 af
Primary=6.80 cfs 19.585 af Secondary=0.00 cfs 0.000 af Outflow=6.80 cfs 19.585 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=21.75' Storage=6.859 af Inflow=16.29 cfs 42.940 af
Primary=14.45 cfs 42.412 af Secondary=0.00 cfs 0.000 af Outflow=14.45 cfs 42.412 af

Pond 12P: Maple Springs Road Dam Peak Elev=38.91' Storage=2.441 af Inflow=5.63 cfs 10.156 af
Primary=3.41 cfs 10.156 af Secondary=0.00 cfs 0.000 af Outflow=3.41 cfs 10.156 af

Pond 13.1P: Bogs_L_US Peak Elev=30.05' Storage=0.197 af Inflow=6.59 cfs 13.424 af
Primary=6.59 cfs 13.425 af Secondary=0.00 cfs 0.000 af Outflow=6.59 cfs 13.425 af

Pond 13.2P: Bogs_L_DS Peak Elev=26.15' Storage=0.276 af Inflow=6.59 cfs 13.425 af
Primary=6.57 cfs 13.427 af Secondary=0.00 cfs 0.000 af Outflow=6.57 cfs 13.427 af

Pond 14P: Bogs_M - 2.7sm Peak Elev=16.61' Storage=2.422 af Inflow=27.43 cfs 71.922 af
Primary=27.38 cfs 71.836 af Secondary=0.00 cfs 0.000 af Outflow=27.38 cfs 71.836 af

Pond 15.1P: Bogs_N_US Peak Elev=25.73' Storage=3.987 af Inflow=16.62 cfs 16.315 af
Primary=10.08 cfs 16.310 af Tertiary=0.00 cfs 0.000 af Outflow=10.08 cfs 16.310 af

Pond 15.2P: Bogs_N_DS Peak Elev=20.44' Storage=10.313 af Inflow=10.08 cfs 16.310 af
Primary=4.73 cfs 14.947 af Tertiary=0.00 cfs 0.000 af Outflow=4.73 cfs 14.947 af

Pond 16.1: Mill Pond Dam -PC Peak Elev=14.93' Storage=564.307 af Inflow=214.48 cfs 557.261 af
Primary=72.86 cfs 364.175 af Secondary=25.19 cfs 155.084 af Tertiary=0.00 cfs 0.000 af Outflow=98.05 cfs 519.259 af

Pond 16.3: Downstream Weir Peak Elev=8.91' Storage=9,816 cf Inflow=83.34 cfs 364.167 af
Outflow=72.86 cfs 364.160 af

Pond 17B: Proposed Bridge Peak Elev=8.91' Storage=9,826 cf Inflow=72.86 cfs 364.175 af
518.0" x 127.0" Box Culvert n=0.013 L=60.0' S=0.0000 '/' Outflow=83.34 cfs 364.167 af

Link 23L: Inflow Inflow=182.48 cfs 335.110 af
Primary=182.48 cfs 335.110 af

Link A1: 1/2 Flow x 0.50 Inflow=155.46 cfs 82.415 af
Primary=77.73 cfs 41.208 af Secondary=77.73 cfs 41.208 af

Link B1: 1/2 Flow x 0.50 Inflow=28.28 cfs 12.842 af
Primary=14.14 cfs 6.421 af Secondary=14.14 cfs 6.421 af

Link C1: 1/2 Flow x 0.50 Inflow=27.95 cfs 22.906 af
Primary=13.97 cfs 11.453 af Secondary=13.97 cfs 11.453 af

Link D1: 1/2 Flow x 0.50 Inflow=46.64 cfs 17.700 af
Primary=23.32 cfs 8.850 af Secondary=23.32 cfs 8.850 af

Link E1: 1/2 Flow x 0.50 Inflow=186.90 cfs 83.573 af
Primary=93.45 cfs 41.786 af Secondary=93.45 cfs 41.786 af

Link F1: 1/2 Flow x 0.50 Inflow=8.31 cfs 8.285 af
Primary=4.15 cfs 4.143 af Secondary=4.15 cfs 4.143 af

Link G1: 1/2 Flow x 0.50 Inflow=17.35 cfs 12.253 af
Primary=8.67 cfs 6.126 af Secondary=8.67 cfs 6.126 af

Link H1: 1/2 Flow x 0.50 Inflow=0.43 cfs 0.474 af
Primary=0.21 cfs 0.237 af Secondary=0.21 cfs 0.237 af

Link I1: 1/2 Flow x 0.50 Inflow=16.72 cfs 9.950 af
Primary=8.36 cfs 4.975 af Secondary=8.36 cfs 4.975 af

Link JL: 1/2 Flow x 0.50 Inflow=4.63 cfs 3.214 af
Primary=2.32 cfs 1.607 af Secondary=2.32 cfs 1.607 af

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Link KL: 1/2 Flow x 0.50 Inflow=5.06 cfs 5.563 af
Primary=2.53 cfs 2.781 af Secondary=2.53 cfs 2.781 af

Link LL: 1/2 Flow x 0.50 Inflow=5.69 cfs 7.176 af
Primary=2.85 cfs 3.588 af Secondary=2.85 cfs 3.588 af

Link ML: 1/2 Flow x 0.50 Inflow=11.57 cfs 10.529 af
Primary=5.78 cfs 5.265 af Secondary=5.78 cfs 5.265 af

Link NL: 1/2 Flow x 0.50 Inflow=16.02 cfs 12.150 af
Primary=8.01 cfs 6.075 af Secondary=8.01 cfs 6.075 af

Link OL: 1/2 Flow x 0.50 Inflow=130.55 cfs 70.116 af
Primary=65.28 cfs 35.058 af Secondary=65.28 cfs 35.058 af

Link PL: 1/2 Flow x 0.50 Inflow=18.94 cfs 8.679 af
Primary=9.47 cfs 4.339 af Secondary=9.47 cfs 4.339 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 367.826 af Average Runoff Depth = 0.89"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

Summary for Subcatchment A: A

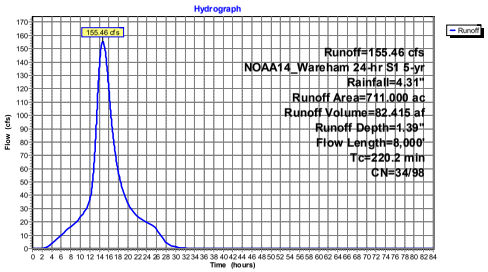
Runoff = 155.46 cfs @ 14.68 hrs, Volume= 82.415 af, Depth= 1.39"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

Area (ac)	CN	Description
* 711.000	56	"33.99% imp"
469.331	34	66.01% Pervious Area
241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



Summary for Subcatchment B: B

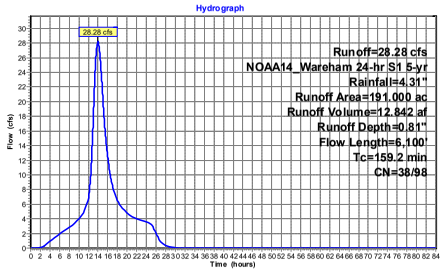
Runoff = 28.28 cfs @ 13.97 hrs, Volume= 12.842 af, Depth= 0.81"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

Area (ac)	CN	Description
* 191.000	49	"18.54% imp"
155.589	38	81.46% Pervious Area
35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



Summary for Subcatchment C: C

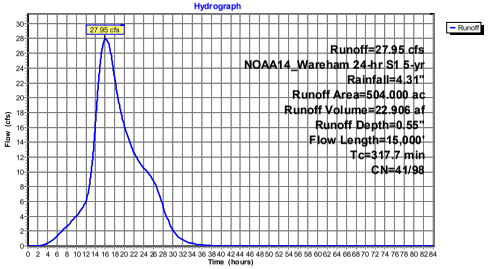
Runoff = 27.95 cfs @ 15.89 hrs, Volume= 22.906 af, Depth= 0.55"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

Area (ac)	CN	Description
* 504.000	47	"10.54% imp"
450.878	41	89.46% Pervious Area
53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



Summary for Subcatchment D: D

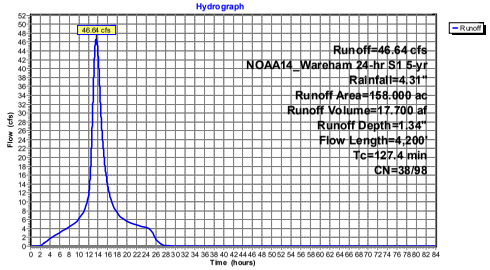
Runoff = 46.64 cfs @ 13.59 hrs, Volume= 17.700 af, Depth= 1.34"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

Area (ac)	CN	Description
* 158.000	57	"31.94% imp"
107.535	38	68.06% Pervious Area
50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



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Summary for Subcatchment E: E

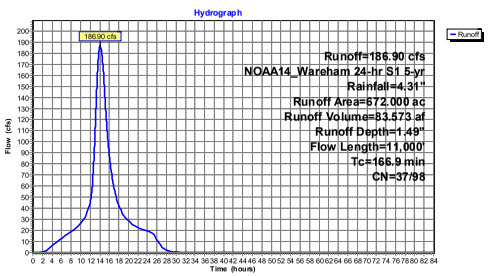
Runoff = 186.90 cfs @ 14.09 hrs, Volume= 83.573 af, Depth= 1.49"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

Area (ac)	CN	Description
* 672.000	59	*35.91% imp*
430.685	37	64.09% Pervious Area
241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



Summary for Subcatchment F: F

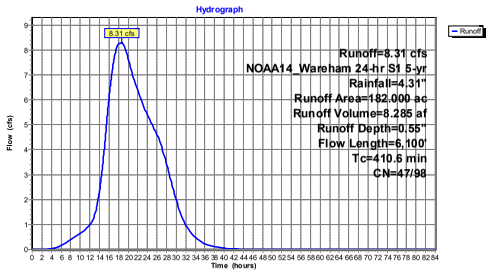
Runoff = 8.31 cfs @ 18.70 hrs, Volume= 8.285 af, Depth= 0.55"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

Area (ac)	CN	Description
* 182.000	50	*6.11% imp*
170.880	47	93.89% Pervious Area
11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



Summary for Subcatchment G: G

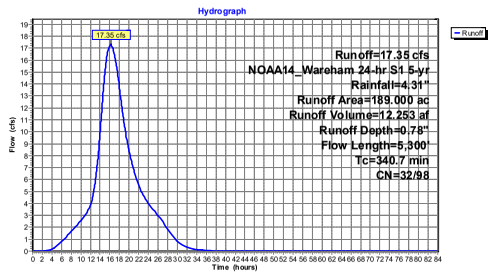
Runoff = 17.35 cfs @ 16.28 hrs, Volume= 12.253 af, Depth= 0.78"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

Area (ac)	CN	Description
* 189.000	45	*19.09% imp*
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



Summary for Subcatchment H: H

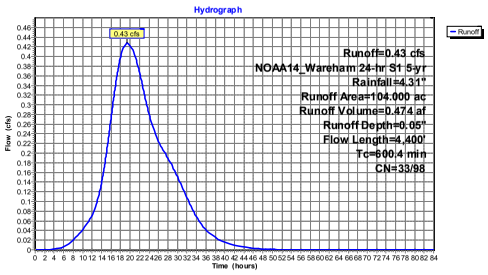
Runoff = 0.43 cfs @ 19.35 hrs, Volume= 0.474 af, Depth= 0.05"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

Area (ac)	CN	Description
* 104.000	34	*1.27% imp*
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

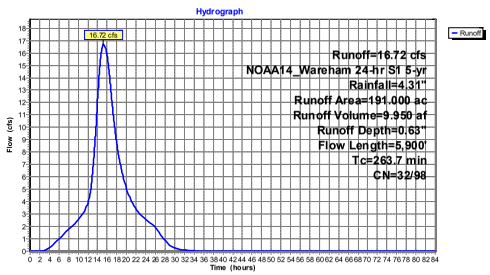
Runoff = 16.72 cfs @ 15.24 hrs, Volume= 9.950 af, Depth= 0.63"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

Area (ac)	CN	Description
* 191.000	42	*15.34% imp*
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



Summary for Subcatchment J: J

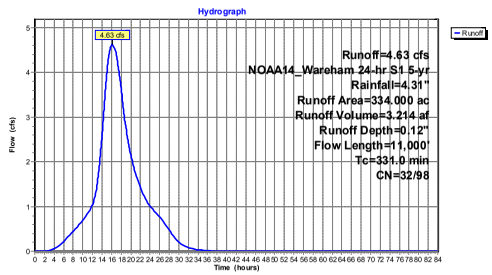
Runoff = 4.63 cfs @ 16.18 hrs, Volume= 3.214 af, Depth= 0.12"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

Area (ac)	CN	Description
* 334.000	34	*2.83% imp*
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



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Summary for Subcatchment K: K

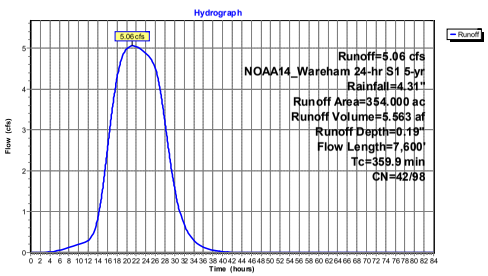
Runoff = 5.06 cfs @ 21.19 hrs, Volume= 5.563 af, Depth= 0.19"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

	Area (ac)	CN	Description
*	354.000	42	"0.83% imp"
	351.062	42	99.17% Pervious Area
	2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



Summary for Subcatchment L: L

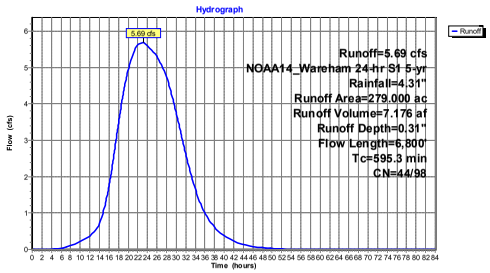
Runoff = 5.69 cfs @ 23.15 hrs, Volume= 7.176 af, Depth= 0.31"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

	Area (ac)	CN	Description
*	279.000	45	"2.43% imp"
	272.220	44	97.57% Pervious Area
	6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



Summary for Subcatchment M: M

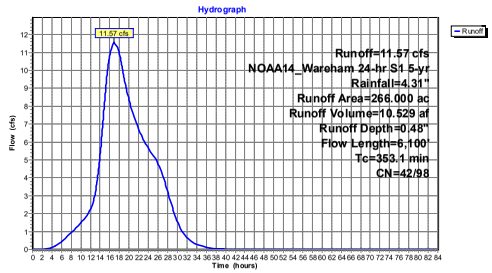
Runoff = 11.57 cfs @ 16.87 hrs, Volume= 10.529 af, Depth= 0.48"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

	Area (ac)	CN	Description
*	266.000	47	"8.14% imp"
	244.348	42	91.86% Pervious Area
	21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



Summary for Subcatchment N: N

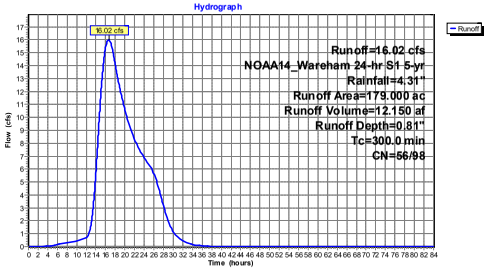
Runoff = 16.02 cfs @ 16.67 hrs, Volume= 12.150 af, Depth= 0.81"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

	Area (ac)	CN	Description
*	179.000	57	"3.17% imp"
	173.326	56	96.83% Pervious Area
	5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

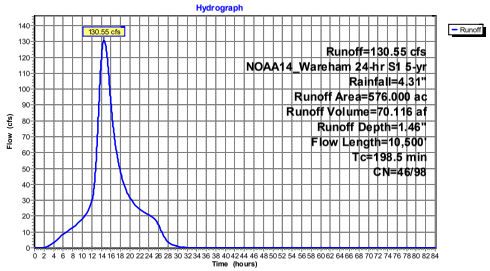
Runoff = 130.55 cfs @ 14.56 hrs, Volume= 70.116 af, Depth= 1.46"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

	Area (ac)	CN	Description
*	576.000	62	"31.1% imp"
	396.864	46	68.90% Pervious Area
	179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



Summary for Subcatchment P: P

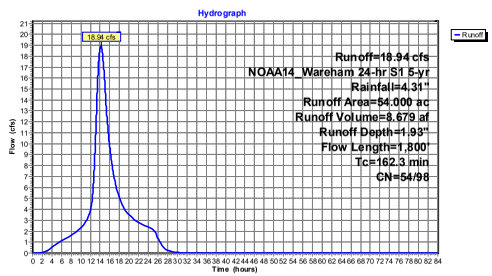
Runoff = 18.94 cfs @ 14.25 hrs, Volume= 8.679 af, Depth= 1.93"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 5-yr Rainfall=4.31"

	Area (ac)	CN	Description
*	54.000	71	"38.05% imp"
	33.453	54	61.95% Pervious Area
	20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Proposal No. 606352-136278
A00840 - 536

Summary for Pond 1P: Halfway Pond

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth > 1.65" for 5-yr event
Inflow = 157.66 cfs @ 14.68 hrs, Volume= 97.688 af, Incl. 2.20 cfs Base Flow
Outflow = 5.43 cfs @ 28.56 hrs, Volume= 32.001 af, Atten= 97%, Lag= 832.9 min
Primary = 5.43 cfs @ 28.56 hrs, Volume= 32.001 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 64.68' @ 28.56 hrs Storage= 449.303 af (78.693 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,528.7 min (2,727.1 - 1,198.4)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

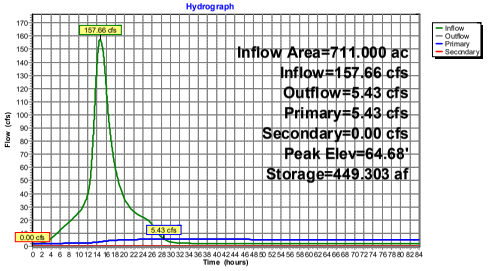
Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=5.41 cfs @ 28.56 hrs HW=64.68' TW=57.57' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 5.41 cfs @ 2.65 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 1P: Halfway Pond



Summary for Pond 2P: Kennard Res

Inflow Area = 902.000 ac, 30.72% Impervious, Inflow Depth > 0.65" for 5-yr event
Inflow = 31.93 cfs @ 13.97 hrs, Volume= 49.008 af, Incl. 0.60 cfs Base Flow
Outflow = 12.04 cfs @ 17.77 hrs, Volume= 46.453 af, Atten= 62%, Lag= 227.5 min
Primary = 12.04 cfs @ 17.77 hrs, Volume= 46.453 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 57.65' @ 17.77 hrs Storage= 11.042 af (7.042 af above start)

Plug-Flow detention time= 759.4 min calculated for 42.453 af (87% of inflow)
Center-of-Mass det. time= 208.1 min (2,444.1 - 2,236.1)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

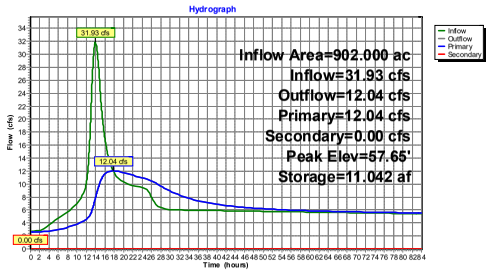
Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=12.04 cfs @ 17.77 hrs HW=57.65' TW=47.12' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 12.04 cfs @ 2.45 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.30' TW=46.77' (Dynamic Tailwater)
└**1=TOD** (Controls 0.00 cfs)

Pond 2P: Kennard Res



Summary for Pond 3P: Fawn Pond

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth > 1.61" for 5-yr event
Inflow = 47.14 cfs @ 13.59 hrs, Volume= 21.171 af, Incl. 0.50 cfs Base Flow
Outflow = 1.40 cfs @ 26.49 hrs, Volume= 7.693 af, Atten= 97%, Lag= 773.8 min
Primary = 1.40 cfs @ 26.49 hrs, Volume= 7.693 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 60.05' @ 26.49 hrs Storage= 44.571 af (16.851 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,538.4 min (2,686.0 - 1,147.6)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

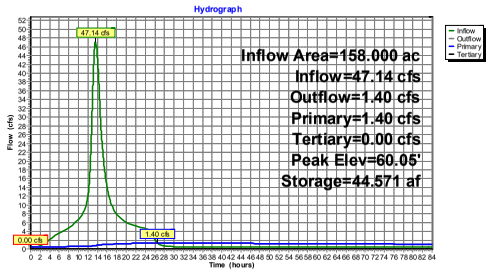
Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=1.40 cfs @ 26.49 hrs HW=60.05' TW=47.27' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 1.40 cfs @ 2.61 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=59.83' TW=46.77' (Dynamic Tailwater)
└**2=TOD South** (Controls 0.00 cfs)

Pond 3P: Fawn Pond



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A00840 - 537

Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow Area = 1,564.000 ac, 24.34% Impervious, Inflow Depth > 0.68" for 5-yr event
Inflow = 42.28 cfs @ 16.24 hrs, Volume= 88.159 af, Incl. 1.60 cfs Base Flow
Outflow = 21.91 cfs @ 26.25 hrs, Volume= 83.010 af, Atten= 48%, Lag= 600.9 min
Primary = 21.91 cfs @ 26.25 hrs, Volume= 83.010 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 47.27' @ 26.25 hrs Storage= 27.672 af (17.952 af above start)

Plug-Flow detention time= 1,026.0 min calculated for 73.289 af (83% of inflow)
Center-of-Mass det. time= 326.9 min (2,455.9 - 2,129.0)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

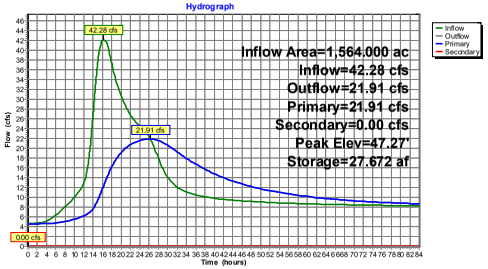
Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=21.90 cfs @ 26.25 hrs HW=47.27' TW=34.40' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 21.90 cfs @ 2.89 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=46.77' TW=33.99' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 4P: Bessey Bog Res - 2.4sm



Summary for Pond 5P: Glen Charlie Pond

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 0.97" for 5-yr event
Inflow = 196.87 cfs @ 14.09 hrs, Volume= 181.161 af, Incl. 2.10 cfs Base Flow
Outflow = 39.05 cfs @ 25.52 hrs, Volume= 163.215 af, Atten= 80%, Lag= 685.3 min
Primary = 39.05 cfs @ 25.52 hrs, Volume= 163.215 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 34.40' @ 25.52 hrs Storage= 90.598 af (64.473 af above start)

Plug-Flow detention time= 1,642.3 min calculated for 137.090 af (76% of inflow)
Center-of-Mass det. time= 710.0 min (2,458.3 - 1,748.3)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00

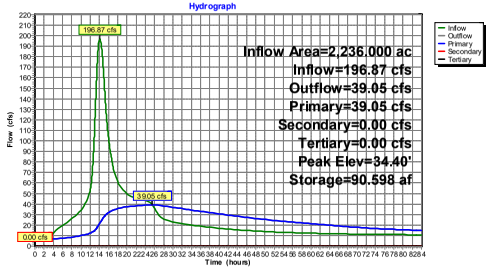
			Elev. (feet) 41.00 40.00 39.00 37.70 37.70 41.00
#6	Tertiary	34.50'	**24.0" W x 12.0" H Vert. NE Culvert** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=38.91 cfs @ 25.52 hrs HW=34.40' TW=21.11' (Dynamic Tailwater)
└**1=Spillway** (Weir Controls 38.91 cfs @ 2.73 fps)
└**2=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
└**3=SE Dike** (Controls 0.00 cfs)
└**4=SE Culvert** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
└**5=NE Dike** (Controls 0.00 cfs)
└**6=NE Culvert** (Controls 0.00 cfs)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 34.20' @ 0.00 hrs Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

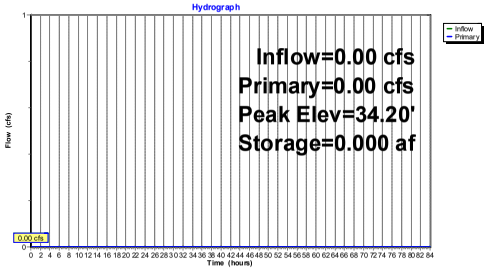
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=34.20' TW=22.70' (Dynamic Tailwater)
└**1=Orifice/Grate** (Controls 0.00 cfs)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



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A00840 - 538

Summary for Pond 6.2P: Maple Sping Bogs US

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 0.55" for 5-yr event
Inflow = 8.31 cfs @ 18.70 hrs, Volume= 8.285 af
Outflow = 2.90 cfs @ 28.73 hrs, Volume= 7.053 af, Atten= 65%, Lag= 601.3 min
Primary = 2.90 cfs @ 28.73 hrs, Volume= 7.053 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 23.02' @ 28.73 hrs Storage= 5.553 af

Plug-Flow detention time= 1,199.0 min calculated for 7.053 af (85% of inflow)
Center-of-Mass det. time= 1,107.6 min (2,377.4 - 1,269.8)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

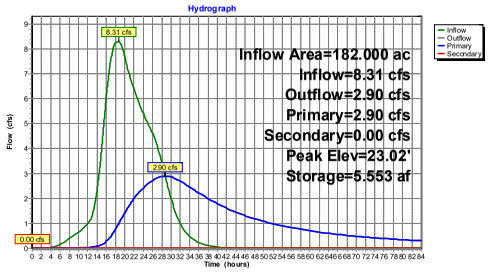
Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=2.90 cfs @ 28.73 hrs HW=23.02' TW=17.31' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 2.90 cfs @ 1.81 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.70' TW=17.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.2P: Maple Sping Bogs US



Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 0.47" for 5-yr event
Inflow = 2.90 cfs @ 28.73 hrs, Volume= 7.053 af
Outflow = 2.82 cfs @ 30.61 hrs, Volume= 6.900 af, Atten= 3%, Lag= 113.2 min
Primary = 2.82 cfs @ 30.61 hrs, Volume= 6.900 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 17.31' @ 30.61 hrs Storage= 0.627 af

Plug-Flow detention time= 198.9 min calculated for 6.900 af (98% of inflow)
Center-of-Mass det. time= 143.6 min (2,521.0 - 2,377.4)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

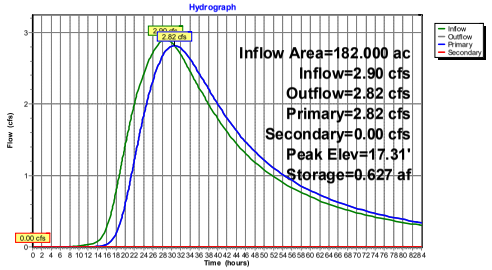
Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=2.82 cfs @ 30.61 hrs HW=17.31' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 2.82 cfs @ 1.80 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 0.88" for 5-yr event
Inflow = 39.05 cfs @ 25.52 hrs, Volume= 163.215 af
Outflow = 39.03 cfs @ 25.84 hrs, Volume= 162.633 af, Atten= 0%, Lag= 19.6 min
Primary = 39.03 cfs @ 25.84 hrs, Volume= 162.633 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 21.11' @ 25.84 hrs Storage= 1.911 af (1.464 af above start)

Plug-Flow detention time= 41.6 min calculated for 162.184 af (99% of inflow)
Center-of-Mass det. time= 18.6 min (2,476.9 - 2,458.3)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

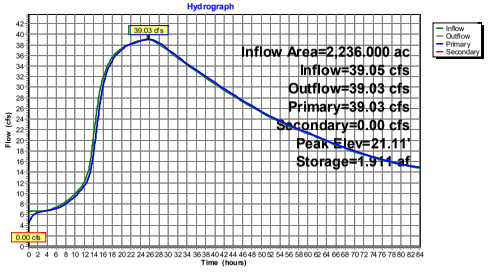
Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

Primary OutFlow Max=39.03 cfs @ 25.84 hrs HW=21.11' TW=0.00' (Dynamic Tailwater)
└**1=Bridge/Spillway** (Weir Controls 39.03 cfs @ 3.24 fps)
└**3=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.49' TW=22.70' (Dynamic Tailwater)
└**2=Culvert to Bogs** (Controls 0.00 cfs)
└**4=TOD_Bogs** (Controls 0.00 cfs)

Pond 6P: Maple Springs Dam - 3.5sm



Proposal No. 606352-136278
A00840 - 539

Summary for Pond 7P: Little Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 1.04" for 5-yr event
Inflow = 17.94 cfs @ 16.28 hrs, Volume= 16.349 af, Incl. 0.59 cfs Base Flow
Outflow = 17.18 cfs @ 16.88 hrs, Volume= 16.298 af, Atten= 4%, Lag= 36.4 min
Primary = 17.18 cfs @ 16.88 hrs, Volume= 16.298 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 59.70' @ 16.88 hrs Storage= 23.610 af (1.450 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 65.2 min (1,491.8 - 1,426.6)

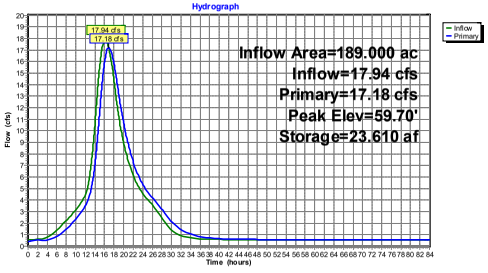
Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=17.18 cfs @ 16.88 hrs HW=59.70' TW=52.10' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 17.18 cfs @ 0.61 fps)

Pond 7P: Little Five Mile Pond



Summary for Pond 8P: Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 1.03" for 5-yr event
Inflow = 17.18 cfs @ 16.88 hrs, Volume= 16.298 af
Outflow = 0.89 cfs @ 35.33 hrs, Volume= 4.395 af, Atten= 95%, Lag= 1,107.0 min
Primary = 0.89 cfs @ 35.33 hrs, Volume= 4.395 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 52.39' @ 35.33 hrs Storage= 12.796 af

Plug-Flow detention time= 2,316.1 min calculated for 4.395 af (27% of inflow)
Center-of-Mass det. time= 1,599.1 min (3,090.9 - 1,491.8)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

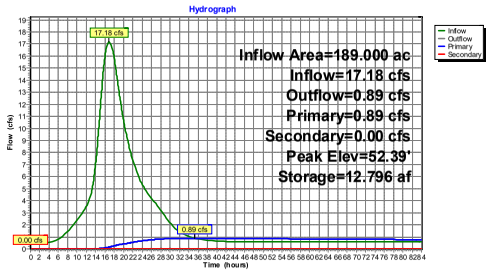
Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=0.86 cfs @ 35.33 hrs HW=52.39' TW=29.83' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.86 cfs @ 2.21 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=51.90' TW=29.60' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 8P: Five Mile Pond



Summary for Pond 9P: Kettle Hole

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth > 0.30" for 5-yr event
Inflow = 0.73 cfs @ 19.35 hrs, Volume= 2.557 af, Incl. 0.30 cfs Base Flow
Outflow = 0.66 cfs @ 22.09 hrs, Volume= 2.566 af, Atten= 9%, Lag= 164.8 min
Primary = 0.66 cfs @ 22.09 hrs, Volume= 2.566 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.01' @ 22.09 hrs Storage= 9.028 af (0.078 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 28.2 min (2,328.0 - 2,299.9)

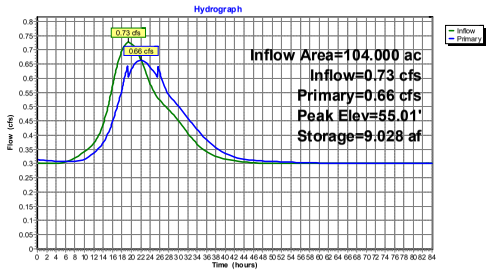
Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=0.66 cfs @ 22.09 hrs HW=55.01' TW=29.98' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 0.66 cfs @ 0.34 fps)

Pond 9P: Kettle Hole



Proposal No. 606352-136278
A00840 - 540

Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow Area = 484.000 ac, 13.78% Impervious, Inflow Depth > 0.52" for 5-yr event
Inflow = 17.77 cfs @ 15.24 hrs, Volume= 21.076 af, Incl. 0.60 cfs Base Flow
Outflow = 6.80 cfs @ 19.91 hrs, Volume= 19.585 af, Atten= 62%, Lag= 280.2 min
Primary = 6.80 cfs @ 19.91 hrs, Volume= 19.585 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1.500 af
Peak Elev= 29.99' @ 19.91 hrs Storage= 7.408 af (5.908 af above start)

Plug-Flow detention time= 949.8 min calculated for 18.085 af (86% of inflow)
Center-of-Mass det. time= 395.0 min (2,289.1 - 1,894.1)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LiDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
35.00	115.000
36.50	160.000
40.00	300.000

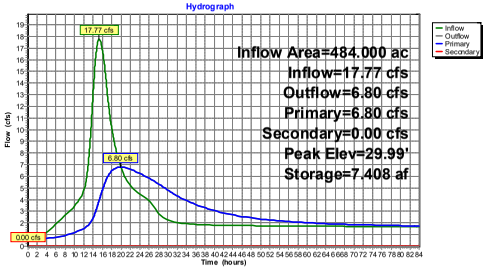
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=6.78 cfs @ 19.91 hrs HW=29.99' TW=21.63' (Dynamic Tailwater)
└**1=Drop Inlet Spillway** (Weir Controls 6.78 cfs @ 2.33 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.60' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 10P: Maple Springs Brook Dam - 0.8sm



Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow Area = 1,172.000 ac, 6.75% Impervious, Inflow Depth > 0.44" for 5-yr event
Inflow = 16.29 cfs @ 20.39 hrs, Volume= 42.940 af, Incl. 1.10 cfs Base Flow
Outflow = 14.45 cfs @ 25.39 hrs, Volume= 42.412 af, Atten= 11%, Lag= 299.9 min
Primary = 14.45 cfs @ 25.39 hrs, Volume= 42.412 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 21.75' @ 25.39 hrs Storage= 6.859 af (4.149 af above start)

Plug-Flow detention time= 464.0 min calculated for 39.702 af (92% of inflow)
Center-of-Mass det. time= 122.4 min (2,308.7 - 2,186.3)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

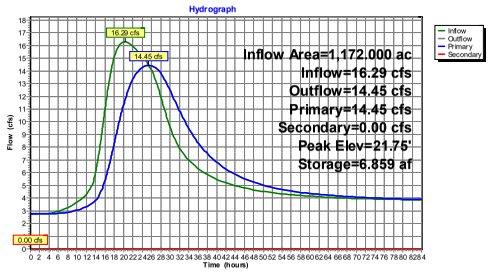
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=14.45 cfs @ 25.39 hrs HW=21.75' TW=16.60' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 14.45 cfs @ 3.22 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.26' TW=15.71' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 11P: Unnamed Road - 1.8sm



Summary for Pond 12P: Maple Springs Road Dam

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth > 0.36" for 5-yr event
Inflow = 5.63 cfs @ 16.18 hrs, Volume= 10.156 af, Incl. 1.00 cfs Base Flow
Outflow = 3.41 cfs @ 19.54 hrs, Volume= 10.156 af, Atten= 39%, Lag= 201.6 min
Primary = 3.41 cfs @ 19.54 hrs, Volume= 10.156 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 38.91' @ 19.54 hrs Storage= 2.441 af (1.361 af above start)

Plug-Flow detention time= 664.2 min calculated for 9.076 af (89% of inflow)
Center-of-Mass det. time= 139.6 min (2,196.3 - 2,056.7)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

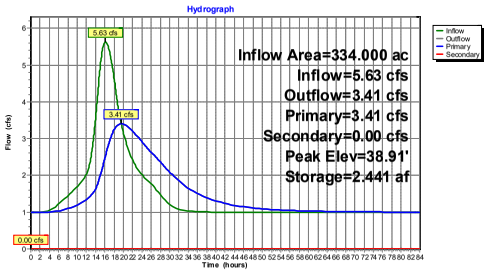
Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=3.41 cfs @ 19.54 hrs HW=38.91' TW=21.61' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 3.41 cfs @ 2.14 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=38.68' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 12P: Maple Springs Road Dam



Proposal No. 606352-136278
A00840 - 541

Summary for Pond 13.1P: Bogs_L_US

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 0.58" for 5-yr event
Inflow = 6.59 cfs @ 23.15 hrs, Volume= 13.424 af, Incl. 0.90 cfs Base Flow
Outflow = 6.59 cfs @ 23.22 hrs, Volume= 13.425 af, Atten= 0%, Lag= 4.0 min
Primary = 6.59 cfs @ 23.22 hrs, Volume= 13.425 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 30.05' @ 23.22 hrs Storage= 0.197 af (0.144 af above start)

Plug-Flow detention time= 30.4 min calculated for 13.372 af (100% of inflow)
Center-of-Mass det. time= 10.6 min (1,985.7 - 1,975.1)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

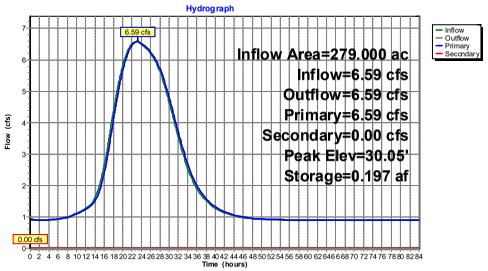
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=6.59 cfs @ 23.22 hrs HW=30.05' TW=26.15' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 6.59 cfs @ 2.39 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.65' TW=25.75' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.1P: Bogs_L_US



Summary for Pond 13.2P: Bogs_L_DS

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 0.58" for 5-yr event
Inflow = 6.59 cfs @ 23.22 hrs, Volume= 13.425 af
Outflow = 6.57 cfs @ 23.48 hrs, Volume= 13.427 af, Atten= 0%, Lag= 16.1 min
Primary = 6.57 cfs @ 23.48 hrs, Volume= 13.427 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 26.15' @ 23.48 hrs Storage= 0.276 af (0.201 af above start)

Plug-Flow detention time= 42.5 min calculated for 13.352 af (99% of inflow)
Center-of-Mass det. time= 14.9 min (2,000.6 - 1,985.7)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

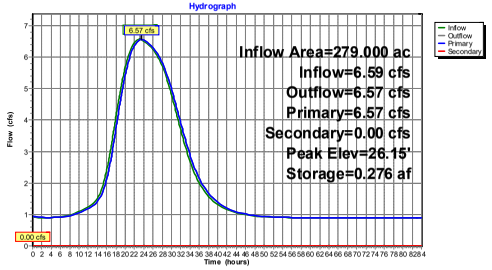
Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=6.57 cfs @ 23.48 hrs HW=26.15' TW=16.61' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 6.57 cfs @ 2.38 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.2P: Bogs_L_DS



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow Area = 1,717.000 ac, 6.26% Impervious, Inflow Depth > 0.50" for 5-yr event
Inflow = 27.43 cfs @ 23.11 hrs, Volume= 71.922 af, Incl. 0.80 cfs Base Flow
Outflow = 27.38 cfs @ 23.61 hrs, Volume= 71.836 af, Atten= 0%, Lag= 30.2 min
Primary = 27.38 cfs @ 23.61 hrs, Volume= 71.836 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 16.61' @ 23.61 hrs Storage= 2.422 af (1.357 af above start)

Plug-Flow detention time= 101.1 min calculated for 70.771 af (98% of inflow)
Center-of-Mass det. time= 23.8 min (2,125.2 - 2,101.4)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

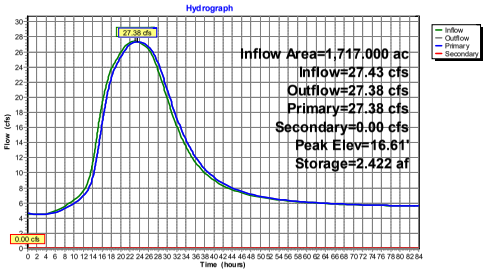
Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

Primary OutFlow Max=27.38 cfs @ 23.61 hrs HW=16.61' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 27.38 cfs @ 2.58 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.71' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 14P: Bogs_M - 2.7sm



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Summary for Pond 15.1P: Bogs_N_US

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 1.09" for 5-yr event
Inflow = 16.62 cfs @ 16.67 hrs, Volume= 16.315 af, Incl. 0.60 cfs Base Flow
Outflow = 10.08 cfs @ 20.85 hrs, Volume= 16.310 af, Atten= 39%, Lag= 251.1 min
Primary = 10.08 cfs @ 20.85 hrs, Volume= 16.310 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 25.73' @ 20.85 hrs Storage= 3.987 af (3.635 af above start)

Plug-Flow detention time= 295.0 min calculated for 15.958 af (98% of inflow)
Center-of-Mass det. time= 188.1 min (1,714.2 - 1,526.1)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

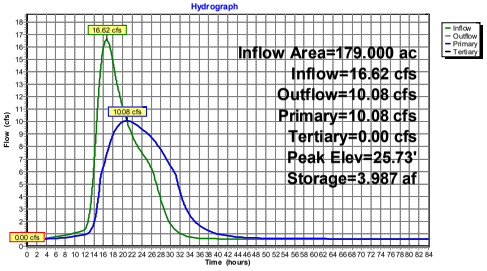
Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=10.06 cfs @ 20.85 hrs HW=25.73' TW=20.27' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 10.06 cfs @ 2.75 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.11' TW=20.11' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 15.1P: Bogs_N_US



Summary for Pond 15.2P: Bogs_N_DS

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 1.09" for 5-yr event
Inflow = 10.08 cfs @ 20.85 hrs, Volume= 16.310 af
Outflow = 4.73 cfs @ 31.74 hrs, Volume= 14.947 af, Atten= 53%, Lag= 653.3 min
Primary = 4.73 cfs @ 31.74 hrs, Volume= 14.947 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 20.44' @ 31.74 hrs Storage= 10.313 af (7.746 af above start)

Plug-Flow detention time= 1,519.8 min calculated for 12.380 af (76% of inflow)
Center-of-Mass det. time= 805.6 min (2,519.8 - 1,714.2)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

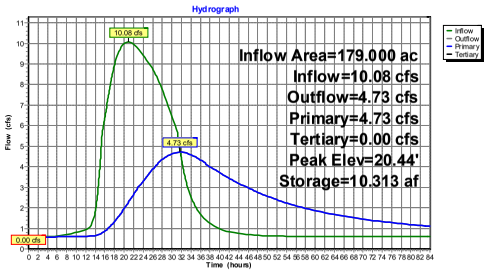
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=4.72 cfs @ 31.74 hrs HW=20.44' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 4.72 cfs @ 2.13 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS



Summary for Pond 16.1: Mill Pond Dam -PC

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.35" for 5-yr event
Inflow = 214.48 cfs @ 14.78 hrs, Volume= 557.261 af, Incl. 32.00 cfs Base Flow
Outflow = 98.05 cfs @ 30.13 hrs, Volume= 519.259 af, Atten= 54%, Lag= 921.1 min
Primary = 72.86 cfs @ 30.13 hrs, Volume= 364.175 af
Routed to Pond 17B : Proposed Bridge
Secondary = 25.19 cfs @ 30.13 hrs, Volume= 155.084 af
Routed to Pond Wr 24 :
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 17B : Proposed Bridge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 470.969 af
Peak Elev= 14.93' @ 30.13 hrs Storage= 564.307 af (93.338 af above start)

Plug-Flow detention time= 4,407.7 min calculated for 48.288 af (9% of inflow)
Center-of-Mass det. time= 346.9 min (2,583.4 - 2,236.5)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,941.850 af	**Storage** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.130
5.00	4.140
6.00	9.110
7.00	16.590
8.00	34.960
9.00	60.590
10.00	94.410
11.00	142.690
12.00	214.660
13.00	314.540
13.80	403.920
14.00	426.260
15.00	575.290
16.00	771.680
17.00	994.600
18.30	1,368.590
19.00	1,592.930
20.00	1,941.850

Device	Routing	Invert	Outlet Devices
#1	Primary	15.50'	**110.0' long x 1.5' breadth Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32
#2	Primary	13.60'	**15.0' long x 1.0' breadth Notch as SW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#3	Secondary	12.50'	**3.3' long x 1.0' breadth 3.25' Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#4	Tertiary	18.00'	**TOD, C= 2.60** Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00 Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 8	5.20'	**48.0" W x 48.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#7	Device 8	15.50'	**6.0' long x 20.00' rise MLO DownwardOpGate** 2 End Contraction(s) 5.0' Crest Height
#8	Tertiary	4.00'	**96.0" W x 48.0" H Box Culvert X 0.00** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 32.00 sf

Primary OutFlow Max=72.30 cfs @ 30.13 hrs HW=14.93' TW=8.91' (Dynamic Tailwater)
└**1=Spillway** (Controls 0.00 cfs)
└**2=Notch as SW** (Weir Controls 72.30 cfs @ 3.63 fps)

Secondary OutFlow Max=25.30 cfs @ 30.13 hrs HW=14.93' TW=14.45' (Dynamic Tailwater)
└**3=3.25' Weir** (Weir Controls 25.30 cfs @ 3.16 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.30' TW=8.48' (Dynamic Tailwater)
├**4=TOD** (Controls 0.00 cfs)
├**5=US Relief - Bypasses Dam** (Controls 0.00 cfs)
└**8=Culvert** (Controls 0.00 cfs)
└**6=Orifice/Grate** (Controls 0.00 cfs)
└**7=MLO DownwardOpGate** (Controls 0.00 cfs)

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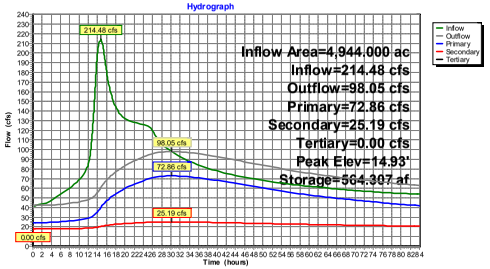
Pond 16.1: Mill Pond Dam -PC



Summary for Pond 16.3: Downstream Weir

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 0.88" for 5-yr event
Inflow = 83.34 cfs @ 0.01 hrs, Volume= 364.167 af
Outflow = 72.86 cfs @ 30.14 hrs, Volume= 364.160 af, Atten= 13%, Lag= 1,807.4 min
Primary = 72.86 cfs @ 30.14 hrs, Volume= 364.160 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 8.91' @ 30.14 hrs Surf.Area= 2,000 sf Storage= 9,816 cf (856 cf above start)

Plug-Flow detention time= 3.0 min calculated for 363.949 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,596.8 - 2,596.7)

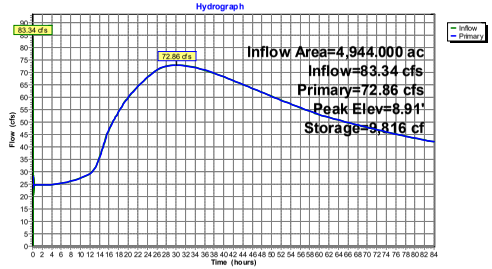
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	8.00'	**DS Weir, C= 2.60** Offset (feet) 0.00 0.00 23.00 23.00 Elev. (feet) 17.00 10.00 8.00 17.00
#2	Primary	8.00'	**27.0' long x 1.5' breadth El 8 Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32

Primary OutFlow Max=72.86 cfs @ 30.14 hrs HW=8.91' (Free Discharge)
1=DS Weir (Weir Controls 9.39 cfs @ 0.99 fps)
2=El 8 Weir (Weir Controls 63.47 cfs @ 2.59 fps)

Pond 16.3: Downstream Weir



Summary for Pond 17B: Proposed Bridge

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 0.88" for 5-yr event
Inflow = 72.86 cfs @ 30.13 hrs, Volume= 364.175 af
Outflow = 83.34 cfs @ 0.01 hrs, Volume= 364.167 af, Atten= 0%, Lag= 0.0 min
Primary = 83.34 cfs @ 0.01 hrs, Volume= 364.167 af
Routed to Pond 16.3 : Downstream Weir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 8.91' @ 30.14 hrs Surf.Area= 2,000 sf Storage= 9,826 cf (866 cf above start)

Plug-Flow detention time= 3.0 min calculated for 363.957 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,596.7 - 2,596.5)

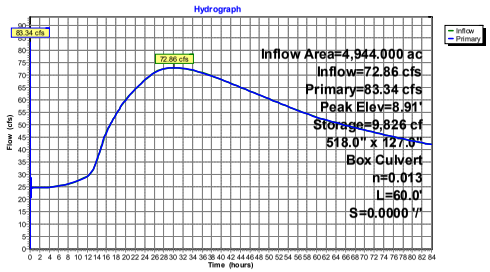
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	4.00'	**518.0" W x 127.0" H Box Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 456.85 sf

Primary OutFlow Max=0.00 cfs @ 0.01 hrs HW=8.46' TW=8.48' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond 17B: Proposed Bridge

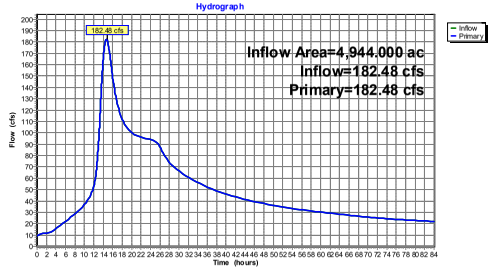


Summary for Link 23L: Inflow

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 0.81" for 5-yr event
Inflow = 182.48 cfs @ 14.78 hrs, Volume= 335.110 af
Primary = 182.48 cfs @ 14.78 hrs, Volume= 335.110 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16.1 : Mill Pond Dam -PC

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow



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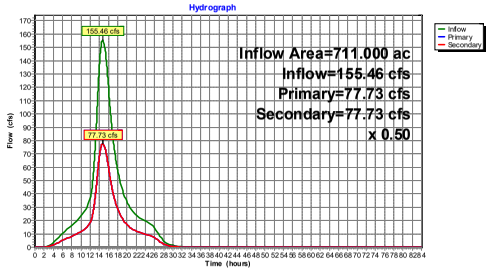
Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 1.39" for 5-yr event
Inflow = 155.46 cfs @ 14.68 hrs, Volume= 82.415 af
Primary = 77.73 cfs @ 14.68 hrs, Volume= 41.208 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 1P : Halfway Pond
Secondary = 77.73 cfs @ 14.68 hrs, Volume= 41.208 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow

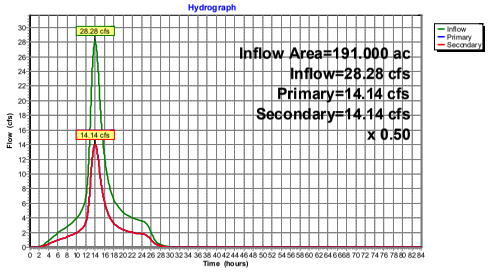


Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 0.81" for 5-yr event
Inflow = 28.28 cfs @ 13.97 hrs, Volume= 12.842 af
Primary = 14.14 cfs @ 13.97 hrs, Volume= 6.421 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 2P : Kennard Res
Secondary = 14.14 cfs @ 13.97 hrs, Volume= 6.421 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

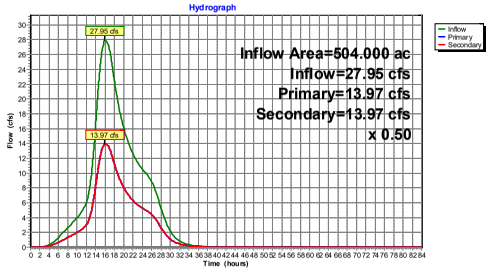


Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth = 0.55" for 5-yr event
Inflow = 27.95 cfs @ 15.89 hrs, Volume= 22.906 af
Primary = 13.97 cfs @ 15.89 hrs, Volume= 11.453 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 13.97 cfs @ 15.89 hrs, Volume= 11.453 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

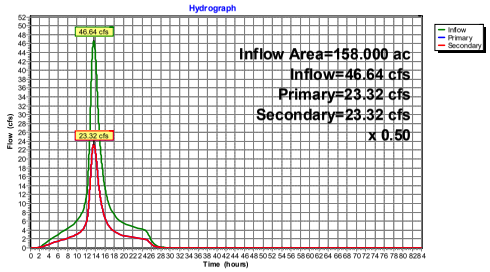


Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 1.34" for 5-yr event
Inflow = 46.64 cfs @ 13.59 hrs, Volume= 17.700 af
Primary = 23.32 cfs @ 13.59 hrs, Volume= 8.850 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 3P : Fawn Pond
Secondary = 23.32 cfs @ 13.59 hrs, Volume= 8.850 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow

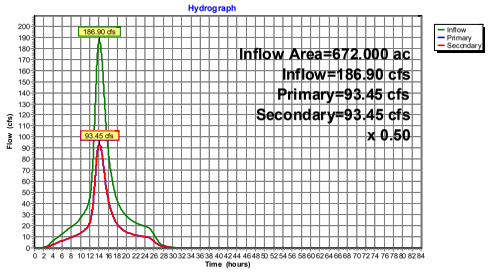


Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 1.49" for 5-yr event
Inflow = 186.90 cfs @ 14.09 hrs, Volume= 83.573 af
Primary = 93.45 cfs @ 14.09 hrs, Volume= 41.786 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 5P : Glen Charlie Pond
Secondary = 93.45 cfs @ 14.09 hrs, Volume= 41.786 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow

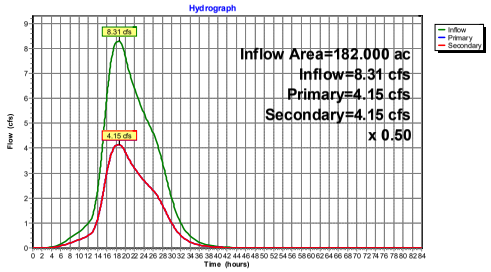


Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 0.55" for 5-yr event
Inflow = 8.31 cfs @ 18.70 hrs, Volume= 8.285 af
Primary = 4.15 cfs @ 18.70 hrs, Volume= 4.143 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 6.2P : Maple Sping Bogs US
Secondary = 4.15 cfs @ 18.70 hrs, Volume= 4.143 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow



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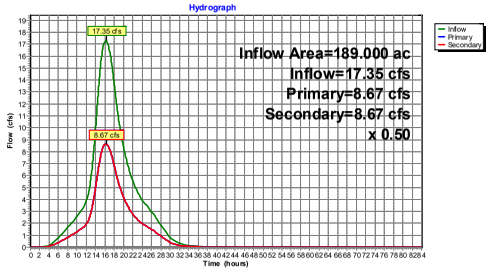
Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth = 0.78" for 5-yr event
Inflow = 17.35 cfs @ 16.28 hrs, Volume= 12.253 af
Primary = 8.67 cfs @ 16.28 hrs, Volume= 6.126 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 7P : Little Five Mile Pond
Secondary = 8.67 cfs @ 16.28 hrs, Volume= 6.126 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow

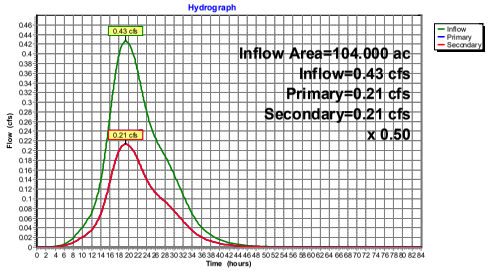


Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth = 0.05" for 5-yr event
Inflow = 0.43 cfs @ 19.35 hrs, Volume= 0.474 af
Primary = 0.21 cfs @ 19.35 hrs, Volume= 0.237 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 9P : Kettle Hole
Secondary = 0.21 cfs @ 19.35 hrs, Volume= 0.237 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow

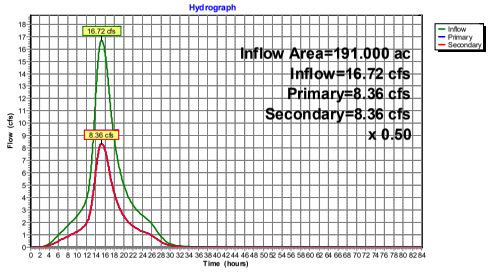


Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth = 0.63" for 5-yr event
Inflow = 16.72 cfs @ 15.24 hrs, Volume= 9.950 af
Primary = 8.36 cfs @ 15.24 hrs, Volume= 4.975 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 8.36 cfs @ 15.24 hrs, Volume= 4.975 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

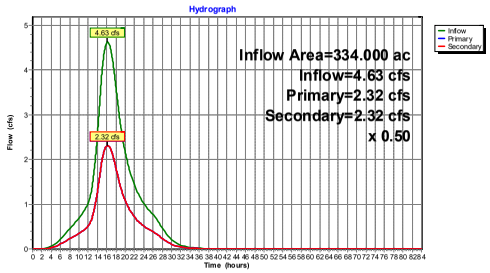


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth = 0.12" for 5-yr event
Inflow = 4.63 cfs @ 16.18 hrs, Volume= 3.214 af
Primary = 2.32 cfs @ 16.18 hrs, Volume= 1.607 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 12P : Maple Springs Road Dam
Secondary = 2.32 cfs @ 16.18 hrs, Volume= 1.607 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow

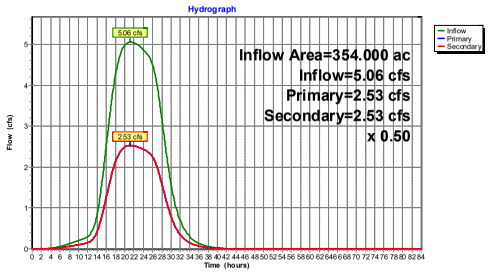


Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth = 0.19" for 5-yr event
Inflow = 5.06 cfs @ 21.19 hrs, Volume= 5.563 af
Primary = 2.53 cfs @ 21.19 hrs, Volume= 2.781 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 2.53 cfs @ 21.19 hrs, Volume= 2.781 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow

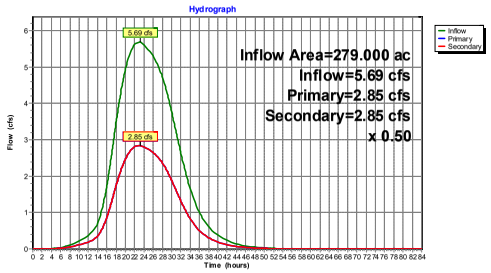


Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth = 0.31" for 5-yr event
Inflow = 5.69 cfs @ 23.15 hrs, Volume= 7.176 af
Primary = 2.85 cfs @ 23.15 hrs, Volume= 3.588 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 13.1P : Bogs_L_US
Secondary = 2.85 cfs @ 23.15 hrs, Volume= 3.588 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow



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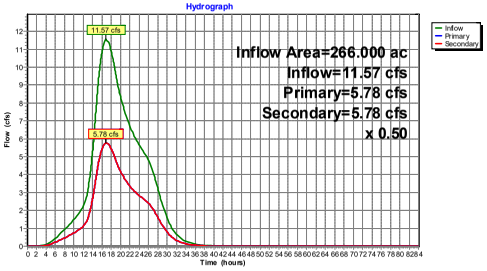
Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth = 0.48" for 5-yr event
Inflow = 11.57 cfs @ 16.87 hrs, Volume= 10.529 af
Primary = 5.78 cfs @ 16.87 hrs, Volume= 5.265 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 5.78 cfs @ 16.87 hrs, Volume= 5.265 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow

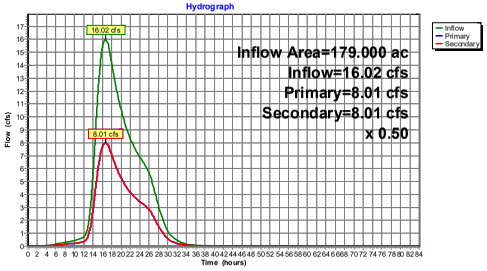


Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth = 0.81" for 5-yr event
Inflow = 16.02 cfs @ 16.67 hrs, Volume= 12.150 af
Primary = 8.01 cfs @ 16.67 hrs, Volume= 6.075 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 15.1P : Bogs_N_US
Secondary = 8.01 cfs @ 16.67 hrs, Volume= 6.075 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow

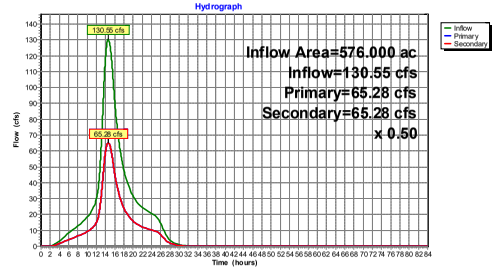


Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 1.46" for 5-yr event
Inflow = 130.55 cfs @ 14.56 hrs, Volume= 70.116 af
Primary = 65.28 cfs @ 14.56 hrs, Volume= 35.058 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 65.28 cfs @ 14.56 hrs, Volume= 35.058 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow

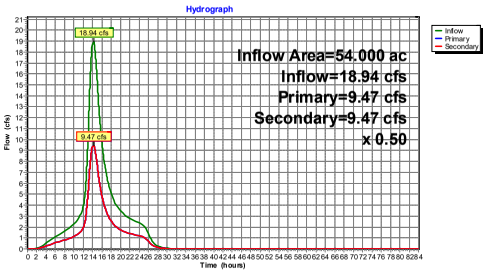


Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 1.93" for 5-yr event
Inflow = 18.94 cfs @ 14.25 hrs, Volume= 8.679 af
Primary = 9.47 cfs @ 14.25 hrs, Volume= 4.339 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 9.47 cfs @ 14.25 hrs, Volume= 4.339 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=1.67"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=184.57 cfs 99.035 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=1.03"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=34.15 cfs 16.383 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=0.76"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=38.28 cfs 31.737 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=1.65"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=55.85 cfs 21.704 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=1.81"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=222.92 cfs 101.466 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=0.81"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=13.03 cfs 12.244 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=0.94"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=20.54 cfs 14.763 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=0.10"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=0.61 cfs 0.906 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=0.76"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=19.82 cfs 12.075 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=0.16"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=5.49 cfs 4.522 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=0.36"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=10.45 cfs 10.534 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=0.51"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=10.00 cfs 11.914 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=0.68"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=16.89 cfs 15.164 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=1.18"
Tc=300.0 min CN=56/98 Runoff=24.66 cfs 17.535 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=1.83"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=165.66 cfs 88.050 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=2.40"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=24.26 cfs 10.811 af

Pond 1P: Halfway Pond Peak Elev=64.74' Storage=465.069 af Inflow=186.77 cfs 114.308 af
Primary=6.18 cfs 35.798 af Secondary=0.00 cfs 0.000 af Outflow=6.18 cfs 35.798 af

Pond 2P: Kennard Res Peak Elev=57.73' Storage=12.632 af Inflow=37.97 cfs 56.346 af
Primary=14.73 cfs 53.322 af Secondary=0.00 cfs 0.000 af Outflow=14.73 cfs 53.322 af

Pond 3P: Fawn Pond Peak Elev=60.13' Storage=48.225 af Inflow=56.35 cfs 25.175 af
Primary=1.81 cfs 9.444 af Tertiary=0.00 cfs 0.000 af Outflow=1.81 cfs 9.444 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=47.43' Storage=33.422 af Inflow=55.54 cfs 105.610 af
Primary=29.04 cfs 99.435 af Secondary=0.00 cfs 0.000 af Outflow=29.04 cfs 99.435 af

Pond 5P: Glen Charlie Pond Peak Elev=34.49' Storage=105.604 af Inflow=233.57 cfs 215.480 af
Primary=47.86 cfs 193.639 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=47.86 cfs 193.639 af

Pond 6.1P: Ortalani Reservoir Peak Elev=34.20' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=23.15' Storage=7.766 af Inflow=13.03 cfs 12.244 af
Primary=4.82 cfs 10.826 af Secondary=0.00 cfs 0.000 af Outflow=4.82 cfs 10.826 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=17.44' Storage=0.886 af Inflow=4.82 cfs 10.826 af
Primary=4.73 cfs 10.649 af Secondary=0.00 cfs 0.000 af Outflow=4.73 cfs 10.649 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=21.22' Storage=2.172 af Inflow=47.86 cfs 193.639 af
Primary=47.83 cfs 192.969 af Secondary=0.00 cfs 0.000 af Outflow=47.83 cfs 192.969 af

Pond 7P: Little Five Mile Pond Peak Elev=59.72' Storage=23.767 af Inflow=21.13 cfs 18.859 af
Outflow=20.36 cfs 18.808 af

Pond 8P: Five Mile Pond Peak Elev=52.47' Storage=14.932 af Inflow=20.36 cfs 18.808 af
Primary=1.19 cfs 5.635 af Secondary=0.00 cfs 0.000 af Outflow=1.19 cfs 5.635 af

Pond 9P: Kettle Hole Peak Elev=55.02' Storage=9.075 af Inflow=0.91 cfs 2.988 af
Outflow=0.89 cfs 2.997 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=30.06' Storage=8.348 af Inflow=20.92 cfs 24.872 af
Primary=8.13 cfs 23.164 af Secondary=0.00 cfs 0.000 af Outflow=8.13 cfs 23.164 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=21.94' Storage=6.488 af Inflow=23.49 cfs 52.799 af
Primary=20.36 cfs 52.176 af Secondary=0.00 cfs 0.000 af Outflow=20.36 cfs 52.176 af

Pond 12P: Maple Springs Road Dam Peak Elev=38.95' Storage=2.676 af Inflow=6.49 cfs 11.465 af
Primary=3.91 cfs 11.464 af Secondary=0.00 cfs 0.000 af Outflow=3.91 cfs 11.464 af

Pond 13.1P: Bogs_L_US Peak Elev=30.27' Storage=0.276 af Inflow=10.90 cfs 18.162 af
Primary=10.89 cfs 18.163 af Secondary=0.00 cfs 0.000 af Outflow=10.89 cfs 18.163 af

Pond 13.2P: Bogs_L_DS Peak Elev=26.37' Storage=0.386 af Inflow=10.89 cfs 18.163 af
Primary=10.87 cfs 18.165 af Secondary=0.00 cfs 0.000 af Outflow=10.87 cfs 18.165 af

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Pond 14P: Bogs_M - 2.7sm Peak Elev=17.00' Storage=2.996 af Inflow=41.26 cfs 91.059 af
Primary=41.19 cfs 90.953 af Secondary=0.00 cfs 0.000 af Outflow=41.19 cfs 90.953 af

Pond 15.1P: Bogs_N_US Peak Elev=25.93' Storage=6.044 af Inflow=25.26 cfs 21.700 af
Primary=14.48 cfs 21.695 af Tertiary=0.00 cfs 0.000 af Outflow=14.48 cfs 21.695 af

Pond 15.2P: Bogs_N_DS Peak Elev=20.56' Storage=13.083 af Inflow=14.48 cfs 21.695 af
Primary=6.77 cfs 19.986 af Tertiary=0.00 cfs 0.000 af Outflow=6.77 cfs 19.986 af

Pond 16.1: Mill Pond Dam -PC Peak Elev=15.09' Storage=593.359 af Inflow=260.41 cfs 635.569 af
Primary=88.66 cfs 425.569 af Secondary=27.19 cfs 163.356 af Tertiary=0.00 cfs 0.000 af Outflow=115.85 cfs 588.925 af

Pond 16.3: Downstream Weir Peak Elev=9.02' Storage=10,031 cf Inflow=88.66 cfs 425.560 af
Outflow=88.66 cfs 425.551 af

Pond 17B: Proposed Bridge Peak Elev=9.02' Storage=10,046 cf Inflow=88.66 cfs 425.569 af
518.0" x 127.0" Box Culvert n=0.013 L=60.0' S=0.0000 '/' Outflow=88.66 cfs 425.560 af

Link 23L: Inflow Inflow=228.41 cfs 413.418 af
Primary=228.41 cfs 413.418 af

Link A1: 1/2 Flow x 0.50 Inflow=184.57 cfs 99.035 af
Primary=92.29 cfs 49.517 af Secondary=92.29 cfs 49.517 af

Link B1: 1/2 Flow x 0.50 Inflow=34.15 cfs 16.383 af
Primary=17.08 cfs 8.191 af Secondary=17.08 cfs 8.191 af

Link C1: 1/2 Flow x 0.50 Inflow=38.28 cfs 31.737 af
Primary=19.14 cfs 15.868 af Secondary=19.14 cfs 15.868 af

Link D1: 1/2 Flow x 0.50 Inflow=55.85 cfs 21.704 af
Primary=27.92 cfs 10.852 af Secondary=27.92 cfs 10.852 af

Link E1: 1/2 Flow x 0.50 Inflow=222.92 cfs 101.466 af
Primary=111.46 cfs 50.733 af Secondary=111.46 cfs 50.733 af

Link F1: 1/2 Flow x 0.50 Inflow=13.03 cfs 12.244 af
Primary=6.52 cfs 6.122 af Secondary=6.52 cfs 6.122 af

Link G1: 1/2 Flow x 0.50 Inflow=20.54 cfs 14.763 af
Primary=10.27 cfs 7.382 af Secondary=10.27 cfs 7.382 af

Link H1: 1/2 Flow x 0.50 Inflow=0.61 cfs 0.906 af
Primary=0.30 cfs 0.453 af Secondary=0.30 cfs 0.453 af

Link I1: 1/2 Flow x 0.50 Inflow=19.82 cfs 12.075 af
Primary=9.91 cfs 6.038 af Secondary=9.91 cfs 6.038 af

Link JL: 1/2 Flow x 0.50 Inflow=5.49 cfs 4.522 af
Primary=2.74 cfs 2.261 af Secondary=2.74 cfs 2.261 af

Link KL: 1/2 Flow x 0.50 Inflow=10.45 cfs 10.534 af
Primary=5.23 cfs 5.267 af Secondary=5.23 cfs 5.267 af

Link LL: 1/2 Flow x 0.50 Inflow=10.00 cfs 11.914 af
Primary=5.00 cfs 5.957 af Secondary=5.00 cfs 5.957 af

Link ML: 1/2 Flow x 0.50 Inflow=16.89 cfs 15.164 af
Primary=8.44 cfs 7.582 af Secondary=8.44 cfs 7.582 af

Link NL: 1/2 Flow x 0.50 Inflow=24.66 cfs 17.535 af
Primary=12.33 cfs 8.767 af Secondary=12.33 cfs 8.767 af

Link OL: 1/2 Flow x 0.50 Inflow=165.66 cfs 88.050 af
Primary=82.83 cfs 44.025 af Secondary=82.83 cfs 44.025 af

Link PL: 1/2 Flow x 0.50 Inflow=24.26 cfs 10.811 af
Primary=12.13 cfs 5.406 af Secondary=12.13 cfs 5.406 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 468.842 af Average Runoff Depth = 1.14"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

Summary for Subcatchment A: A

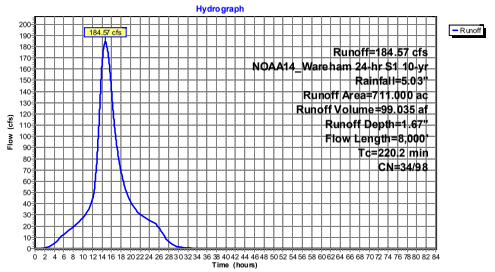
Runoff = 184.57 cfs @ 14.68 hrs, Volume= 99.035 af, Depth= 1.67"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 711.000	56	"33.99% imp"
469.331	34	66.01% Pervious Area
241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



Summary for Subcatchment B: B

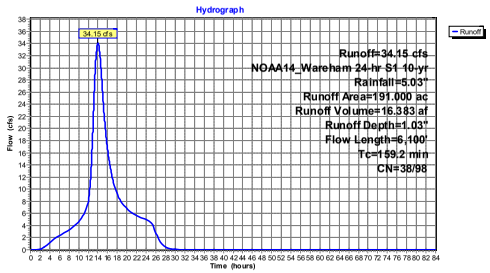
Runoff = 34.15 cfs @ 13.97 hrs, Volume= 16.383 af, Depth= 1.03"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 191.000	49	"18.54% imp"
155.589	38	81.46% Pervious Area
35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



Summary for Subcatchment C: C

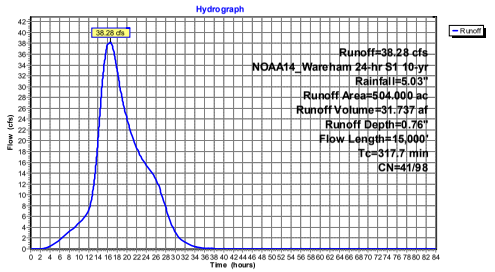
Runoff = 38.28 cfs @ 16.59 hrs, Volume= 31.737 af, Depth= 0.76"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 504.000	47	"10.54% imp"
450.878	41	89.46% Pervious Area
53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



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Summary for Subcatchment D: D

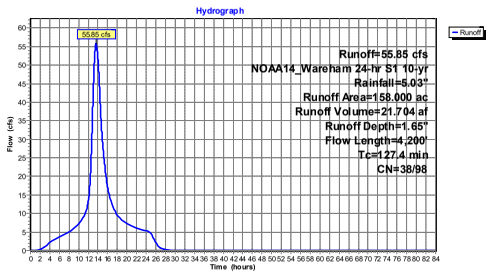
Runoff = 55.85 cfs @ 13.59 hrs, Volume= 21.704 af, Depth= 1.65"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 158.000	57	"31.94% imp"
107.535	38	68.06% Pervious Area
50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



Summary for Subcatchment E: E

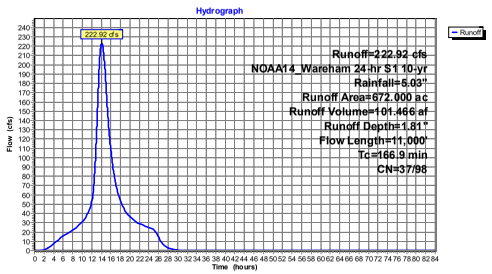
Runoff = 222.92 cfs @ 14.09 hrs, Volume= 101.466 af, Depth= 1.81"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 672.000	59	"35.91% imp"
430.685	37	64.09% Pervious Area
241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



Summary for Subcatchment F: F

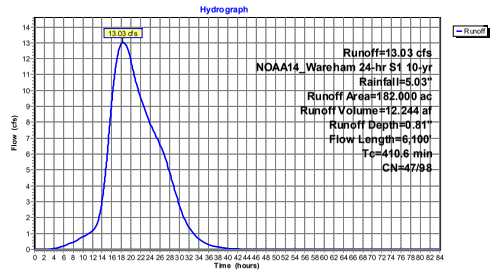
Runoff = 13.03 cfs @ 18.25 hrs, Volume= 12.244 af, Depth= 0.81"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 182.000	50	"6.11% imp"
170.880	47	93.89% Pervious Area
11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



Summary for Subcatchment G: G

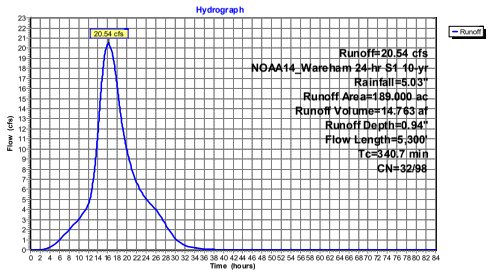
Runoff = 20.54 cfs @ 16.28 hrs, Volume= 14.763 af, Depth= 0.94"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 189.000	45	"19.09% imp"
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



Summary for Subcatchment H: H

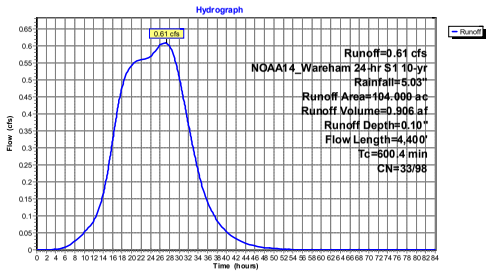
Runoff = 0.61 cfs @ 27.35 hrs, Volume= 0.906 af, Depth= 0.10"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 104.000	34	"1.27% imp"
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

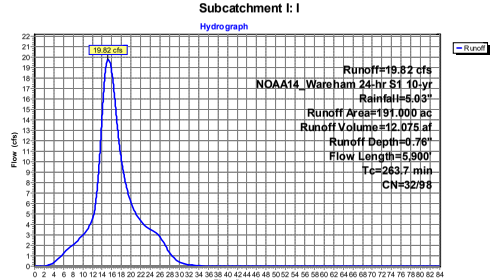
Runoff = 19.82 cfs @ 15.24 hrs, Volume= 12.075 af, Depth= 0.76"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 191.000	42	"15.34% imp"
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



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Summary for Subcatchment J: J

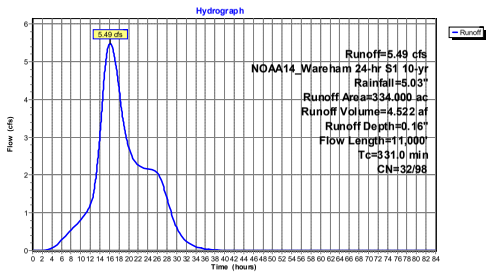
Runoff = 5.49 cfs @ 16.18 hrs, Volume= 4.522 af, Depth= 0.16"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 334.000	34	"2.83% imp"
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Summary for Subcatchment K: K

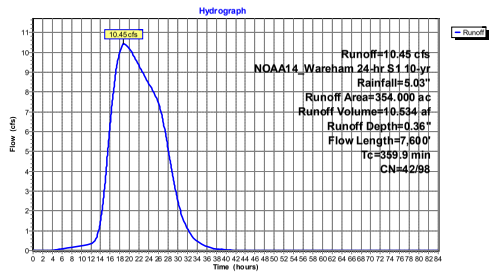
Runoff = 10.45 cfs @ 18.80 hrs, Volume= 10.534 af, Depth= 0.36"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 354.000	42	"0.83% imp"
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



Summary for Subcatchment L: L

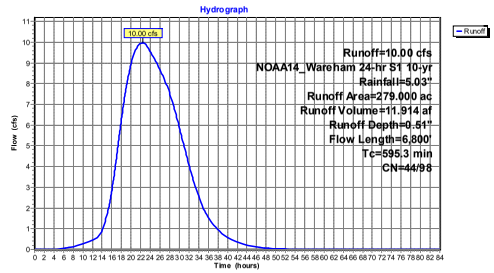
Runoff = 10.00 cfs @ 22.49 hrs, Volume= 11.914 af, Depth= 0.51"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 279.000	45	"2.43% imp"
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



Summary for Subcatchment M: M

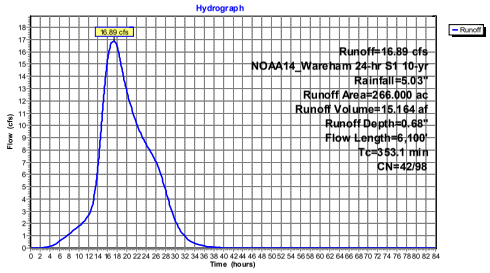
Runoff = 16.89 cfs @ 17.26 hrs, Volume= 15.164 af, Depth= 0.68"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 266.000	47	"8.14% imp"
244.348	42	91.86% Pervious Area
21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



Summary for Subcatchment N: N

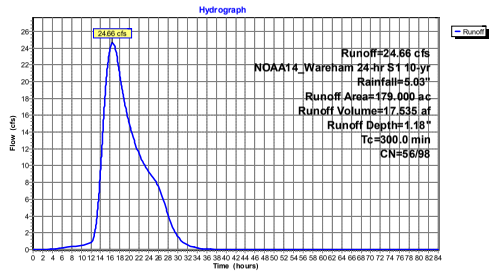
Runoff = 24.66 cfs @ 16.33 hrs, Volume= 17.535 af, Depth= 1.18"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 179.000	57	"3.17% imp"
173.326	56	96.83% Pervious Area
5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

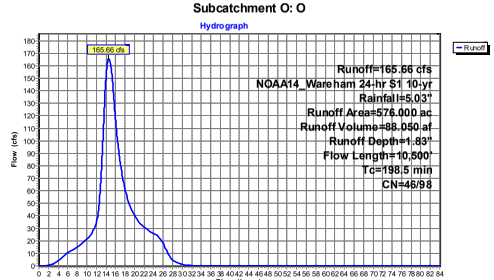
Runoff = 165.66 cfs @ 14.56 hrs, Volume= 88.050 af, Depth= 1.83"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 576.000	62	"31.1% imp"
396.864	46	68.90% Pervious Area
179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



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Summary for Subcatchment P: P

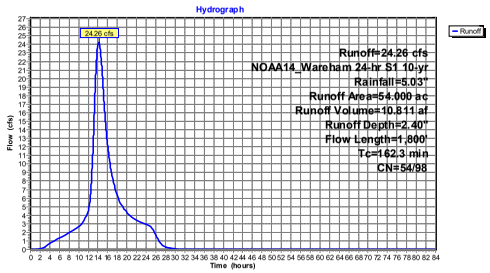
Runoff = 24.26 cfs @ 14.25 hrs, Volume= 10.811 af, Depth= 2.40"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 10-yr Rainfall=5.03"

Area (ac)	CN	Description
* 54.000	71	"38.05% imp"
33.453	54	61.95% Pervious Area
20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Summary for Pond 1P: Halfway Pond

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth > 1.93" for 10-yr event
Inflow = 186.77 cfs @ 14.68 hrs, Volume= 114.308 af, Incl. 2.20 cfs Base Flow
Outflow = 6.18 cfs @ 28.62 hrs, Volume= 35.798 af, Atten= 97%, Lag= 836.0 min
Primary = 6.18 cfs @ 28.62 hrs, Volume= 35.798 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 64.74' @ 28.62 hrs Storage= 465.069 af (94.459 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,579.7 min (2,746.9 - 1,167.2)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

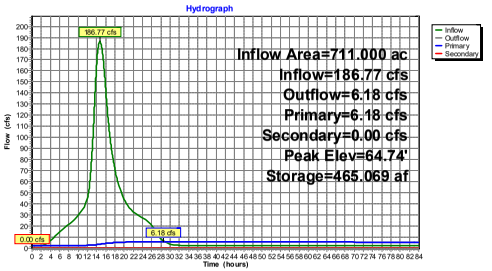
Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=6.17 cfs @ 28.62 hrs HW=64.74' TW=57.63' (Dynamic Tailwater)
↳**1=Culvert** (Inlet Controls 6.17 cfs @ 2.77 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
↳**2=TOR** (Controls 0.00 cfs)

Pond 1P: Halfway Pond



Summary for Pond 2P: Kennard Res

Inflow Area = 902.000 ac, 30.72% Impervious, Inflow Depth > 0.75" for 10-yr event
Inflow = 37.97 cfs @ 13.97 hrs, Volume= 56.346 af, Incl. 0.60 cfs Base Flow
Outflow = 14.73 cfs @ 18.13 hrs, Volume= 53.322 af, Atten= 61%, Lag= 249.1 min
Primary = 14.73 cfs @ 18.13 hrs, Volume= 53.322 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 57.73' @ 18.13 hrs Storage= 12.632 af (8.632 af above start)

Plug-Flow detention time= 721.5 min calculated for 49.322 af (88% of inflow)
Center-of-Mass det. time= 218.8 min (2,422.4 - 2,203.6)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

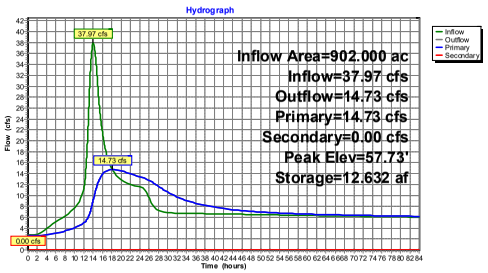
Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=14.73 cfs @ 18.13 hrs HW=57.73' TW=47.24' (Dynamic Tailwater)
↳**2=Sharp-Crested Rectangular Weir** (Weir Controls 14.73 cfs @ 2.63 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.30' TW=46.77' (Dynamic Tailwater)
↳**1=TOD** (Controls 0.00 cfs)

Pond 2P: Kennard Res



Summary for Pond 3P: Fawn Pond

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth > 1.91" for 10-yr event
Inflow = 56.35 cfs @ 13.59 hrs, Volume= 25.175 af, Incl. 0.50 cfs Base Flow
Outflow = 1.81 cfs @ 26.38 hrs, Volume= 9.444 af, Atten= 97%, Lag= 767.3 min
Primary = 1.81 cfs @ 26.38 hrs, Volume= 9.444 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 60.13' @ 26.38 hrs Storage= 48.225 af (20.505 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,587.9 min (2,698.9 - 1,110.9)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=1.81 cfs @ 26.38 hrs HW=60.13' TW=47.43' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 1.81 cfs @ 2.81 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=59.83' TW=46.77' (Dynamic Tailwater)
↳**2=TOD South** (Controls 0.00 cfs)

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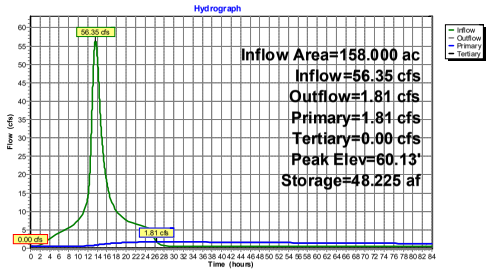
Pond 3P: Fawn Pond



Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow Area = 1,564.000 ac, 24.34% Impervious, Inflow Depth > 0.81" for 10-yr event
Inflow = 55.54 cfs @ 16.59 hrs, Volume= 105.610 af, Incl. 1.60 cfs Base Flow
Outflow = 29.04 cfs @ 25.98 hrs, Volume= 99.435 af, Atten= 48%, Lag= 563.1 min
Primary = 29.04 cfs @ 25.98 hrs, Volume= 99.435 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 47.43' @ 25.98 hrs Storage= 33.422 af (23.702 af above start)

Plug-Flow detention time= 956.9 min calculated for 89.714 af (85% of inflow)
Center-of-Mass det. time= 348.9 min (2,418.3 - 2,069.4)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

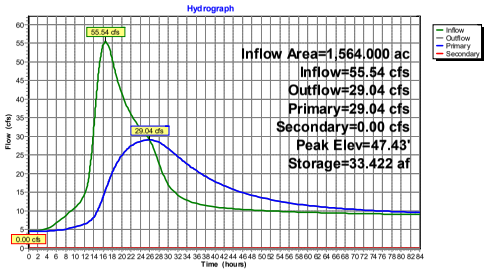
Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=29.03 cfs @ 25.98 hrs HW=47.43' TW=34.49' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 29.03 cfs @ 3.19 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=46.77' TW=33.99' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 4P: Bessey Bog Res - 2.4sm



Summary for Pond 5P: Glen Charlie Pond

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 1.16" for 10-yr event
Inflow = 233.57 cfs @ 14.09 hrs, Volume= 215.480 af, Incl. 2.10 cfs Base Flow
Outflow = 47.86 cfs @ 25.79 hrs, Volume= 193.639 af, Atten= 80%, Lag= 701.7 min
Primary = 47.86 cfs @ 25.79 hrs, Volume= 193.639 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 34.49' @ 25.79 hrs Storage= 105.604 af (79.479 af above start)

Plug-Flow detention time= 1,563.2 min calculated for 167.513 af (78% of inflow)
Center-of-Mass det. time= 739.2 min (2,457.1 - 1,717.9)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00

Elev. (feet) 41.00 40.00 39.00 37.70 37.70 41.00

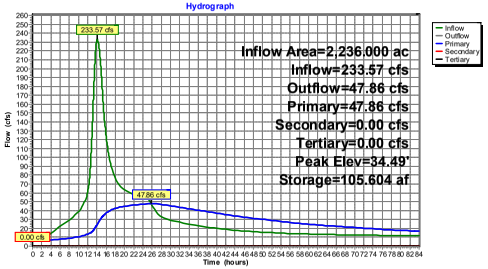
#6	Tertiary	34.50'	**24.0" W x 12.0" H Vert. NE Culvert** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=47.85 cfs @ 25.79 hrs HW=34.49' TW=21.22' (Dynamic Tailwater)
└**1=Spillway** (Weir Controls 47.85 cfs @ 2.94 fps)
└**2=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
└**3=SE Dike** (Controls 0.00 cfs)
└**4=SE Culvert** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
└**5=NE Dike** (Controls 0.00 cfs)
└**6=NE Culvert** (Controls 0.00 cfs)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 34.20' @ 0.00 hrs Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

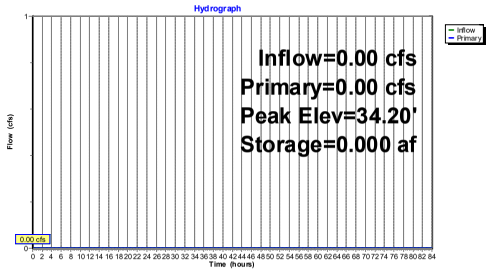
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=34.20' TW=22.70' (Dynamic Tailwater)
└**1=Orifice/Grate** (Controls 0.00 cfs)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



Summary for Pond 6.2P: Maple Sping Bogs US

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 0.81" for 10-yr event
Inflow = 13.03 cfs @ 18.25 hrs, Volume= 12.244 af
Outflow = 4.82 cfs @ 28.03 hrs, Volume= 10.826 af, Atten= 63%, Lag= 586.8 min
Primary = 4.82 cfs @ 28.03 hrs, Volume= 10.826 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 23.15' @ 28.03 hrs Storage= 7.766 af

Plug-Flow detention time= 1,087.1 min calculated for 10.826 af (88% of inflow)
Center-of-Mass det. time= 1,013.8 min (2,282.9 - 1,269.1)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

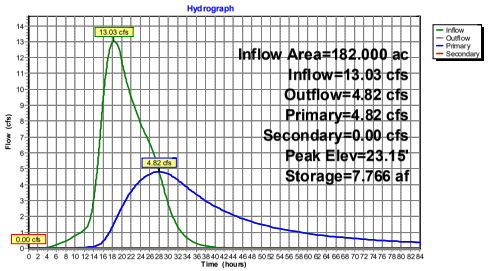
Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=4.79 cfs @ 28.03 hrs HW=23.15' TW=17.44' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 4.79 cfs @ 2.14 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.70' TW=17.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.2P: Maple Sping Bogs US



Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 0.71" for 10-yr event
Inflow = 4.82 cfs @ 28.03 hrs, Volume= 10.826 af
Outflow = 4.73 cfs @ 29.57 hrs, Volume= 10.649 af, Atten= 2%, Lag= 92.4 min
Primary = 4.73 cfs @ 29.57 hrs, Volume= 10.649 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 17.44' @ 29.57 hrs Storage= 0.886 af

Plug-Flow detention time= 170.7 min calculated for 10.649 af (98% of inflow)
Center-of-Mass det. time= 127.7 min (2,410.6 - 2,282.9)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

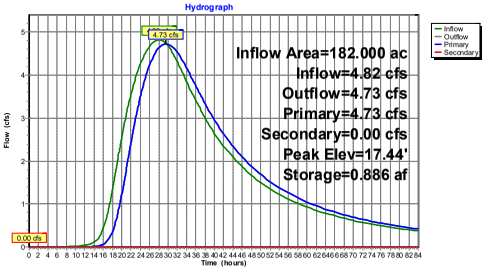
Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=4.73 cfs @ 29.57 hrs HW=17.44' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 4.73 cfs @ 2.14 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 1.04" for 10-yr event
Inflow = 47.86 cfs @ 25.79 hrs, Volume= 193.639 af
Outflow = 47.83 cfs @ 26.11 hrs, Volume= 192.969 af, Atten= 0%, Lag= 19.1 min
Primary = 47.83 cfs @ 26.11 hrs, Volume= 192.969 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 21.22' @ 26.11 hrs Storage= 2.172 af (1.725 af above start)

Plug-Flow detention time= 38.9 min calculated for 192.519 af (99% of inflow)
Center-of-Mass det. time= 18.4 min (2,475.5 - 2,457.1)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

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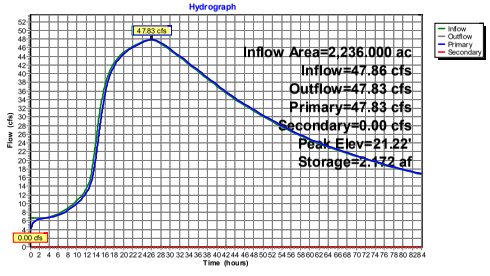
Primary OutFlow Max=47.83 cfs @ 26.11 hrs HW=21.22' TW=0.00' (Dynamic Tailwater)
└─**1=Bridge/Spillway** (Weir Controls 47.83 cfs @ 3.50 fps)
└─**3=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.49' TW=22.70' (Dynamic Tailwater)
└─**2=Culvert to Bogs** (Controls 0.00 cfs)
└─**4=TOD_Bogs** (Controls 0.00 cfs)

Pond 6P: Maple Springs Dam - 3.5sm



Summary for Pond 7P: Little Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 1.20" for 10-yr event
Inflow = 21.13 cfs @ 16.28 hrs, Volume= 18.859 af, Incl. 0.59 cfs Base Flow
Outflow = 20.36 cfs @ 16.81 hrs, Volume= 18.808 af, Atten= 4%, Lag= 31.9 min
Primary = 20.36 cfs @ 16.81 hrs, Volume= 18.808 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 59.72' @ 16.81 hrs Storage= 23.767 af (1.607 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 64.0 min (1,448.7 - 1,384.6)

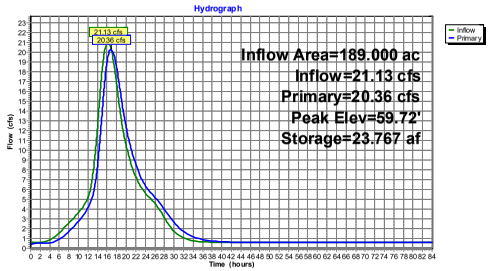
Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=20.36 cfs @ 16.81 hrs HW=59.72' TW=52.13' (Dynamic Tailwater)
└─**1=Relief** (Weir Controls 20.36 cfs @ 0.62 fps)

Pond 7P: Little Five Mile Pond



Summary for Pond 8P: Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 1.19" for 10-yr event
Inflow = 20.36 cfs @ 16.81 hrs, Volume= 18.808 af
Outflow = 1.19 cfs @ 33.91 hrs, Volume= 5.635 af, Atten= 94%, Lag= 1,026.1 min
Primary = 1.19 cfs @ 33.91 hrs, Volume= 5.635 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 52.47' @ 33.91 hrs Storage= 14.932 af

Plug-Flow detention time= 2,250.4 min calculated for 5.635 af (30% of inflow)
Center-of-Mass det. time= 1,600.5 min (3,049.2 - 1,448.7)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

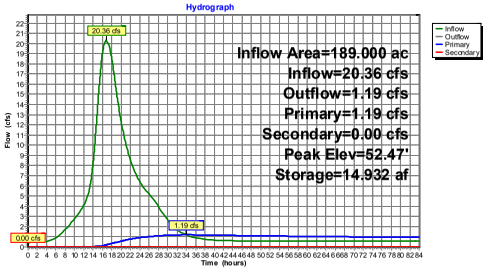
Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=1.18 cfs @ 33.91 hrs HW=52.47' TW=29.90' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.18 cfs @ 2.42 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=51.90' TW=29.60' (Dynamic Tailwater)
└─**2=TOD** (Controls 0.00 cfs)

Pond 8P: Five Mile Pond



Summary for Pond 9P: Kettle Hole

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth > 0.34" for 10-yr event
Inflow = 0.91 cfs @ 27.35 hrs, Volume= 2.988 af, Incl. 0.30 cfs Base Flow
Outflow = 0.89 cfs @ 28.39 hrs, Volume= 2.997 af, Atten= 2%, Lag= 62.1 min
Primary = 0.89 cfs @ 28.39 hrs, Volume= 2.997 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.02' @ 28.39 hrs Storage= 9.075 af (0.125 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 48.0 min (2,255.9 - 2,208.0)

Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=0.89 cfs @ 28.39 hrs HW=55.02' TW=29.98' (Dynamic Tailwater)
└─**1=Relief** (Weir Controls 0.89 cfs @ 0.36 fps)

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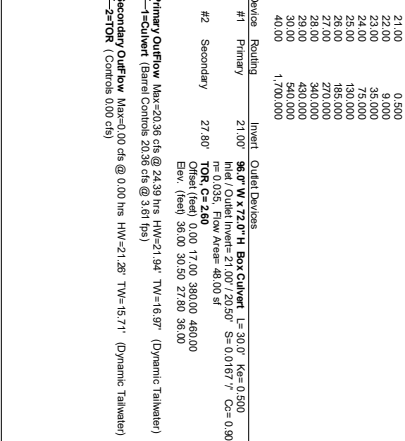
Pond 9P: Kettle Hole

Hydrograph



Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow Area = 484.000 ac, 13.78% Impervious, Inflow Depth > 0.62" for 10-yr event
Inflow = 20.92 cfs @ 12.17 hrs, Volume= 23.164 af, Incl. 0.80 cfs Base Flow
Outflow = 8.13 cfs @ 19.85 hrs, Volume= 23.164 af, Atten= 61%, Lag= 261.8 min
Primary = 8.13 cfs @ 19.85 hrs, Volume= 23.164 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1.500 af (6.848 af above start)
Peak Elev= 30.06' @ 19.85 hrs Storage= 8.348 af (6.848 af above start)

Plug-Flow detention time= 894.9 min calculated for 21.664 af (87% of inflow)
Center-of-Mass det. time= 401.0 min (2,272.9 - 1,871.9)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LiDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s)
			5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60**
			Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=8.10 cfs @ 19.85 hrs HW=30.06' TW=21.82' (Dynamic Tailwater)
1=Drop Inlet Spillway (Weir Controls 8.10 cfs @ 2.47 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.60' TW=21.26' (Dynamic Tailwater)
2=TOD (Controls 0.00 cfs)

Pond 10P: Maple Springs Brook Dam - 0.8sm

Hydrograph

Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow Area = 1,172.000 ac, 6.75% Impervious, Inflow Depth > 0.54" for 10-yr event
Inflow = 23.49 cfs @ 19.19 hrs, Volume= 52.799 af, Incl. 1.10 cfs Base Flow
Outflow = 20.36 cfs @ 24.39 hrs, Volume= 52.176 af, Atten= 13%, Lag= 311.7 min
Primary = 20.36 cfs @ 24.39 hrs, Volume= 52.176 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.20' Storage= 2.710 af
Peak Elev= 21.94' @ 24.39 hrs Storage= 8.488 af (5.778 af above start)

Plug-Flow detention time= 417.6 min calculated for 49.466 af (94% of inflow)
Center-of-Mass det. time= 136.1 min (2,225.9 - 2,089.8)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	135.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500
			Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900
			n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60**
			Offset (feet) 0.00 17.00 380.00 460.00
			Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=20.36 cfs @ 24.39 hrs HW=21.94' TW=16.97' (Dynamic Tailwater)
1=Culvert (Barrel Controls 20.36 cfs @ 3.61 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.26' TW=15.71' (Dynamic Tailwater)
2=TOR (Controls 0.00 cfs)

Pond 11P: Unnamed Road - 1.8sm

Hydrograph

Summary for Pond 12P: Maple Springs Road Dam

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth > 0.41" for 10-yr event
Inflow = 6.49 cfs @ 16.18 hrs, Volume= 11.465 af, Incl. 1.00 cfs Base Flow
Outflow = 3.91 cfs @ 19.64 hrs, Volume= 11.464 af, Atten= 40%, Lag= 207.7 min
Primary = 3.91 cfs @ 19.64 hrs, Volume= 11.464 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.060 af
Peak Elev= 38.95' @ 19.64 hrs Storage= 2.676 af (1.596 af above start)

Plug-Flow detention time= 630.1 min calculated for 10.384 af (91% of inflow)
Center-of-Mass det. time= 168.2 min (2,141.6 - 1,973.3)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

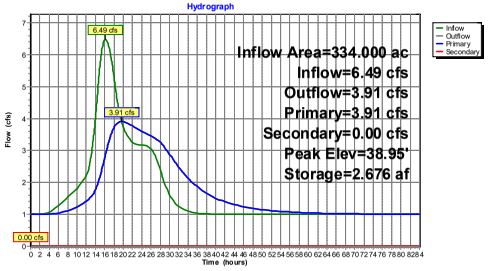
Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir**
			2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60**
			Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40
			Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00
			46.00

Primary OutFlow Max=3.91 cfs @ 19.64 hrs HW=38.95' TW=21.81' (Dynamic Tailwater)
1=Sharp-Crested Rectangular Weir (Weir Controls 3.91 cfs @ 2.24 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=38.68' TW=21.26' (Dynamic Tailwater)
2=TOD (Controls 0.00 cfs)

Pond 12P: Maple Springs Road Dam



Summary for Pond 13.1P: Bogs_L_US

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 0.78" for 10-yr event
Inflow = 10.90 cfs @ 22.49 hrs, Volume= 18.162 af, Incl. 0.90 cfs Base Flow
Outflow = 10.89 cfs @ 22.57 hrs, Volume= 18.163 af, Atten= 0%, Lag= 4.6 min
Primary = 10.89 cfs @ 22.57 hrs, Volume= 18.163 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 30.27' @ 22.57 hrs Storage= 0.276 af (0.222 af above start)

Plug-Flow detention time= 26.4 min calculated for 18.109 af (100% of inflow)
Center-of-Mass det. time= 11.8 min (1,856.9 - 1,845.2)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

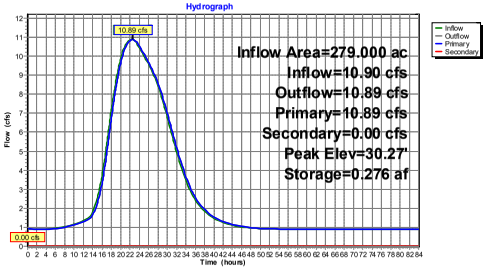
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=10.89 cfs @ 22.57 hrs HW=30.27' TW=26.37' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 10.89 cfs @ 2.82 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.65' TW=25.75' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 13.1P: Bogs_L_US



Summary for Pond 13.2P: Bogs_L_DS

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 0.78" for 10-yr event
Inflow = 10.89 cfs @ 22.57 hrs, Volume= 18.163 af
Outflow = 10.87 cfs @ 22.83 hrs, Volume= 18.165 af, Atten= 0%, Lag= 15.9 min
Primary = 10.87 cfs @ 22.83 hrs, Volume= 18.165 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 26.37' @ 22.83 hrs Storage= 0.386 af (0.311 af above start)

Plug-Flow detention time= 36.9 min calculated for 18.090 af (100% of inflow)
Center-of-Mass det. time= 16.5 min (1,873.4 - 1,856.9)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

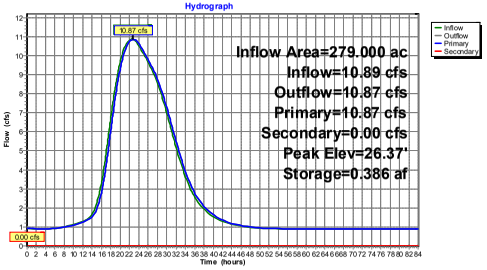
Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=10.87 cfs @ 22.83 hrs HW=26.37' TW=17.00' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 10.87 cfs @ 2.82 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 13.2P: Bogs_L_DS



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow Area = 1,717.000 ac, 6.26% Impervious, Inflow Depth > 0.64" for 10-yr event
Inflow = 41.26 cfs @ 22.15 hrs, Volume= 91.059 af, Incl. 0.80 cfs Base Flow
Outflow = 41.19 cfs @ 22.56 hrs, Volume= 90.953 af, Atten= 0%, Lag= 24.8 min
Primary = 41.19 cfs @ 22.56 hrs, Volume= 90.953 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 17.00' @ 22.56 hrs Storage= 2.996 af (1.931 af above start)

Plug-Flow detention time= 87.3 min calculated for 89.887 af (99% of inflow)
Center-of-Mass det. time= 25.6 min (2,026.4 - 2,000.7)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

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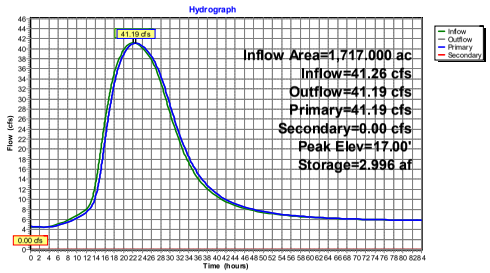
Primary OutFlow Max=41.18 cfs @ 22.56 hrs HW=17.00' TW=0.00' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 41.18 cfs @ 3.06 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.71' TW=0.00' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 14P: Bogs_M - 2.7sm



Summary for Pond 15.1P: Bogs_N_US

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 1.45" for 10-yr event
Inflow = 25.26 cfs @ 16.33 hrs, Volume= 21.700 af, Incl. 0.60 cfs Base Flow
Outflow = 14.48 cfs @ 20.49 hrs, Volume= 21.695 af, Atten= 43%, Lag= 249.4 min
Primary = 14.48 cfs @ 20.49 hrs, Volume= 21.695 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 25.93' @ 20.49 hrs Storage= 6.044 af (5.692 af above start)

Plug-Flow detention time= 302.7 min calculated for 21.343 af (98% of inflow)
Center-of-Mass det. time= 222.2 min (1,652.5 - 1,430.4)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

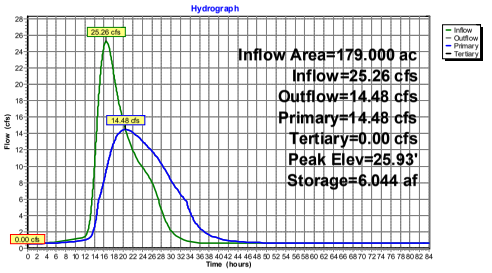
Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=14.46 cfs @ 20.49 hrs HW=25.93' TW=20.33' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 14.46 cfs @ 3.10 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.11' TW=20.11' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 15.1P: Bogs_N_US



Summary for Pond 15.2P: Bogs_N_DS

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 1.45" for 10-yr event
Inflow = 14.48 cfs @ 20.49 hrs, Volume= 21.695 af
Outflow = 6.77 cfs @ 31.76 hrs, Volume= 19.986 af, Atten= 53%, Lag= 675.8 min
Primary = 6.77 cfs @ 31.76 hrs, Volume= 19.986 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 20.56' @ 31.76 hrs Storage= 13.083 af (10.517 af above start)

Plug-Flow detention time= 1,366.2 min calculated for 17.419 af (80% of inflow)
Center-of-Mass det. time= 829.4 min (2,481.9 - 1,652.5)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

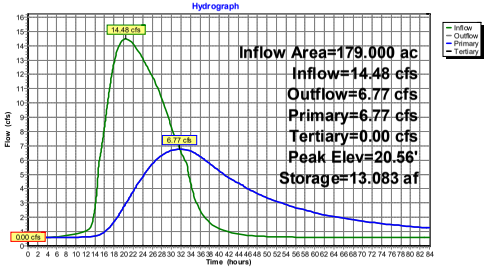
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=6.74 cfs @ 31.76 hrs HW=20.56' TW=0.00' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 6.74 cfs @ 2.40 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS



Summary for Pond 16.1: Mill Pond Dam -PC

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.54" for 10-yr event
Inflow = 260.41 cfs @ 14.78 hrs, Volume= 635.569 af, Incl. 32.00 cfs Base Flow
Outflow = 115.85 cfs @ 30.70 hrs, Volume= 588.925 af, Atten= 56%, Lag= 955.5 min
Primary = 88.66 cfs @ 30.70 hrs, Volume= 425.569 af
Routed to Pond 17B : Proposed Bridge
Secondary = 27.19 cfs @ 30.70 hrs, Volume= 163.356 af
Routed to Pond Wr 24 :
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 17B : Proposed Bridge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 470.969 af
Peak Elev= 15.09' @ 30.70 hrs Storage= 593.359 af (122.390 af above start)

Plug-Flow detention time= 3,809.0 min calculated for 117.955 af (19% of inflow)
Center-of-Mass det. time= 395.0 min (2,586.5 - 2,191.4)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,941.850 af	**Storage** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.130
5.00	4.140
6.00	9.110
7.00	16.590
8.00	34.960
9.00	60.590
10.00	94.410
11.00	142.690
12.00	214.660
13.00	314.540
13.80	403.920
14.00	426.260
15.00	575.290
16.00	771.680
17.00	994.600
18.30	1,368.590
19.00	1,592.930
20.00	1,941.850

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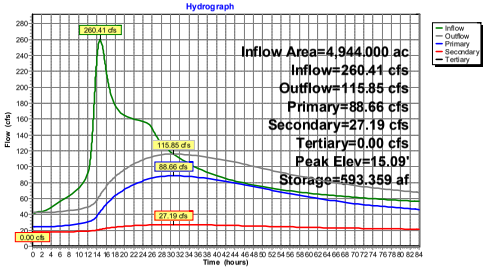
Device	Routing	Invert	Outlet Devices
#1	Primary	15.50'	**110.0' long x 1.5' breadth Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32
#2	Primary	13.60'	**15.0' long x 1.0' breadth Notch as SW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#3	Secondary	12.50'	**3.3' long x 1.0' breadth 3.25' Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#4	Tertiary	18.00'	**TOD, C= 2.60** Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00 Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 8	5.20'	**48.0" W x 48.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#7	Device 8	15.50'	**6.0' long x 20.00' rise MLO DownwardOpGate** 2 End Contraction(s) 5.0' Crest Height
#8	Tertiary	4.00'	**96.0" W x 48.0" H Box Culvert X 0.00** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 32.00 sf

Primary OutFlow Max=88.48 cfs @ 30.70 hrs HW=15.09' TW=9.02' (Dynamic Tailwater)
1=**Spillway** (Controls 0.00 cfs)
2=**Notch as SW** (Weir Controls 88.48 cfs @ 3.95 fps)

Secondary OutFlow Max=27.25 cfs @ 30.70 hrs HW=15.09' TW=14.62' (Dynamic Tailwater)
3=**3.25' Weir** (Weir Controls 27.25 cfs @ 3.19 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.30' TW=8.48' (Dynamic Tailwater)
4=**TOD** (Controls 0.00 cfs)
5=**US Relief - Bypasses Dam** (Controls 0.00 cfs)
8=**Culvert** (Controls 0.00 cfs)
6=**Orifice/Grate** (Controls 0.00 cfs)
7=**MLO DownwardOpGate** (Controls 0.00 cfs)

Pond 16.1: Mill Pond Dam -PC



Summary for Pond 16.3: Downstream Weir

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.03" for 10-yr event
Inflow = 88.66 cfs @ 30.71 hrs, Volume= 425.560 af
Outflow = 88.66 cfs @ 30.71 hrs, Volume= 425.551 af, Atten= 0%, Lag= 0.2 min
Primary = 88.66 cfs @ 30.71 hrs, Volume= 425.551 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 9.02' @ 30.71 hrs Surf.Area= 2,000 sf Storage= 10,031 cf (1,071 cf above start)

Plug-Flow detention time= 2.6 min calculated for 425.344 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,597.9 - 2,597.8)

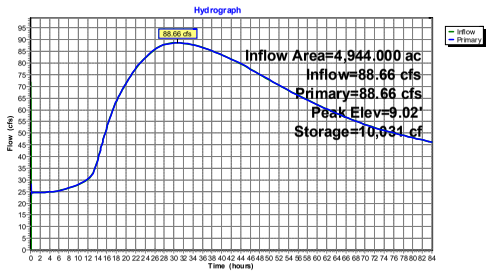
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	8.00'	**DS Weir, C= 2.60** Offset (feet) 0.00 0.00 23.00 23.00 Elev. (feet) 17.00 10.00 8.00 17.00
#2	Primary	8.00'	**27.0' long x 1.5' breadth El 8 Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32

Primary OutFlow Max=88.66 cfs @ 30.71 hrs HW=9.02' (Free Discharge)
1=**DS Weir** (Weir Controls 12.43 cfs @ 1.05 fps)
2=**El 8 Weir** (Weir Controls 76.23 cfs @ 2.78 fps)

Pond 16.3: Downstream Weir



Summary for Pond 17B: Proposed Bridge

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.03" for 10-yr event
Inflow = 88.66 cfs @ 30.70 hrs, Volume= 425.569 af
Outflow = 88.66 cfs @ 30.71 hrs, Volume= 425.560 af, Atten= 0%, Lag= 0.2 min
Primary = 88.66 cfs @ 30.71 hrs, Volume= 425.560 af
Routed to Pond 16.3 : Downstream Weir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 9.02' @ 30.71 hrs Surf.Area= 2,000 sf Storage= 10,046 cf (1,086 cf above start)

Plug-Flow detention time= 2.6 min calculated for 425.349 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,597.8 - 2,597.6)

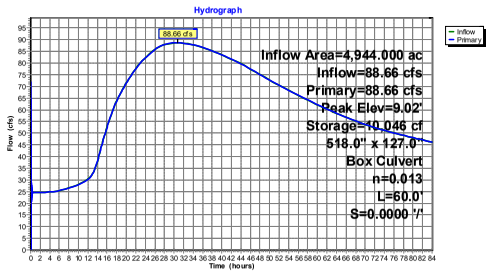
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	4.00'	**518.0" W x 127.0" H Box Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 456.85 sf

Primary OutFlow Max=88.66 cfs @ 30.71 hrs HW=9.02' TW=9.02' (Dynamic Tailwater)
1=**Culvert** (Inlet Controls 88.66 cfs @ 0.41 fps)

Pond 17B: Proposed Bridge



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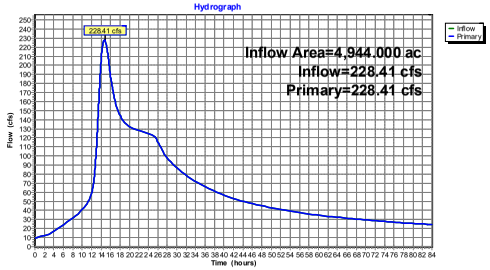
Summary for Link 23L: Inflow

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.00" for 10-yr event
Inflow = 228.41 cfs @ 14.78 hrs, Volume= 413.418 af
Primary = 228.41 cfs @ 14.78 hrs, Volume= 413.418 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16.1 : Mill Pond Dam -PC

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow

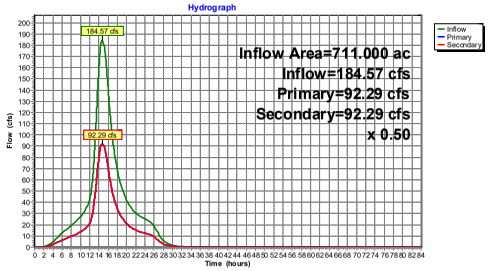


Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 1.67" for 10-yr event
Inflow = 184.57 cfs @ 14.68 hrs, Volume= 99.035 af
Primary = 92.29 cfs @ 14.68 hrs, Volume= 49.517 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 1P : Halfway Pond
Secondary = 92.29 cfs @ 14.68 hrs, Volume= 49.517 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow

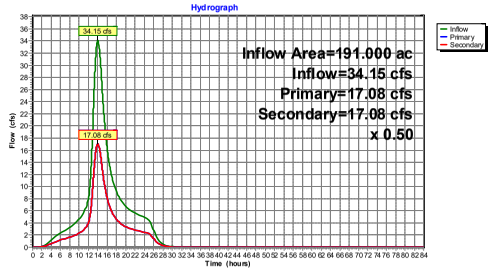


Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 1.03" for 10-yr event
Inflow = 34.15 cfs @ 13.97 hrs, Volume= 16.383 af
Primary = 17.08 cfs @ 13.97 hrs, Volume= 8.191 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 2P : Kennard Res
Secondary = 17.08 cfs @ 13.97 hrs, Volume= 8.191 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

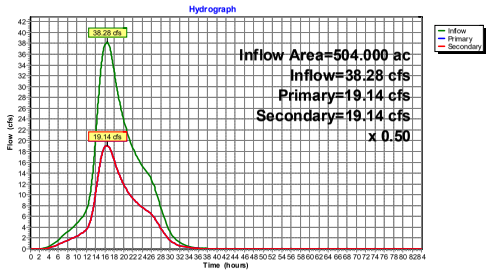


Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth = 0.76" for 10-yr event
Inflow = 38.28 cfs @ 16.59 hrs, Volume= 31.737 af
Primary = 19.14 cfs @ 16.59 hrs, Volume= 15.868 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 19.14 cfs @ 16.59 hrs, Volume= 15.868 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

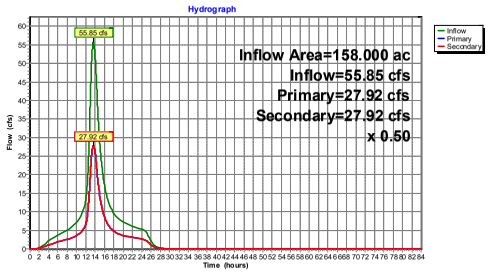


Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 1.65" for 10-yr event
Inflow = 55.85 cfs @ 13.59 hrs, Volume= 21.704 af
Primary = 27.92 cfs @ 13.59 hrs, Volume= 10.852 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 3P : Fawn Pond
Secondary = 27.92 cfs @ 13.59 hrs, Volume= 10.852 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow

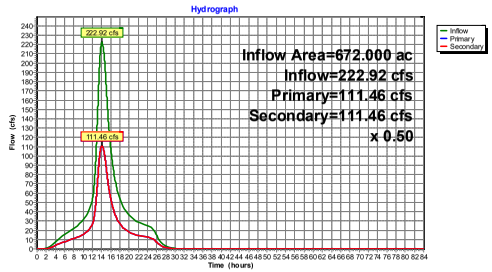


Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 1.81" for 10-yr event
Inflow = 222.92 cfs @ 14.09 hrs, Volume= 101.466 af
Primary = 111.46 cfs @ 14.09 hrs, Volume= 50.733 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 5P : Glen Charlie Pond
Secondary = 111.46 cfs @ 14.09 hrs, Volume= 50.733 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow



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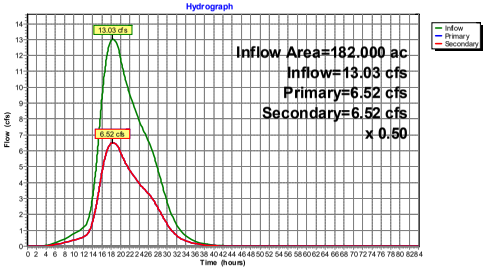
Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 0.81" for 10-yr event
Inflow = 13.03 cfs @ 18.25 hrs, Volume= 12.244 af
Primary = 6.52 cfs @ 18.25 hrs, Volume= 6.122 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 6.2P : Maple Sping Bogs US
Secondary = 6.52 cfs @ 18.25 hrs, Volume= 6.122 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow

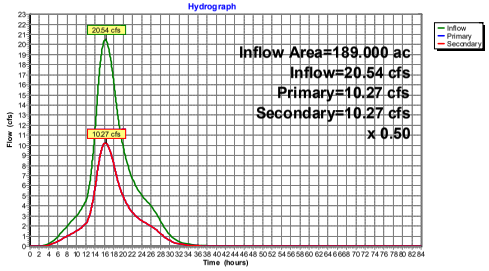


Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth = 0.94" for 10-yr event
Inflow = 20.54 cfs @ 16.28 hrs, Volume= 14.763 af
Primary = 10.27 cfs @ 16.28 hrs, Volume= 7.382 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 7P : Little Five Mile Pond
Secondary = 10.27 cfs @ 16.28 hrs, Volume= 7.382 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow

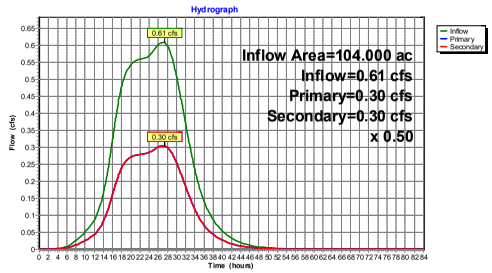


Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth = 0.10" for 10-yr event
Inflow = 0.61 cfs @ 27.35 hrs, Volume= 0.906 af
Primary = 0.30 cfs @ 27.35 hrs, Volume= 0.453 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 9P : Kettle Hole
Secondary = 0.30 cfs @ 27.35 hrs, Volume= 0.453 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow

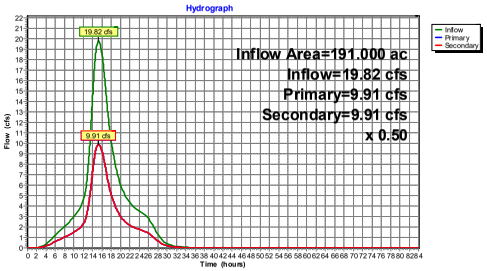


Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth = 0.76" for 10-yr event
Inflow = 19.82 cfs @ 15.24 hrs, Volume= 12.075 af
Primary = 9.91 cfs @ 15.24 hrs, Volume= 6.038 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 9.91 cfs @ 15.24 hrs, Volume= 6.038 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

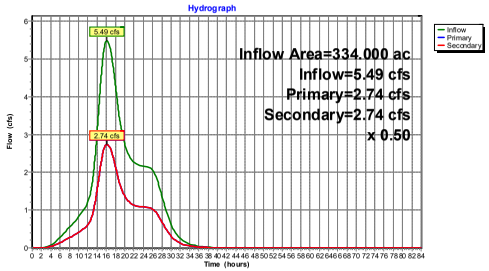


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth = 0.16" for 10-yr event
Inflow = 5.49 cfs @ 16.18 hrs, Volume= 4.522 af
Primary = 2.74 cfs @ 16.18 hrs, Volume= 2.261 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 12P : Maple Springs Road Dam
Secondary = 2.74 cfs @ 16.18 hrs, Volume= 2.261 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow

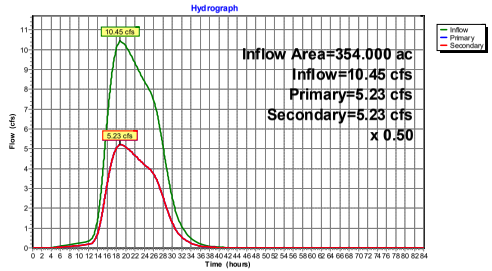


Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth = 0.36" for 10-yr event
Inflow = 10.45 cfs @ 18.80 hrs, Volume= 10.534 af
Primary = 5.23 cfs @ 18.80 hrs, Volume= 5.267 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 5.23 cfs @ 18.80 hrs, Volume= 5.267 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow



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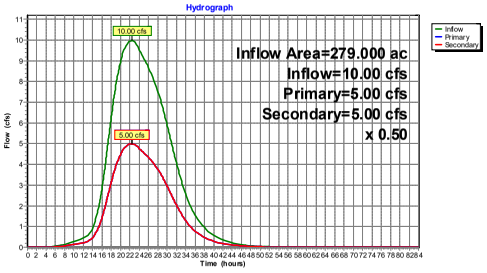
Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth = 0.51" for 10-yr event
Inflow = 10.00 cfs @ 22.49 hrs, Volume= 11.914 af
Primary = 5.00 cfs @ 22.49 hrs, Volume= 5.957 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 13.1P : Bogs_L_US
Secondary = 5.00 cfs @ 22.49 hrs, Volume= 5.957 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow

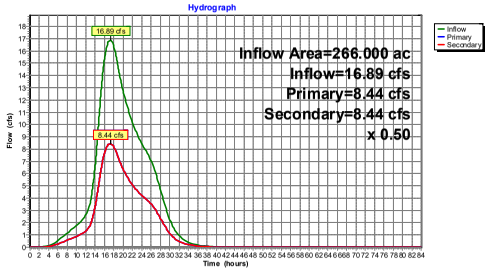


Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth = 0.68" for 10-yr event
Inflow = 16.89 cfs @ 17.26 hrs, Volume= 15.164 af
Primary = 8.44 cfs @ 17.26 hrs, Volume= 7.582 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 8.44 cfs @ 17.26 hrs, Volume= 7.582 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow

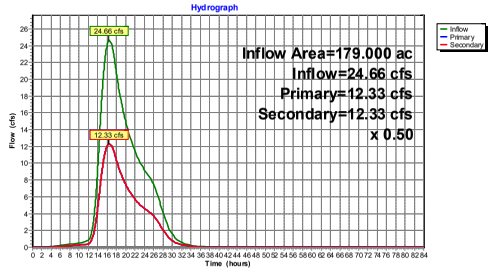


Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth = 1.18" for 10-yr event
Inflow = 24.66 cfs @ 16.33 hrs, Volume= 17.535 af
Primary = 12.33 cfs @ 16.33 hrs, Volume= 8.767 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 15.1P : Bogs_N_US
Secondary = 12.33 cfs @ 16.33 hrs, Volume= 8.767 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow

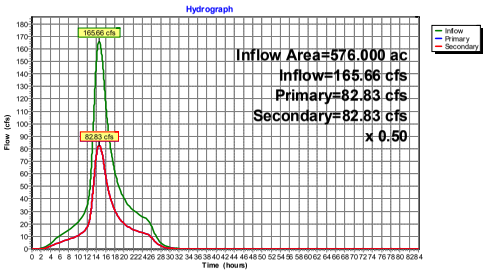


Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 1.83" for 10-yr event
Inflow = 165.66 cfs @ 14.56 hrs, Volume= 88.050 af
Primary = 82.83 cfs @ 14.56 hrs, Volume= 44.025 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 82.83 cfs @ 14.56 hrs, Volume= 44.025 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow

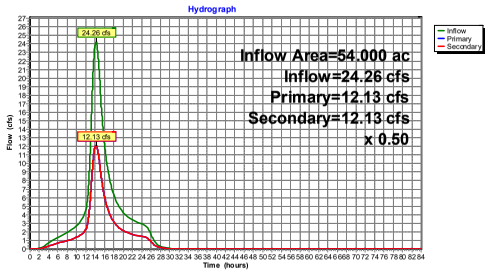


Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 2.40" for 10-yr event
Inflow = 24.26 cfs @ 14.25 hrs, Volume= 10.811 af
Primary = 12.13 cfs @ 14.25 hrs, Volume= 5.406 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 12.13 cfs @ 14.25 hrs, Volume= 5.406 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=2.11"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=228.26 cfs 124.734 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=1.40"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=45.52 cfs 22.229 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=1.11"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=58.95 cfs 46.751 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=2.12"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=71.36 cfs 27.886 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=2.30"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=280.80 cfs 128.762 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=1.24"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=21.34 cfs 18.776 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=1.21"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=25.34 cfs 19.118 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=0.24"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=1.64 cfs 2.112 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=1.00"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=24.45 cfs 15.951 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=0.30"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=7.64 cfs 8.235 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=0.66"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=21.70 cfs 19.611 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=0.87"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=17.91 cfs 20.170 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=1.04"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=27.25 cfs 23.097 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=1.74"
Tc=300.0 min CN=56/98 Runoff=38.91 cfs 25.962 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=2.40"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=223.29 cfs 115.249 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=3.10"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=32.42 cfs 13.947 af

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Pond 1P: Halfway Pond Peak Elev=64.84' Storage=489.415 af Inflow=230.46 cfs 140.007 af
Primary=7.41 cfs 41.989 af Secondary=0.00 cfs 0.000 af Outflow=7.41 cfs 41.989 af

Pond 2P: Kennard Res Peak Elev=57.86' Storage=15.332 af Inflow=49.59 cfs 68.383 af
Primary=19.50 cfs 64.608 af Secondary=0.00 cfs 0.000 af Outflow=19.50 cfs 64.608 af

Pond 3P: Fawn Pond Peak Elev=60.25' Storage=53.782 af Inflow=71.86 cfs 31.357 af
Primary=2.52 cfs 12.429 af Tertiary=0.00 cfs 0.000 af Outflow=2.52 cfs 12.429 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=47.68' Storage=42.886 af Inflow=81.20 cfs 134.896 af
Primary=41.35 cfs 127.120 af Secondary=0.00 cfs 0.000 af Outflow=41.35 cfs 127.120 af

Pond 5P: Glen Charlie Pond Peak Elev=34.62' Storage=128.803 af Inflow=292.61 cfs 270.460 af
Primary=63.14 cfs 242.362 af Secondary=0.00 cfs 0.000 af Tertiary=0.29 cfs 0.289 af Outflow=63.43 cfs 242.650 af

Pond 6.1P: Ortalani Reservoir Peak Elev=34.22' Storage=0.277 af Inflow=0.29 cfs 0.289 af
Outflow=0.01 cfs 0.054 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=23.34' Storage=11.167 af Inflow=21.34 cfs 18.830 af
Primary=8.28 cfs 17.188 af Secondary=0.00 cfs 0.000 af Outflow=8.28 cfs 17.188 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=17.64' Storage=1.275 af Inflow=8.28 cfs 17.188 af
Primary=8.17 cfs 16.984 af Secondary=0.00 cfs 0.000 af Outflow=8.17 cfs 16.984 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=21.40' Storage=2.584 af Inflow=63.14 cfs 242.362 af
Primary=63.11 cfs 241.555 af Secondary=0.00 cfs 0.000 af Outflow=63.11 cfs 241.555 af

Pond 7P: Little Five Mile Pond Peak Elev=59.75' Storage=23.981 af Inflow=25.93 cfs 23.214 af
Outflow=25.15 cfs 23.164 af

Pond 8P: Five Mile Pond Peak Elev=52.60' Storage=18.573 af Inflow=25.15 cfs 23.164 af
Primary=1.82 cfs 8.141 af Secondary=0.00 cfs 0.000 af Outflow=1.82 cfs 8.141 af

Pond 9P: Kettle Hole Peak Elev=55.06' Storage=9.226 af Inflow=1.94 cfs 4.195 af
Outflow=1.91 cfs 4.203 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=30.17' Storage=10.046 af Inflow=25.65 cfs 32.460 af
Primary=10.71 cfs 30.372 af Secondary=0.00 cfs 0.000 af Outflow=10.71 cfs 30.372 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=22.18' Storage=13.806 af Inflow=38.24 cfs 72.795 af
Primary=28.72 cfs 72.009 af Secondary=0.00 cfs 0.000 af Outflow=28.72 cfs 72.009 af

Pond 12P: Maple Springs Road Dam Peak Elev=39.12' Storage=3.710 af Inflow=8.64 cfs 15.177 af
Primary=6.39 cfs 15.175 af Secondary=0.00 cfs 0.000 af Outflow=6.39 cfs 15.175 af

Pond 13.1P: Bogs_L_US Peak Elev=30.61' Storage=0.396 af Inflow=18.81 cfs 26.418 af
Primary=18.77 cfs 26.419 af Secondary=0.00 cfs 0.000 af Outflow=18.77 cfs 26.419 af

Pond 13.2P: Bogs_L_DS Peak Elev=26.71' Storage=0.555 af Inflow=18.77 cfs 26.419 af
Primary=18.75 cfs 26.421 af Secondary=0.00 cfs 0.000 af Outflow=18.75 cfs 26.421 af

Pond 14P: Bogs_M - 2.7sm Peak Elev=17.45' Storage=7.040 af Inflow=62.82 cfs 127.080 af
Primary=60.08 cfs 126.942 af Secondary=0.00 cfs 0.000 af Outflow=60.08 cfs 126.942 af

Pond 15.1P: Bogs_N_US Peak Elev=26.24' Storage=9.179 af Inflow=39.51 cfs 30.128 af
Primary=22.14 cfs 30.122 af Tertiary=0.00 cfs 0.000 af Outflow=22.14 cfs 30.122 af

Pond 15.2P: Bogs_N_DS Peak Elev=20.74' Storage=17.279 af Inflow=22.14 cfs 30.122 af
Primary=10.24 cfs 28.007 af Tertiary=0.00 cfs 0.000 af Outflow=10.24 cfs 28.007 af

Pond 16.1: Mill Pond Dam -PC Peak Elev=15.35' Storage=644.103 af Inflow=334.78 cfs 764.834 af
Primary=114.72 cfs 528.565 af Secondary=30.33 cfs 176.265 af Tertiary=0.00 cfs 0.000 af Outflow=145.05 cfs 704.831 af

Pond 16.3: Downstream Weir Peak Elev=9.17' Storage=10,338 cf Inflow=114.72 cfs 528.553 af
Outflow=114.72 cfs 528.541 af

Pond 17B: Proposed Bridge Peak Elev=9.18' Storage=10,361 cf Inflow=114.72 cfs 528.565 af
518.0" x 127.0" Box Culvert n=0.013 L=60.0' S=0.0000 '/' Outflow=114.72 cfs 528.553 af

Link 23L: Inflow Inflow=302.78 cfs 542.683 af
Primary=302.78 cfs 542.683 af

Link A1: 1/2 Flow x 0.50 Inflow=228.26 cfs 124.734 af
Primary=114.13 cfs 62.367 af Secondary=114.13 cfs 62.367 af

Link B1: 1/2 Flow x 0.50 Inflow=45.52 cfs 22.229 af
Primary=22.76 cfs 11.114 af Secondary=22.76 cfs 11.114 af

Link C1: 1/2 Flow x 0.50 Inflow=58.95 cfs 46.751 af
Primary=29.47 cfs 23.376 af Secondary=29.47 cfs 23.376 af

Link D1: 1/2 Flow x 0.50 Inflow=71.36 cfs 27.886 af
Primary=35.68 cfs 13.943 af Secondary=35.68 cfs 13.943 af

Link E1: 1/2 Flow x 0.50 Inflow=280.80 cfs 128.762 af
Primary=140.40 cfs 64.381 af Secondary=140.40 cfs 64.381 af

Link F1: 1/2 Flow x 0.50 Inflow=21.34 cfs 18.776 af
Primary=10.67 cfs 9.388 af Secondary=10.67 cfs 9.388 af

Link G1: 1/2 Flow x 0.50 Inflow=25.34 cfs 19.118 af
Primary=12.67 cfs 9.559 af Secondary=12.67 cfs 9.559 af

Link H1: 1/2 Flow x 0.50 Inflow=1.64 cfs 2.112 af
Primary=0.82 cfs 1.056 af Secondary=0.82 cfs 1.056 af

Link I1: 1/2 Flow x 0.50 Inflow=24.45 cfs 15.951 af
Primary=12.23 cfs 7.975 af Secondary=12.23 cfs 7.975 af

Link JL: 1/2 Flow x 0.50 Inflow=7.64 cfs 8.235 af
Primary=3.82 cfs 4.118 af Secondary=3.82 cfs 4.118 af

Link KL: 1/2 Flow x 0.50 Inflow=21.70 cfs 19.611 af
Primary=10.85 cfs 9.805 af Secondary=10.85 cfs 9.805 af

Link LL: 1/2 Flow x 0.50 Inflow=17.91 cfs 20.170 af
Primary=8.95 cfs 10.085 af Secondary=8.95 cfs 10.085 af

Link ML: 1/2 Flow x 0.50 Inflow=27.25 cfs 23.097 af
Primary=13.62 cfs 11.548 af Secondary=13.62 cfs 11.548 af

Link NL: 1/2 Flow x 0.50 Inflow=38.91 cfs 25.962 af
Primary=19.46 cfs 12.981 af Secondary=19.46 cfs 12.981 af

Link OL: 1/2 Flow x 0.50 Inflow=223.29 cfs 115.249 af
Primary=111.65 cfs 57.625 af Secondary=111.65 cfs 57.625 af

Link PL: 1/2 Flow x 0.50 Inflow=32.42 cfs 13.947 af
Primary=16.21 cfs 6.973 af Secondary=16.21 cfs 6.973 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 632.590 af Average Runoff Depth = 1.54"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

Summary for Subcatchment A: A

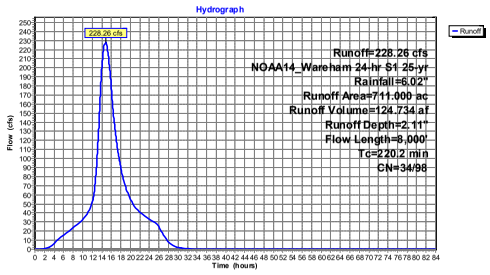
Runoff = 228.26 cfs @ 14.92 hrs, Volume= 124.734 af, Depth= 2.11"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 711.000	56	"33.99% imp"
469.331	34	66.01% Pervious Area
241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



Summary for Subcatchment B: B

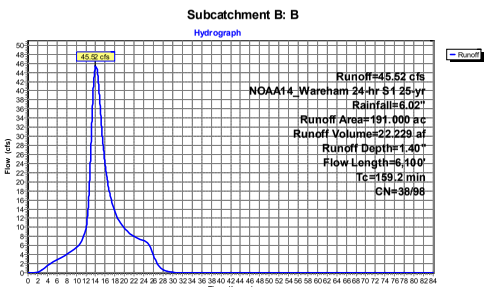
Runoff = 45.52 cfs @ 13.97 hrs, Volume= 22.229 af, Depth= 1.40"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 191.000	49	"18.54% imp"
155.589	38	81.46% Pervious Area
35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



Summary for Subcatchment C: C

Runoff = 58.95 cfs @ 16.59 hrs, Volume= 46.751 af, Depth= 1.11"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 504.000	47	"10.54% imp"
450.878	41	89.46% Pervious Area
53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

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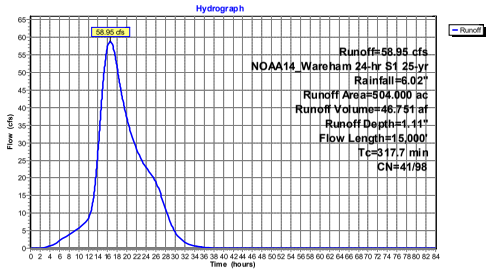
Subcatchment C: C



Summary for Subcatchment D: D

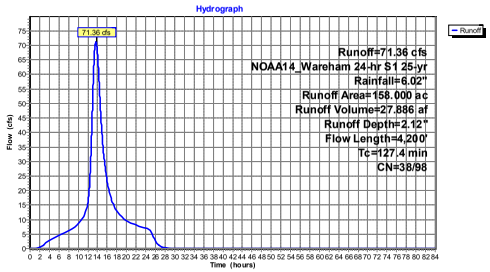
Runoff = 71.36 cfs @ 13.73 hrs, Volume= 27.886 af, Depth= 2.12"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 158.000	57	"31.94% imp"
107.535	38	68.06% Pervious Area
50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



Summary for Subcatchment E: E

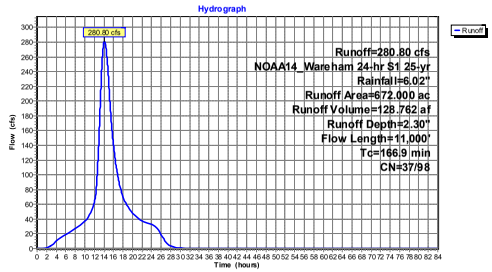
Runoff = 280.80 cfs @ 14.09 hrs, Volume= 128.762 af, Depth= 2.30"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 672.000	59	"35.91% imp"
430.685	37	64.09% Pervious Area
241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



Summary for Subcatchment F: F

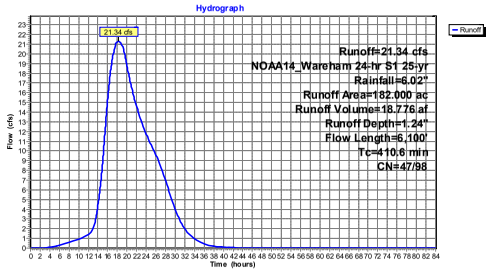
Runoff = 21.34 cfs @ 18.25 hrs, Volume= 18.776 af, Depth= 1.24"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 182.000	50	"6.11% imp"
170.880	47	93.89% Pervious Area
11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



Summary for Subcatchment G: G

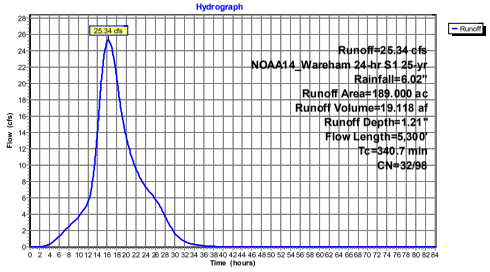
Runoff = 25.34 cfs @ 16.28 hrs, Volume= 19.118 af, Depth= 1.21"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 189.000	45	"19.09% imp"
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



Summary for Subcatchment H: H

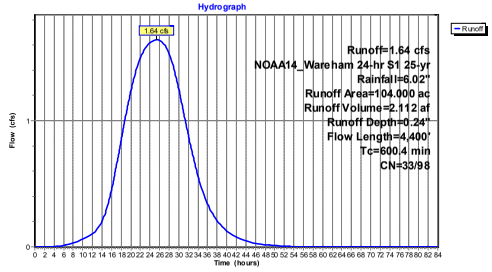
Runoff = 1.64 cfs @ 25.35 hrs, Volume= 2.112 af, Depth= 0.24"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 104.000	34	"1.27% imp"
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



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Summary for Subcatchment I: I

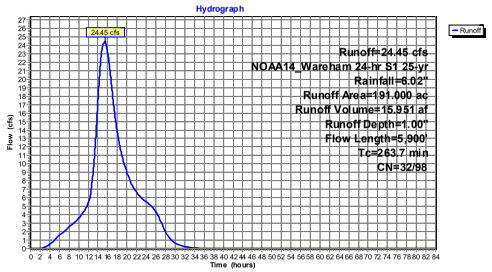
Runoff = 24.45 cfs @ 15.53 hrs, Volume= 15.951 af, Depth= 1.00"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 191.000	42	"15.34% imp"
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



Summary for Subcatchment J: J

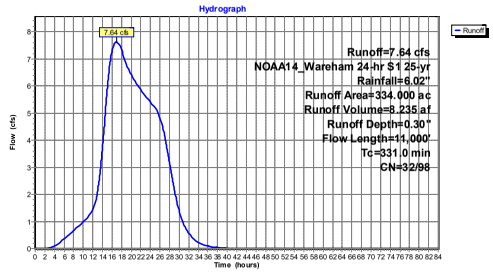
Runoff = 7.64 cfs @ 16.92 hrs, Volume= 8.235 af, Depth= 0.30"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 334.000	34	"2.83% imp"
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Summary for Subcatchment K: K

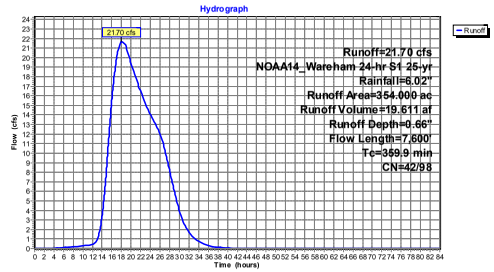
Runoff = 21.70 cfs @ 18.00 hrs, Volume= 19.611 af, Depth= 0.66"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 354.000	42	"0.83% imp"
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



Summary for Subcatchment L: L

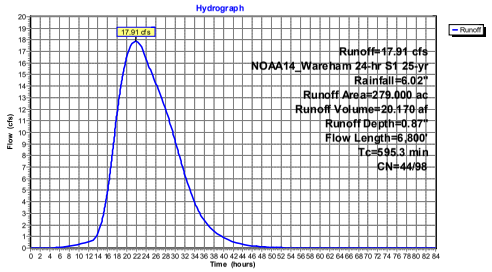
Runoff = 17.91 cfs @ 21.83 hrs, Volume= 20.170 af, Depth= 0.87"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 279.000	45	"2.43% imp"
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



Summary for Subcatchment M: M

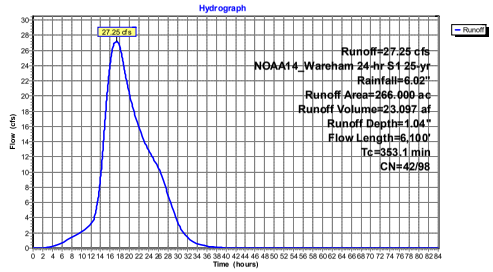
Runoff = 27.25 cfs @ 17.26 hrs, Volume= 23.097 af, Depth= 1.04"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 266.000	47	"8.14% imp"
244.348	42	91.86% Pervious Area
21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



Summary for Subcatchment N: N

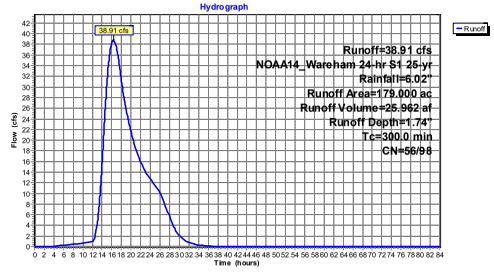
Runoff = 38.91 cfs @ 16.33 hrs, Volume= 25.962 af, Depth= 1.74"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 179.000	57	"3.17% imp"
173.326	56	96.83% Pervious Area
5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



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Summary for Subcatchment O: O

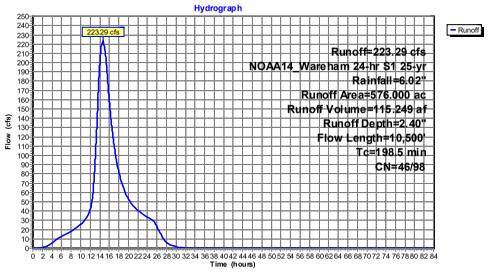
Runoff = 223.29 cfs @ 14.78 hrs, Volume= 115.249 af, Depth= 2.40"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 576.000	62	"31.1% imp"
396.864	46	68.90% Pervious Area
179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



Summary for Subcatchment P: P

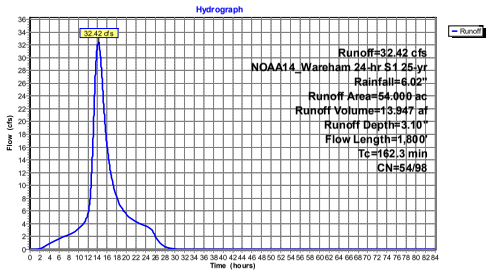
Runoff = 32.42 cfs @ 14.25 hrs, Volume= 13.947 af, Depth= 3.10"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 25-yr Rainfall=6.02"

Area (ac)	CN	Description
* 54.000	71	"38.05% imp"
33.453	54	61.95% Pervious Area
20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Summary for Pond 1P: Halfway Pond

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth > 2.36" for 25-yr event
Inflow = 230.46 cfs @ 14.92 hrs, Volume= 140.007 af, Incl. 2.20 cfs Base Flow
Outflow = 7.41 cfs @ 28.63 hrs, Volume= 41.989 af, Atten= 97%, Lag= 822.3 min
Primary = 7.41 cfs @ 28.63 hrs, Volume= 41.989 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 64.84' @ 28.63 hrs Storage= 489.415 af (118.805 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,636.6 min (2,772.3 - 1,135.7)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

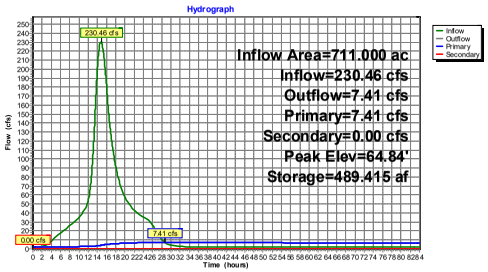
Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=7.41 cfs @ 28.63 hrs HW=64.84' TW=57.72' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 7.41 cfs @ 2.94 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 1P: Halfway Pond



Summary for Pond 2P: Kennard Res

Inflow Area = 902.000 ac, 30.72% Impervious, Inflow Depth > 0.91" for 25-yr event
Inflow = 49.59 cfs @ 13.98 hrs, Volume= 68.383 af, Incl. 0.60 cfs Base Flow
Outflow = 19.50 cfs @ 18.20 hrs, Volume= 64.608 af, Atten= 61%, Lag= 253.4 min
Primary = 19.50 cfs @ 18.20 hrs, Volume= 64.608 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 57.86' @ 18.20 hrs Storage= 15.332 af (11.332 af above start)

Plug-Flow detention time= 672.8 min calculated for 60.607 af (89% of inflow)
Center-of-Mass det. time= 227.8 min (2,392.1 - 2,164.4)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

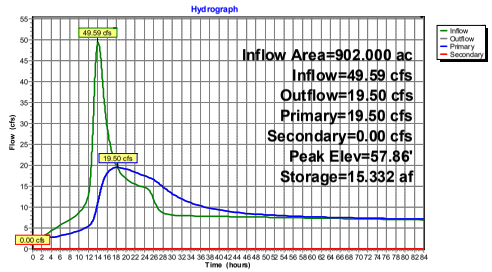
Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=19.48 cfs @ 18.20 hrs HW=57.86' TW=47.44' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 19.48 cfs @ 2.89 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.30' TW=46.77' (Dynamic Tailwater)
└**1=TOD** (Controls 0.00 cfs)

Pond 2P: Kennard Res



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Summary for Pond 3P: Fawn Pond

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth > 2.38" for 25-yr event
Inflow = 71.86 cfs @ 13.13 hrs, Volume= 31.337 af Incl. 0.50 cfs Base Flow
Outflow = 2.52 cfs @ 26.24 hrs, Volume= 13.429 af, Atten= 96%, Lag= 150.9 min
Primary = 2.52 cfs @ 26.24 hrs, Volume= 12.429 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27,720 af
Peak Elev= 60.25' @ 26.24 hrs Storage= 53,782 af (26,062 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,633.0 min (2,705.9 - 1,072.9)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370,000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

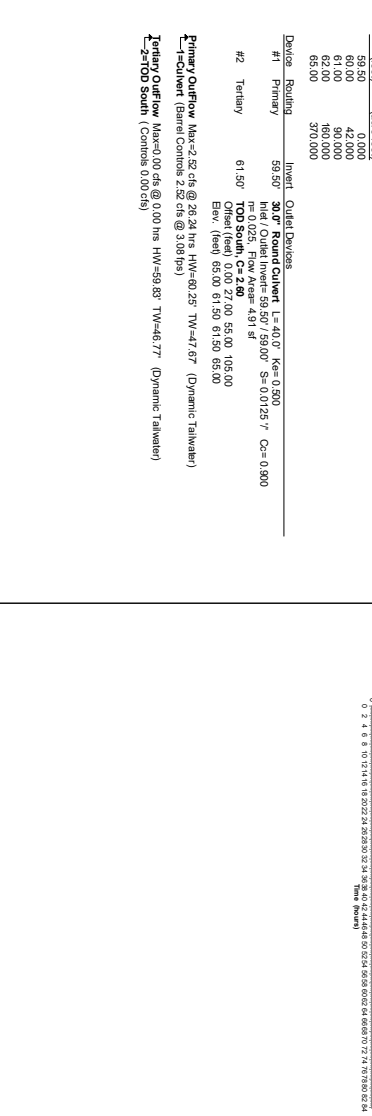
Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=2.52 cfs @ 26.24 hrs HW=60.25' TW=47.67' (Dynamic Tailwater)
1=Culvert (Barrel Controls 2.52 cfs @ 3.08 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=59.83' TW=46.77' (Dynamic Tailwater)
2=TOD South (Controls 0.00 cfs)

Pond 3P: Fawn Pond

Hydrograph



Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow Area = 1,564.000 ac, 24.34% Impervious, Inflow Depth > 1.04" for 25-yr event
Inflow = 41.35 cfs @ 25.36 hrs, Volume= 135.568 af Incl. 1.60 cfs Base Flow
Outflow = 41.35 cfs @ 25.36 hrs, Volume= 127.120 af, Atten= 49%, Lag= 526.2 min
Primary = 41.35 cfs @ 25.36 hrs, Volume= 127.120 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9,720 af
Peak Elev= 47.68' @ 25.36 hrs Storage= 42,886 af (33,166 af above start)

Plug-Flow detention time= 874.6 min calculated for 117,399 af (87% of inflow)
Center-of-Mass det. time= 366.8 min (2,364.7 - 1,997.9)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	350,000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	150.000
51.00	220.000
52.00	290.000
55.00	550.000

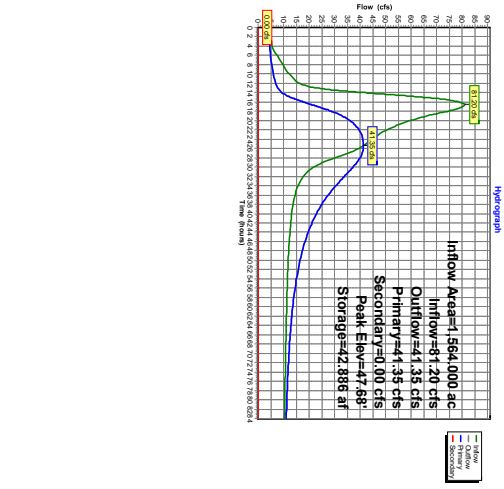
Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 1.0' Crest Height Coefficient(s) 10.0 Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=41.34 cfs @ 25.36 hrs HW=47.68' TW=34.62' (Dynamic Tailwater)
1=Sharp-Crested Rectangular Weir (Weir Controls 41.34 cfs @ 3.60 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=46.77' TW=33.99' (Dynamic Tailwater)
2=TOD (Controls 0.00 cfs)

Pond 4P: Bessey Bog Res - 2.4sm

Hydrograph



Summary for Pond 5P: Glen Charlie Pond

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 1.45" for 25-yr event
Inflow = 292.61 cfs @ 14.28 hrs, Volume= 270.460 af Incl. 2.10 cfs Base Flow
Outflow = 63.14 cfs @ 25.93 hrs, Volume= 242.580 af, Atten= 78%, Lag= 698.9 min
Primary = 63.14 cfs @ 25.93 hrs, Volume= 242.362 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6 1P : Ortalani Reservoir
Tertiary = 0.29 cfs @ 25.93 hrs, Volume= 0.289 af
Routed to Pond 6 1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26,125 af
Peak Elev= 34.62' @ 25.93 hrs Storage= 128,803 af (102,678 af above start)

Plug-Flow detention time= 1,462.5 min calculated for 216,525 af (80% of inflow)
Center-of-Mass det. time= 756.8 min (2,443.3 - 1,686.5)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400,000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	185.000
36.00	365.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 Elev. (feet) 1,030.00 1,050.00 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 122" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00

#6	Tertiary	34.50'	Elev. (feet) 41.00 40.00 39.00 37.70 37.70 41.00 **24.0' W x 12.0' H Vert. NE Culvert** C= 0.600 Limited to weir flow at low heads

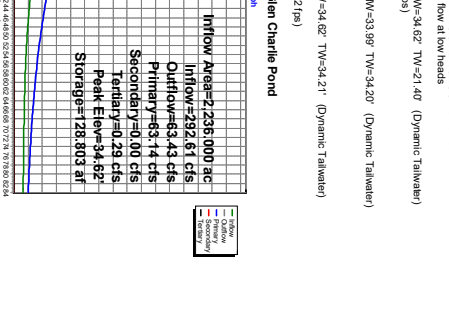
Primary OutFlow Max=63.01 cfs @ 25.93 hrs HW=34.62' TW=21.40' (Dynamic Tailwater)
1=Spillway (Weir Controls 63.01 cfs @ 3.26 fps)
2=TOD (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
3=SE Dike (Controls 0.00 cfs)
4=SE Culvert (Controls 0.00 cfs)

Tertiary OutFlow Max=0.27 cfs @ 25.93 hrs HW=34.62' TW=34.21' (Dynamic Tailwater)
5=NE Dike (Controls 0.00 cfs)
6=NE Culvert (Orifice Controls 0.27 cfs @ 1.12 fps)

Pond 5P: Glen Charlie Pond

Hydrograph



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 0.29 cfs @ 25.93 hrs, Volume= 0.289 af
Outflow = 0.01 cfs @ 38.29 hrs, Volume= 0.054 af, Atten= 96%, Lag= 742.0 min
Primary = 0.01 cfs @ 38.29 hrs, Volume= 0.054 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 34.22' @ 38.29 hrs Storage= 0.277 af

Plug-Flow detention time= 2,062.2 min calculated for 0.054 af (19% of inflow)
Center-of-Mass det. time= 1,676.0 min (3,265.3 - 1,589.2)

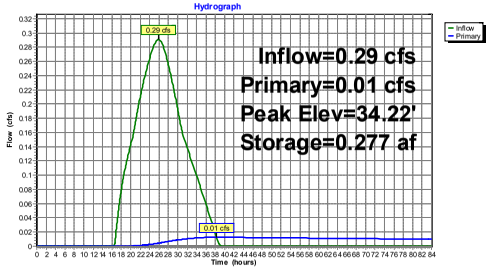
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=0.01 cfs @ 38.29 hrs HW=34.22' TW=23.13' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 0.01 cfs @ 0.40 fps)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



Summary for Pond 6.2P: Maple Sping Bogs US

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 1.24" for 25-yr event
Inflow = 21.34 cfs @ 18.25 hrs, Volume= 18.830 af
Outflow = 8.28 cfs @ 27.10 hrs, Volume= 17.188 af, Atten= 61%, Lag= 531.2 min
Primary = 8.28 cfs @ 27.10 hrs, Volume= 17.188 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 23.34' @ 27.10 hrs Storage= 11.167 af

Plug-Flow detention time= 973.3 min calculated for 17.188 af (91% of inflow)
Center-of-Mass det. time= 911.6 min (2,180.3 - 1,268.7)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

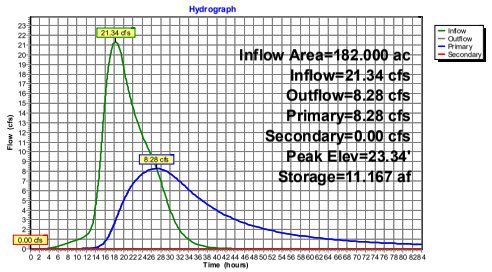
Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=8.26 cfs @ 27.10 hrs HW=23.34' TW=17.63' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 8.26 cfs @ 2.57 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.70' TW=17.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.2P: Maple Sping Bogs US



Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 1.13" for 25-yr event
Inflow = 8.28 cfs @ 27.10 hrs, Volume= 17.188 af
Outflow = 8.17 cfs @ 28.38 hrs, Volume= 16.984 af, Atten= 1%, Lag= 76.5 min
Primary = 8.17 cfs @ 28.38 hrs, Volume= 16.984 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 17.64' @ 28.38 hrs Storage= 1.275 af

Plug-Flow detention time= 144.5 min calculated for 16.983 af (99% of inflow)
Center-of-Mass det. time= 111.9 min (2,292.2 - 2,180.3)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

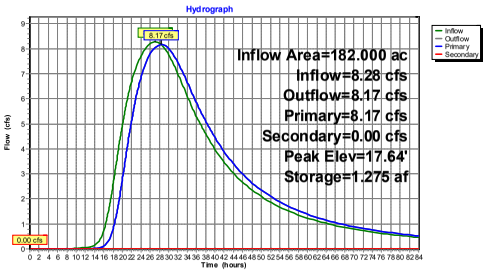
Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=8.17 cfs @ 28.38 hrs HW=17.64' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 8.17 cfs @ 2.56 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.3P: Maple Sping Bogs DS



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A00840 - 567

Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 1.30" for 25-yr event
Inflow = 63.14 cfs @ 25.93 hrs, Volume= 242.362 af
Outflow = 63.11 cfs @ 26.23 hrs, Volume= 241.555 af, Atten= 0%, Lag= 18.0 min
Primary = 63.11 cfs @ 26.23 hrs, Volume= 241.555 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 21.40' @ 26.23 hrs Storage= 2.584 af (2.137 af above start)

Plug-Flow detention time= 35.7 min calculated for 241.105 af (99% of inflow)
Center-of-Mass det. time= 17.8 min (2,462.0 - 2,444.3)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

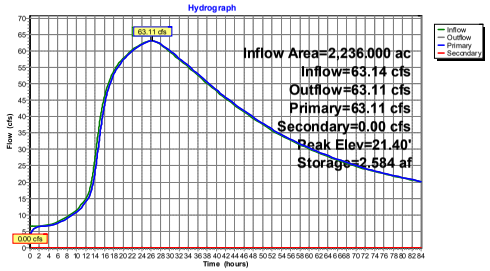
Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

Primary OutFlow Max=63.11 cfs @ 26.23 hrs HW=21.40' TW=0.00' (Dynamic Tailwater)
└─**1=Bridge/Spillway** (Weir Controls 63.11 cfs @ 3.89 fps)
└─**3=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.49' TW=22.70' (Dynamic Tailwater)
└─**2=Culvert to Bogs** (Controls 0.00 cfs)
└─**4=TOD_Bogs** (Controls 0.00 cfs)

Pond 6P: Maple Springs Dam - 3.5sm



Summary for Pond 7P: Little Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 1.47" for 25-yr event
Inflow = 25.93 cfs @ 16.28 hrs, Volume= 23.214 af, Incl. 0.59 cfs Base Flow
Outflow = 25.15 cfs @ 16.81 hrs, Volume= 23.164 af, Atten= 3%, Lag= 31.7 min
Primary = 25.15 cfs @ 16.81 hrs, Volume= 23.164 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 59.75' @ 16.81 hrs Storage= 23.981 af (1.821 af above start)

Plug-Flow detention time= 4,075.5 min calculated for 1.003 af (4% of inflow)
Center-of-Mass det. time= 61.6 min (1,402.4 - 1,340.8)

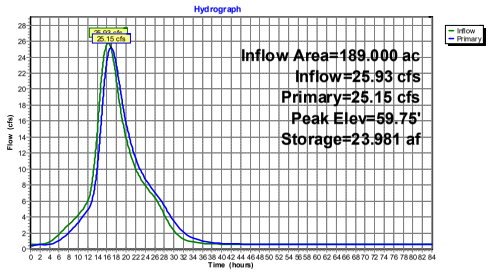
Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=25.15 cfs @ 16.81 hrs HW=59.75' TW=52.17' (Dynamic Tailwater)
└─**1=Relief** (Weir Controls 25.15 cfs @ 0.64 fps)

Pond 7P: Little Five Mile Pond



Summary for Pond 8P: Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 1.47" for 25-yr event
Inflow = 25.15 cfs @ 16.81 hrs, Volume= 23.164 af
Outflow = 1.82 cfs @ 32.60 hrs, Volume= 8.141 af, Atten= 93%, Lag= 947.9 min
Primary = 1.82 cfs @ 32.60 hrs, Volume= 8.141 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 52.60' @ 32.60 hrs Storage= 18.573 af

Plug-Flow detention time= 2,150.2 min calculated for 8.141 af (35% of inflow)
Center-of-Mass det. time= 1,586.7 min (2,989.2 - 1,402.4)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

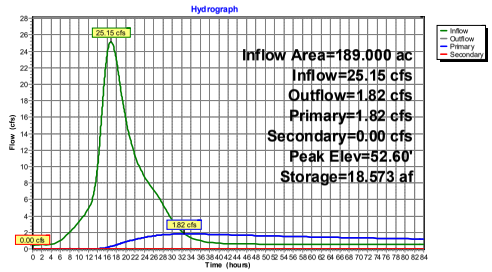
Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=1.82 cfs @ 32.60 hrs HW=52.60' TW=30.02' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.82 cfs @ 2.73 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=51.90' TW=29.60' (Dynamic Tailwater)
└─**2=TOD** (Controls 0.00 cfs)

Pond 8P: Five Mile Pond



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A00840 - 568

Summary for Pond 9P: Kettle Hole

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth > 0.48" for 25-yr event
Inflow = 1.94 cfs @ 25.35 hrs, Volume= 4.195 af, Incl. 0.30 cfs Base Flow
Outflow = 1.91 cfs @ 26.87 hrs, Volume= 4.203 af, Atten= 2%, Lag= 91.0 min
Primary = 1.91 cfs @ 26.87 hrs, Volume= 4.203 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.06' @ 26.87 hrs Storage= 9.226 af (0.276 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 70.5 min (2,096.0 - 2,025.6)

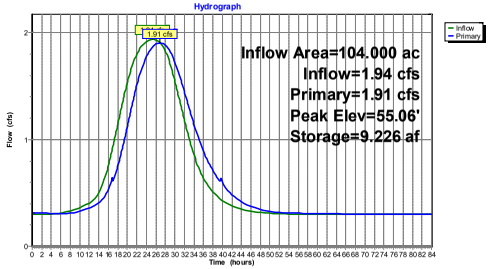
Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=1.91 cfs @ 26.87 hrs HW=55.06' TW=30.13' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 1.91 cfs @ 0.42 fps)

Pond 9P: Kettle Hole



Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow Area = 484.000 ac, 13.78% Impervious, Inflow Depth > 0.80" for 25-yr event
Inflow = 25.65 cfs @ 15.53 hrs, Volume= 32.460 af, Incl. 0.60 cfs Base Flow
Outflow = 10.71 cfs @ 20.81 hrs, Volume= 30.372 af, Atten= 58%, Lag= 316.8 min
Primary = 10.71 cfs @ 20.81 hrs, Volume= 30.372 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1.500 af
Peak Elev= 30.17' @ 20.81 hrs Storage= 10.046 af (8.546 af above start)

Plug-Flow detention time= 812.8 min calculated for 28.872 af (89% of inflow)
Center-of-Mass det. time= 403.1 min (2,252.5 - 1,849.4)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LiDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
35.00	115.000
36.50	160.000
40.00	300.000

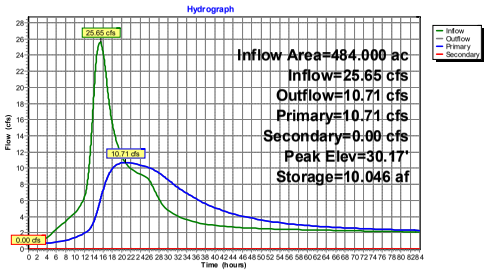
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=10.69 cfs @ 20.81 hrs HW=30.17' TW=22.10' (Dynamic Tailwater)
└**1=Drop Inlet Spillway** (Weir Controls 10.69 cfs @ 2.72 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.60' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 10P: Maple Springs Brook Dam - 0.8sm



Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow Area = 1,172.000 ac, 6.75% Impervious, Inflow Depth > 0.75" for 25-yr event
Inflow = 38.24 cfs @ 18.79 hrs, Volume= 72.795 af, Incl. 1.10 cfs Base Flow
Outflow = 28.72 cfs @ 26.40 hrs, Volume= 72.009 af, Atten= 25%, Lag= 456.1 min
Primary = 28.72 cfs @ 26.40 hrs, Volume= 72.009 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 22.18' @ 26.40 hrs Storage= 13.806 af (11.096 af above start)

Plug-Flow detention time= 387.5 min calculated for 69.298 af (95% of inflow)
Center-of-Mass det. time= 176.7 min (2,148.6 - 1,971.9)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

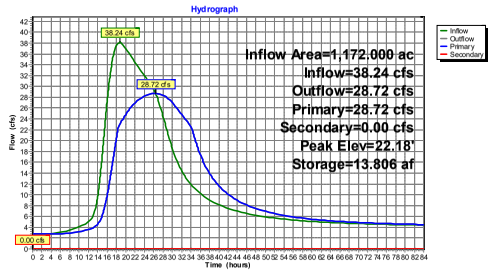
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=28.70 cfs @ 26.40 hrs HW=22.18' TW=17.40' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 28.70 cfs @ 4.04 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.26' TW=15.71' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 11P: Unnamed Road - 1.8sm



Proposal No. 606352-136278
A00840 - 569

Summary for Pond 12P: Maple Springs Road Dam

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth > 0.55" for 25-yr event
Inflow = 8.64 cfs @ 16.92 hrs, Volume= 15.177 af, Incl. 1.00 cfs Base Flow
Outflow = 6.39 cfs @ 24.04 hrs, Volume= 15.175 af, Atten= 26%, Lag= 427.5 min
Primary = 6.39 cfs @ 24.04 hrs, Volume= 15.175 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 39.12' @ 24.04 hrs Storage= 3.710 af (2.630 af above start)

Plug-Flow detention time= 553.6 min calculated for 14.095 af (93% of inflow)
Center-of-Mass det. time= 209.8 min (2,021.0 - 1,811.2)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

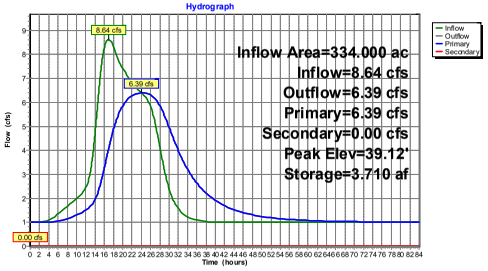
Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=6.39 cfs @ 24.04 hrs HW=39.12' TW=22.17' (Dynamic Tailwater)
↳**1=Sharp-Crested Rectangular Weir** (Weir Controls 6.39 cfs @ 2.67 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=38.68' TW=21.26' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 12P: Maple Springs Road Dam



Summary for Pond 13.1P: Bogs_L_US

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 1.14" for 25-yr event
Inflow = 18.81 cfs @ 21.83 hrs, Volume= 26.418 af, Incl. 0.90 cfs Base Flow
Outflow = 18.77 cfs @ 21.96 hrs, Volume= 26.419 af, Atten= 0%, Lag= 8.2 min
Primary = 18.77 cfs @ 21.96 hrs, Volume= 26.419 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 30.61' @ 21.96 hrs Storage= 0.396 af (0.343 af above start)

Plug-Flow detention time= 22.1 min calculated for 26.365 af (100% of inflow)
Center-of-Mass det. time= 12.1 min (1,734.7 - 1,722.6)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

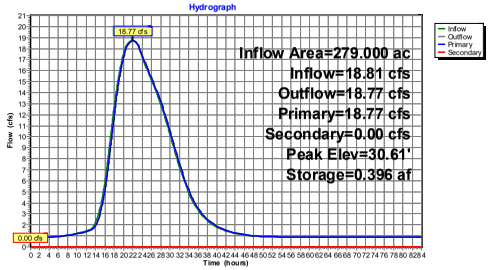
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=18.77 cfs @ 21.96 hrs HW=30.61' TW=26.71' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 18.77 cfs @ 3.38 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.65' TW=25.75' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 13.1P: Bogs_L_US



Summary for Pond 13.2P: Bogs_L_DS

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 1.14" for 25-yr event
Inflow = 18.77 cfs @ 21.96 hrs, Volume= 26.419 af
Outflow = 18.75 cfs @ 22.22 hrs, Volume= 26.421 af, Atten= 0%, Lag= 15.3 min
Primary = 18.75 cfs @ 22.22 hrs, Volume= 26.421 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 26.71' @ 22.22 hrs Storage= 0.555 af (0.480 af above start)

Plug-Flow detention time= 31.0 min calculated for 26.346 af (100% of inflow)
Center-of-Mass det. time= 17.0 min (1,751.7 - 1,734.7)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

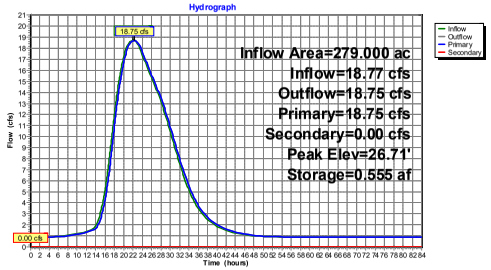
Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=18.75 cfs @ 22.22 hrs HW=26.71' TW=17.43' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 18.75 cfs @ 3.38 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 13.2P: Bogs_L_DS



Proposal No. 606352-136278
A00840 - 570

Summary for Pond 14P: Bogs_M - 2.7sm

Inflow Area = 1,717.000 ac, 6.26% Impervious, Inflow Depth > 0.89" for 25-yr event
Inflow = 62.82 cfs @ 20.81 hrs, Volume= 127.080 af, Incl. 0.80 cfs Base Flow
Outflow = 60.08 cfs @ 23.70 hrs, Volume= 126.942 af, Atten= 4%, Lag= 173.2 min
Primary = 60.08 cfs @ 23.70 hrs, Volume= 126.942 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 17.45' @ 23.70 hrs Storage= 7.040 af (5.975 af above start)

Plug-Flow detention time= 88.2 min calculated for 125.877 af (99% of inflow)
Center-of-Mass det. time= 43.1 min (1,951.8 - 1,908.7)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

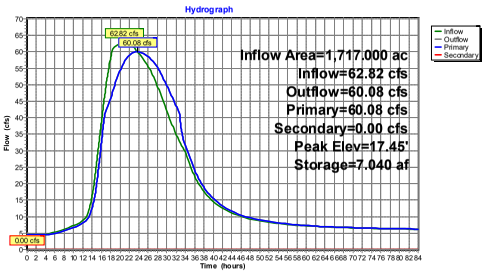
Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

Primary OutFlow Max=60.08 cfs @ 23.70 hrs HW=17.45' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 60.08 cfs @ 3.56 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.71' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 14P: Bogs_M - 2.7sm



Summary for Pond 15.1P: Bogs_N_US

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 2.02" for 25-yr event
Inflow = 39.51 cfs @ 16.33 hrs, Volume= 30.128 af, Incl. 0.60 cfs Base Flow
Outflow = 22.14 cfs @ 19.99 hrs, Volume= 30.122 af, Atten= 44%, Lag= 219.2 min
Primary = 22.14 cfs @ 19.99 hrs, Volume= 30.122 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 26.24' @ 19.99 hrs Storage= 9.179 af (8.827 af above start)

Plug-Flow detention time= 304.0 min calculated for 29.770 af (99% of inflow)
Center-of-Mass det. time= 246.0 min (1,591.1 - 1,345.1)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

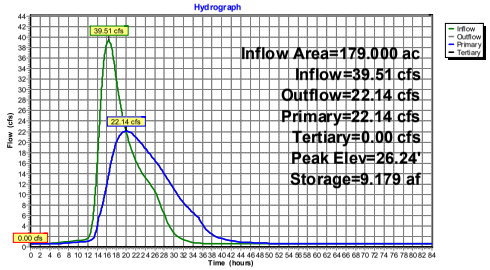
Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=22.11 cfs @ 19.99 hrs HW=26.24' TW=20.41' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 22.11 cfs @ 3.57 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.11' TW=20.11' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 15.1P: Bogs_N_US



Summary for Pond 15.2P: Bogs_N_DS

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 2.02" for 25-yr event
Inflow = 22.14 cfs @ 19.99 hrs, Volume= 30.122 af
Outflow = 10.24 cfs @ 30.56 hrs, Volume= 28.007 af, Atten= 54%, Lag= 634.4 min
Primary = 10.24 cfs @ 30.56 hrs, Volume= 28.007 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 20.74' @ 30.56 hrs Storage= 17.279 af (14.713 af above start)

Plug-Flow detention time= 1,221.4 min calculated for 25.440 af (84% of inflow)
Center-of-Mass det. time= 830.9 min (2,422.0 - 1,591.1)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

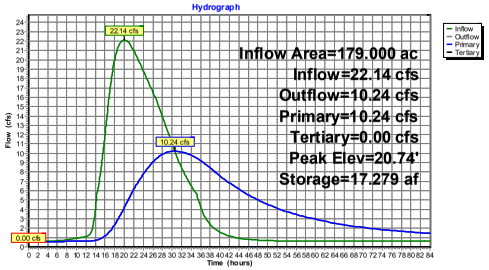
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=10.23 cfs @ 30.56 hrs HW=20.74' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 10.23 cfs @ 2.76 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS



Proposal No. 606352-136278
A00840 - 571

Summary for Pond 16.1: Mill Pond Dam -PC

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.86" for 25-yr event
Inflow = 334.78 cfs @ 14.78 hrs, Volume= 764.834 af, Incl. 32.00 cfs Base Flow
Outflow = 145.05 cfs @ 32.91 hrs, Volume= 704.831 af, Atten= 57%, Lag= 1,087.8 min
Primary = 114.72 cfs @ 32.91 hrs, Volume= 528.565 af
Routed to Pond 17B : Proposed Bridge
Secondary = 30.33 cfs @ 32.90 hrs, Volume= 176.265 af
Routed to Pond Wr 24 :
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 17B : Proposed Bridge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 470.969 af
Peak Elev= 15.35' @ 32.91 hrs Storage= 644.103 af (173.134 af above start)

Plug-Flow detention time= 3,226.6 min calculated for 233.857 af (31% of inflow)
Center-of-Mass det. time= 468.0 min (2,605.2 - 2,137.2)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,941.850 af	**Storage** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.130
5.00	4.140
6.00	9.110
7.00	16.590
8.00	34.960
9.00	60.590
10.00	94.410
11.00	142.690
12.00	214.660
13.00	314.540
13.80	403.920
14.00	426.260
15.00	575.290
16.00	771.680
17.00	994.600
18.30	1,368.590
19.00	1,592.930
20.00	1,941.850

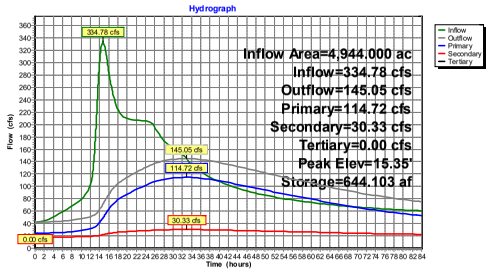
Device	Routing	Invert	Outlet Devices
#1	Primary	15.50'	**110.0' long x 1.5' breadth Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32
#2	Primary	13.60'	**15.0' long x 1.0' breadth Notch as SW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#3	Secondary	12.50'	**3.3' long x 1.0' breadth 3.25' Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#4	Tertiary	18.00'	**TOD, C= 2.60** Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00 Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 8	5.20'	**48.0" W x 48.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#7	Device 8	15.50'	**6.0' long x 20.00' rise MLO DownwardOpGate** 2 End Contraction(s) 5.0' Crest Height
#8	Tertiary	4.00'	**96.0" W x 48.0" H Box Culvert X 0.00** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 32.00 sf

Primary OutFlow Max=114.72 cfs @ 32.91 hrs HW=15.35' TW=9.18' (Dynamic Tailwater)
└─**1=Spillway** (Controls 0.00 cfs)
└─**2=Notch as SW** (Weir Controls 114.72 cfs @ 4.37 fps)

Secondary OutFlow Max=30.33 cfs @ 32.90 hrs HW=15.35' TW=14.88' (Dynamic Tailwater)
└─**3=3.25' Weir** (Weir Controls 30.33 cfs @ 3.22 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.30' TW=8.48' (Dynamic Tailwater)
└─**4=TOD** (Controls 0.00 cfs)
└─**5=US Relief - Bypasses Dam** (Controls 0.00 cfs)
└─**8=Culvert** (Controls 0.00 cfs)
└─**6=Orifice/Grate** (Controls 0.00 cfs)
└─**7=MLO DownwardOpGate** (Controls 0.00 cfs)

Pond 16.1: Mill Pond Dam -PC



Summary for Pond 16.3: Downstream Weir

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.28" for 25-yr event
Inflow = 114.72 cfs @ 32.91 hrs, Volume= 528.553 af
Outflow = 114.72 cfs @ 32.91 hrs, Volume= 528.541 af, Atten= 0%, Lag= 0.2 min
Primary = 114.72 cfs @ 32.91 hrs, Volume= 528.541 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 9.17' @ 32.91 hrs Surf.Area= 2,000 sf Storage= 10,338 cf (1,378 cf above start)

Plug-Flow detention time= 2.1 min calculated for 528.328 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,617.1 - 2,616.9)

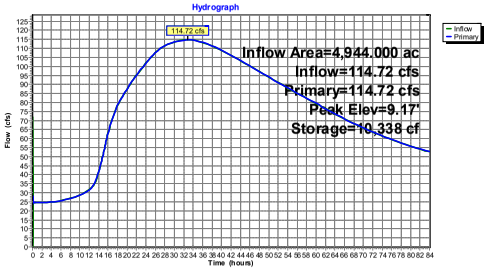
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	8.00'	**DS Weir, C= 2.60** Offset (feet) 0.00 0.00 23.00 23.00 Elev. (feet) 17.00 10.00 8.00 17.00
#2	Primary	8.00'	**27.0' long x 1.5' breadth EI 8 Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32

Primary OutFlow Max=114.72 cfs @ 32.91 hrs HW=9.17' (Free Discharge)
└─**1=DS Weir** (Weir Controls 17.68 cfs @ 1.12 fps)
└─**2=EI 8 Weir** (Weir Controls 97.04 cfs @ 3.07 fps)

Pond 16.3: Downstream Weir



Summary for Pond 17B: Proposed Bridge

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.28" for 25-yr event
Inflow = 114.72 cfs @ 32.91 hrs, Volume= 528.565 af
Outflow = 114.72 cfs @ 32.91 hrs, Volume= 528.553 af, Atten= 0%, Lag= 0.2 min
Primary = 114.72 cfs @ 32.91 hrs, Volume= 528.553 af
Routed to Pond 16.3 : Downstream Weir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 9.18' @ 32.91 hrs Surf.Area= 2,000 sf Storage= 10,361 cf (1,401 cf above start)

Plug-Flow detention time= 2.2 min calculated for 528.347 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,616.9 - 2,616.8)

Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	4.00'	**518.0" W x 127.0" H Box Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 456.85 sf

Primary OutFlow Max=114.72 cfs @ 32.91 hrs HW=9.18' TW=9.17' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 114.72 cfs @ 0.51 fps)

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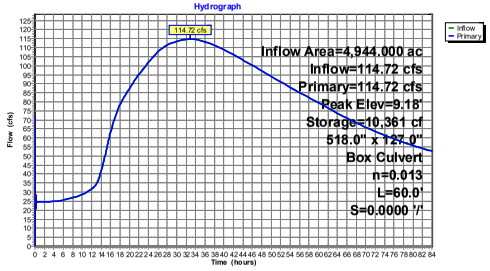
Pond 17B: Proposed Bridge

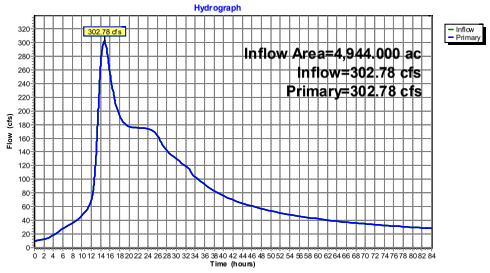


Summary for Link 23L: Inflow

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.32" for 25-yr event
Inflow = 302.78 cfs @ 14.78 hrs, Volume= 542.683 af
Primary = 302.78 cfs @ 14.78 hrs, Volume= 542.683 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16.1 : Mill Pond Dam -PC

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow

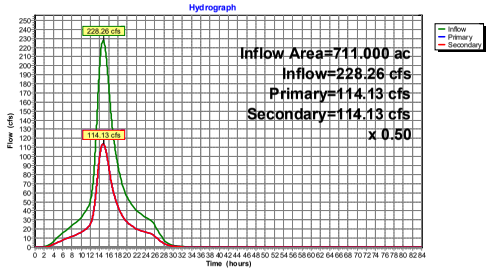


Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 2.11" for 25-yr event
Inflow = 228.26 cfs @ 14.92 hrs, Volume= 124.734 af
Primary = 114.13 cfs @ 14.92 hrs, Volume= 62.367 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 1P : Halfway Pond
Secondary = 114.13 cfs @ 14.92 hrs, Volume= 62.367 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow

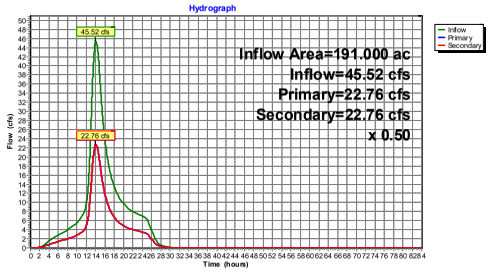


Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 1.40" for 25-yr event
Inflow = 45.52 cfs @ 13.97 hrs, Volume= 22.229 af
Primary = 22.76 cfs @ 13.97 hrs, Volume= 11.114 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 2P : Kennard Res
Secondary = 22.76 cfs @ 13.97 hrs, Volume= 11.114 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

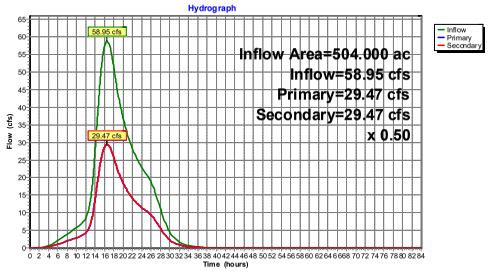


Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth = 1.11" for 25-yr event
Inflow = 58.95 cfs @ 16.59 hrs, Volume= 46.751 af
Primary = 29.47 cfs @ 16.59 hrs, Volume= 23.376 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 29.47 cfs @ 16.59 hrs, Volume= 23.376 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

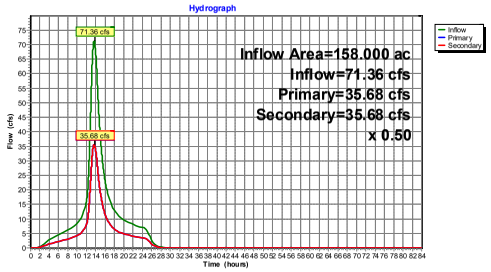


Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 2.12" for 25-yr event
Inflow = 71.36 cfs @ 13.73 hrs, Volume= 27.886 af
Primary = 35.68 cfs @ 13.73 hrs, Volume= 13.943 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 3P : Fawn Pond
Secondary = 35.68 cfs @ 13.73 hrs, Volume= 13.943 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow



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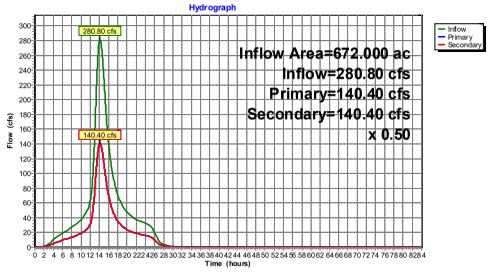
Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 2.30" for 25-yr event
Inflow = 280.80 cfs @ 14.09 hrs, Volume= 128.762 af
Primary = 140.40 cfs @ 14.09 hrs, Volume= 64.381 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 5P : Glen Charlie Pond
Secondary = 140.40 cfs @ 14.09 hrs, Volume= 64.381 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow

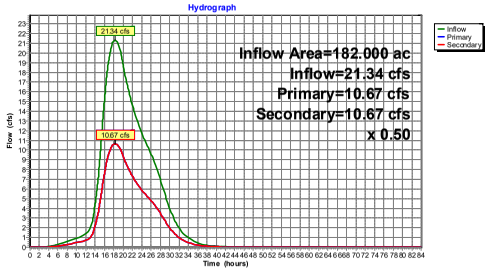


Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 1.24" for 25-yr event
Inflow = 21.34 cfs @ 18.25 hrs, Volume= 18.776 af
Primary = 10.67 cfs @ 18.25 hrs, Volume= 9.388 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 6.2P : Maple Sping Bogs US
Secondary = 10.67 cfs @ 18.25 hrs, Volume= 9.388 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow

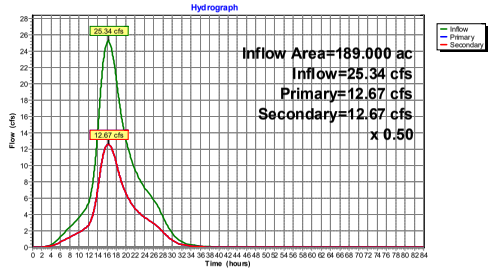


Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth = 1.21" for 25-yr event
Inflow = 25.34 cfs @ 16.28 hrs, Volume= 19.118 af
Primary = 12.67 cfs @ 16.28 hrs, Volume= 9.559 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 7P : Little Five Mile Pond
Secondary = 12.67 cfs @ 16.28 hrs, Volume= 9.559 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow

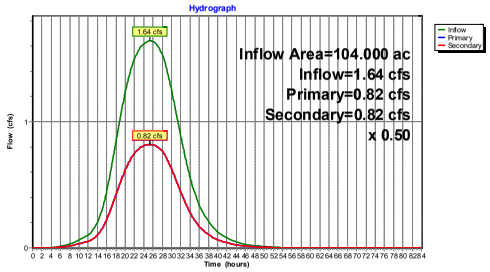


Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth = 0.24" for 25-yr event
Inflow = 1.64 cfs @ 25.35 hrs, Volume= 2.112 af
Primary = 0.82 cfs @ 25.35 hrs, Volume= 1.056 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 9P : Kettle Hole
Secondary = 0.82 cfs @ 25.35 hrs, Volume= 1.056 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow

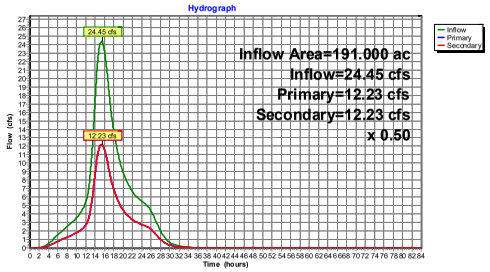


Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth = 1.00" for 25-yr event
Inflow = 24.45 cfs @ 15.53 hrs, Volume= 15.951 af
Primary = 12.23 cfs @ 15.53 hrs, Volume= 7.975 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 12.23 cfs @ 15.53 hrs, Volume= 7.975 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

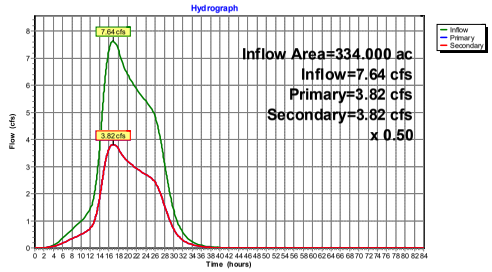


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth = 0.30" for 25-yr event
Inflow = 7.64 cfs @ 16.92 hrs, Volume= 8.235 af
Primary = 3.82 cfs @ 16.92 hrs, Volume= 4.118 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 12P : Maple Springs Road Dam
Secondary = 3.82 cfs @ 16.92 hrs, Volume= 4.118 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow



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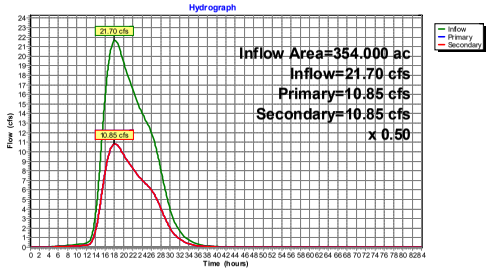
Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth = 0.66" for 25-yr event
Inflow = 21.70 cfs @ 18.00 hrs, Volume= 19.611 af
Primary = 10.85 cfs @ 18.00 hrs, Volume= 9.805 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 10.85 cfs @ 18.00 hrs, Volume= 9.805 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow

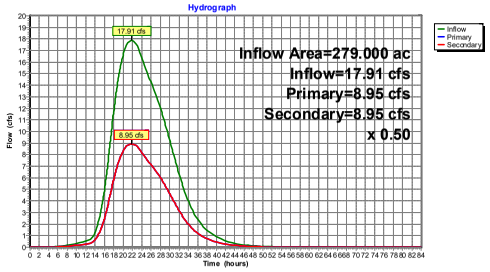


Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth = 0.87" for 25-yr event
Inflow = 17.91 cfs @ 21.83 hrs, Volume= 20.170 af
Primary = 8.95 cfs @ 21.83 hrs, Volume= 10.085 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 13.1P : Bogs_L_US
Secondary = 8.95 cfs @ 21.83 hrs, Volume= 10.085 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow

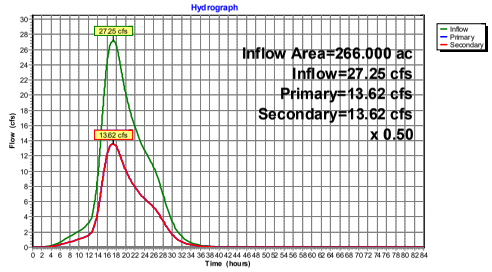


Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth = 1.04" for 25-yr event
Inflow = 27.25 cfs @ 17.26 hrs, Volume= 23.097 af
Primary = 13.62 cfs @ 17.26 hrs, Volume= 11.548 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 13.62 cfs @ 17.26 hrs, Volume= 11.548 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow

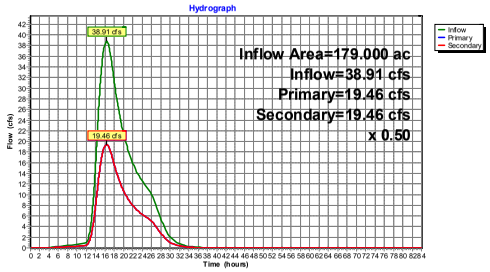


Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth = 1.74" for 25-yr event
Inflow = 38.91 cfs @ 16.33 hrs, Volume= 25.962 af
Primary = 19.46 cfs @ 16.33 hrs, Volume= 12.981 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 15.1P : Bogs_N_US
Secondary = 19.46 cfs @ 16.33 hrs, Volume= 12.981 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow

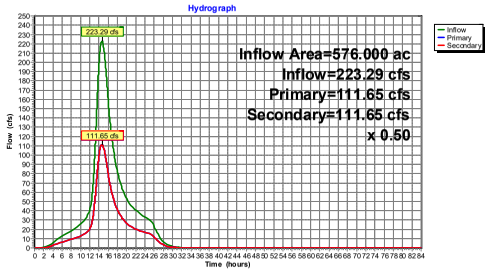


Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 2.40" for 25-yr event
Inflow = 223.29 cfs @ 14.78 hrs, Volume= 115.249 af
Primary = 111.65 cfs @ 14.78 hrs, Volume= 57.625 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 111.65 cfs @ 14.78 hrs, Volume= 57.625 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow

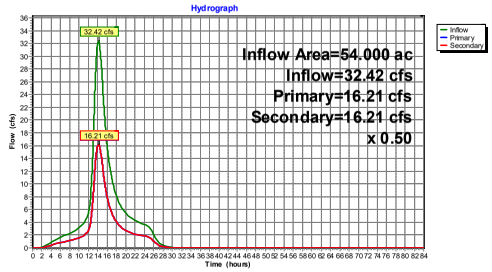


Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 3.10" for 25-yr event
Inflow = 32.42 cfs @ 14.25 hrs, Volume= 13.947 af
Primary = 16.21 cfs @ 14.25 hrs, Volume= 6.973 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 16.21 cfs @ 14.25 hrs, Volume= 6.973 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



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Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=2.47"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=265.84 cfs 146.155 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=1.72"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=56.39 cfs 27.317 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=1.43"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=78.12 cfs 60.042 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=2.51"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=85.05 cfs 33.026 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=2.70"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=330.27 cfs 151.263 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=1.61"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=28.68 cfs 24.432 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=1.46"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=29.85 cfs 23.041 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=0.40"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=2.77 cfs 3.448 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=1.23"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=29.15 cfs 19.546 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=0.44"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=12.10 cfs 12.370 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=0.95"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=32.72 cfs 27.976 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=1.19"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=25.13 cfs 27.573 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=1.36"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=36.93 cfs 30.144 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=2.21"
Tc=300.0 min CN=56/98 Runoff=50.93 cfs 32.987 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=2.86"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=271.33 cfs 137.514 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=3.66"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=38.94 cfs 16.450 af

Pond 1P: Halfway Pond Peak Elev=64.92' Storage=509.663 af Inflow=268.04 cfs 161.428 af
Primary=8.50 cfs 47.353 af Secondary=0.00 cfs 0.000 af Outflow=8.50 cfs 47.353 af

Pond 2P: Kennard Res Peak Elev=57.97' Storage=17.698 af Inflow=60.80 cfs 78.835 af
Primary=23.81 cfs 74.474 af Secondary=0.00 cfs 0.000 af Outflow=23.81 cfs 74.474 af

Pond 3P: Fawn Pond Peak Elev=60.34' Storage=58.342 af Inflow=85.55 cfs 36.497 af
Primary=3.18 cfs 15.106 af Tertiary=0.00 cfs 0.000 af Outflow=3.18 cfs 15.106 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=47.88' Storage=51.000 af Inflow=104.94 cfs 160.730 af
Primary=52.69 cfs 151.661 af Secondary=0.00 cfs 0.000 af Outflow=52.69 cfs 151.661 af

Pond 5P: Glen Charlie Pond Peak Elev=34.73' Storage=147.968 af Inflow=343.60 cfs 317.503 af
Primary=76.85 cfs 283.923 af Secondary=0.00 cfs 0.000 af Tertiary=0.73 cfs 0.944 af Outflow=77.58 cfs 284.867 af

Pond 6.1P: Ortalani Reservoir Peak Elev=34.25' Storage=0.856 af Inflow=0.73 cfs 0.944 af
Outflow=0.07 cfs 0.279 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=23.50' Storage=13.930 af Inflow=28.68 cfs 24.711 af
Primary=11.53 cfs 22.872 af Secondary=0.00 cfs 0.000 af Outflow=11.53 cfs 22.872 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=17.80' Storage=1.594 af Inflow=11.53 cfs 22.872 af
Primary=11.42 cfs 22.645 af Secondary=0.00 cfs 0.000 af Outflow=11.42 cfs 22.645 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=21.54' Storage=2.920 af Inflow=76.85 cfs 283.923 af
Primary=76.81 cfs 283.025 af Secondary=0.00 cfs 0.000 af Outflow=76.81 cfs 283.025 af

Pond 7P: Little Five Mile Pond Peak Elev=59.77' Storage=24.164 af Inflow=30.44 cfs 27.137 af
Outflow=29.69 cfs 27.087 af

Pond 8P: Five Mile Pond Peak Elev=52.73' Storage=21.796 af Inflow=29.69 cfs 27.087 af
Primary=2.50 cfs 10.558 af Secondary=0.00 cfs 0.000 af Outflow=2.50 cfs 10.558 af

Pond 9P: Kettle Hole Peak Elev=55.10' Storage=9.340 af Inflow=3.07 cfs 5.531 af
Outflow=3.03 cfs 5.540 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=30.29' Storage=11.788 af Inflow=30.45 cfs 39.810 af
Primary=13.59 cfs 37.401 af Secondary=0.00 cfs 0.000 af Outflow=13.59 cfs 37.401 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=22.43' Storage=20.093 af Inflow=53.36 cfs 92.324 af
Primary=37.70 cfs 91.395 af Secondary=0.00 cfs 0.000 af Outflow=37.70 cfs 91.395 af

Pond 12P: Maple Springs Road Dam Peak Elev=39.32' Storage=4.917 af Inflow=13.10 cfs 19.312 af
Primary=9.78 cfs 19.310 af Secondary=0.00 cfs 0.000 af Outflow=9.78 cfs 19.310 af

Pond 13.1P: Bogs_L_US Peak Elev=30.88' Storage=0.493 af Inflow=26.03 cfs 33.821 af
Primary=26.01 cfs 33.822 af Secondary=0.00 cfs 0.000 af Outflow=26.01 cfs 33.822 af

Pond 13.2P: Bogs_L_DS Peak Elev=26.98' Storage=0.689 af Inflow=26.01 cfs 33.822 af
Primary=25.98 cfs 33.824 af Secondary=0.00 cfs 0.000 af Outflow=25.98 cfs 33.824 af

Pond 14P: Bogs_M - 2.7sm Peak Elev=17.85' Storage=10.616 af Inflow=82.44 cfs 160.916 af
Primary=78.79 cfs 160.749 af Secondary=0.00 cfs 0.000 af Outflow=78.79 cfs 160.749 af

Pond 15.1P: Bogs_N_US Peak Elev=26.48' Storage=11.693 af Inflow=51.53 cfs 37.152 af
Primary=29.00 cfs 37.147 af Tertiary=0.00 cfs 0.000 af Outflow=29.00 cfs 37.147 af

Pond 15.2P: Bogs_N_DS Peak Elev=20.89' Storage=20.682 af Inflow=29.00 cfs 37.147 af
Primary=13.41 cfs 34.773 af Tertiary=0.00 cfs 0.000 af Outflow=13.41 cfs 34.773 af

Pond 16.1: Mill Pond Dam -PC Peak Elev=15.56' Storage=685.471 af Inflow=397.54 cfs 877.308 af
rimary=143.54 cfs 619.604 af Secondary=32.88 cfs 186.821 af Tertiary=0.00 cfs 0.000 af Outflow=176.41 cfs 806.425 af

Pond 16.3: Downstream Weir Peak Elev=9.33' Storage=10,650 cf Inflow=143.54 cfs 619.589 af
Outflow=143.54 cfs 619.575 af

Pond 17B: Proposed Bridge Peak Elev=9.34' Storage=10,684 cf Inflow=143.54 cfs 619.604 af
518.0" x 127.0" Box Culvert n=0.013 L=60.0' S=0.0000 '/' Outflow=143.54 cfs 619.589 af

Link 23L: Inflow Inflow=365.54 cfs 655.156 af
Primary=365.54 cfs 655.156 af

Link A1: 1/2 Flow x 0.50 Inflow=265.84 cfs 146.155 af
Primary=132.92 cfs 73.078 af Secondary=132.92 cfs 73.078 af

Link B1: 1/2 Flow x 0.50 Inflow=56.39 cfs 27.317 af
Primary=28.20 cfs 13.658 af Secondary=28.20 cfs 13.658 af

Link C1: 1/2 Flow x 0.50 Inflow=78.12 cfs 60.042 af
Primary=39.06 cfs 30.021 af Secondary=39.06 cfs 30.021 af

Link D1: 1/2 Flow x 0.50 Inflow=85.05 cfs 33.026 af
Primary=42.52 cfs 16.513 af Secondary=42.52 cfs 16.513 af

Link E1: 1/2 Flow x 0.50 Inflow=330.27 cfs 151.263 af
Primary=165.14 cfs 75.631 af Secondary=165.14 cfs 75.631 af

Link F1: 1/2 Flow x 0.50 Inflow=28.68 cfs 24.432 af
Primary=14.34 cfs 12.216 af Secondary=14.34 cfs 12.216 af

Link G1: 1/2 Flow x 0.50 Inflow=29.85 cfs 23.041 af
Primary=14.93 cfs 11.521 af Secondary=14.93 cfs 11.521 af

Link H1: 1/2 Flow x 0.50 Inflow=2.77 cfs 3.448 af
Primary=1.39 cfs 1.724 af Secondary=1.39 cfs 1.724 af

Link I1: 1/2 Flow x 0.50 Inflow=29.15 cfs 19.546 af
Primary=14.58 cfs 9.773 af Secondary=14.58 cfs 9.773 af

Link JL: 1/2 Flow x 0.50 Inflow=12.10 cfs 12.370 af
Primary=6.05 cfs 6.185 af Secondary=6.05 cfs 6.185 af

Link KL: 1/2 Flow x 0.50 Inflow=32.72 cfs 27.976 af
Primary=16.36 cfs 13.988 af Secondary=16.36 cfs 13.988 af

Link LL: 1/2 Flow x 0.50 Inflow=25.13 cfs 27.573 af
Primary=12.56 cfs 13.786 af Secondary=12.56 cfs 13.786 af

Link ML: 1/2 Flow x 0.50 Inflow=36.93 cfs 30.144 af
Primary=18.46 cfs 15.072 af Secondary=18.46 cfs 15.072 af

Link NL: 1/2 Flow x 0.50 Inflow=50.93 cfs 32.987 af
Primary=25.46 cfs 16.493 af Secondary=25.46 cfs 16.493 af

Link OL: 1/2 Flow x 0.50 Inflow=271.33 cfs 137.514 af
Primary=135.67 cfs 68.757 af Secondary=135.67 cfs 68.757 af

Link PL: 1/2 Flow x 0.50 Inflow=38.94 cfs 16.450 af
Primary=19.47 cfs 8.225 af Secondary=19.47 cfs 8.225 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 773.285 af Average Runoff Depth = 1.88"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

Summary for Subcatchment A: A

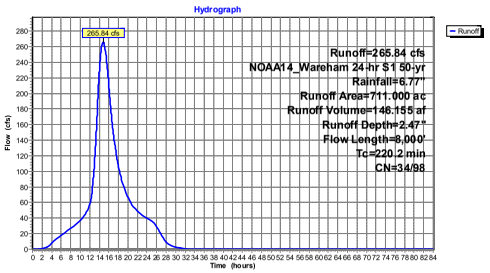
Runoff = 265.84 cfs @ 14.92 hrs, Volume= 146.155 af, Depth= 2.47"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

	Area (ac)	CN	Description
*	711.000	56	"33.99% imp"
	469.331	34	66.01% Pervious Area
	241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



Summary for Subcatchment B: B

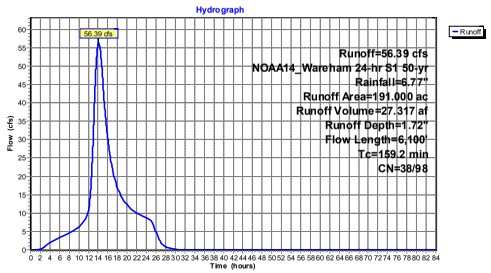
Runoff = 56.39 cfs @ 14.15 hrs, Volume= 27.317 af, Depth= 1.72"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

	Area (ac)	CN	Description
*	191.000	49	"18.54% imp"
	155.589	38	81.46% Pervious Area
	35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



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Summary for Subcatchment C: C

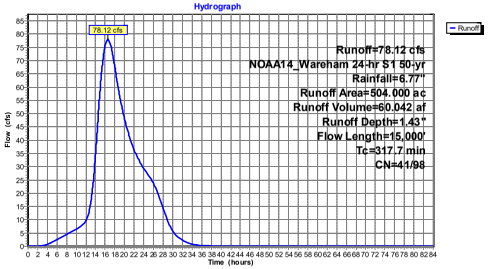
Runoff = 78.12 cfs @ 16.59 hrs, Volume= 60.042 af, Depth= 1.43"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 504.000	47	"10.54% imp"
450.878	41	89.46% Pervious Area
53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



Summary for Subcatchment D: D

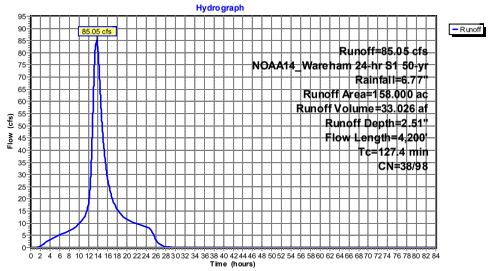
Runoff = 85.05 cfs @ 13.73 hrs, Volume= 33.026 af, Depth= 2.51"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 158.000	57	"31.94% imp"
107.535	38	68.06% Pervious Area
50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



Summary for Subcatchment E: E

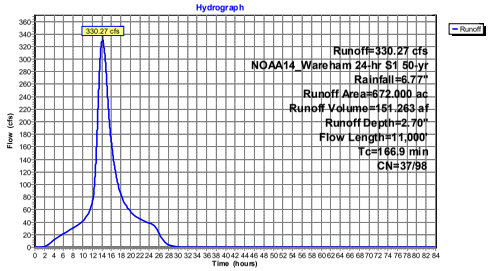
Runoff = 330.27 cfs @ 14.28 hrs, Volume= 151.263 af, Depth= 2.70"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 672.000	59	"35.91% imp"
430.685	37	64.09% Pervious Area
241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



Summary for Subcatchment F: F

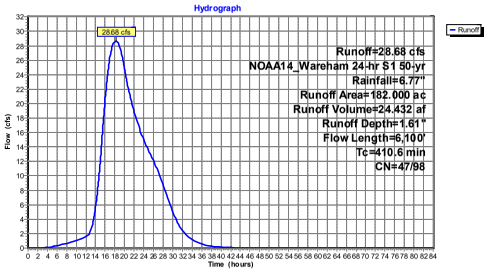
Runoff = 28.68 cfs @ 18.25 hrs, Volume= 24.432 af, Depth= 1.61"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 182.000	50	"6.11% imp"
170.880	47	93.89% Pervious Area
11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



Summary for Subcatchment G: G

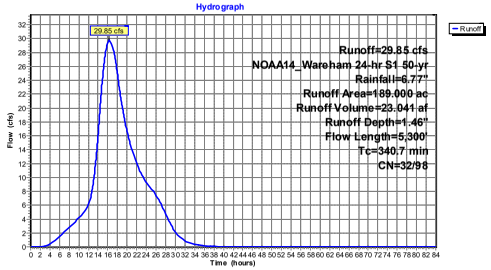
Runoff = 29.85 cfs @ 16.28 hrs, Volume= 23.041 af, Depth= 1.46"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 189.000	45	"19.09% imp"
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



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Summary for Subcatchment H: H

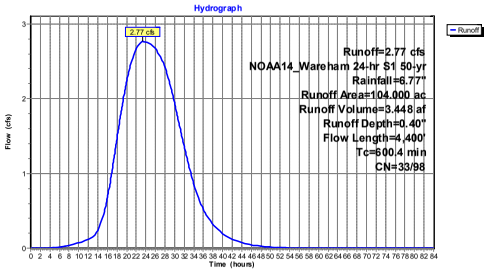
Runoff = 2.77 cfs @ 23.35 hrs, Volume= 3.448 af, Depth= 0.40"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 104.000	34	"1.27% imp"
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

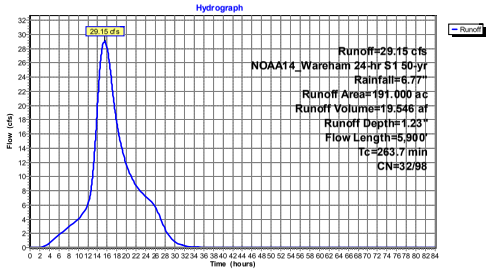
Runoff = 29.15 cfs @ 15.53 hrs, Volume= 19.546 af, Depth= 1.23"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 191.000	42	"15.34% imp"
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



Summary for Subcatchment J: J

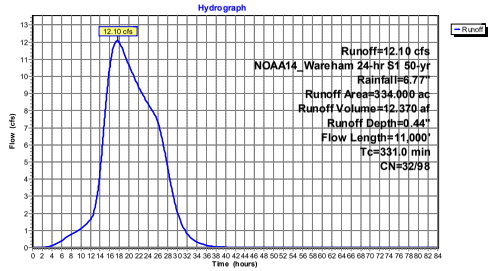
Runoff = 12.10 cfs @ 17.65 hrs, Volume= 12.370 af, Depth= 0.44"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 334.000	34	"2.83% imp"
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Summary for Subcatchment K: K

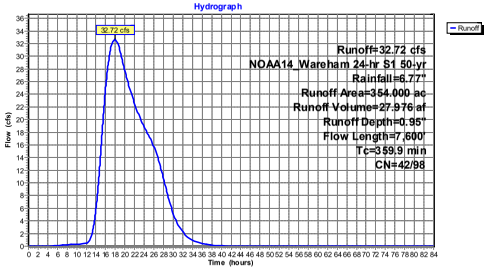
Runoff = 32.72 cfs @ 17.99 hrs, Volume= 27.976 af, Depth= 0.95"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 354.000	42	"0.83% imp"
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



Summary for Subcatchment L: L

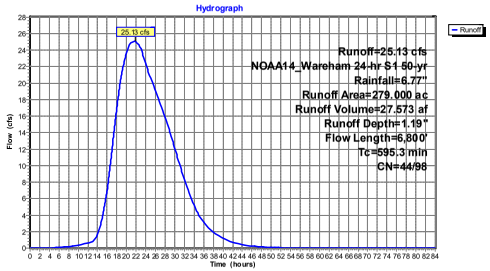
Runoff = 25.13 cfs @ 21.83 hrs, Volume= 27.573 af, Depth= 1.19"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 279.000	45	"2.43% imp"
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



Summary for Subcatchment M: M

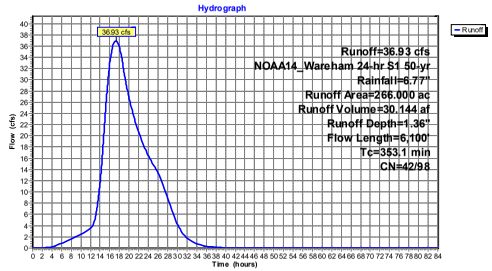
Runoff = 36.93 cfs @ 17.26 hrs, Volume= 30.144 af, Depth= 1.36"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 266.000	47	"8.14% imp"
244.348	42	91.86% Pervious Area
21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



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Summary for Subcatchment N: N

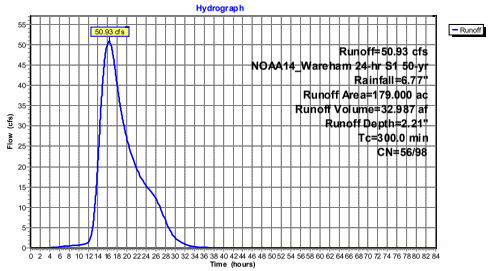
Runoff = 50.93 cfs @ 16.33 hrs, Volume= 32.987 af, Depth= 2.21"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 179.000	57	"3.17% imp"
173.326	56	96.83% Pervious Area
5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

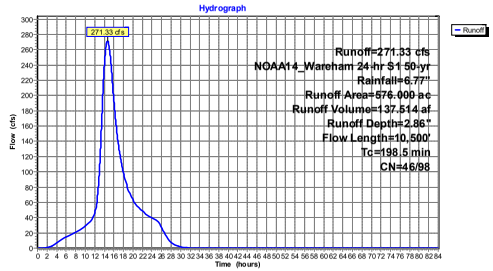
Runoff = 271.33 cfs @ 14.78 hrs, Volume= 137.514 af, Depth= 2.86"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 576.000	62	"31.1% imp"
396.864	46	68.90% Pervious Area
179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



Summary for Subcatchment P: P

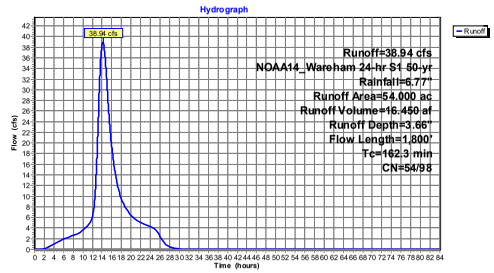
Runoff = 38.94 cfs @ 14.25 hrs, Volume= 16.450 af, Depth= 3.66"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 50-yr Rainfall=6.77"

Area (ac)	CN	Description
* 54.000	71	"38.05% imp"
33.453	54	61.95% Pervious Area
20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Summary for Pond 1P: Halfway Pond

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth > 2.72" for 50-yr event
Inflow = 268.04 cfs @ 14.92 hrs, Volume= 161.428 af, Incl. 2.20 cfs Base Flow
Outflow = 8.50 cfs @ 28.62 hrs, Volume= 47.353 af, Atten= 97%, Lag= 821.5 min
Primary = 8.50 cfs @ 28.62 hrs, Volume= 47.353 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 64.92' @ 28.62 hrs Storage= 509.663 af (139.053 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,669.8 min (2,787.2 - 1,117.5)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

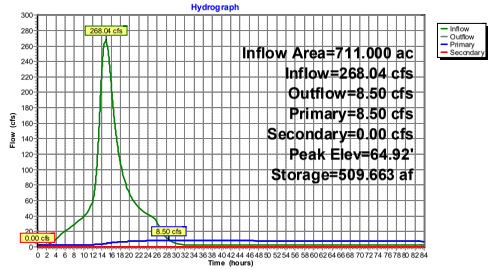
Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=8.49 cfs @ 28.62 hrs HW=64.92' TW=57.79' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 8.49 cfs @ 3.08 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 1P: Halfway Pond



Summary for Pond 2P: Kennard Res

Inflow Area = 902.000 ac, 30.72% Impervious, Inflow Depth > 1.05" for 50-yr event
Inflow = 60.80 cfs @ 14.15 hrs, Volume= 78.835 af, Incl. 0.60 cfs Base Flow
Outflow = 23.81 cfs @ 18.14 hrs, Volume= 74.474 af, Atten= 61%, Lag= 239.1 min
Primary = 23.81 cfs @ 18.14 hrs, Volume= 74.474 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 57.97' @ 18.14 hrs Storage= 17.698 af (13.698 af above start)

Plug-Flow detention time= 640.5 min calculated for 70.474 af (89% of inflow)
Center-of-Mass det. time= 233.1 min (2,371.5 - 2,138.4)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=23.80 cfs @ 18.14 hrs HW=57.97' TW=47.60' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 23.80 cfs @ 3.10 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.30' TW=46.77' (Dynamic Tailwater)
└**1=TOD** (Controls 0.00 cfs)

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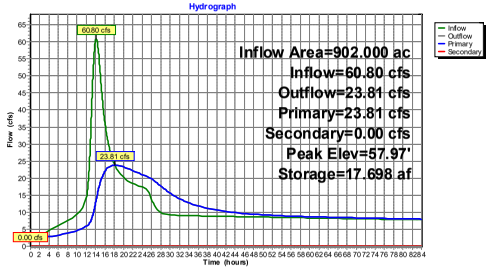
Pond 2P: Kennard Res



Summary for Pond 3P: Fawn Pond

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth > 2.77" for 50-yr event
Inflow = 85.55 cfs @ 13.73 hrs, Volume= 36.497 af, Incl. 0.50 cfs Base Flow
Outflow = 3.18 cfs @ 26.16 hrs, Volume= 15.106 af, Atten= 96%, Lag= 745.6 min
Primary = 3.18 cfs @ 26.16 hrs, Volume= 15.106 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 60.34' @ 26.16 hrs Storage= 58.342 af (30.622 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,651.9 min (2,703.1 - 1,051.1)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

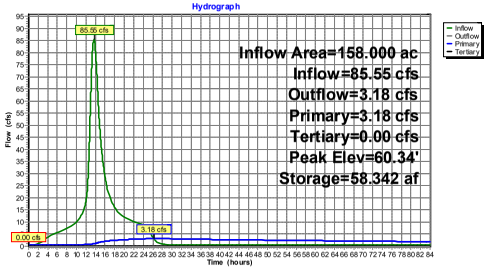
Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=3.18 cfs @ 26.16 hrs HW=60.34' TW=47.88' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 3.18 cfs @ 3.28 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=59.83' TW=46.77' (Dynamic Tailwater)
└**2=TOD South** (Controls 0.00 cfs)

Pond 3P: Fawn Pond



Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow Area = 1,564.000 ac, 24.34% Impervious, Inflow Depth > 1.23" for 50-yr event
Inflow = 104.94 cfs @ 16.59 hrs, Volume= 160.730 af, Incl. 1.60 cfs Base Flow
Outflow = 52.69 cfs @ 24.73 hrs, Volume= 151.661 af, Atten= 50%, Lag= 488.4 min
Primary = 52.69 cfs @ 24.73 hrs, Volume= 151.661 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 47.88' @ 24.73 hrs Storage= 51.000 af (41.280 af above start)

Plug-Flow detention time= 822.8 min calculated for 141.941 af (88% of inflow)
Center-of-Mass det. time= 374.0 min (2,328.1 - 1,954.1)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

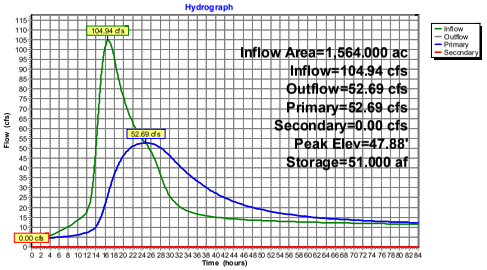
Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=52.68 cfs @ 24.73 hrs HW=47.88' TW=34.73' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 52.68 cfs @ 3.91 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=46.77' TW=33.99' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 4P: Bessey Bog Res - 2.4sm



Summary for Pond 5P: Glen Charlie Pond

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 1.70" for 50-yr event
Inflow = 343.60 cfs @ 14.28 hrs, Volume= 317.503 af, Incl. 2.10 cfs Base Flow
Outflow = 77.58 cfs @ 25.98 hrs, Volume= 284.867 af, Atten= 77%, Lag= 701.9 min
Primary = 76.85 cfs @ 25.98 hrs, Volume= 283.923 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 0.73 cfs @ 25.98 hrs, Volume= 0.944 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 34.73' @ 25.98 hrs Storage= 147.968 af (121.843 af above start)

Plug-Flow detention time= 1,392.6 min calculated for 258.742 af (81% of inflow)
Center-of-Mass det. time= 756.7 min (2,425.7 - 1,669.0)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00

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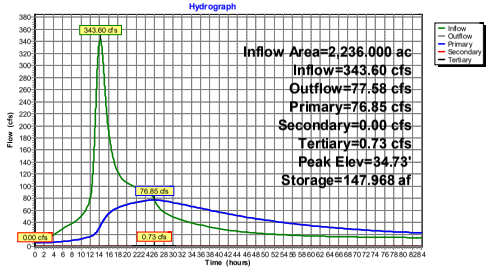
Elev. (feet) 41.00 40.00 39.00 37.70 37.70 41.00
#6 Tertiary 34.50' **24.0" W x 12.0" H Vert. NE Culvert** C= 0.600
Limited to weir flow at low heads

Primary OutFlow Max=76.73 cfs @ 25.98 hrs HW=34.73' TW=21.54' (Dynamic Tailwater)
└**1=Spillway** (Weir Controls 76.73 cfs @ 3.52 fps)
└**2=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
└**3=SE Dike** (Controls 0.00 cfs)
└**4=SE Culvert** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.71 cfs @ 25.98 hrs HW=34.73' TW=34.22' (Dynamic Tailwater)
└**5=NE Dike** (Controls 0.00 cfs)
└**6=NE Culvert** (Orifice Controls 0.71 cfs @ 1.54 fps)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 0.73 cfs @ 25.98 hrs, Volume= 0.944 af
Outflow = 0.07 cfs @ 42.53 hrs, Volume= 0.279 af, Atten= 90%, Lag= 993.3 min
Primary = 0.07 cfs @ 42.53 hrs, Volume= 0.279 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 34.25' @ 42.53 hrs Storage= 0.856 af

Plug-Flow detention time= 2,007.5 min calculated for 0.279 af (30% of inflow)
Center-of-Mass det. time= 1,592.5 min (3,246.5 - 1,654.0)

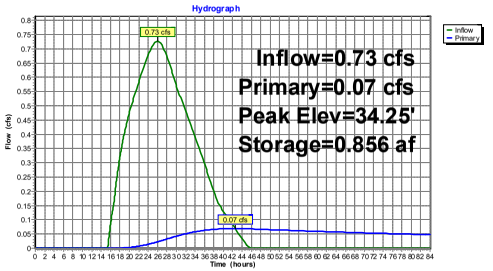
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=0.07 cfs @ 42.53 hrs HW=34.25' TW=23.11' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 0.07 cfs @ 0.71 fps)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



Summary for Pond 6.2P: Maple Sping Bogs US

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 1.63" for 50-yr event
Inflow = 28.68 cfs @ 18.25 hrs, Volume= 24.711 af
Outflow = 11.53 cfs @ 26.38 hrs, Volume= 22.872 af, Atten= 60%, Lag= 488.2 min
Primary = 11.53 cfs @ 26.38 hrs, Volume= 22.872 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 23.50' @ 26.38 hrs Storage= 13.930 af

Plug-Flow detention time= 909.7 min calculated for 22.872 af (93% of inflow)
Center-of-Mass det. time= 843.0 min (2,123.4 - 1,280.4)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

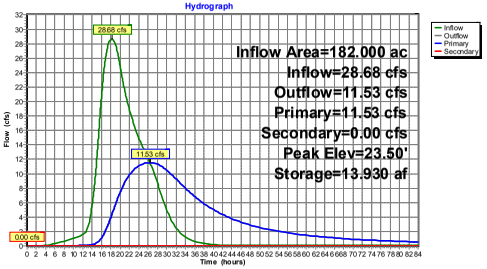
Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=11.51 cfs @ 26.38 hrs HW=23.50' TW=17.79' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 11.51 cfs @ 2.87 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.70' TW=17.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.2P: Maple Sping Bogs US



Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 1.51" for 50-yr event
Inflow = 11.53 cfs @ 26.38 hrs, Volume= 22.872 af
Outflow = 11.42 cfs @ 27.59 hrs, Volume= 22.645 af, Atten= 1%, Lag= 72.1 min
Primary = 11.42 cfs @ 27.59 hrs, Volume= 22.645 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 17.80' @ 27.59 hrs Storage= 1.594 af

Plug-Flow detention time= 130.3 min calculated for 22.644 af (99% of inflow)
Center-of-Mass det. time= 102.4 min (2,225.8 - 2,123.4)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=11.42 cfs @ 27.59 hrs HW=17.80' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 11.42 cfs @ 2.87 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

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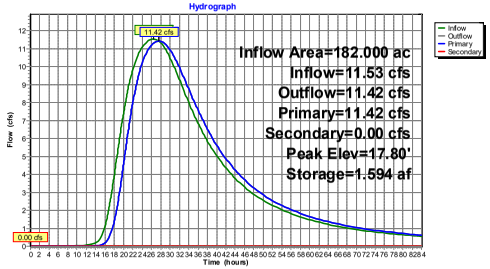
Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 1.52" for 50-yr event
Inflow = 76.85 cfs @ 25.98 hrs, Volume= 283.923 af
Outflow = 76.81 cfs @ 26.26 hrs, Volume= 283.025 af, Atten= 0%, Lag= 16.8 min
Primary = 76.81 cfs @ 26.26 hrs, Volume= 283.025 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 21.54' @ 26.26 hrs Storage= 2.920 af (2.473 af above start)

Plug-Flow detention time= 33.5 min calculated for 282.577 af (100% of inflow)
Center-of-Mass det. time= 17.3 min (2,445.6 - 2,428.3)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

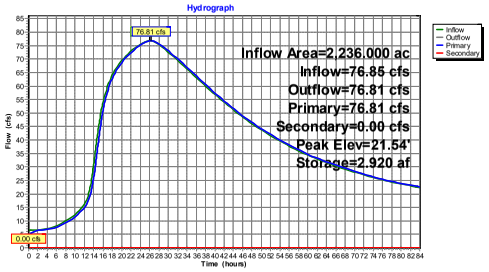
Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

Primary OutFlow Max=76.81 cfs @ 26.26 hrs HW=21.54' TW=0.00' (Dynamic Tailwater)
└**1=Bridge/Spillway** (Weir Controls 76.81 cfs @ 4.20 fps)
└**3=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.49' TW=22.70' (Dynamic Tailwater)
└**2=Culvert to Bogs** (Controls 0.00 cfs)
└**4=TOD_Bogs** (Controls 0.00 cfs)

Pond 6P: Maple Springs Dam - 3.5sm



Summary for Pond 7P: Little Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 1.72" for 50-yr event
Inflow = 30.44 cfs @ 16.28 hrs, Volume= 27.137 af, Incl. 0.59 cfs Base Flow
Outflow = 29.69 cfs @ 16.86 hrs, Volume= 27.087 af, Atten= 2%, Lag= 35.1 min
Primary = 29.69 cfs @ 16.86 hrs, Volume= 27.087 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 59.77' @ 16.86 hrs Storage= 24.164 af (2.004 af above start)

Plug-Flow detention time= 2,017.6 min calculated for 4.926 af (18% of inflow)
Center-of-Mass det. time= 59.3 min (1,373.0 - 1,313.7)

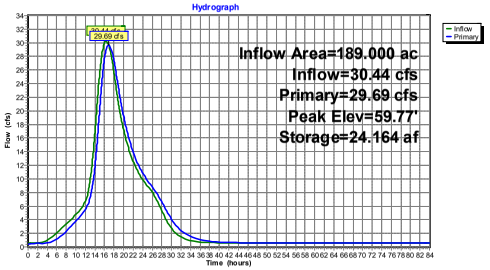
Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=29.69 cfs @ 16.86 hrs HW=59.77' TW=52.22' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 29.69 cfs @ 0.66 fps)

Pond 7P: Little Five Mile Pond



Summary for Pond 8P: Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 1.72" for 50-yr event
Inflow = 29.69 cfs @ 16.86 hrs, Volume= 27.087 af
Outflow = 2.50 cfs @ 31.87 hrs, Volume= 10.558 af, Atten= 92%, Lag= 900.3 min
Primary = 2.50 cfs @ 31.87 hrs, Volume= 10.558 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 52.73' @ 31.87 hrs Storage= 21.796 af

Plug-Flow detention time= 2,079.0 min calculated for 10.558 af (39% of inflow)
Center-of-Mass det. time= 1,572.2 min (2,945.2 - 1,373.0)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=2.47 cfs @ 31.87 hrs HW=52.73' TW=30.14' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 2.47 cfs @ 2.98 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=51.90' TW=29.60' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

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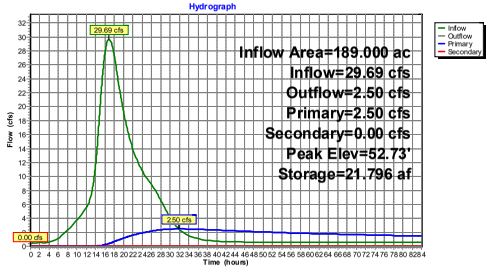
Pond 8P: Five Mile Pond



Summary for Pond 9P: Kettle Hole

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth > 0.64" for 50-yr event
Inflow = 3.07 cfs @ 23.35 hrs, Volume= 5.531 af, Incl. 0.30 cfs Base Flow
Outflow = 3.03 cfs @ 25.00 hrs, Volume= 5.540 af, Atten= 1%, Lag= 99.1 min
Primary = 3.03 cfs @ 25.00 hrs, Volume= 5.540 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.10' @ 25.00 hrs Storage= 9.340 af (0.390 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 76.3 min (1,979.5 - 1,903.2)

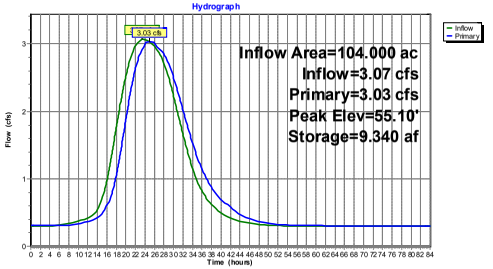
Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=2.99 cfs @ 25.00 hrs HW=55.10' TW=30.28' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 2.99 cfs @ 0.46 fps)

Pond 9P: Kettle Hole



Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow Area = 484.000 ac, 13.78% Impervious, Inflow Depth > 0.99" for 50-yr event
Inflow = 30.45 cfs @ 15.53 hrs, Volume= 39.810 af, Incl. 0.60 cfs Base Flow
Outflow = 13.59 cfs @ 21.97 hrs, Volume= 37.401 af, Atten= 55%, Lag= 386.4 min
Primary = 13.59 cfs @ 21.97 hrs, Volume= 37.401 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1.500 af
Peak Elev= 30.29' @ 21.97 hrs Storage= 11.788 af (10.288 af above start)

Plug-Flow detention time= 755.0 min calculated for 35.901 af (90% of inflow)
Center-of-Mass det. time= 398.4 min (2,229.9 - 1,831.5)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LiDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
35.00	115.000
36.50	160.000
40.00	300.000

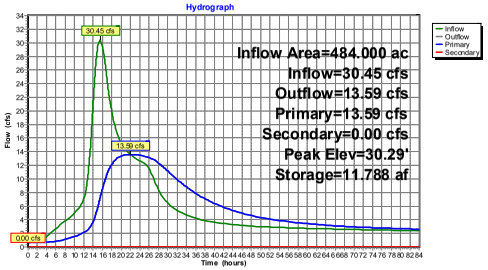
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=13.57 cfs @ 21.97 hrs HW=30.29' TW=22.34' (Dynamic Tailwater)
└**1=Drop Inlet Spillway** (Weir Controls 13.57 cfs @ 2.95 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.60' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 10P: Maple Springs Brook Dam - 0.8sm



Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow Area = 1,172.000 ac, 6.75% Impervious, Inflow Depth > 0.95" for 50-yr event
Inflow = 53.36 cfs @ 18.40 hrs, Volume= 92.324 af, Incl. 1.10 cfs Base Flow
Outflow = 37.70 cfs @ 26.63 hrs, Volume= 91.395 af, Atten= 29%, Lag= 494.0 min
Primary = 37.70 cfs @ 26.63 hrs, Volume= 91.395 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 22.43' @ 26.63 hrs Storage= 20.093 af (17.383 af above start)

Plug-Flow detention time= 390.3 min calculated for 88.685 af (96% of inflow)
Center-of-Mass det. time= 218.8 min (2,116.5 - 1,897.7)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=37.67 cfs @ 26.63 hrs HW=22.43' TW=17.77' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 37.67 cfs @ 4.40 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.26' TW=15.71' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

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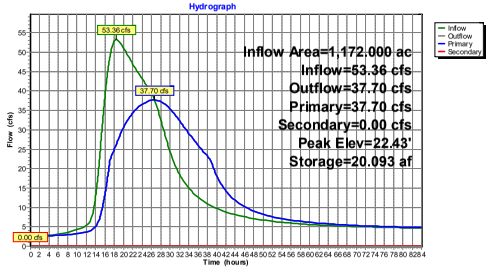
Pond 11P: Unnamed Road - 1.8sm



Summary for Pond 12P: Maple Springs Road Dam

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth > 0.69" for 50-yr event
Inflow = 13.10 cfs @ 17.65 hrs, Volume= 19.312 af, Incl. 1.00 cfs Base Flow
Outflow = 9.78 cfs @ 23.13 hrs, Volume= 19.310 af, Atten= 25%, Lag= 328.6 min
Primary = 9.78 cfs @ 23.13 hrs, Volume= 19.310 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 39.32' @ 23.13 hrs Storage= 4.917 af (3.837 af above start)

Plug-Flow detention time= 494.0 min calculated for 18.230 af (94% of inflow)
Center-of-Mass det. time= 226.9 min (1,920.7 - 1,693.8)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

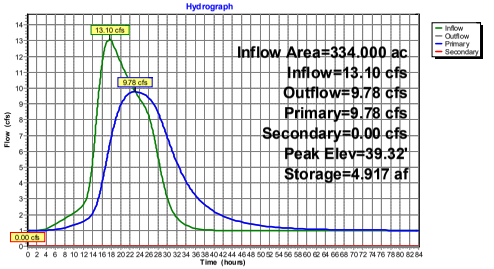
Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=9.77 cfs @ 23.13 hrs HW=39.32' TW=22.38' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 9.77 cfs @ 3.11 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=38.68' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 12P: Maple Springs Road Dam



Summary for Pond 13.1P: Bogs_L_US

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 1.45" for 50-yr event
Inflow = 26.03 cfs @ 21.83 hrs, Volume= 33.821 af, Incl. 0.90 cfs Base Flow
Outflow = 26.01 cfs @ 21.86 hrs, Volume= 33.822 af, Atten= 0%, Lag= 1.9 min
Primary = 26.01 cfs @ 21.86 hrs, Volume= 33.822 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 30.88' @ 21.86 hrs Storage= 0.493 af (0.439 af above start)

Plug-Flow detention time= 19.8 min calculated for 33.768 af (100% of inflow)
Center-of-Mass det. time= 12.0 min (1,672.3 - 1,660.4)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

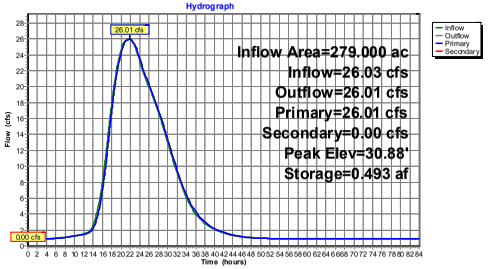
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=26.01 cfs @ 21.86 hrs HW=30.88' TW=26.98' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 26.01 cfs @ 3.77 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.65' TW=25.75' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.1P: Bogs_L_US



Summary for Pond 13.2P: Bogs_L_DS

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 1.45" for 50-yr event
Inflow = 26.01 cfs @ 21.86 hrs, Volume= 33.822 af
Outflow = 25.98 cfs @ 21.99 hrs, Volume= 33.824 af, Atten= 0%, Lag= 7.9 min
Primary = 25.98 cfs @ 21.99 hrs, Volume= 33.824 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 26.98' @ 21.99 hrs Storage= 0.689 af (0.614 af above start)

Plug-Flow detention time= 27.7 min calculated for 33.748 af (100% of inflow)
Center-of-Mass det. time= 16.7 min (1,689.1 - 1,672.3)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=25.98 cfs @ 21.99 hrs HW=26.98' TW=17.81' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 25.98 cfs @ 3.77 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

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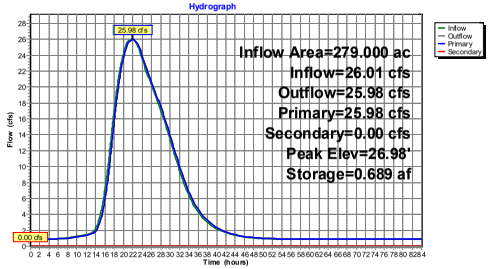
Pond 13.2P: Bogs_L_DS

Hydrograph



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow Area = 1,717.000 ac, 6.26% Impervious, Inflow Depth > 1.12" for 50-yr event
Inflow = 82.44 cfs @ 20.87 hrs, Volume= 160.916 af, Incl. 0.80 cfs Base Flow
Outflow = 78.79 cfs @ 23.62 hrs, Volume= 160.749 af, Atten= 4%, Lag= 165.1 min
Primary = 78.79 cfs @ 23.62 hrs, Volume= 160.749 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 17.85' @ 23.62 hrs Storage= 10.616 af (9.551 af above start)

Plug-Flow detention time= 92.3 min calculated for 159.684 af (99% of inflow)
Center-of-Mass det. time= 56.1 min (1,923.7 - 1,867.6)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

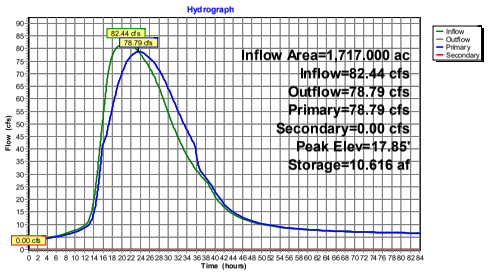
Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

Primary OutFlow Max=78.79 cfs @ 23.62 hrs HW=17.85' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 78.79 cfs @ 3.97 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.71' TW=0.00' (Dynamic Tailwater)
2=TOD (Controls 0.00 cfs)

Pond 14P: Bogs_M - 2.7sm

Hydrograph



Summary for Pond 15.1P: Bogs_N_US

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 2.49" for 50-yr event
Inflow = 51.53 cfs @ 16.33 hrs, Volume= 37.152 af, Incl. 0.60 cfs Base Flow
Outflow = 29.00 cfs @ 19.69 hrs, Volume= 37.147 af, Atten= 44%, Lag= 201.3 min
Primary = 29.00 cfs @ 19.69 hrs, Volume= 37.147 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 26.48' @ 19.69 hrs Storage= 11.693 af (11.341 af above start)

Plug-Flow detention time= 300.7 min calculated for 36.795 af (99% of inflow)
Center-of-Mass det. time= 253.6 min (1,555.7 - 1,302.1)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

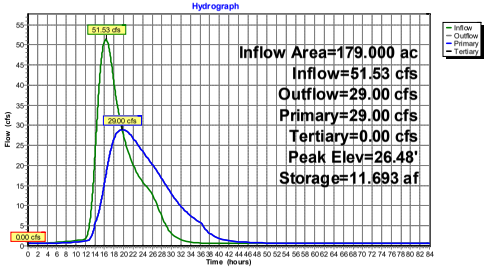
Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=28.99 cfs @ 19.69 hrs HW=26.48' TW=20.48' (Dynamic Tailwater)
1=Orifice/Grate (Orifice Controls 28.99 cfs @ 3.91 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.11' TW=20.11' (Dynamic Tailwater)
2=TOD (Controls 0.00 cfs)

Pond 15.1P: Bogs_N_US

Hydrograph



Summary for Pond 15.2P: Bogs_N_DS

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 2.49" for 50-yr event
Inflow = 29.00 cfs @ 19.69 hrs, Volume= 37.147 af
Outflow = 13.41 cfs @ 29.80 hrs, Volume= 34.773 af, Atten= 54%, Lag= 607.0 min
Primary = 13.41 cfs @ 29.80 hrs, Volume= 34.773 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 20.89' @ 29.80 hrs Storage= 20.682 af (18.115 af above start)

Plug-Flow detention time= 1,139.8 min calculated for 32.206 af (87% of inflow)
Center-of-Mass det. time= 819.8 min (2,375.6 - 1,555.7)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=13.39 cfs @ 29.80 hrs HW=20.89' TW=0.00' (Dynamic Tailwater)
1=Orifice/Grate (Orifice Controls 13.39 cfs @ 3.02 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
2=TOD (Controls 0.00 cfs)

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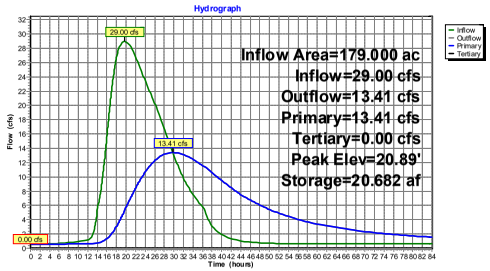
Pond 15.2P: Bogs_N_DS



Summary for Pond 16.1: Mill Pond Dam -PC

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 2.13" for 50-yr event
Inflow = 397.54 cfs @ 14.78 hrs, Volume= 877.308 af, Incl. 32.00 cfs Base Flow
Outflow = 176.41 cfs @ 32.69 hrs, Volume= 806.425 af, Atten= 56%, Lag= 1,075.1 min
Primary = 143.54 cfs @ 32.70 hrs, Volume= 619.604 af
Routed to Pond 17B : Proposed Bridge
Secondary = 32.88 cfs @ 32.69 hrs, Volume= 186.821 af
Routed to Pond Wr 24 :
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 17B : Proposed Bridge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 470.969 af
Peak Elev= 15.56' @ 32.70 hrs Storage= 685.471 af (214.502 af above start)

Plug-Flow detention time= 2,888.0 min calculated for 335.454 af (38% of inflow)
Center-of-Mass det. time= 512.6 min (2,614.5 - 2,101.9)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,941.850 af	**Storage** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.130
5.00	4.140
6.00	9.110
7.00	16.590
8.00	34.960
9.00	60.590
10.00	94.410
11.00	142.690
12.00	214.660
13.00	314.540
13.80	403.920
14.00	426.260
15.00	575.290
16.00	771.680
17.00	994.600
18.30	1,368.590
19.00	1,592.930
20.00	1,941.850

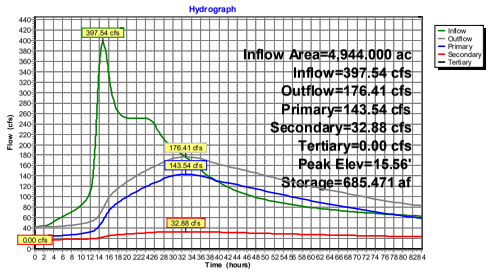
Device	Routing	Invert	Outlet Devices
#1	Primary	15.50'	**110.0' long x 1.5' breadth Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32
#2	Primary	13.60'	**15.0' long x 1.0' breadth Notch as SW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#3	Secondary	12.50'	**3.3' long x 1.0' breadth 3.25' Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#4	Tertiary	18.00'	**TOD, C= 2.60** Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00 Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 8	5.20'	**48.0" W x 48.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#7	Device 8	15.50'	**6.0' long x 20.00' rise MLO DownwardOpGate** 2 End Contraction(s) 5.0' Crest Height
#8	Tertiary	4.00'	**96.0" W x 48.0" H Box Culvert X 0.00** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 32.00 sf

Primary OutFlow Max=140.36 cfs @ 32.70 hrs HW=15.56' TW=9.34' (Dynamic Tailwater)
- **1=Spillway** (Weir Controls 4.35 cfs @ 0.65 fps)
- **2=Notch as SW** (Weir Controls 136.02 cfs @ 4.62 fps)

Secondary OutFlow Max=32.93 cfs @ 32.69 hrs HW=15.56' TW=15.09' (Dynamic Tailwater)
- **3=3.25' Weir** (Weir Controls 32.93 cfs @ 3.26 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.30' TW=8.48' (Dynamic Tailwater)
- **4=TOD** (Controls 0.00 cfs)
- **5=US Relief - Bypasses Dam** (Controls 0.00 cfs)
- **8=Culvert** (Controls 0.00 cfs)
  - **6=Orifice/Grate** (Controls 0.00 cfs)
  - **7=MLO DownwardOpGate** (Controls 0.00 cfs)

Pond 16.1: Mill Pond Dam -PC



Summary for Pond 16.3: Downstream Weir

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.50" for 50-yr event
Inflow = 143.54 cfs @ 32.70 hrs, Volume= 619.589 af
Outflow = 143.54 cfs @ 32.70 hrs, Volume= 619.575 af, Atten= 0%, Lag= 0.2 min
Primary = 143.54 cfs @ 32.70 hrs, Volume= 619.575 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 9.33' @ 32.70 hrs Surf.Area= 2,000 sf Storage= 10,650 cf (1,690 cf above start)

Plug-Flow detention time= 1.9 min calculated for 619.368 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,625.4 - 2,625.3)

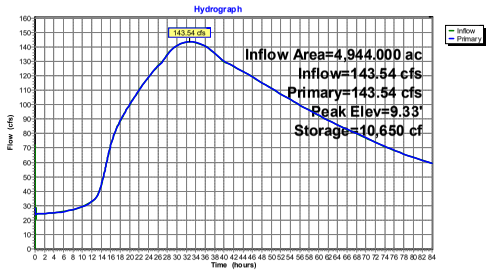
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	8.00'	**DS Weir, C= 2.60** Offset (feet) 0.00 0.00 23.00 23.00 Elev. (feet) 17.00 10.00 8.00 17.00
#2	Primary	8.00'	**27.0' long x 1.5' breadth El 8 Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32

Primary OutFlow Max=143.54 cfs @ 32.70 hrs HW=9.33' (Free Discharge)
- **1=DS Weir** (Weir Controls 24.18 cfs @ 1.20 fps)
- **2=El 8 Weir** (Weir Controls 119.36 cfs @ 3.34 fps)

Pond 16.3: Downstream Weir



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Summary for Pond 17B: Proposed Bridge

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.50" for 50-yr event
Inflow = 143.54 cfs @ 32.70 hrs, Volume= 619.589 af
Outflow = 143.54 cfs @ 32.70 hrs, Volume= 619.589 af, Atten= 0%, Lag= 0.2 min
Primary = 143.54 cfs @ 32.70 hrs, Volume= 619.589 af
Routed to Pond 16.3 : Downstream Weir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 9.34' @ 32.70 hrs Surf.Area= 2,000 sf Storage= 10,684 cf (1,724 cf above start)

Plug-Flow detention time= 1.9 min calculated for 619.383 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,625.3 - 2,625.1)

Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

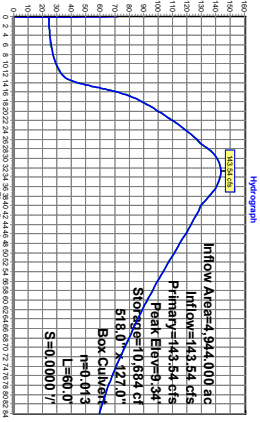
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	4.00'	**518.0" W x 127.0" H Box Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 456.85 sf

Primary OutFlow Max=143.54 cfs @ 32.70 hrs HW=9.34' TW=9.33' (Dynamic Tailwater)
1=Culvert (Inlet Controls 143.54 cfs @ 0.62 fps)

Pond 17B: Proposed Bridge

Hydrograph



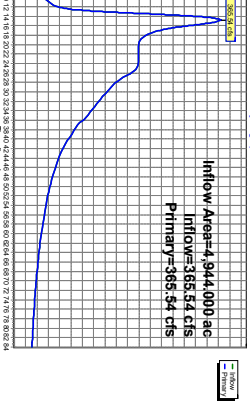
Summary for Link 23L: Inflow

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.59" for 50-yr event
Inflow = 365.54 cfs @ 14.78 hrs, Volume= 655.156 af
Primary = 365.54 cfs @ 14.78 hrs, Volume= 655.156 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16.1 : Mill Pond Dam -PC

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow

Hydrograph



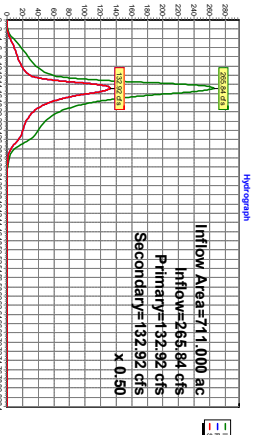
Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 2.47" for 50-yr event
Inflow = 265.84 cfs @ 14.92 hrs, Volume= 146.155 af
Primary = 132.92 cfs @ 14.92 hrs, Volume= 73.078 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 1P : Halfway Pond
Secondary = 132.92 cfs @ 14.92 hrs, Volume= 73.078 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow

Hydrograph



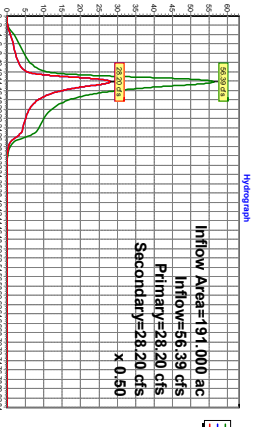
Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 1.72" for 50-yr event
Inflow = 56.39 cfs @ 14.15 hrs, Volume= 27.317 af
Primary = 28.20 cfs @ 14.15 hrs, Volume= 13.658 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 2P : Kennard Res
Secondary = 28.20 cfs @ 14.15 hrs, Volume= 13.658 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

Hydrograph



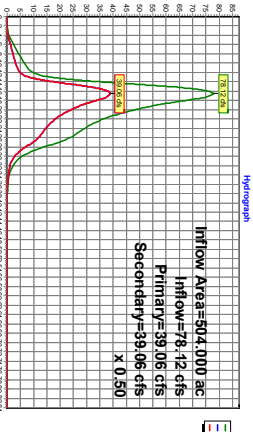
Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth = 1.43" for 50-yr event
Inflow = 78.12 cfs @ 16.59 hrs, Volume= 60.042 af
Primary = 39.06 cfs @ 16.59 hrs, Volume= 30.021 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 4P : Bessey Bog Res - 2.4in
Secondary = 39.06 cfs @ 16.59 hrs, Volume= 30.021 af
Routed to Pond 4P : Bessey Bog Res - 2.4in

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

Hydrograph

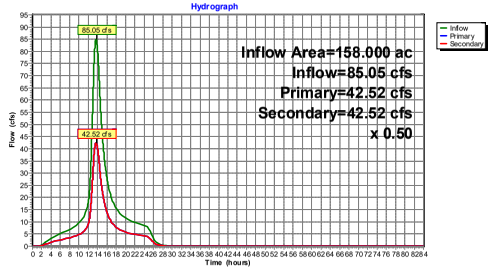


Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 2.51" for 50-yr event
Inflow = 85.05 cfs @ 13.73 hrs, Volume= 33.026 af
Primary = 42.52 cfs @ 13.73 hrs, Volume= 16.513 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 3P : Fawn Pond
Secondary = 42.52 cfs @ 13.73 hrs, Volume= 16.513 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow

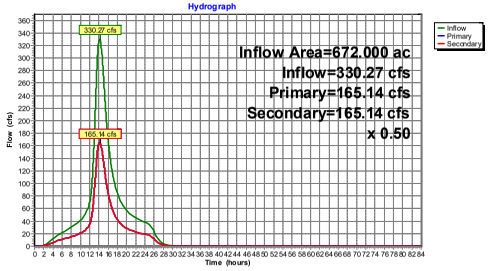


Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 2.70" for 50-yr event
Inflow = 330.27 cfs @ 14.28 hrs, Volume= 151.263 af
Primary = 165.14 cfs @ 14.28 hrs, Volume= 75.631 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 5P : Glen Charlie Pond
Secondary = 165.14 cfs @ 14.28 hrs, Volume= 75.631 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow

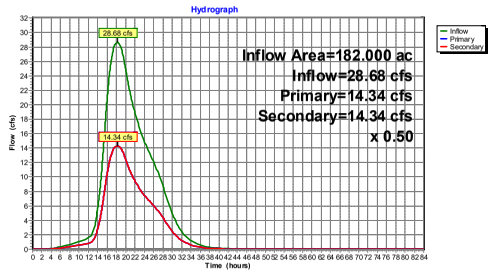


Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 1.61" for 50-yr event
Inflow = 28.68 cfs @ 18.25 hrs, Volume= 24.432 af
Primary = 14.34 cfs @ 18.25 hrs, Volume= 12.216 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 6.2P : Maple Sping Bogs US
Secondary = 14.34 cfs @ 18.25 hrs, Volume= 12.216 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow

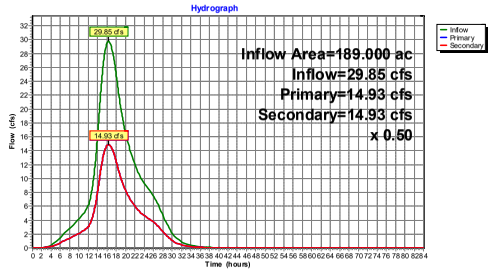


Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth = 1.46" for 50-yr event
Inflow = 29.85 cfs @ 16.28 hrs, Volume= 23.041 af
Primary = 14.93 cfs @ 16.28 hrs, Volume= 11.521 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 7P : Little Five Mile Pond
Secondary = 14.93 cfs @ 16.28 hrs, Volume= 11.521 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow

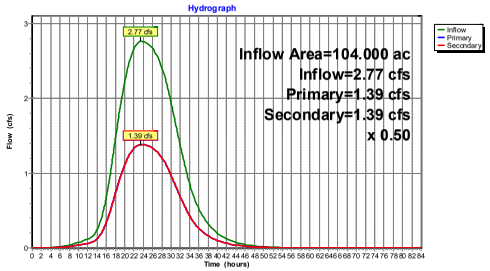


Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth = 0.40" for 50-yr event
Inflow = 2.77 cfs @ 23.35 hrs, Volume= 3.448 af
Primary = 1.39 cfs @ 23.35 hrs, Volume= 1.724 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 9P : Kettle Hole
Secondary = 1.39 cfs @ 23.35 hrs, Volume= 1.724 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow

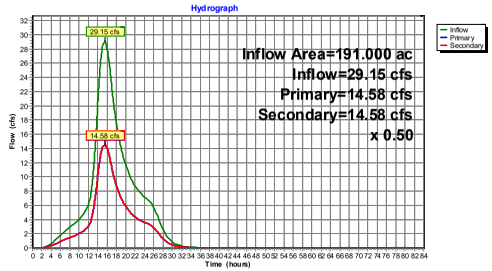


Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth = 1.23" for 50-yr event
Inflow = 29.15 cfs @ 15.53 hrs, Volume= 19.546 af
Primary = 14.58 cfs @ 15.53 hrs, Volume= 9.773 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 14.58 cfs @ 15.53 hrs, Volume= 9.773 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow



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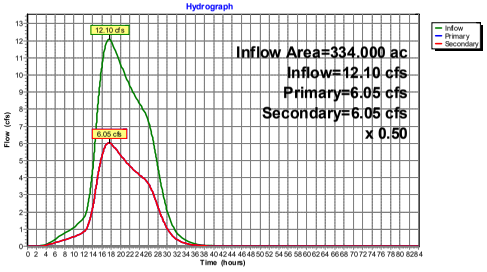
Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth = 0.44" for 50-yr event
Inflow = 12.10 cfs @ 17.65 hrs, Volume= 12.370 af
Primary = 6.05 cfs @ 17.65 hrs, Volume= 6.185 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 12P : Maple Springs Road Dam
Secondary = 6.05 cfs @ 17.65 hrs, Volume= 6.185 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow

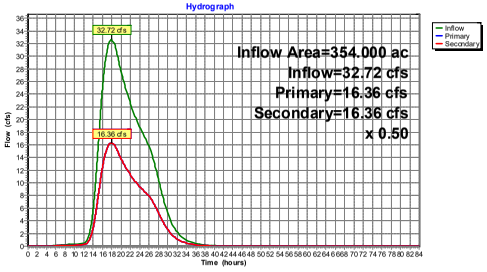


Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth = 0.95" for 50-yr event
Inflow = 32.72 cfs @ 17.99 hrs, Volume= 27.976 af
Primary = 16.36 cfs @ 17.99 hrs, Volume= 13.988 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 16.36 cfs @ 17.99 hrs, Volume= 13.988 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow

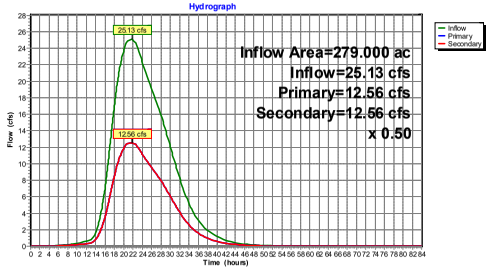


Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth = 1.19" for 50-yr event
Inflow = 25.13 cfs @ 21.83 hrs, Volume= 27.573 af
Primary = 12.56 cfs @ 21.83 hrs, Volume= 13.786 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 13.1P : Bogs_L_US
Secondary = 12.56 cfs @ 21.83 hrs, Volume= 13.786 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow

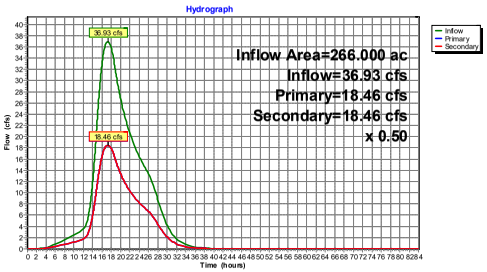


Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth = 1.36" for 50-yr event
Inflow = 36.93 cfs @ 17.26 hrs, Volume= 30.144 af
Primary = 18.46 cfs @ 17.26 hrs, Volume= 15.072 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 18.46 cfs @ 17.26 hrs, Volume= 15.072 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow

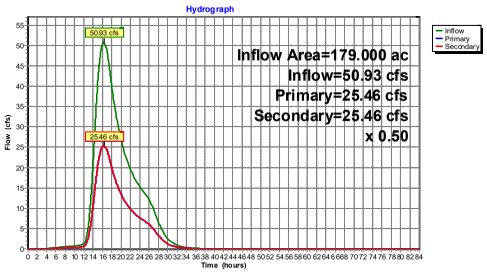


Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth = 2.21" for 50-yr event
Inflow = 50.93 cfs @ 16.33 hrs, Volume= 32.987 af
Primary = 25.46 cfs @ 16.33 hrs, Volume= 16.493 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 15.1P : Bogs_N_US
Secondary = 25.46 cfs @ 16.33 hrs, Volume= 16.493 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow

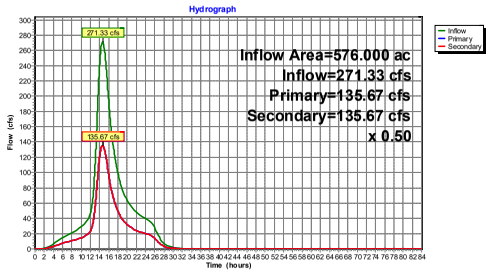


Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 2.86" for 50-yr event
Inflow = 271.33 cfs @ 14.78 hrs, Volume= 137.514 af
Primary = 135.67 cfs @ 14.78 hrs, Volume= 68.757 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 135.67 cfs @ 14.78 hrs, Volume= 68.757 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow



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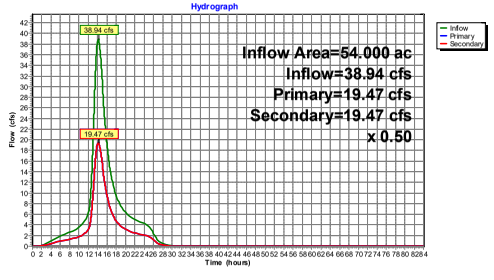
Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 3.66" for 50-yr event
Inflow = 38.94 cfs @ 14.25 hrs, Volume= 16.450 af
Primary = 19.47 cfs @ 14.25 hrs, Volume= 8.225 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 19.47 cfs @ 14.25 hrs, Volume= 8.225 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=2.87"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=309.85 cfs 170.022 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=2.08"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=69.98 cfs 33.138 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=1.79"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=101.18 cfs 75.385 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=2.94"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=101.21 cfs 38.737 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=3.15"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=388.24 cfs 176.131 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=2.04"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=37.32 cfs 30.864 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=1.75"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=35.53 cfs 27.633 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=0.60"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=4.32 cfs 5.184 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=1.50"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=35.36 cfs 23.827 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=0.64"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=18.73 cfs 17.755 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=1.28"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=46.15 cfs 37.854 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=1.56"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=33.67 cfs 36.172 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=1.73"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=48.58 cfs 38.292 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=2.73"
Tc=300.0 min CN=56/98 Runoff=64.43 cfs 40.771 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=3.37"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=325.91 cfs 161.962 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=4.26"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=46.13 cfs 19.150 af

Pond 1P: Halfway Pond Peak Elev=65.01' Storage=532.187 af Inflow=312.05 cfs 185.295 af
Primary=9.76 cfs 53.549 af Secondary=0.00 cfs 0.000 af Outflow=9.76 cfs 53.549 af

Pond 2P: Kennard Res Peak Elev=58.10' Storage=20.393 af Inflow=74.62 cfs 90.852 af
Primary=29.08 cfs 85.812 af Secondary=0.00 cfs 0.000 af Outflow=29.08 cfs 85.812 af

Pond 3P: Fawn Pond Peak Elev=60.44' Storage=63.352 af Inflow=101.71 cfs 42.208 af
Primary=3.98 cfs 18.256 af Tertiary=0.00 cfs 0.000 af Outflow=3.98 cfs 18.256 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=48.13' Storage=60.383 af Inflow=133.68 cfs 190.561 af
Primary=65.57 cfs 180.064 af Secondary=0.00 cfs 0.000 af Outflow=65.57 cfs 180.064 af

Pond 5P: Glen Charlie Pond Peak Elev=34.85' Storage=168.911 af Inflow=402.91 cfs 370.774 af
Primary=93.04 cfs 331.154 af Secondary=0.00 cfs 0.000 af Tertiary=1.35 cfs 2.024 af Outflow=94.38 cfs 333.178 af

Pond 6.1P: Ortalani Reservoir Peak Elev=34.30' Storage=1.727 af Inflow=1.35 cfs 2.024 af
Outflow=0.20 cfs 0.775 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=23.67' Storage=16.950 af Inflow=37.33 cfs 31.639 af
Primary=15.45 cfs 29.544 af Secondary=0.00 cfs 0.000 af Outflow=15.45 cfs 29.544 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=17.97' Storage=1.939 af Inflow=15.45 cfs 29.544 af
Primary=15.32 cfs 29.287 af Secondary=0.00 cfs 0.000 af Outflow=15.32 cfs 29.287 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=21.70' Storage=3.286 af Inflow=93.04 cfs 331.154 af
Primary=93.00 cfs 330.167 af Secondary=0.00 cfs 0.000 af Outflow=93.00 cfs 330.167 af

Pond 7P: Little Five Mile Pond Peak Elev=59.80' Storage=24.375 af Inflow=36.12 cfs 31.729 af
Outflow=35.42 cfs 31.678 af

Pond 8P: Five Mile Pond Peak Elev=52.87' Storage=25.508 af Inflow=35.42 cfs 31.678 af
Primary=3.35 cfs 13.564 af Secondary=0.00 cfs 0.000 af Outflow=3.35 cfs 13.564 af

Pond 9P: Kettle Hole Peak Elev=55.13' Storage=9.466 af Inflow=4.62 cfs 7.266 af
Outflow=4.55 cfs 7.275 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=30.43' Storage=13.985 af Inflow=36.78 cfs 48.830 af
Primary=17.51 cfs 46.087 af Secondary=0.00 cfs 0.000 af Outflow=17.51 cfs 46.087 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=22.72' Storage=27.760 af Inflow=73.00 cfs 116.271 af
Primary=49.53 cfs 115.191 af Secondary=0.00 cfs 0.000 af Outflow=49.53 cfs 115.191 af

Pond 12P: Maple Springs Road Dam Peak Elev=39.56' Storage=6.379 af Inflow=19.73 cfs 24.698 af
Primary=14.46 cfs 24.695 af Secondary=0.00 cfs 0.000 af Outflow=14.46 cfs 24.695 af

Pond 13.1P: Bogs_L_US Peak Elev=31.17' Storage=0.595 af Inflow=34.57 cfs 42.420 af
Primary=34.54 cfs 42.421 af Secondary=0.00 cfs 0.000 af Outflow=34.54 cfs 42.421 af

Pond 13.2P: Bogs_L_DS Peak Elev=27.27' Storage=0.833 af Inflow=34.54 cfs 42.421 af
Primary=34.52 cfs 42.423 af Secondary=0.00 cfs 0.000 af Outflow=34.52 cfs 42.423 af

Pond 14P: Bogs_M - 2.7sm Peak Elev=18.24' Storage=15.907 af Inflow=106.92 cfs 201.460 af
Primary=99.29 cfs 201.262 af Secondary=0.00 cfs 0.000 af Outflow=99.29 cfs 201.262 af

Pond 15.1P: Bogs_N_US Peak Elev=26.75' Storage=14.408 af Inflow=65.03 cfs 44.936 af
Primary=37.10 cfs 44.931 af Tertiary=0.00 cfs 0.000 af Outflow=37.10 cfs 44.931 af

Pond 15.2P: Bogs_N_DS Peak Elev=21.04' Storage=24.366 af Inflow=37.10 cfs 44.931 af
Primary=17.13 cfs 42.327 af Tertiary=0.00 cfs 0.000 af Outflow=17.13 cfs 42.327 af

Pond 16.1: Mill Pond Dam -PC Peak Elev=15.75' Storage=721.854 af Inflow=469.40 cfs 1,006.306 af
'rimary=191.90 cfs 729.735 af Secondary=35.14 cfs 195.559 af Tertiary=0.00 cfs 0.000 af Outflow=226.89 cfs 925.294 af

Pond 16.3: Downstream Weir Peak Elev=9.54' Storage=11,085 cf Inflow=193.84 cfs 729.717 af
Outflow=191.86 cfs 729.701 af

Pond 17B: Proposed Bridge Peak Elev=9.57' Storage=11,140 cf Inflow=191.90 cfs 729.735 af
518.0" x 127.0" Box Culvert n=0.013 L=60.0' S=0.0000 '/' Outflow=193.84 cfs 729.717 af

Link 23L: Inflow Inflow=437.40 cfs 784.155 af
Primary=437.40 cfs 784.155 af

Link A1: 1/2 Flow x 0.50 Inflow=309.85 cfs 170.022 af
Primary=154.93 cfs 85.011 af Secondary=154.93 cfs 85.011 af

Link B1: 1/2 Flow x 0.50 Inflow=69.98 cfs 33.138 af
Primary=34.99 cfs 16.569 af Secondary=34.99 cfs 16.569 af

Link C1: 1/2 Flow x 0.50 Inflow=101.18 cfs 75.385 af
Primary=50.59 cfs 37.693 af Secondary=50.59 cfs 37.693 af

Link D1: 1/2 Flow x 0.50 Inflow=101.21 cfs 38.737 af
Primary=50.61 cfs 19.369 af Secondary=50.61 cfs 19.369 af

Link E1: 1/2 Flow x 0.50 Inflow=388.24 cfs 176.131 af
Primary=194.12 cfs 88.066 af Secondary=194.12 cfs 88.066 af

Link F1: 1/2 Flow x 0.50 Inflow=37.32 cfs 30.864 af
Primary=18.66 cfs 15.432 af Secondary=18.66 cfs 15.432 af

Link G1: 1/2 Flow x 0.50 Inflow=35.53 cfs 27.633 af
Primary=17.77 cfs 13.817 af Secondary=17.77 cfs 13.817 af

Link H1: 1/2 Flow x 0.50 Inflow=4.32 cfs 5.184 af
Primary=2.16 cfs 2.592 af Secondary=2.16 cfs 2.592 af

Link I1: 1/2 Flow x 0.50 Inflow=35.36 cfs 23.827 af
Primary=17.68 cfs 11.913 af Secondary=17.68 cfs 11.913 af

Link JL: 1/2 Flow x 0.50 Inflow=18.73 cfs 17.755 af
Primary=9.37 cfs 8.878 af Secondary=9.37 cfs 8.878 af

Link KL: 1/2 Flow x 0.50 Inflow=46.15 cfs 37.854 af
Primary=23.08 cfs 18.927 af Secondary=23.08 cfs 18.927 af

Link LL: 1/2 Flow x 0.50 Inflow=33.67 cfs 36.172 af
Primary=16.84 cfs 18.086 af Secondary=16.84 cfs 18.086 af

Link ML: 1/2 Flow x 0.50 Inflow=48.58 cfs 38.292 af
Primary=24.29 cfs 19.146 af Secondary=24.29 cfs 19.146 af

Link NL: 1/2 Flow x 0.50 Inflow=64.43 cfs 40.771 af
Primary=32.21 cfs 20.386 af Secondary=32.21 cfs 20.386 af

Link OL: 1/2 Flow x 0.50 Inflow=325.91 cfs 161.962 af
Primary=162.96 cfs 80.981 af Secondary=162.96 cfs 80.981 af

Link PL: 1/2 Flow x 0.50 Inflow=46.13 cfs 19.150 af
Primary=23.06 cfs 9.575 af Secondary=23.06 cfs 9.575 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 932.877 af Average Runoff Depth = 2.26"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

Summary for Subcatchment A: A

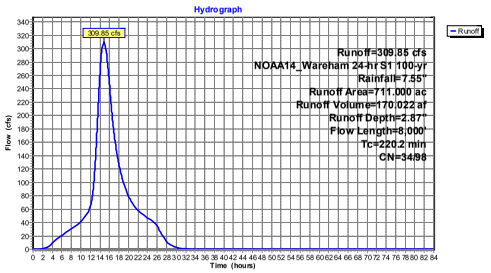
Runoff = 309.85 cfs @ 14.92 hrs, Volume= 170.022 af, Depth= 2.87"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	711.000	56	"33.99% imp"
	469.331	34	66.01% Pervious Area
	241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



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Summary for Subcatchment B: B

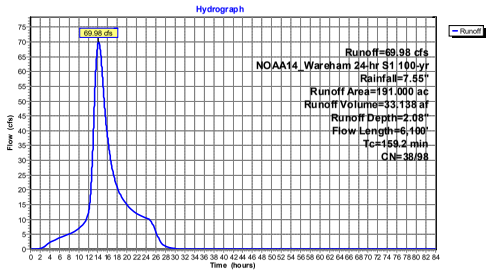
Runoff = 69.98 cfs @ 14.15 hrs, Volume= 33.138 af, Depth= 2.08"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	191.000	49	"18.54% imp"
	155.589	38	81.46% Pervious Area
	35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



Summary for Subcatchment C: C

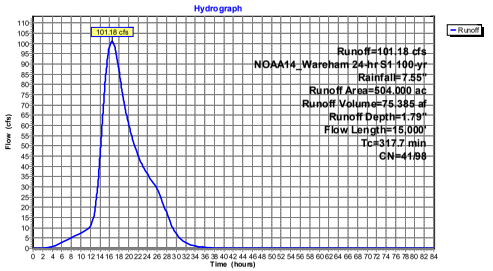
Runoff = 101.18 cfs @ 16.59 hrs, Volume= 75.385 af, Depth= 1.79"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	504.000	47	"10.54% imp"
	450.878	41	89.46% Pervious Area
	53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



Summary for Subcatchment D: D

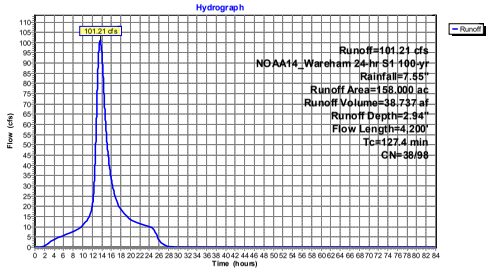
Runoff = 101.21 cfs @ 13.73 hrs, Volume= 38.737 af, Depth= 2.94"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	158.000	57	"31.94% imp"
	107.535	38	68.06% Pervious Area
	50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



Summary for Subcatchment E: E

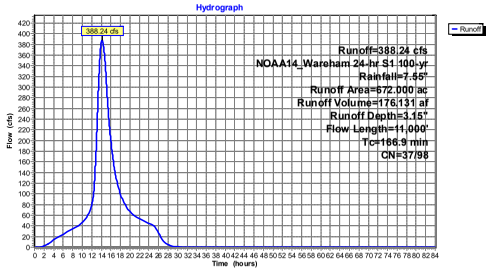
Runoff = 388.24 cfs @ 14.28 hrs, Volume= 176.131 af, Depth= 3.15"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	672.000	59	"35.91% imp"
	430.685	37	64.09% Pervious Area
	241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



Summary for Subcatchment F: F

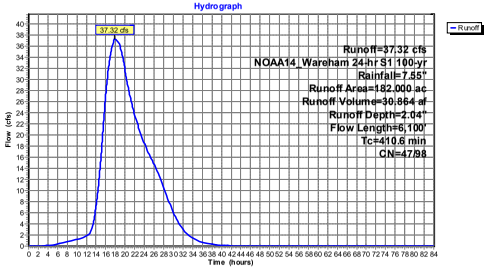
Runoff = 37.32 cfs @ 17.79 hrs, Volume= 30.864 af, Depth= 2.04"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	182.000	50	"6.11% imp"
	170.880	47	93.89% Pervious Area
	11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



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Summary for Subcatchment G: G

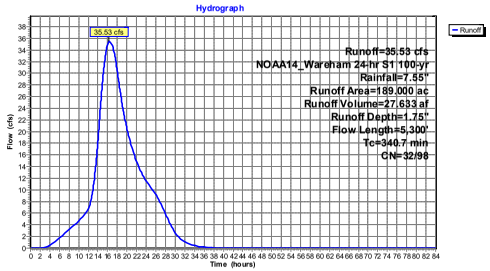
Runoff = 35.53 cfs @ 16.28 hrs, Volume= 27.633 af, Depth= 1.75"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

Area (ac)	CN	Description
* 189.000	45	"19.09% imp"
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



Summary for Subcatchment H: H

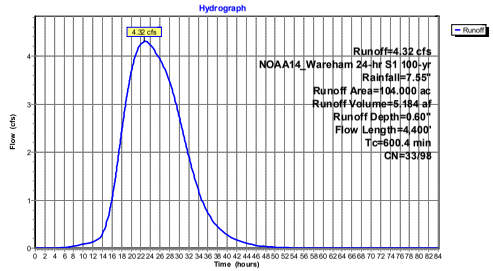
Runoff = 4.32 cfs @ 22.68 hrs, Volume= 5.184 af, Depth= 0.60"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

Area (ac)	CN	Description
* 104.000	34	"1.27% imp"
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

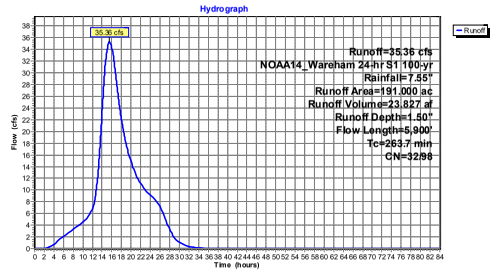
Runoff = 35.36 cfs @ 15.53 hrs, Volume= 23.827 af, Depth= 1.50"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

Area (ac)	CN	Description
* 191.000	42	"15.34% imp"
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



Summary for Subcatchment J: J

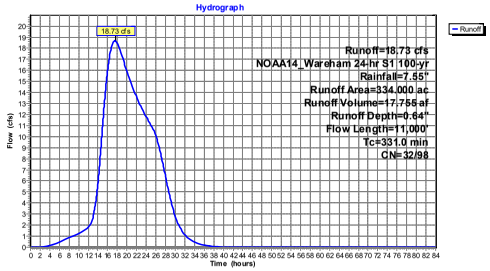
Runoff = 18.73 cfs @ 17.65 hrs, Volume= 17.755 af, Depth= 0.64"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

Area (ac)	CN	Description
* 334.000	34	"2.83% imp"
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Summary for Subcatchment K: K

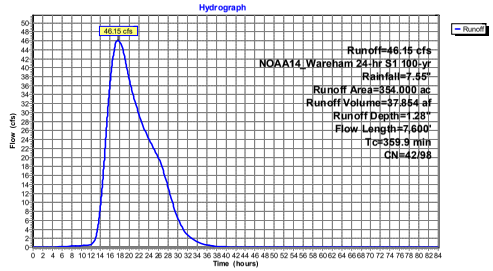
Runoff = 46.15 cfs @ 17.60 hrs, Volume= 37.854 af, Depth= 1.28"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

Area (ac)	CN	Description
* 354.000	42	"0.83% imp"
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



Summary for Subcatchment L: L

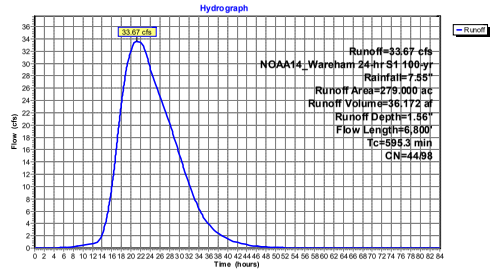
Runoff = 33.67 cfs @ 21.17 hrs, Volume= 36.172 af, Depth= 1.56"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

Area (ac)	CN	Description
* 279.000	45	"2.43% imp"
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



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Summary for Subcatchment M: M

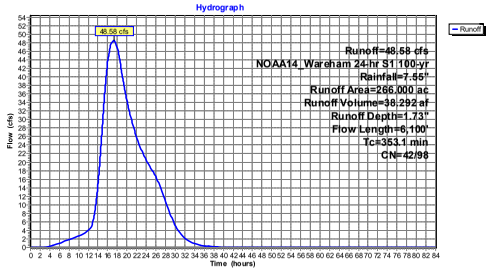
Runoff = 48.58 cfs @ 17.26 hrs, Volume= 38.292 af, Depth= 1.73"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	266.000	47	"8.14% imp"
	244.348	42	91.86% Pervious Area
	21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



Summary for Subcatchment N: N

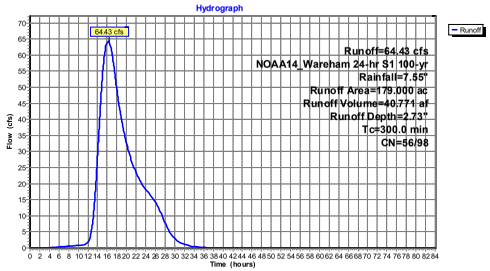
Runoff = 64.43 cfs @ 16.33 hrs, Volume= 40.771 af, Depth= 2.73"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	179.000	57	"3.17% imp"
	173.326	56	96.83% Pervious Area
	5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

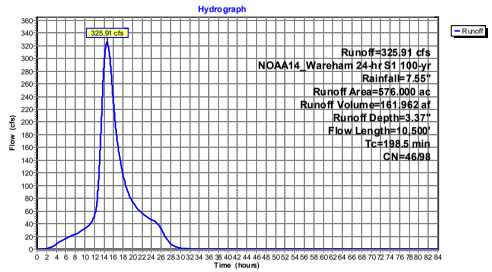
Runoff = 325.91 cfs @ 14.78 hrs, Volume= 161.962 af, Depth= 3.37"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	576.000	62	"31.1% imp"
	396.864	46	68.90% Pervious Area
	179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



Summary for Subcatchment P: P

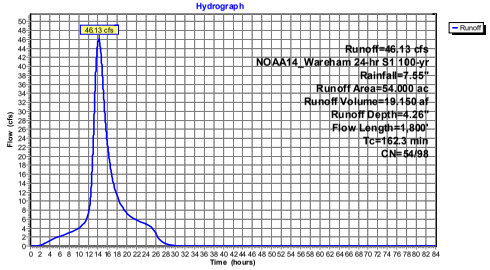
Runoff = 46.13 cfs @ 14.25 hrs, Volume= 19.150 af, Depth= 4.26"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	54.000	71	"38.05% imp"
	33.453	54	61.95% Pervious Area
	20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Summary for Pond 1P: Halfway Pond

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth > 3.13" for 100-yr event
Inflow = 312.05 cfs @ 14.92 hrs, Volume= 185.295 af, Incl. 2.20 cfs Base Flow
Outflow = 9.76 cfs @ 28.59 hrs, Volume= 53.549 af, Atten= 97%, Lag= 820.0 min
Primary = 9.76 cfs @ 28.59 hrs, Volume= 53.549 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 65.01' @ 28.59 hrs Storage= 532.187 af (161.577 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,699.9 min (2,802.0 - 1,102.1)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

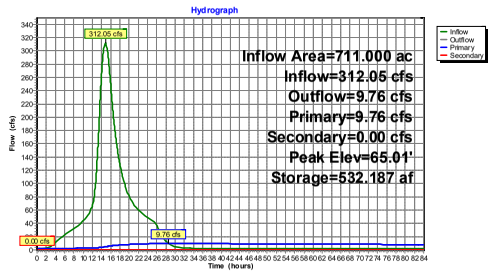
Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=9.76 cfs @ 28.59 hrs HW=65.01' TW=57.87' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 9.76 cfs @ 3.22 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 1P: Halfway Pond



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Summary for Pond 2P: Kennard Res

Inflow Area = 902.000 ac, 30.72% Impervious, Inflow Depth > 1.21" for 100-yr event
Inflow = 74.62 cfs @ 14.15 hrs, Volume= 90.852 af, Incl. 0.60 cfs Base Flow
Outflow = 29.08 cfs @ 17.97 hrs, Volume= 85.812 af, Atten= 61%, Lag= 229.4 min
Primary = 29.08 cfs @ 17.97 hrs, Volume= 85.812 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 58.10' @ 17.97 hrs Storage= 20.393 af (16.393 af above start)

Plug-Flow detention time= 610.4 min calculated for 81.811 af (90% of inflow)
Center-of-Mass det. time= 235.2 min (2,352.3 - 2,117.0)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

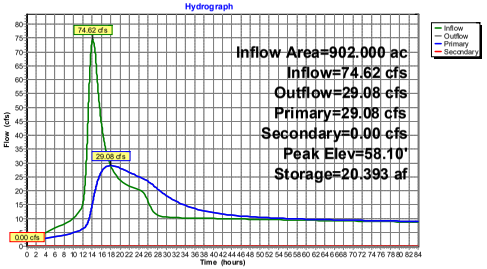
Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=29.06 cfs @ 17.97 hrs HW=58.10' TW=47.77' (Dynamic Tailwater)
↳**2=Sharp-Crested Rectangular Weir** (Weir Controls 29.06 cfs @ 3.32 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.30' TW=46.77' (Dynamic Tailwater)
↳**1=TOD** (Controls 0.00 cfs)

Pond 2P: Kennard Res



Summary for Pond 3P: Fawn Pond

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth > 3.21" for 100-yr event
Inflow = 101.71 cfs @ 13.73 hrs, Volume= 42.208 af, Incl. 0.50 cfs Base Flow
Outflow = 3.98 cfs @ 26.07 hrs, Volume= 18.256 af, Atten= 96%, Lag= 740.4 min
Primary = 3.98 cfs @ 26.07 hrs, Volume= 18.256 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 60.44' @ 26.07 hrs Storage= 63.352 af (35.632 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,662.1 min (2,695.2 - 1,033.0)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

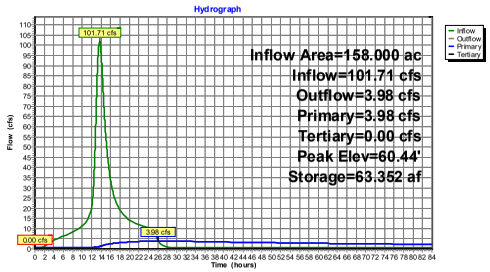
Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=3.98 cfs @ 26.07 hrs HW=60.44' TW=48.11' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 3.98 cfs @ 3.48 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=59.83' TW=46.77' (Dynamic Tailwater)
↳**2=TOD South** (Controls 0.00 cfs)

Pond 3P: Fawn Pond



Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow Area = 1,564.000 ac, 24.34% Impervious, Inflow Depth > 1.46" for 100-yr event
Inflow = 133.68 cfs @ 16.59 hrs, Volume= 190.561 af, Incl. 1.60 cfs Base Flow
Outflow = 65.57 cfs @ 24.25 hrs, Volume= 180.064 af, Atten= 51%, Lag= 459.5 min
Primary = 65.57 cfs @ 24.25 hrs, Volume= 180.064 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 48.13' @ 24.25 hrs Storage= 60.383 af (50.663 af above start)

Plug-Flow detention time= 778.2 min calculated for 170.344 af (89% of inflow)
Center-of-Mass det. time= 377.8 min (2,294.3 - 1,916.5)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

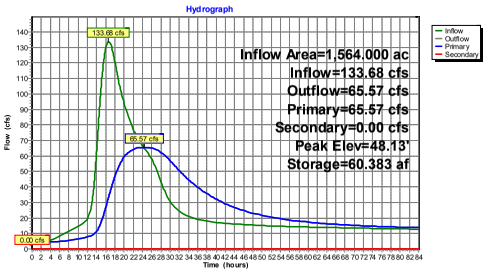
Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=65.59 cfs @ 24.25 hrs HW=48.13' TW=34.84' (Dynamic Tailwater)
↳**1=Sharp-Crested Rectangular Weir** (Orifice Controls 65.59 cfs @ 4.51 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=46.77' TW=33.99' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 4P: Bessey Bog Res - 2.4sm



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Summary for Pond 5P: Glen Charlie Pond

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 1.99" for 100-yr event
Inflow = 402.91 cfs @ 14.28 hrs, Volume= 370.774 af, Incl. 2.10 cfs Base Flow
Outflow = 94.38 cfs @ 25.96 hrs, Volume= 333.178 af, Atten= 77%, Lag= 700.8 min
Primary = 93.04 cfs @ 25.96 hrs, Volume= 331.154 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 1.35 cfs @ 25.96 hrs, Volume= 2.024 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 34.85' @ 25.96 hrs Storage= 168.911 af (142.786 af above start)

Plug-Flow detention time= 1,326.7 min calculated for 307.049 af (83% of inflow)
Center-of-Mass det. time= 750.5 min (2,405.1 - 1,654.6)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00

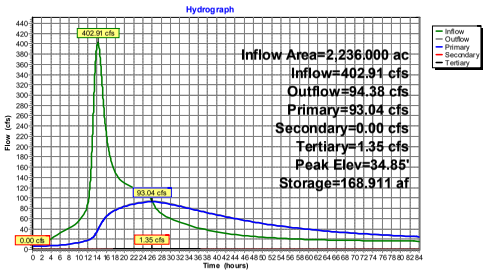
			Elev. (feet) 41.00 40.00 39.00 37.70 37.70 41.00
#6	Tertiary	34.50'	**24.0" W x 12.0" H Vert. NE Culvert** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=92.91 cfs @ 25.96 hrs HW=34.85' TW=21.70' (Dynamic Tailwater)
1=**Spillway** (Weir Controls 92.91 cfs @ 3.78 fps)
2=**TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
3=**SE Dike** (Controls 0.00 cfs)
4=**SE Culvert** (Controls 0.00 cfs)

Tertiary OutFlow Max=1.33 cfs @ 25.96 hrs HW=34.85' TW=34.25' (Dynamic Tailwater)
5=**NE Dike** (Controls 0.00 cfs)
6=**NE Culvert** (Orifice Controls 1.33 cfs @ 1.90 fps)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 1.35 cfs @ 25.96 hrs, Volume= 2.024 af
Outflow = 0.20 cfs @ 43.92 hrs, Volume= 0.775 af, Atten= 85%, Lag= 1,077.9 min
Primary = 0.20 cfs @ 43.92 hrs, Volume= 0.775 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 34.30' @ 43.92 hrs Storage= 1.727 af

Plug-Flow detention time= 1,938.5 min calculated for 0.775 af (38% of inflow)
Center-of-Mass det. time= 1,516.9 min (3,223.8 - 1,706.9)

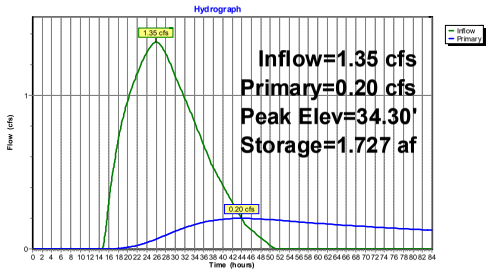
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=0.20 cfs @ 43.92 hrs HW=34.30' TW=23.13' (Dynamic Tailwater)
1=**Orifice/Grate** (Orifice Controls 0.20 cfs @ 1.01 fps)
2=**TOD** (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



Summary for Pond 6.2P: Maple Sping Bogs US

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 2.09" for 100-yr event
Inflow = 37.33 cfs @ 17.79 hrs, Volume= 31.639 af
Outflow = 15.45 cfs @ 25.64 hrs, Volume= 29.544 af, Atten= 59%, Lag= 470.9 min
Primary = 15.45 cfs @ 25.64 hrs, Volume= 29.544 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 23.67' @ 25.64 hrs Storage= 16.950 af

Plug-Flow detention time= 859.3 min calculated for 29.544 af (93% of inflow)
Center-of-Mass det. time= 779.0 min (2,079.9 - 1,300.9)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

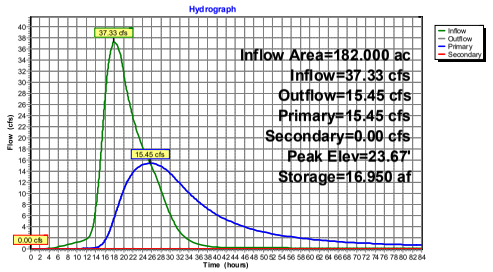
Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=15.44 cfs @ 25.64 hrs HW=23.67' TW=17.96' (Dynamic Tailwater)
1=**Orifice/Grate** (Orifice Controls 15.44 cfs @ 3.17 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.70' TW=17.00' (Dynamic Tailwater)
2=**TOD** (Controls 0.00 cfs)

Pond 6.2P: Maple Sping Bogs US



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Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 1.95" for 100-yr event
Inflow = 15.45 cfs @ 25.64 hrs, Volume= 29.544 af
Outflow = 15.32 cfs @ 26.80 hrs, Volume= 29.287 af, Atten= 1%, Lag= 69.3 min
Primary = 15.32 cfs @ 26.80 hrs, Volume= 29.287 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 17.97' @ 26.80 hrs Storage= 1.939 af

Plug-Flow detention time= 118.9 min calculated for 29.286 af (99% of inflow)
Center-of-Mass det. time= 94.0 min (2,173.9 - 2,079.9)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

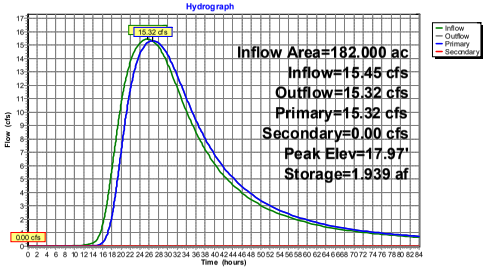
Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=15.32 cfs @ 26.80 hrs HW=17.97' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 15.32 cfs @ 3.16 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 1.78" for 100-yr event
Inflow = 93.04 cfs @ 25.96 hrs, Volume= 331.154 af
Outflow = 93.00 cfs @ 26.22 hrs, Volume= 330.167 af, Atten= 0%, Lag= 15.6 min
Primary = 93.00 cfs @ 26.22 hrs, Volume= 330.167 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 21.70' @ 26.22 hrs Storage= 3.286 af (2.839 af above start)

Plug-Flow detention time= 31.5 min calculated for 329.716 af (100% of inflow)
Center-of-Mass det. time= 16.9 min (2,426.3 - 2,409.4)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

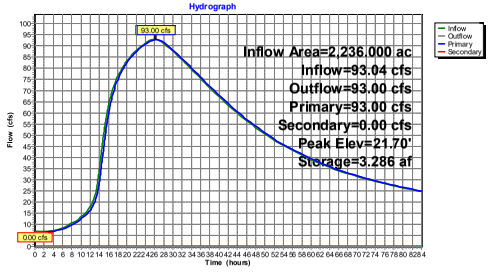
Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

Primary OutFlow Max=93.00 cfs @ 26.22 hrs HW=21.70' TW=0.00' (Dynamic Tailwater)
└**1=Bridge/Spillway** (Weir Controls 93.00 cfs @ 4.52 fps)
└**3=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.49' TW=22.70' (Dynamic Tailwater)
└**2=Culvert to Bogs** (Controls 0.00 cfs)
└**4=TOD_Bogs** (Controls 0.00 cfs)

Pond 6P: Maple Springs Dam - 3.5sm



Summary for Pond 7P: Little Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 2.01" for 100-yr event
Inflow = 36.12 cfs @ 16.28 hrs, Volume= 31.729 af, Incl. 0.59 cfs Base Flow
Outflow = 35.42 cfs @ 16.92 hrs, Volume= 31.678 af, Atten= 2%, Lag= 38.7 min
Primary = 35.42 cfs @ 16.92 hrs, Volume= 31.678 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 59.80' @ 16.92 hrs Storage= 24.375 af (2.215 af above start)

Plug-Flow detention time= 1,349.0 min calculated for 9.518 af (30% of inflow)
Center-of-Mass det. time= 56.6 min (1,346.8 - 1,290.2)

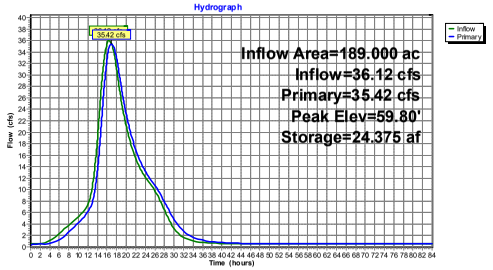
Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=35.42 cfs @ 16.92 hrs HW=59.80' TW=52.28' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 35.42 cfs @ 0.68 fps)

Pond 7P: Little Five Mile Pond



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Summary for Pond 8P: Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 2.01" for 100-yr event
Inflow = 35.42 cfs @ 16.92 hrs, Volume= 31.678 af
Outflow = 3.35 cfs @ 31.28 hrs, Volume= 13.564 af, Atten= 91%, Lag= 861.4 min
Primary = 3.35 cfs @ 31.28 hrs, Volume= 13.564 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 52.87' @ 31.28 hrs Storage= 25.508 af

Plug-Flow detention time= 2,007.7 min calculated for 13.563 af (43% of inflow)
Center-of-Mass det. time= 1,552.2 min (2,899.0 - 1,346.8)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

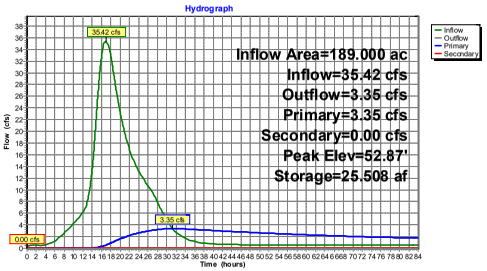
Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=3.33 cfs @ 31.28 hrs HW=52.87' TW=30.27' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 3.33 cfs @ 3.24 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=51.90' TW=29.60' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 8P: Five Mile Pond



Summary for Pond 9P: Kettle Hole

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth > 0.84" for 100-yr event
Inflow = 4.62 cfs @ 22.68 hrs, Volume= 7.266 af, Incl. 0.30 cfs Base Flow
Outflow = 4.55 cfs @ 23.83 hrs, Volume= 7.275 af, Atten= 1%, Lag= 69.0 min
Primary = 4.55 cfs @ 23.83 hrs, Volume= 7.275 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.13' @ 23.83 hrs Storage= 9.466 af (0.516 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 76.3 min (1,881.3 - 1,805.0)

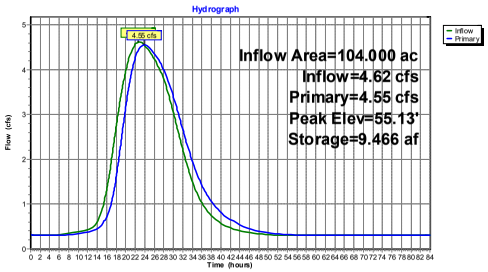
Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=4.55 cfs @ 23.83 hrs HW=55.13' TW=30.43' (Dynamic Tailwater)
↳**1=Relief** (Weir Controls 4.55 cfs @ 0.50 fps)

Pond 9P: Kettle Hole



Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow Area = 484.000 ac, 13.78% Impervious, Inflow Depth > 1.21" for 100-yr event
Inflow = 36.78 cfs @ 15.53 hrs, Volume= 48.830 af, Incl. 0.60 cfs Base Flow
Outflow = 17.51 cfs @ 22.87 hrs, Volume= 46.087 af, Atten= 52%, Lag= 440.5 min
Primary = 17.51 cfs @ 22.87 hrs, Volume= 46.087 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1.500 af
Peak Elev= 30.43' @ 22.87 hrs Storage= 13.985 af (12.485 af above start)

Plug-Flow detention time= 701.3 min calculated for 44.586 af (91% of inflow)
Center-of-Mass det. time= 391.4 min (2,204.7 - 1,813.3)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LiDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
35.00	115.000
36.50	160.000
40.00	300.000

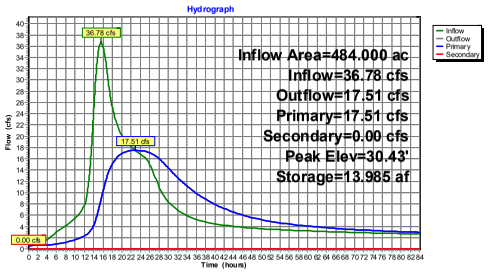
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=17.50 cfs @ 22.87 hrs HW=30.43' TW=22.65' (Dynamic Tailwater)
↳**1=Drop Inlet Spillway** (Weir Controls 17.50 cfs @ 3.23 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.60' TW=21.26' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 10P: Maple Springs Brook Dam - 0.8sm



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Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow Area = 1,172.000 ac, 6.75% Impervious, Inflow Depth > 1.19" for 100-yr event
Inflow = 73.00 cfs @ 18.39 hrs, Volume= 116.271 af, Incl. 1.10 cfs Base Flow
Outflow = 49.53 cfs @ 26.48 hrs, Volume= 115.191 af, Atten= 32%, Lag= 485.1 min
Primary = 49.53 cfs @ 26.48 hrs, Volume= 115.191 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 22.72' @ 26.48 hrs Storage= 27.760 af (25.050 af above start)

Plug-Flow detention time= 396.3 min calculated for 112.479 af (97% of inflow)
Center-of-Mass det. time= 255.4 min (2,090.7 - 1,835.3)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

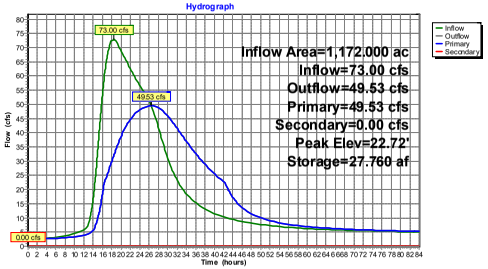
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=49.48 cfs @ 26.48 hrs HW=22.72' TW=18.21' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 49.48 cfs @ 4.79 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.26' TW=15.71' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 11P: Unnamed Road - 1.8sm



Summary for Pond 12P: Maple Springs Road Dam

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth > 0.89" for 100-yr event
Inflow = 19.73 cfs @ 17.65 hrs, Volume= 24.698 af, Incl. 1.00 cfs Base Flow
Outflow = 14.46 cfs @ 22.10 hrs, Volume= 24.695 af, Atten= 27%, Lag= 267.0 min
Primary = 14.46 cfs @ 22.10 hrs, Volume= 24.695 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 39.56' @ 22.10 hrs Storage= 6.379 af (5.299 af above start)

Plug-Flow detention time= 439.9 min calculated for 23.614 af (96% of inflow)
Center-of-Mass det. time= 233.2 min (1,826.6 - 1,593.4)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

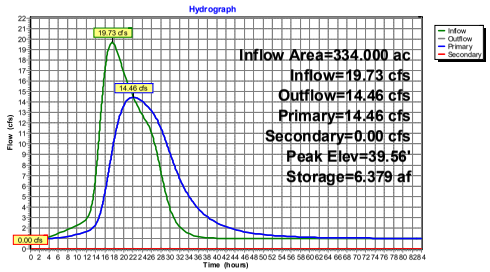
Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=14.46 cfs @ 22.10 hrs HW=39.56' TW=22.61' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 14.46 cfs @ 3.59 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=38.68' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 12P: Maple Springs Road Dam



Summary for Pond 13.1P: Bogs_L_US

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 1.82" for 100-yr event
Inflow = 34.57 cfs @ 21.17 hrs, Volume= 42.420 af, Incl. 0.90 cfs Base Flow
Outflow = 34.54 cfs @ 21.38 hrs, Volume= 42.421 af, Atten= 0%, Lag= 12.6 min
Primary = 34.54 cfs @ 21.38 hrs, Volume= 42.421 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 31.17' @ 21.38 hrs Storage= 0.595 af (0.542 af above start)

Plug-Flow detention time= 17.9 min calculated for 42.367 af (100% of inflow)
Center-of-Mass det. time= 11.6 min (1,624.4 - 1,612.8)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

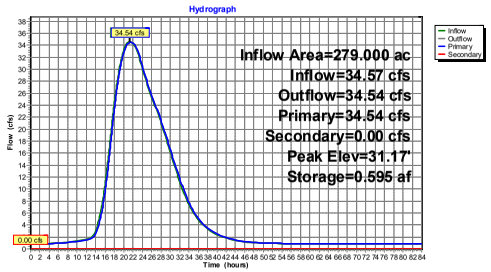
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=34.54 cfs @ 21.38 hrs HW=31.17' TW=27.26' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 34.54 cfs @ 4.14 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.65' TW=25.75' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.1P: Bogs_L_US



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Summary for Pond 13.2P: Bogs_L_DS

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 1.82" for 100-yr event
Inflow = 34.54 cfs @ 21.38 hrs, Volume= 42.421 af
Outflow = 34.52 cfs @ 21.66 hrs, Volume= 42.423 af, Atten= 0%, Lag= 17.3 min
Primary = 34.52 cfs @ 21.66 hrs, Volume= 42.423 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 27.27' @ 21.66 hrs Storage= 0.833 af (0.758 af above start)

Plug-Flow detention time= 25.0 min calculated for 42.347 af (100% of inflow)
Center-of-Mass det. time= 16.3 min (1,640.7 - 1,624.4)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

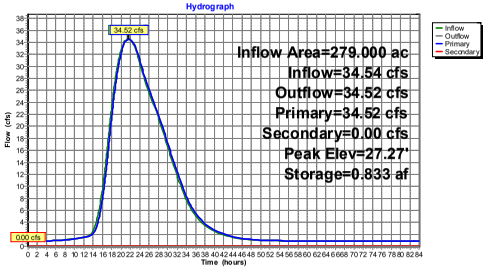
Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=34.52 cfs @ 21.66 hrs HW=27.27' TW=18.17' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 34.52 cfs @ 4.14 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 13.2P: Bogs_L_DS



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow Area = 1,717.000 ac, 6.26% Impervious, Inflow Depth > 1.41" for 100-yr event
Inflow = 106.92 cfs @ 20.86 hrs, Volume= 201.460 af, Incl. 0.80 cfs Base Flow
Outflow = 99.29 cfs @ 24.29 hrs, Volume= 201.262 af, Atten= 7%, Lag= 205.8 min
Primary = 99.29 cfs @ 24.29 hrs, Volume= 201.262 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 18.24' @ 24.29 hrs Storage= 15.907 af (14.842 af above start)

Plug-Flow detention time= 99.5 min calculated for 200.194 af (99% of inflow)
Center-of-Mass det. time= 70.0 min (1,906.8 - 1,836.8)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

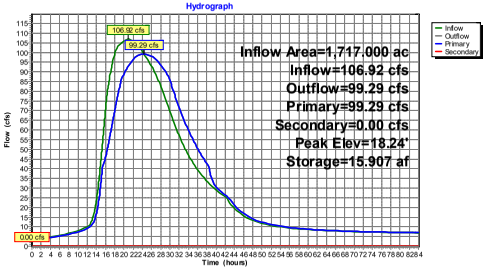
Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

Primary OutFlow Max=99.29 cfs @ 24.29 hrs HW=18.24' TW=0.00' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 99.29 cfs @ 4.35 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.71' TW=0.00' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 14P: Bogs_M - 2.7sm



Summary for Pond 15.1P: Bogs_N_US

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 3.01" for 100-yr event
Inflow = 65.03 cfs @ 16.33 hrs, Volume= 44.936 af, Incl. 0.60 cfs Base Flow
Outflow = 37.10 cfs @ 19.41 hrs, Volume= 44.931 af, Atten= 43%, Lag= 184.7 min
Primary = 37.10 cfs @ 19.41 hrs, Volume= 44.931 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 26.75' @ 19.41 hrs Storage= 14.408 af (14.056 af above start)

Plug-Flow detention time= 295.3 min calculated for 44.579 af (99% of inflow)
Center-of-Mass det. time= 256.4 min (1,525.0 - 1,268.6)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

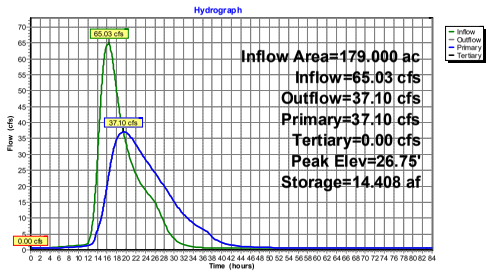
Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=37.08 cfs @ 19.41 hrs HW=26.75' TW=20.55' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Orifice Controls 37.08 cfs @ 4.24 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.11' TW=20.11' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 15.1P: Bogs_N_US



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Summary for Pond 15.2P: Bogs_N_DS

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 3.01" for 100-yr event
Inflow = 37.10 cfs @ 19.41 hrs, Volume= 44.931 af
Outflow = 17.13 cfs @ 29.12 hrs, Volume= 42.327 af, Atten= 54%, Lag= 582.5 min
Primary = 17.13 cfs @ 29.12 hrs, Volume= 42.327 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 21.04' @ 29.12 hrs Storage= 24.366 af (21.799 af above start)

Plug-Flow detention time= 1,071.3 min calculated for 39.760 af (88% of inflow)
Center-of-Mass det. time= 803.8 min (2,328.7 - 1,525.0)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

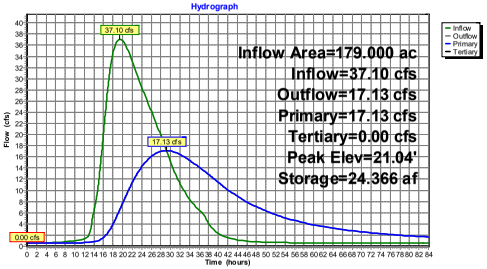
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=17.13 cfs @ 29.12 hrs HW=21.04' TW=0.00' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 17.13 cfs @ 3.28 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
└─**2=TOD** (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS



Summary for Pond 16.1: Mill Pond Dam -PC

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 2.44" for 100-yr event
Inflow = 469.40 cfs @ 14.78 hrs, Volume= 1,006.306 af, Incl. 32.00 cfs Base Flow
Outflow = 226.89 cfs @ 33.27 hrs, Volume= 925.294 af, Atten= 52%, Lag= 1,109.7 min
Primary = 191.90 cfs @ 33.26 hrs, Volume= 729.735 af
Routed to Pond 17B : Proposed Bridge
Secondary = 35.14 cfs @ 31.15 hrs, Volume= 195.559 af
Routed to Pond Wr 24 :
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 17B : Proposed Bridge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 470.969 af
Peak Elev= 15.75' @ 31.15 hrs Storage= 721.854 af (250.885 af above start)

Plug-Flow detention time= 2,562.6 min calculated for 454.323 af (45% of inflow)
Center-of-Mass det. time= 519.1 min (2,589.3 - 2,070.2)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,941.850 af	**Storage** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.130
5.00	4.140
6.00	9.110
7.00	16.590
8.00	34.960
9.00	60.590
10.00	94.410
11.00	142.690
12.00	214.660
13.00	314.540
13.80	403.920
14.00	426.260
15.00	575.290
16.00	771.680
17.00	994.600
18.30	1,368.590
19.00	1,592.930
20.00	1,941.850

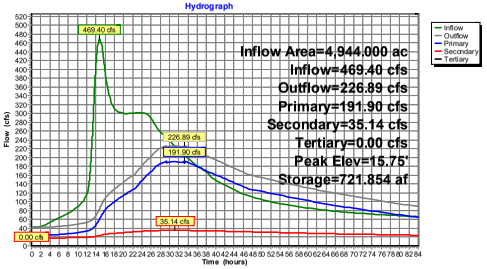
Device	Routing	Invert	Outlet Devices
#1	Primary	15.50'	**110.0' long x 1.5' breadth Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32
#2	Primary	13.60'	**15.0' long x 1.0' breadth Notch as SW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#3	Secondary	12.50'	**3.3' long x 1.0' breadth 3.25' Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#4	Tertiary	18.00'	**TOD, C= 2.60** Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00 Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 8	5.20'	**48.0" W x 48.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#7	Device 8	15.50'	**6.0' long x 20.00' rise MLO DownwardOpGate** 2 End Contraction(s) 5.0' Crest Height
#8	Tertiary	4.00'	**96.0" W x 48.0" H Box Culvert X 0.00** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 32.00 sf

Primary OutFlow Max=188.29 cfs @ 33.26 hrs HW=15.74' TW=9.56' (Dynamic Tailwater)
├─**1=Spillway** (Weir Controls 33.45 cfs @ 1.28 fps)
└─**2=Notch as SW** (Weir Controls 154.84 cfs @ 4.83 fps)

Secondary OutFlow Max=35.14 cfs @ 31.15 hrs HW=15.75' TW=15.27' (Dynamic Tailwater)
└─**3=3.25' Weir** (Weir Controls 35.14 cfs @ 3.28 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.30' TW=8.48' (Dynamic Tailwater)
├─**4=TOD** (Controls 0.00 cfs)
├─**5=US Relief - Bypasses Dam** (Controls 0.00 cfs)
└─**8=Culvert** (Controls 0.00 cfs)
  ├─**6=Orifice/Grate** (Controls 0.00 cfs)
  └─**7=MLO DownwardOpGate** (Controls 0.00 cfs)

Pond 16.1: Mill Pond Dam -PC



Summary for Pond 16.3: Downstream Weir

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.77" for 100-yr event
Inflow = 193.84 cfs @ 33.27 hrs, Volume= 729.717 af
Outflow = 191.86 cfs @ 29.29 hrs, Volume= 729.701 af, Atten= 1%, Lag= 0.0 min
Primary = 191.86 cfs @ 29.29 hrs, Volume= 729.701 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 9.54' @ 29.29 hrs Surf.Area= 2,000 sf Storage= 11,085 cf (2,125 cf above start)

Plug-Flow detention time= 1.6 min calculated for 729.486 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,591.6 - 2,591.5)

Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	8.00'	**DS Weir, C= 2.60** Offset (feet) 0.00 0.00 23.00 23.00 Elev. (feet) 17.00 10.00 8.00 17.00
#2	Primary	8.00'	**27.0' long x 1.5' breadth El 8 Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32

Primary OutFlow Max=191.86 cfs @ 29.29 hrs HW=9.54' (Free Discharge)
├─**1=DS Weir** (Weir Controls 35.33 cfs @ 1.29 fps)
└─**2=El 8 Weir** (Weir Controls 156.53 cfs @ 3.76 fps)

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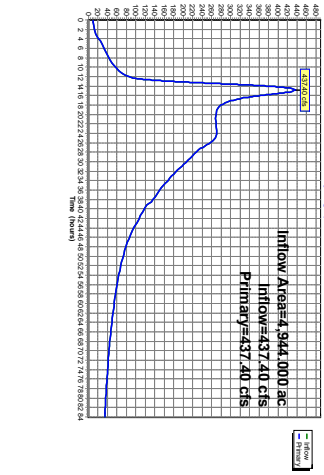
Pond 16.3: Downstream Weir



Summary for Pond 17B: Proposed Bridge

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.77" for 100-yr event
Inflow = 193.84 cfs @ 33.27 hrs, Volume= 729.717 af
Outflow = 193.84 cfs @ 33.27 hrs, Volume= 729.717 af, Atten= 0%, Lag= 0.5 min
Primary = 193.84 cfs @ 33.27 hrs, Volume= 729.717 af
Routed to Pond 16.3 : Downstream Weir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 9.57' @ 29.29 hrs Surf.Area= 2,000 sf Storage= 11,140 cf (2,180 cf above start)

Plug-Flow detention time= 1.6 min calculated for 729.503 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,591.5 - 2,591.3)

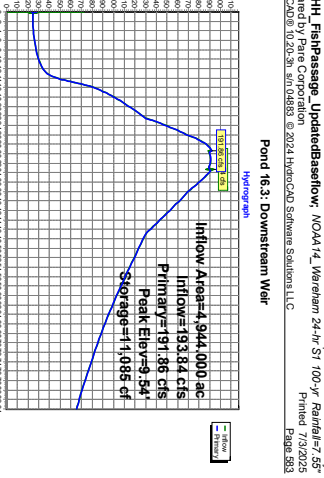
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	4.00'	**518.0" W x 127.0" H Box Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 456.85 sf

Primary OutFlow Max=189.85 cfs @ 33.27 hrs HW=9.56' TW=9.54' (Dynamic Tailwater)
1=Culvert (Inlet Controls 189.85 cfs @ 0.79 fps)

Pond 17B: Proposed Bridge

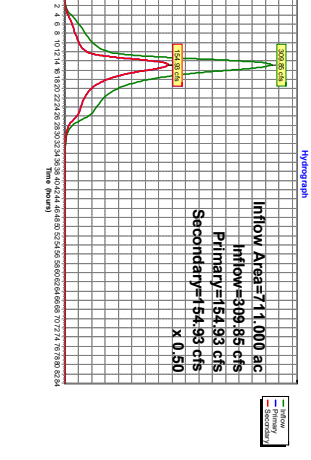


Summary for Link 23L: Inflow

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 1.90" for 100-yr event
Inflow = 437.40 cfs @ 14.78 hrs, Volume= 784.155 af
Primary = 437.40 cfs @ 14.78 hrs, Volume= 784.155 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16.1 : Mill Pond Dam - PC

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow

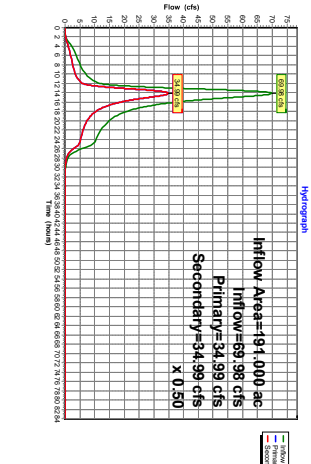


Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 2.87" for 100-yr event
Inflow = 309.85 cfs @ 14.92 hrs, Volume= 170.022 af
Primary = 154.93 cfs @ 14.92 hrs, Volume= 85.011 af, Atten= 50%, Lag= 0.0 min
Secondary = 154.93 cfs @ 14.92 hrs, Volume= 85.011 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow

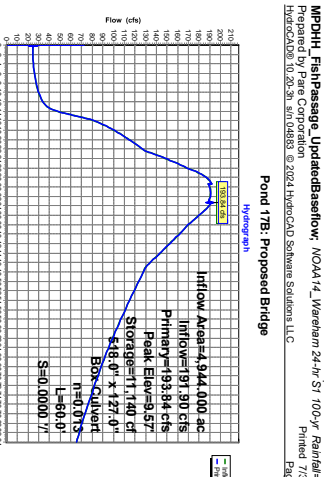


Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 2.08" for 100-yr event
Inflow = 69.98 cfs @ 14.15 hrs, Volume= 33.138 af
Primary = 34.99 cfs @ 14.15 hrs, Volume= 16.569 af, Atten= 50%, Lag= 0.0 min
Secondary = 34.99 cfs @ 14.15 hrs, Volume= 16.569 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

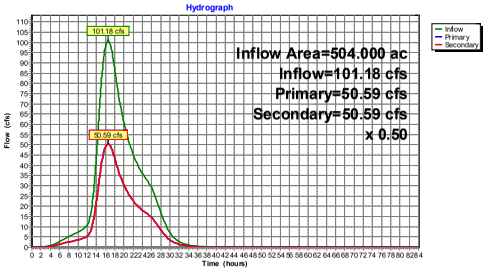


Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth = 1.79" for 100-yr event
Inflow = 101.18 cfs @ 16.59 hrs, Volume= 75.385 af
Primary = 50.59 cfs @ 16.59 hrs, Volume= 37.693 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 50.59 cfs @ 16.59 hrs, Volume= 37.693 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

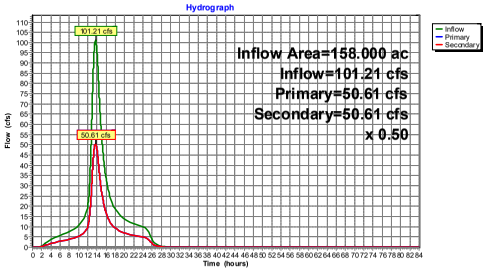


Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 2.94" for 100-yr event
Inflow = 101.21 cfs @ 13.73 hrs, Volume= 38.737 af
Primary = 50.61 cfs @ 13.73 hrs, Volume= 19.369 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 3P : Fawn Pond
Secondary = 50.61 cfs @ 13.73 hrs, Volume= 19.369 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow

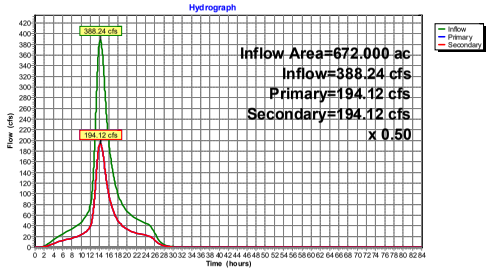


Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 3.15" for 100-yr event
Inflow = 388.24 cfs @ 14.28 hrs, Volume= 176.131 af
Primary = 194.12 cfs @ 14.28 hrs, Volume= 88.066 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 5P : Glen Charlie Pond
Secondary = 194.12 cfs @ 14.28 hrs, Volume= 88.066 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow

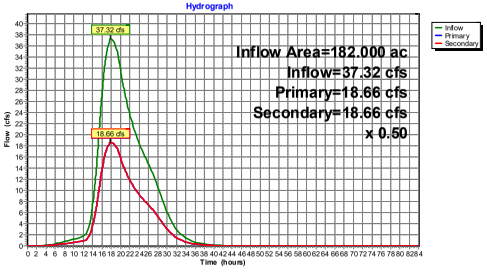


Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 2.04" for 100-yr event
Inflow = 37.32 cfs @ 17.79 hrs, Volume= 30.864 af
Primary = 18.66 cfs @ 17.79 hrs, Volume= 15.432 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 6.2P : Maple Sping Bogs US
Secondary = 18.66 cfs @ 17.79 hrs, Volume= 15.432 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow

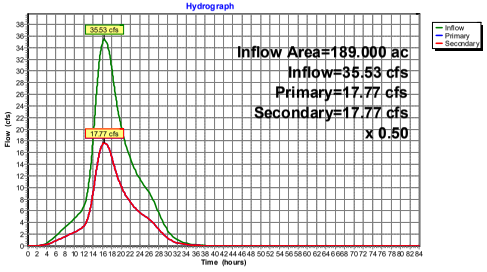


Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth = 1.75" for 100-yr event
Inflow = 35.53 cfs @ 16.28 hrs, Volume= 27.633 af
Primary = 17.77 cfs @ 16.28 hrs, Volume= 13.817 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 7P : Little Five Mile Pond
Secondary = 17.77 cfs @ 16.28 hrs, Volume= 13.817 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow

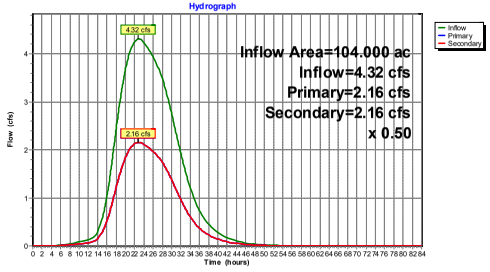


Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth = 0.60" for 100-yr event
Inflow = 4.32 cfs @ 22.68 hrs, Volume= 5.184 af
Primary = 2.16 cfs @ 22.68 hrs, Volume= 2.592 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 9P : Kettle Hole
Secondary = 2.16 cfs @ 22.68 hrs, Volume= 2.592 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow



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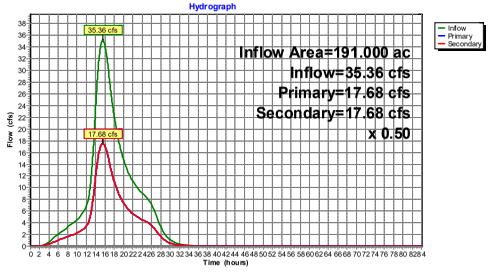
Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth = 1.50" for 100-yr event
Inflow = 35.36 cfs @ 15.53 hrs, Volume= 23.827 af
Primary = 17.68 cfs @ 15.53 hrs, Volume= 11.913 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 17.68 cfs @ 15.53 hrs, Volume= 11.913 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

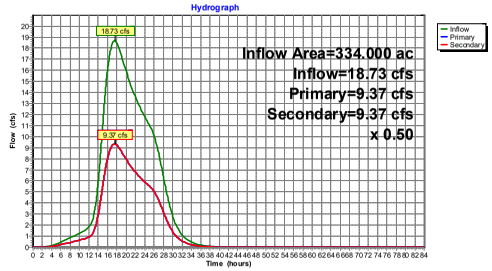


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth = 0.64" for 100-yr event
Inflow = 18.73 cfs @ 17.65 hrs, Volume= 17.755 af
Primary = 9.37 cfs @ 17.65 hrs, Volume= 8.878 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 12P : Maple Springs Road Dam
Secondary = 9.37 cfs @ 17.65 hrs, Volume= 8.878 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow

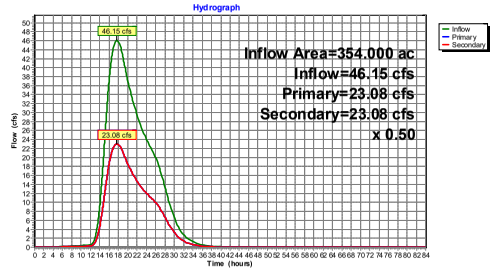


Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth = 1.28" for 100-yr event
Inflow = 46.15 cfs @ 17.60 hrs, Volume= 37.854 af
Primary = 23.08 cfs @ 17.60 hrs, Volume= 18.927 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 23.08 cfs @ 17.60 hrs, Volume= 18.927 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow

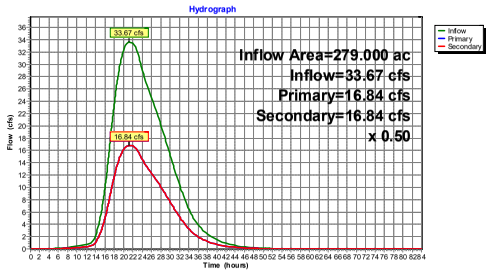


Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth = 1.56" for 100-yr event
Inflow = 33.67 cfs @ 21.17 hrs, Volume= 36.172 af
Primary = 16.84 cfs @ 21.17 hrs, Volume= 18.086 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 13.1P : Bogs_L_US
Secondary = 16.84 cfs @ 21.17 hrs, Volume= 18.086 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow

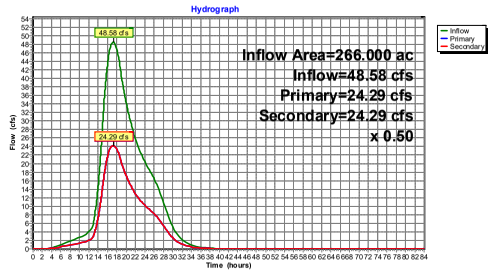


Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth = 1.73" for 100-yr event
Inflow = 48.58 cfs @ 17.26 hrs, Volume= 38.292 af
Primary = 24.29 cfs @ 17.26 hrs, Volume= 19.146 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 24.29 cfs @ 17.26 hrs, Volume= 19.146 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow

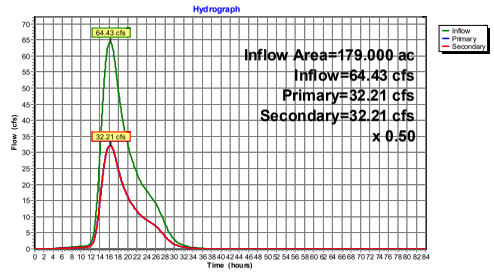


Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth = 2.73" for 100-yr event
Inflow = 64.43 cfs @ 16.33 hrs, Volume= 40.771 af
Primary = 32.21 cfs @ 16.33 hrs, Volume= 20.386 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 15.1P : Bogs_N_US
Secondary = 32.21 cfs @ 16.33 hrs, Volume= 20.386 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow



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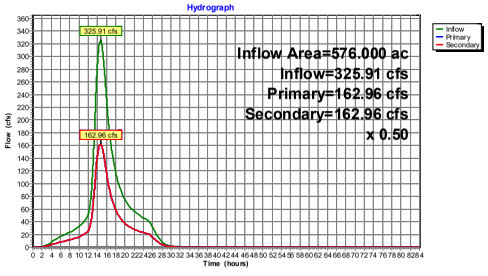
Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 3.37" for 100-yr event
Inflow = 325.91 cfs @ 14.78 hrs, Volume= 161.962 af
Primary = 162.96 cfs @ 14.78 hrs, Volume= 80.981 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 162.96 cfs @ 14.78 hrs, Volume= 80.981 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow

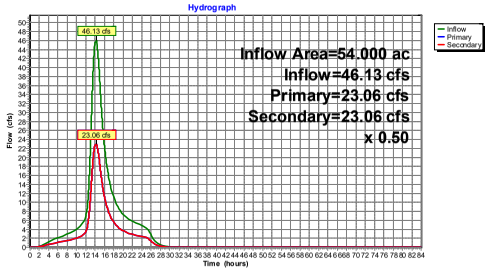


Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 4.26" for 100-yr event
Inflow = 46.13 cfs @ 14.25 hrs, Volume= 19.150 af
Primary = 23.06 cfs @ 14.25 hrs, Volume= 9.575 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 23.06 cfs @ 14.25 hrs, Volume= 9.575 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=3.34"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=365.25 cfs 198.027 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=2.52"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=87.64 cfs 40.112 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=2.24"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=130.35 cfs 93.883 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=3.45"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=121.70 cfs 45.419 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=3.66"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=460.84 cfs 205.096 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=2.54"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=47.99 cfs 38.516 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=2.11"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=43.04 cfs 33.243 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=0.86"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=6.42 cfs 7.465 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=1.83"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=43.84 cfs 29.125 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=0.89"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=28.22 cfs 24.855 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=1.69"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=63.53 cfs 49.965 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=2.00"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=44.33 cfs 46.581 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=2.17"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=63.37 cfs 48.126 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=3.34"
Tc=300.0 min CN=56/98 Runoff=80.54 cfs 49.828 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=3.96"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=392.37 cfs 190.237 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=4.94"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=54.68 cfs 22.224 af

Pond 1P: Halfway Pond Peak Elev=65.12' Storage=558.532 af Inflow=367.45 cfs 213.299 af
Primary=11.37 cfs 61.209 af Secondary=0.00 cfs 0.000 af Outflow=11.37 cfs 61.209 af

Pond 2P: Kennard Res Peak Elev=58.24' Storage=23.638 af Inflow=92.54 cfs 105.486 af
Primary=35.85 cfs 99.685 af Secondary=0.00 cfs 0.000 af Outflow=35.85 cfs 99.685 af

Pond 3P: Fawn Pond Peak Elev=60.57' Storage=69.139 af Inflow=122.20 cfs 48.890 af
Primary=4.99 cfs 22.145 af Tertiary=0.00 cfs 0.000 af Outflow=4.99 cfs 22.145 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=48.45' Storage=73.085 af Inflow=170.30 cfs 226.820 af
Primary=78.66 cfs 214.686 af Secondary=0.00 cfs 0.000 af Outflow=78.66 cfs 214.686 af

Pond 5P: Glen Charlie Pond Peak Elev=34.98' Storage=191.663 af Inflow=477.17 cfs 434.361 af
Primary=111.91 cfs 387.518 af Secondary=0.00 cfs 0.000 af Tertiary=2.15 cfs 3.617 af Outflow=114.06 cfs 391.135 af

Pond 6.1P: Ortalani Reservoir Peak Elev=34.37' Storage=2.888 af Inflow=2.15 cfs 3.617 af
Outflow=0.43 cfs 1.657 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=23.89' Storage=20.709 af Inflow=48.00 cfs 40.173 af
Primary=19.49 cfs 37.723 af Secondary=0.00 cfs 0.000 af Outflow=19.49 cfs 37.723 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=18.13' Storage=2.269 af Inflow=19.49 cfs 37.723 af
Primary=19.39 cfs 37.425 af Secondary=0.00 cfs 0.000 af Outflow=19.39 cfs 37.425 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=21.86' Storage=3.679 af Inflow=111.91 cfs 387.518 af
Primary=111.87 cfs 386.426 af Secondary=0.00 cfs 0.000 af Outflow=111.87 cfs 386.426 af

Pond 7P: Little Five Mile Pond Peak Elev=59.83' Storage=24.629 af Inflow=43.63 cfs 37.339 af
Outflow=43.00 cfs 37.288 af

Pond 8P: Five Mile Pond Peak Elev=53.03' Storage=29.970 af Inflow=43.00 cfs 37.288 af
Primary=4.45 cfs 17.460 af Secondary=0.00 cfs 0.000 af Outflow=4.45 cfs 17.460 af

Pond 9P: Kettle Hole Peak Elev=55.17' Storage=9.600 af Inflow=6.72 cfs 9.548 af
Outflow=6.65 cfs 9.556 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=30.60' Storage=16.960 af Inflow=45.46 cfs 60.307 af
Primary=22.35 cfs 57.165 af Secondary=0.00 cfs 0.000 af Outflow=22.35 cfs 57.165 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=23.06' Storage=37.315 af Inflow=99.40 cfs 146.560 af
Primary=64.03 cfs 145.290 af Secondary=0.00 cfs 0.000 af Outflow=64.03 cfs 145.290 af

Pond 12P: Maple Springs Road Dam Peak Elev=39.87' Storage=8.220 af Inflow=29.22 cfs 31.797 af
Primary=21.20 cfs 31.793 af Secondary=0.00 cfs 0.000 af Outflow=21.20 cfs 31.793 af

Pond 13.1P: Bogs_L_US Peak Elev=31.49' Storage=0.712 af Inflow=45.23 cfs 52.829 af
Primary=45.20 cfs 52.830 af Secondary=0.00 cfs 0.000 af Outflow=45.20 cfs 52.830 af

Pond 13.2P: Bogs_L_DS Peak Elev=27.59' Storage=0.997 af Inflow=45.20 cfs 52.830 af
Primary=45.16 cfs 52.832 af Secondary=0.00 cfs 0.000 af Outflow=45.16 cfs 52.832 af

Pond 14P: Bogs_M - 2.7sm Peak Elev=18.73' Storage=23.685 af Inflow=138.66 cfs 251.802 af
Primary=126.55 cfs 251.566 af Secondary=0.00 cfs 0.000 af Outflow=126.55 cfs 251.566 af

Pond 15.1P: Bogs_N_US Peak Elev=27.06' Storage=17.492 af Inflow=81.14 cfs 53.993 af
Primary=47.56 cfs 53.988 af Tertiary=0.00 cfs 0.000 af Outflow=47.56 cfs 53.988 af

Pond 15.2P: Bogs_N_DS Peak Elev=21.22' Storage=28.551 af Inflow=47.56 cfs 53.988 af
Primary=21.74 cfs 51.168 af Tertiary=0.00 cfs 0.000 af Outflow=21.74 cfs 51.168 af

Pond 16.1: Mill Pond Dam -PC Peak Elev=15.92' Storage=755.453 af Inflow=557.82 cfs 1,161.197 af
mary=257.15 cfs 865.864 af Secondary=37.45 cfs 203.689 af Tertiary=0.00 cfs 0.000 af Outflow=294.30 cfs 1,069.553 af

Pond 16.3: Downstream Weir Peak Elev=9.82' Storage=11,644 cf Inflow=260.57 cfs 865.844 af
Outflow=257.15 cfs 865.826 af

Pond 17B: Proposed Bridge Peak Elev=9.87' Storage=11,733 cf Inflow=257.15 cfs 865.864 af
518.0" x 127.0' Box Culvert n=0.013 L=60.0' S=0.0000 '/' Outflow=260.57 cfs 865.844 af

Link 23L: Inflow Inflow=525.82 cfs 939.046 af
Primary=525.82 cfs 939.046 af

Link A1: 1/2 Flow x 0.50 Inflow=365.25 cfs 198.027 af
Primary=182.62 cfs 99.013 af Secondary=182.62 cfs 99.013 af

Link B1: 1/2 Flow x 0.50 Inflow=87.64 cfs 40.112 af
Primary=43.82 cfs 20.056 af Secondary=43.82 cfs 20.056 af

Link C1: 1/2 Flow x 0.50 Inflow=130.35 cfs 93.883 af
Primary=65.18 cfs 46.941 af Secondary=65.18 cfs 46.941 af

Link D1: 1/2 Flow x 0.50 Inflow=121.70 cfs 45.419 af
Primary=60.85 cfs 22.709 af Secondary=60.85 cfs 22.709 af

Link E1: 1/2 Flow x 0.50 Inflow=460.84 cfs 205.096 af
Primary=230.42 cfs 102.548 af Secondary=230.42 cfs 102.548 af

Link F1: 1/2 Flow x 0.50 Inflow=47.99 cfs 38.516 af
Primary=24.00 cfs 19.258 af Secondary=24.00 cfs 19.258 af

Link G1: 1/2 Flow x 0.50 Inflow=43.04 cfs 33.243 af
Primary=21.52 cfs 16.622 af Secondary=21.52 cfs 16.622 af

Link H1: 1/2 Flow x 0.50 Inflow=6.42 cfs 7.465 af
Primary=3.21 cfs 3.733 af Secondary=3.21 cfs 3.733 af

Link I1: 1/2 Flow x 0.50 Inflow=43.84 cfs 29.125 af
Primary=21.92 cfs 14.563 af Secondary=21.92 cfs 14.563 af

Link JL: 1/2 Flow x 0.50 Inflow=28.22 cfs 24.855 af
Primary=14.11 cfs 12.427 af Secondary=14.11 cfs 12.427 af

Link KL: 1/2 Flow x 0.50 Inflow=63.53 cfs 49.965 af
Primary=31.77 cfs 24.982 af Secondary=31.77 cfs 24.982 af

Link LL: 1/2 Flow x 0.50 Inflow=44.33 cfs 46.581 af
Primary=22.16 cfs 23.290 af Secondary=22.16 cfs 23.290 af

Link ML: 1/2 Flow x 0.50 Inflow=63.37 cfs 48.126 af
Primary=31.68 cfs 24.063 af Secondary=31.68 cfs 24.063 af

Link NL: 1/2 Flow x 0.50 Inflow=80.54 cfs 49.828 af
Primary=40.27 cfs 24.914 af Secondary=40.27 cfs 24.914 af

Link OL: 1/2 Flow x 0.50 Inflow=392.37 cfs 190.237 af
Primary=196.18 cfs 95.118 af Secondary=196.18 cfs 95.118 af

Link PL: 1/2 Flow x 0.50 Inflow=54.68 cfs 22.224 af
Primary=27.34 cfs 11.112 af Secondary=27.34 cfs 11.112 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 1,122.700 af Average Runoff Depth = 2.72"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

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Summary for Subcatchment A: A

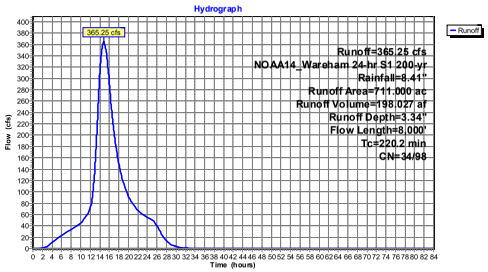
Runoff = 365.25 cfs @ 14.92 hrs, Volume= 198.027 af, Depth= 3.34"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 711.000	66	"33.99% imp"
469.331	34	66.01% Pervious Area
241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



Summary for Subcatchment B: B

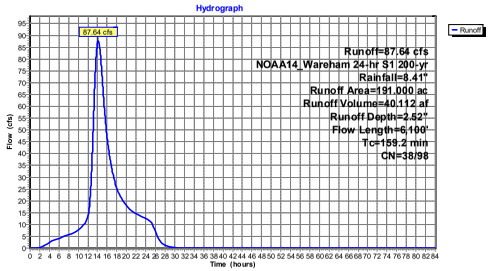
Runoff = 87.64 cfs @ 14.15 hrs, Volume= 40.112 af, Depth= 2.52"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 191.000	49	"18.54% imp"
155.589	38	81.46% Pervious Area
35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



Summary for Subcatchment C: C

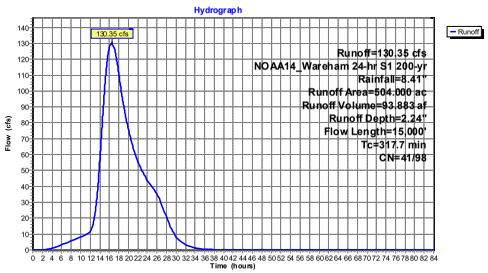
Runoff = 130.35 cfs @ 16.59 hrs, Volume= 93.883 af, Depth= 2.24"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 504.000	47	"10.54% imp"
450.878	41	89.46% Pervious Area
53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



Summary for Subcatchment D: D

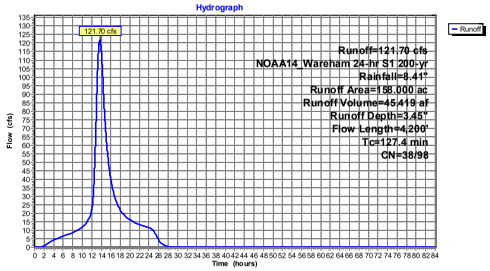
Runoff = 121.70 cfs @ 13.73 hrs, Volume= 45.419 af, Depth= 3.45"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 158.000	57	"31.94% imp"
107.535	38	68.06% Pervious Area
50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



Summary for Subcatchment E: E

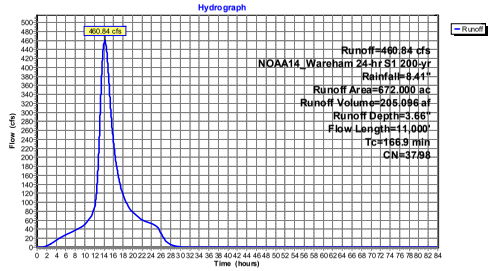
Runoff = 460.84 cfs @ 14.28 hrs, Volume= 205.096 af, Depth= 3.66"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 672.000	59	"35.91% imp"
430.685	37	64.09% Pervious Area
241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



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Summary for Subcatchment F: F

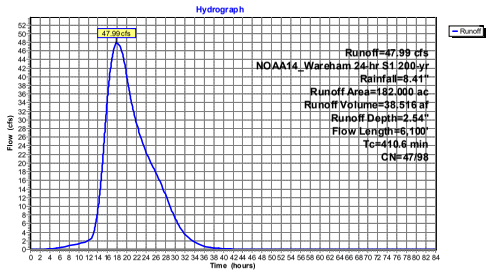
Runoff = 47.99 cfs @ 17.79 hrs, Volume= 38.516 af, Depth= 2.54"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 182.000	50	"6.11% imp"
170.880	47	93.89% Pervious Area
11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



Summary for Subcatchment G: G

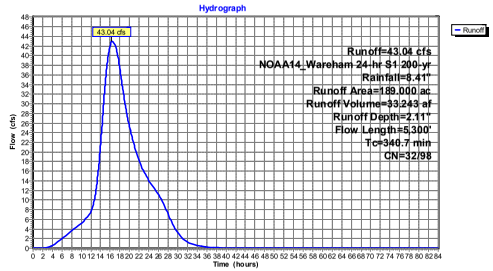
Runoff = 43.04 cfs @ 16.28 hrs, Volume= 33.243 af, Depth= 2.11"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 189.000	45	"19.09% imp"
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



Summary for Subcatchment H: H

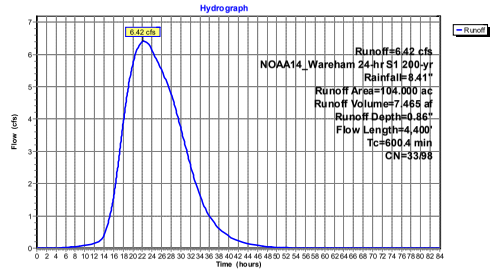
Runoff = 6.42 cfs @ 22.02 hrs, Volume= 7.465 af, Depth= 0.86"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 104.000	34	"1.27% imp"
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

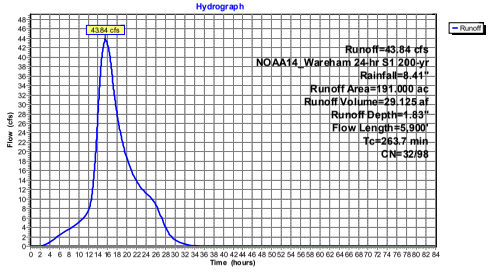
Runoff = 43.84 cfs @ 15.53 hrs, Volume= 29.125 af, Depth= 1.83"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 191.000	42	"15.34% imp"
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



Summary for Subcatchment J: J

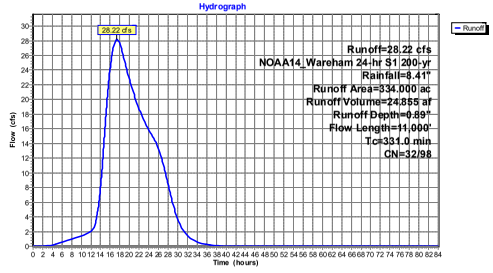
Runoff = 28.22 cfs @ 17.29 hrs, Volume= 24.855 af, Depth= 0.89"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 334.000	34	"2.83% imp"
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Summary for Subcatchment K: K

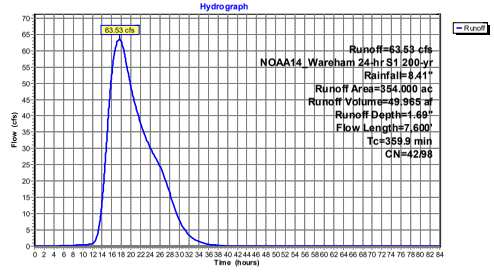
Runoff = 63.53 cfs @ 17.59 hrs, Volume= 49.965 af, Depth= 1.69"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 354.000	42	"0.83% imp"
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



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Summary for Subcatchment L: L

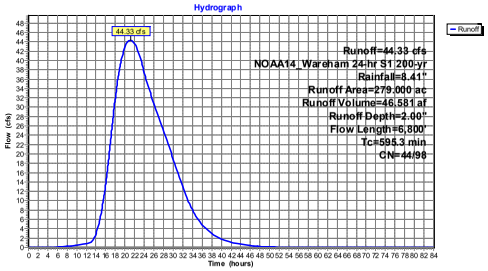
Runoff = 44.33 cfs @ 21.17 hrs, Volume= 46.581 af, Depth= 2.00"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 279.000	45	"2.43% imp"
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



Summary for Subcatchment M: M

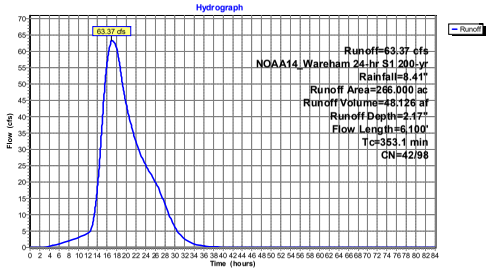
Runoff = 63.37 cfs @ 16.87 hrs, Volume= 48.126 af, Depth= 2.17"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 266.000	47	"8.14% imp"
244.348	42	91.86% Pervious Area
21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



Summary for Subcatchment N: N

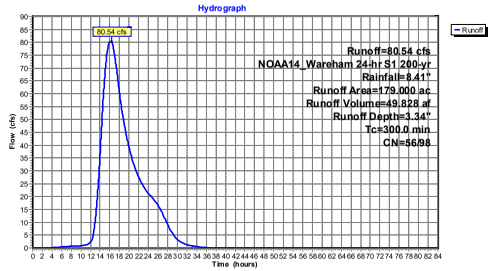
Runoff = 80.54 cfs @ 16.33 hrs, Volume= 49.828 af, Depth= 3.34"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 179.000	57	"3.17% imp"
173.326	56	96.83% Pervious Area
5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

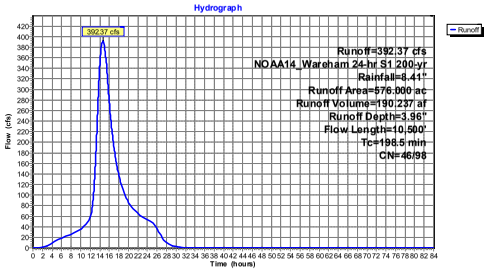
Runoff = 392.37 cfs @ 14.78 hrs, Volume= 190.237 af, Depth= 3.96"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 576.000	62	"31.1% imp"
396.864	46	68.90% Pervious Area
179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



Summary for Subcatchment P: P

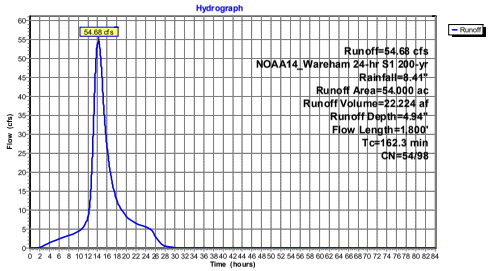
Runoff = 54.68 cfs @ 14.25 hrs, Volume= 22.224 af, Depth= 4.94"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 200-yr Rainfall=8.41"

Area (ac)	CN	Description
* 54.000	71	"38.05% imp"
33.453	54	61.95% Pervious Area
20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Summary for Pond 1P: Halfway Pond

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth > 3.60" for 200-yr event
Inflow = 367.45 cfs @ 14.92 hrs, Volume= 213.299 af, Incl. 2.20 cfs Base Flow
Outflow = 11.37 cfs @ 28.53 hrs, Volume= 61.209 af, Atten= 97%, Lag= 816.3 min
Primary = 11.37 cfs @ 28.53 hrs, Volume= 61.209 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 65.12' @ 28.53 hrs Storage= 558.532 af (187.922 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,724.4 min (2,812.6 - 1,088.2)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=11.36 cfs @ 28.53 hrs HW=65.12' TW=57.96' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 11.36 cfs @ 3.39 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

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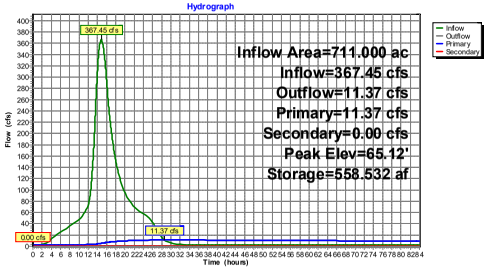
Pond 1P: Halfway Pond

Hydrograph



Summary for Pond 2P: Kennard Res

Inflow Area = 902.000 ac, 30.72% Impervious, Inflow Depth > 1.40" for 200-yr event
Inflow = 92.54 cfs @ 14.15 hrs, Volume= 105.486 af, Incl. 0.60 cfs Base Flow
Outflow = 35.85 cfs @ 17.76 hrs, Volume= 99.685 af, Atten= 61%, Lag= 216.6 min
Primary = 35.85 cfs @ 17.76 hrs, Volume= 99.685 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 58.24' @ 17.76 hrs Storage= 23.638 af (19.638 af above start)

Plug-Flow detention time= 580.2 min calculated for 95.684 af (91% of inflow)
Center-of-Mass det. time= 236.2 min (2,333.4 - 2,097.2)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

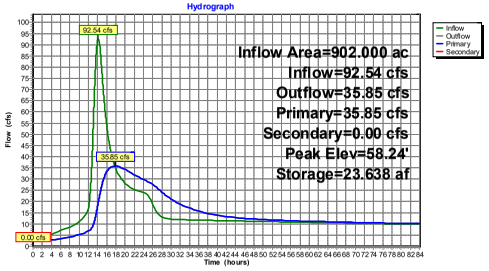
Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=35.84 cfs @ 17.76 hrs HW=58.24' TW=47.97' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 35.84 cfs @ 3.57 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.30' TW=46.77' (Dynamic Tailwater)
└**1=TOD** (Controls 0.00 cfs)

Pond 2P: Kennard Res

Hydrograph



Summary for Pond 3P: Fawn Pond

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth > 3.71" for 200-yr event
Inflow = 122.20 cfs @ 13.73 hrs, Volume= 48.890 af, Incl. 0.50 cfs Base Flow
Outflow = 4.99 cfs @ 25.98 hrs, Volume= 22.145 af, Atten= 96%, Lag= 734.7 min
Primary = 4.99 cfs @ 25.98 hrs, Volume= 22.145 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 60.57' @ 25.98 hrs Storage= 69.139 af (41.419 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,665.6 min (2,682.4 - 1,016.8)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

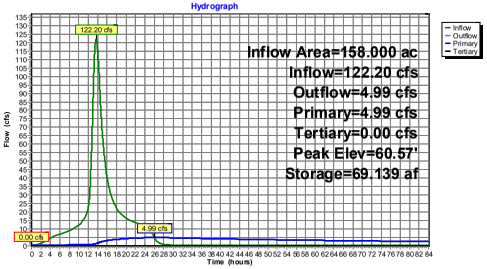
Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=4.99 cfs @ 25.98 hrs HW=60.57' TW=48.44' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 4.99 cfs @ 3.69 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=59.83' TW=46.77' (Dynamic Tailwater)
└**2=TOD South** (Controls 0.00 cfs)

Pond 3P: Fawn Pond

Hydrograph



Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow Area = 1,564.000 ac, 24.34% Impervious, Inflow Depth > 1.74" for 200-yr event
Inflow = 170.30 cfs @ 16.59 hrs, Volume= 226.820 af, Incl. 1.60 cfs Base Flow
Outflow = 78.66 cfs @ 24.27 hrs, Volume= 214.686 af, Atten= 54%, Lag= 460.6 min
Primary = 78.66 cfs @ 24.27 hrs, Volume= 214.686 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 48.45' @ 24.27 hrs Storage= 73.085 af (63.365 af above start)

Plug-Flow detention time= 747.8 min calculated for 204.966 af (90% of inflow)
Center-of-Mass det. time= 389.4 min (2,272.5 - 1,883.0)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=78.66 cfs @ 24.27 hrs HW=48.45' TW=34.97' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Orifice Controls 78.66 cfs @ 5.41 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=46.77' TW=33.99' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

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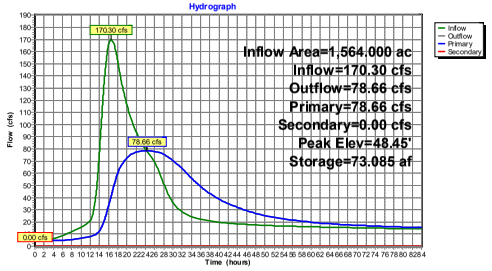
Pond 4P: Bessey Bog Res - 2.4sm



Summary for Pond 5P: Glen Charlie Pond

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 2.33" for 200-yr event
Inflow = 477.17 cfs @ 14.28 hrs, Volume= 434.361 af, Incl. 2.10 cfs Base Flow
Outflow = 114.06 cfs @ 25.84 hrs, Volume= 391.135 af, Atten= 76%, Lag= 693.9 min
Primary = 111.91 cfs @ 25.84 hrs, Volume= 387.518 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 2.15 cfs @ 25.84 hrs, Volume= 3.617 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 34.98' @ 25.84 hrs Storage= 191.663 af (165.538 af above start)

Plug-Flow detention time= 1,262.0 min calculated for 365.010 af (84% of inflow)
Center-of-Mass det. time= 738.4 min (2,385.8 - 1,647.4)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00

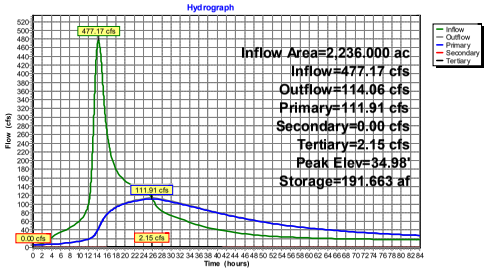
#6	Tertiary	34.50'	Elev. (feet) 41.00 40.00 39.00 37.70 37.70 41.00 **24.0" W x 12.0" H Vert. NE Culvert** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=111.86 cfs @ 25.84 hrs HW=34.98' TW=21.86' (Dynamic Tailwater)
└**1=Spillway** (Weir Controls 111.86 cfs @ 4.07 fps)
└**2=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.99' TW=34.20' (Dynamic Tailwater)
└**3=SE Dike** (Controls 0.00 cfs)
└**4=SE Culvert** (Controls 0.00 cfs)

Tertiary OutFlow Max=2.14 cfs @ 25.84 hrs HW=34.98' TW=34.28' (Dynamic Tailwater)
└**5=NE Dike** (Controls 0.00 cfs)
└**6=NE Culvert** (Orifice Controls 2.14 cfs @ 2.23 fps)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 2.15 cfs @ 25.84 hrs, Volume= 3.617 af
Outflow = 0.43 cfs @ 45.18 hrs, Volume= 1.657 af, Atten= 80%, Lag= 1,160.0 min
Primary = 0.43 cfs @ 45.18 hrs, Volume= 1.657 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 34.37' @ 45.18 hrs Storage= 2.888 af

Plug-Flow detention time= 1,873.7 min calculated for 1.657 af (46% of inflow)
Center-of-Mass det. time= 1,449.5 min (3,204.3 - 1,754.7)

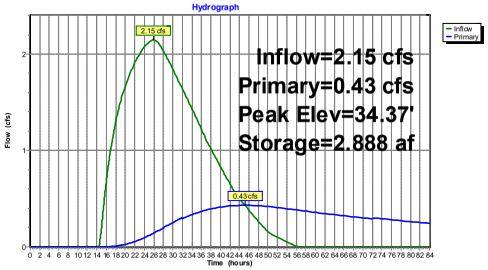
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=0.43 cfs @ 45.18 hrs HW=34.37' TW=23.17' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 0.43 cfs @ 1.30 fps)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



Summary for Pond 6.2P: Maple Sping Bogs US

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 2.65" for 200-yr event
Inflow = 48.00 cfs @ 17.79 hrs, Volume= 40.173 af
Outflow = 19.49 cfs @ 25.28 hrs, Volume= 37.723 af, Atten= 59%, Lag= 449.2 min
Primary = 19.49 cfs @ 25.28 hrs, Volume= 37.723 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 23.89' @ 25.28 hrs Storage= 20.709 af

Plug-Flow detention time= 827.2 min calculated for 37.723 af (94% of inflow)
Center-of-Mass det. time= 728.2 min (2,055.4 - 1,327.2)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=19.52 cfs @ 25.28 hrs HW=23.89' TW=18.13' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 19.52 cfs @ 3.90 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.70' TW=17.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

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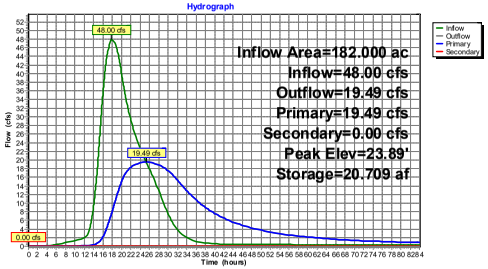
Pond 6.2P: Maple Sping Bogs US



Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 2.49" for 200-yr event
Inflow = 19.49 cfs @ 25.28 hrs, Volume= 37.723 af
Outflow = 19.39 cfs @ 26.38 hrs, Volume= 37.425 af, Atten= 1%, Lag= 65.7 min
Primary = 19.39 cfs @ 26.38 hrs, Volume= 37.425 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 18.13' @ 26.38 hrs Storage= 2.269 af

Plug-Flow detention time= 109.3 min calculated for 37.425 af (99% of inflow)
Center-of-Mass det. time= 86.5 min (2,141.9 - 2,055.4)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

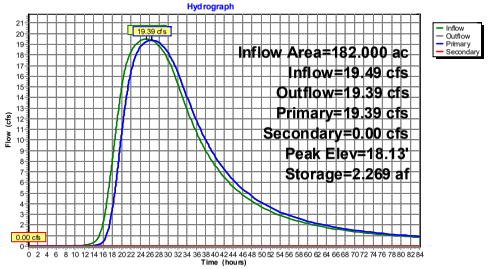
Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=19.39 cfs @ 26.38 hrs HW=18.13' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 19.39 cfs @ 3.42 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 2.08" for 200-yr event
Inflow = 111.91 cfs @ 25.84 hrs, Volume= 387.518 af
Outflow = 111.87 cfs @ 26.08 hrs, Volume= 386.426 af, Atten= 0%, Lag= 14.0 min
Primary = 111.87 cfs @ 26.08 hrs, Volume= 386.426 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 21.86' @ 26.08 hrs Storage= 3.679 af (3.232 af above start)

Plug-Flow detention time= 29.5 min calculated for 385.974 af (100% of inflow)
Center-of-Mass det. time= 16.3 min (2,408.0 - 2,391.7)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

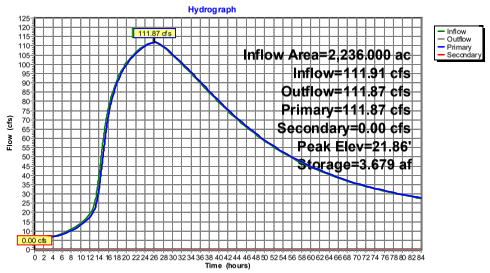
Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

Primary OutFlow Max=111.87 cfs @ 26.08 hrs HW=21.86' TW=0.00' (Dynamic Tailwater)
└**1=Bridge/Spillway** (Weir Controls 111.87 cfs @ 4.87 fps)
└**3=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.49' TW=22.70' (Dynamic Tailwater)
└**2=Culvert to Bogs** (Controls 0.00 cfs)
└**4=TOD_Bogs** (Controls 0.00 cfs)

Pond 6P: Maple Springs Dam - 3.5sm



Summary for Pond 7P: Little Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 2.37" for 200-yr event
Inflow = 43.63 cfs @ 16.28 hrs, Volume= 37.339 af, Incl. 0.59 cfs Base Flow
Outflow = 43.00 cfs @ 16.95 hrs, Volume= 37.288 af, Atten= 1%, Lag= 40.5 min
Primary = 43.00 cfs @ 16.95 hrs, Volume= 37.288 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 59.83' @ 16.95 hrs Storage= 24.629 af (2.469 af above start)

Plug-Flow detention time= 1,003.1 min calculated for 15.128 af (41% of inflow)
Center-of-Mass det. time= 53.6 min (1,322.0 - 1,268.3)

Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=43.00 cfs @ 16.95 hrs HW=59.83' TW=52.34' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 43.00 cfs @ 0.72 fps)

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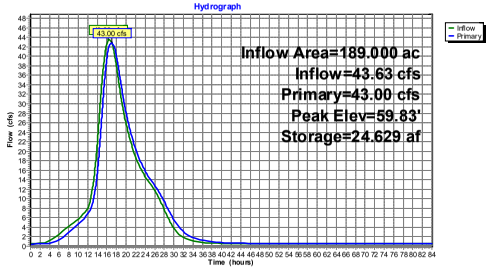
Pond 7P: Little Five Mile Pond



Summary for Pond 8P: Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 2.37" for 200-yr event
Inflow = 43.00 cfs @ 16.95 hrs, Volume= 37.288 af
Outflow = 4.45 cfs @ 30.77 hrs, Volume= 17.460 af, Atten= 90%, Lag= 828.8 min
Primary = 4.45 cfs @ 30.77 hrs, Volume= 17.460 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 53.03' @ 30.77 hrs Storage= 29.970 af

Plug-Flow detention time= 1,939.8 min calculated for 17.460 af (47% of inflow)
Center-of-Mass det. time= 1,532.8 min (2,854.8 - 1,322.0)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

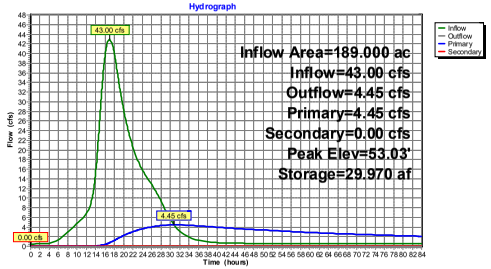
Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=4.44 cfs @ 30.77 hrs HW=53.03' TW=30.45' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 4.44 cfs @ 3.50 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=51.90' TW=29.60' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 8P: Five Mile Pond



Summary for Pond 9P: Kettle Hole

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth > 1.10" for 200-yr event
Inflow = 6.72 cfs @ 22.02 hrs, Volume= 9.548 af, Incl. 0.30 cfs Base Flow
Outflow = 6.65 cfs @ 23.14 hrs, Volume= 9.556 af, Atten= 1%, Lag= 67.4 min
Primary = 6.65 cfs @ 23.14 hrs, Volume= 9.556 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.17' @ 23.14 hrs Storage= 9.600 af (0.650 af above start)

Plug-Flow detention time= 3,709.9 min calculated for 0.606 af (6% of inflow)
Center-of-Mass det. time= 72.9 min (1,796.8 - 1,723.9)

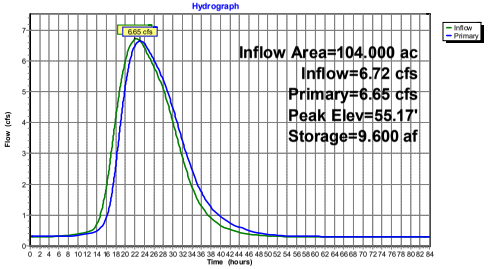
Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=6.65 cfs @ 23.14 hrs HW=55.17' TW=30.60' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 6.65 cfs @ 0.54 fps)

Pond 9P: Kettle Hole



Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow Area = 484.000 ac, 13.78% Impervious, Inflow Depth > 1.50" for 200-yr event
Inflow = 45.46 cfs @ 15.53 hrs, Volume= 60.307 af, Incl. 0.60 cfs Base Flow
Outflow = 22.35 cfs @ 23.58 hrs, Volume= 57.165 af, Atten= 51%, Lag= 483.2 min
Primary = 22.35 cfs @ 23.58 hrs, Volume= 57.165 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1.500 af
Peak Elev= 30.60' @ 23.58 hrs Storage= 16.960 af (15.460 af above start)

Plug-Flow detention time= 654.8 min calculated for 55.664 af (92% of inflow)
Center-of-Mass det. time= 384.6 min (2,180.6 - 1,796.0)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LiDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
35.00	115.000
36.50	160.000
40.00	300.000

Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=22.33 cfs @ 23.58 hrs HW=30.60' TW=23.02' (Dynamic Tailwater)
└**1=Drop Inlet Spillway** (Weir Controls 22.33 cfs @ 3.52 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.60' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

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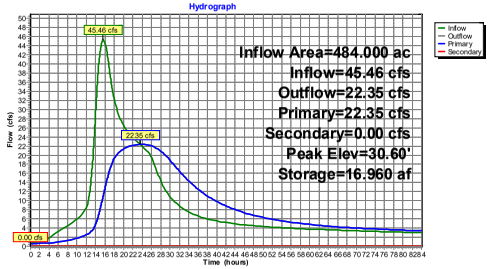
Pond 10P: Maple Springs Brook Dam - 0.8sm



Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow Area = 1,172.000 ac, 6.75% Impervious, Inflow Depth > 1.50" for 200-yr event
Inflow = 99.40 cfs @ 18.10 hrs, Volume= 146.560 af, Incl. 1.10 cfs Base Flow
Outflow = 64.03 cfs @ 26.29 hrs, Volume= 145.290 af, Atten= 36%, Lag= 491.7 min
Primary = 64.03 cfs @ 26.29 hrs, Volume= 145.290 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 23.06' @ 26.29 hrs Storage= 37.315 af (34.605 af above start)

Plug-Flow detention time= 402.3 min calculated for 142.579 af (97% of inflow)
Center-of-Mass det. time= 285.9 min (2,067.6 - 1,781.7)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

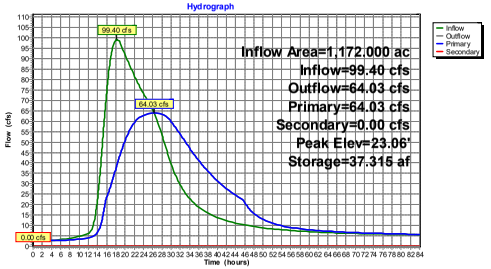
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=64.00 cfs @ 26.29 hrs HW=23.06' TW=18.69' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 64.00 cfs @ 5.18 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.26' TW=15.71' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 11P: Unnamed Road - 1.8sm



Summary for Pond 12P: Maple Springs Road Dam

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth > 1.14" for 200-yr event
Inflow = 29.22 cfs @ 17.29 hrs, Volume= 31.797 af, Incl. 1.00 cfs Base Flow
Outflow = 21.20 cfs @ 21.18 hrs, Volume= 31.793 af, Atten= 27%, Lag= 233.9 min
Primary = 21.20 cfs @ 21.18 hrs, Volume= 31.793 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 39.87' @ 21.18 hrs Storage= 8.220 af (7.140 af above start)

Plug-Flow detention time= 390.9 min calculated for 30.713 af (97% of inflow)
Center-of-Mass det. time= 231.9 min (1,739.7 - 1,507.8)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

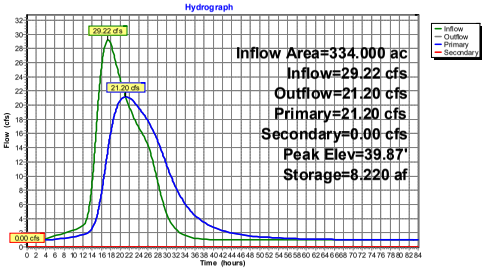
Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=21.18 cfs @ 21.18 hrs HW=39.87' TW=22.88' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 21.18 cfs @ 4.15 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=38.68' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 12P: Maple Springs Road Dam



Summary for Pond 13.1P: Bogs_L_US

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 2.27" for 200-yr event
Inflow = 45.23 cfs @ 21.17 hrs, Volume= 52.829 af, Incl. 0.90 cfs Base Flow
Outflow = 45.20 cfs @ 21.21 hrs, Volume= 52.830 af, Atten= 0%, Lag= 2.9 min
Primary = 45.20 cfs @ 21.21 hrs, Volume= 52.830 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 31.49' @ 21.21 hrs Storage= 0.712 af (0.659 af above start)

Plug-Flow detention time= 16.2 min calculated for 52.776 af (100% of inflow)
Center-of-Mass det. time= 11.2 min (1,584.5 - 1,573.2)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=45.20 cfs @ 21.21 hrs HW=31.49' TW=27.59' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 45.20 cfs @ 4.53 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.65' TW=25.75' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

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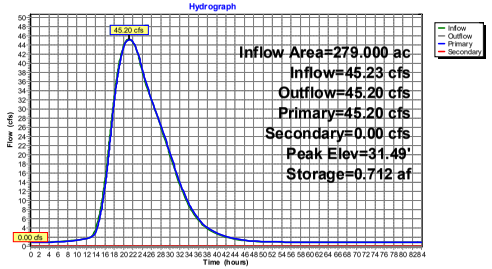
Pond 13.1P: Bogs_L_US



Summary for Pond 13.2P: Bogs_L_DS

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 2.27" for 200-yr event
Inflow = 45.20 cfs @ 21.21 hrs, Volume= 52.830 af
Outflow = 45.16 cfs @ 21.36 hrs, Volume= 52.832 af, Atten= 0%, Lag= 9.0 min
Primary = 45.16 cfs @ 21.36 hrs, Volume= 52.832 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 27.59' @ 21.36 hrs Storage= 0.997 af (0.922 af above start)

Plug-Flow detention time= 22.7 min calculated for 52.756 af (100% of inflow)
Center-of-Mass det. time= 15.7 min (1,600.2 - 1,584.5)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

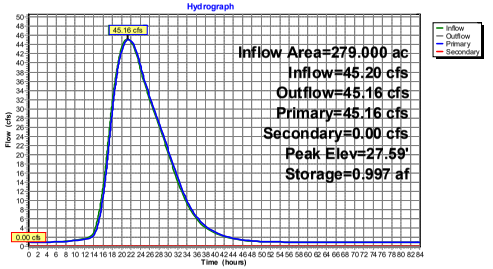
Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=45.16 cfs @ 21.36 hrs HW=27.59' TW=18.58' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 45.16 cfs @ 4.53 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.2P: Bogs_L_DS



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow Area = 1,717.000 ac, 6.26% Impervious, Inflow Depth > 1.76" for 200-yr event
Inflow = 138.66 cfs @ 20.85 hrs, Volume= 251.802 af, Incl. 0.80 cfs Base Flow
Outflow = 126.55 cfs @ 24.30 hrs, Volume= 251.566 af, Atten= 9%, Lag= 207.2 min
Primary = 126.55 cfs @ 24.30 hrs, Volume= 251.566 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 18.73' @ 24.30 hrs Storage= 23.685 af (22.620 af above start)

Plug-Flow detention time= 111.0 min calculated for 250.501 af (99% of inflow)
Center-of-Mass det. time= 86.9 min (1,898.2 - 1,811.3)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

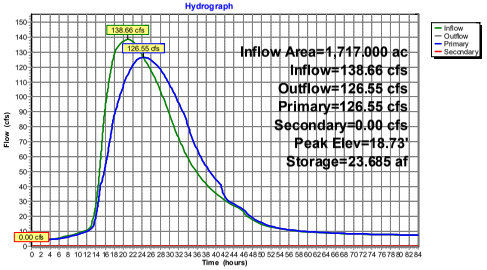
Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

Primary OutFlow Max=126.53 cfs @ 24.30 hrs HW=18.73' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 126.53 cfs @ 4.78 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.71' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 14P: Bogs_M - 2.7sm



Summary for Pond 15.1P: Bogs_N_US

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 3.62" for 200-yr event
Inflow = 81.14 cfs @ 16.33 hrs, Volume= 53.993 af, Incl. 0.60 cfs Base Flow
Outflow = 47.56 cfs @ 19.11 hrs, Volume= 53.988 af, Atten= 41%, Lag= 166.5 min
Primary = 47.56 cfs @ 19.11 hrs, Volume= 53.988 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 27.06' @ 19.11 hrs Storage= 17.492 af (17.140 af above start)

Plug-Flow detention time= 287.9 min calculated for 53.635 af (99% of inflow)
Center-of-Mass det. time= 255.6 min (1,495.5 - 1,239.9)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=47.55 cfs @ 19.11 hrs HW=27.06' TW=20.63' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 47.55 cfs @ 4.61 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.11' TW=20.11' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

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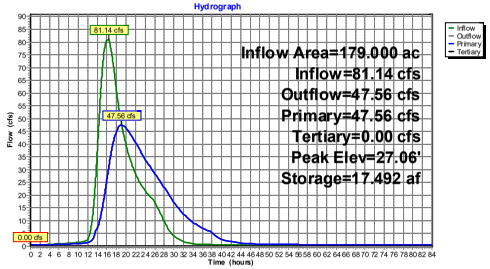
Pond 15.1P: Bogs_N_US



Summary for Pond 15.2P: Bogs_N_DS

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 3.62" for 200-yr event
Inflow = 47.56 cfs @ 19.11 hrs, Volume= 53.988 af
Outflow = 21.74 cfs @ 28.42 hrs, Volume= 51.168 af, Atten= 54%, Lag= 558.9 min
Primary = 21.74 cfs @ 28.42 hrs, Volume= 51.168 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 21.22' @ 28.42 hrs Storage= 28.551 af (25.984 af above start)

Plug-Flow detention time= 1,009.3 min calculated for 48.601 af (90% of inflow)
Center-of-Mass det. time= 783.8 min (2,279.3 - 1,495.5)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

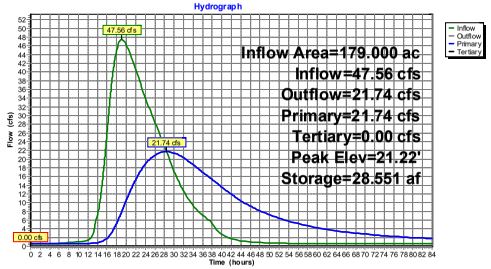
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=21.72 cfs @ 28.42 hrs HW=21.22' TW=0.00' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 21.72 cfs @ 3.55 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
└─**2=TOD** (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS



Summary for Pond 16.1: Mill Pond Dam -PC

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 2.82" for 200-yr event
Inflow = 557.82 cfs @ 14.78 hrs, Volume= 1,161.197 af, Incl. 32.00 cfs Base Flow
Outflow = 294.30 cfs @ 29.39 hrs, Volume= 1,069.553 af, Atten= 47%, Lag= 876.8 min
Primary = 257.15 cfs @ 29.39 hrs, Volume= 865.864 af
Routed to Pond 17B : Proposed Bridge
Secondary = 37.45 cfs @ 30.33 hrs, Volume= 203.689 af
Routed to Pond Wr 24 :
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 17B : Proposed Bridge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 470.969 af
Peak Elev= 15.92' @ 29.39 hrs Storage= 755.453 af (284.484 af above start)

Plug-Flow detention time= 2,247.6 min calculated for 598.575 af (52% of inflow)
Center-of-Mass det. time= 504.3 min (2,546.6 - 2,042.3)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,941.850 af	**Storage** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.130
5.00	4.140
6.00	9.110
7.00	16.590
8.00	34.960
9.00	60.590
10.00	94.410
11.00	142.690
12.00	214.660
13.00	314.540
13.80	403.920
14.00	426.260
15.00	575.290
16.00	771.680
17.00	994.600
18.30	1,368.590
19.00	1,592.930
20.00	1,941.850

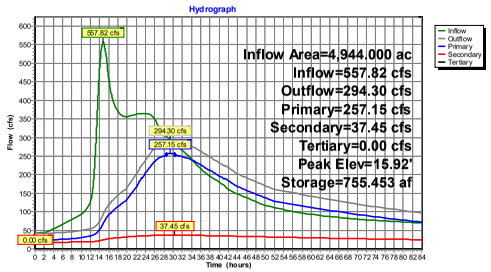
Device	Routing	Invert	Outlet Devices
#1	Primary	15.50'	**110.0' long x 1.5' breadth Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32
#2	Primary	13.60'	**15.0' long x 1.0' breadth Notch as SW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#3	Secondary	12.50'	**3.3' long x 1.0' breadth 3.25' Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#4	Tertiary	18.00'	**TOD, C= 2.60** Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00 Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 8	5.20'	**48.0" W x 48.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#7	Device 8	15.50'	**6.0' long x 20.00' rise MLO DownwardOpGate** 2 End Contraction(s) 5.0' Crest Height
#8	Tertiary	4.00'	**96.0" W x 48.0" H Box Culvert X 0.00** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 32.00 sf

Primary OutFlow Max=253.26 cfs @ 29.39 hrs HW=15.92' TW=9.87' (Dynamic Tailwater)
├─**1=Spillway** (Weir Controls 78.30 cfs @ 1.71 fps)
└─**2=Notch as SW** (Weir Controls 174.96 cfs @ 5.03 fps)

Secondary OutFlow Max=37.26 cfs @ 30.33 hrs HW=15.92' TW=15.44' (Dynamic Tailwater)
└─**3=3.25' Weir** (Weir Controls 37.26 cfs @ 3.31 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.30' TW=8.48' (Dynamic Tailwater)
├─**4=TOD** (Controls 0.00 cfs)
├─**5=US Relief - Bypasses Dam** (Controls 0.00 cfs)
└─**8=Culvert** (Controls 0.00 cfs)
└─**6=Orifice/Grate** (Controls 0.00 cfs)
└─**7=MLO DownwardOpGate** (Controls 0.00 cfs)

Pond 16.1: Mill Pond Dam -PC



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Summary for Pond 16.3: Downstream Weir

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 2.10" for 200-yr event
Inflow = 260.57 cfs @ 30.34 hrs, Volume= 865.844 af
Outflow = 257.15 cfs @ 29.40 hrs, Volume= 865.826 af, Atten= 1%, Lag= 0.0 min
Primary = 257.15 cfs @ 29.40 hrs, Volume= 865.826 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 9.82' @ 29.40 hrs Surf.Area= 2,000 sf Storage= 11,644 cf (2,684 cf above start)

Plug-Flow detention time= 1.4 min calculated for 865.609 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,538.6 - 2,538.5)

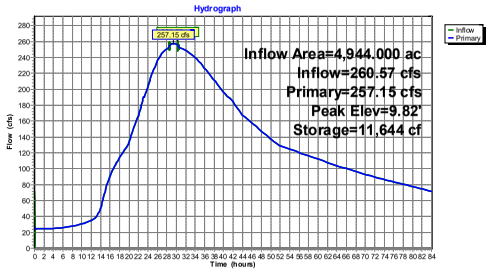
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	8.00'	**DS Weir, C= 2.60** Offset (feet) 0.00 0.00 23.00 23.00 Elev. (feet) 17.00 10.00 8.00 17.00
#2	Primary	8.00'	**27.0' long x 1.5' breadth El 8 Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32

Primary OutFlow Max=257.15 cfs @ 29.40 hrs HW=9.82' (Free Discharge)
└**1=DS Weir** (Weir Controls 53.59 cfs @ 1.40 fps)
└**2=El 8 Weir** (Weir Controls 203.56 cfs @ 4.14 fps)

Pond 16.3: Downstream Weir



Summary for Pond 17B: Proposed Bridge

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 2.10" for 200-yr event
Inflow = 257.15 cfs @ 29.39 hrs, Volume= 865.864 af
Outflow = 260.57 cfs @ 30.34 hrs, Volume= 865.844 af, Atten= 0%, Lag= 56.9 min
Primary = 260.57 cfs @ 30.34 hrs, Volume= 865.844 af
Routed to Pond 16.3 : Downstream Weir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 9.87' @ 29.40 hrs Surf.Area= 2,000 sf Storage= 11,733 cf (2,773 cf above start)

Plug-Flow detention time= 1.4 min calculated for 865.628 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,538.5 - 2,538.4)

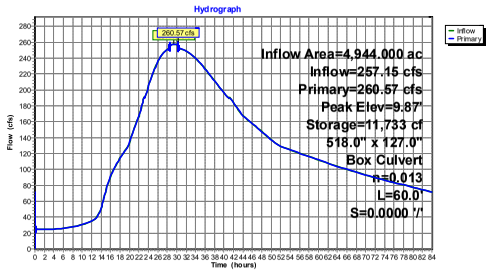
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	4.00'	**518.0" W x 127.0" H Box Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 456.85 sf

Primary OutFlow Max=256.21 cfs @ 30.34 hrs HW=9.85' TW=9.81' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 256.21 cfs @ 1.01 fps)

Pond 17B: Proposed Bridge

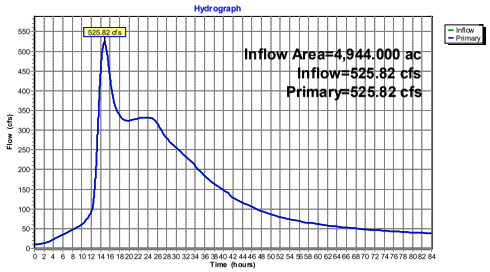


Summary for Link 23L: Inflow

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 2.28" for 200-yr event
Inflow = 525.82 cfs @ 14.78 hrs, Volume= 939.046 af
Primary = 525.82 cfs @ 14.78 hrs, Volume= 939.046 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16.1 : Mill Pond Dam -PC

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow

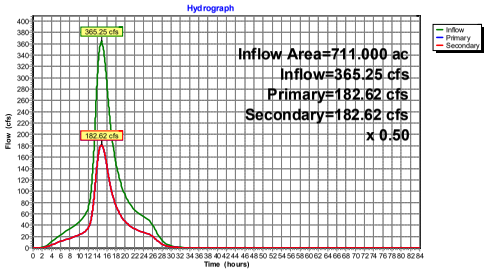


Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 3.34" for 200-yr event
Inflow = 365.25 cfs @ 14.92 hrs, Volume= 198.027 af
Primary = 182.62 cfs @ 14.92 hrs, Volume= 99.013 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 1P : Halfway Pond
Secondary = 182.62 cfs @ 14.92 hrs, Volume= 99.013 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow



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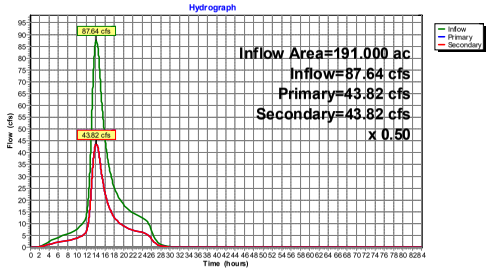
Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 2.52" for 200-yr event
Inflow = 87.64 cfs @ 14.15 hrs, Volume= 40.112 af
Primary = 43.82 cfs @ 14.15 hrs, Volume= 20.056 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 2P : Kennard Res
Secondary = 43.82 cfs @ 14.15 hrs, Volume= 20.056 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

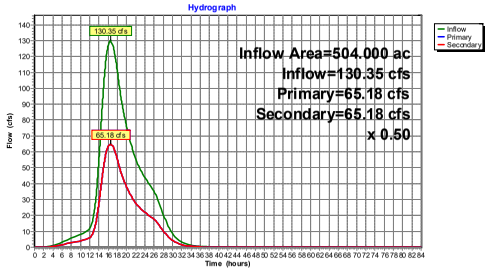


Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth = 2.24" for 200-yr event
Inflow = 130.35 cfs @ 16.59 hrs, Volume= 93.883 af
Primary = 65.18 cfs @ 16.59 hrs, Volume= 46.941 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 65.18 cfs @ 16.59 hrs, Volume= 46.941 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

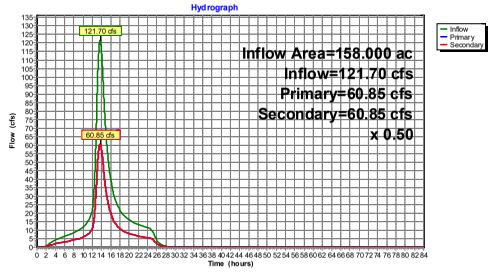


Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 3.45" for 200-yr event
Inflow = 121.70 cfs @ 13.73 hrs, Volume= 45.419 af
Primary = 60.85 cfs @ 13.73 hrs, Volume= 22.709 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 3P : Fawn Pond
Secondary = 60.85 cfs @ 13.73 hrs, Volume= 22.709 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow

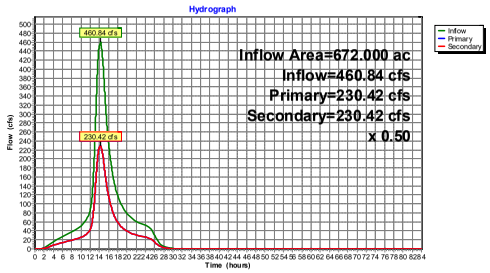


Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 3.66" for 200-yr event
Inflow = 460.84 cfs @ 14.28 hrs, Volume= 205.096 af
Primary = 230.42 cfs @ 14.28 hrs, Volume= 102.548 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 5P : Glen Charlie Pond
Secondary = 230.42 cfs @ 14.28 hrs, Volume= 102.548 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow

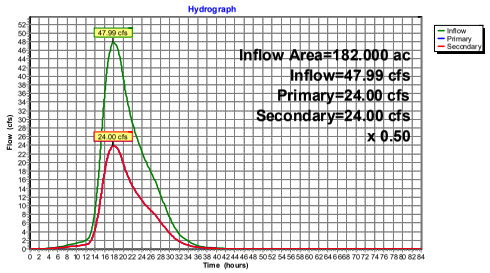


Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 2.54" for 200-yr event
Inflow = 47.99 cfs @ 17.79 hrs, Volume= 38.516 af
Primary = 24.00 cfs @ 17.79 hrs, Volume= 19.258 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 6.2P : Maple Sping Bogs US
Secondary = 24.00 cfs @ 17.79 hrs, Volume= 19.258 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow

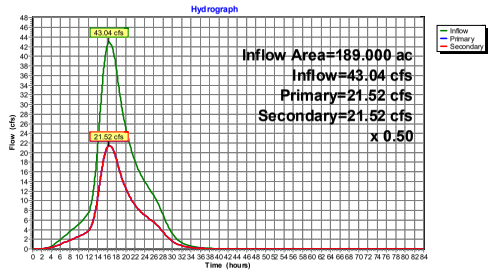


Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth = 2.11" for 200-yr event
Inflow = 43.04 cfs @ 16.28 hrs, Volume= 33.243 af
Primary = 21.52 cfs @ 16.28 hrs, Volume= 16.622 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 7P : Little Five Mile Pond
Secondary = 21.52 cfs @ 16.28 hrs, Volume= 16.622 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow



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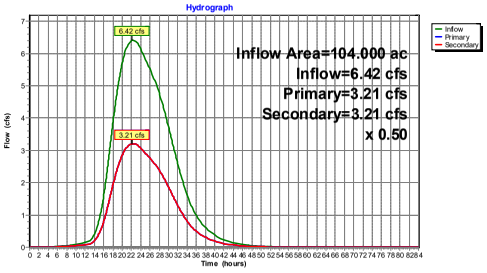
Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth = 0.86" for 200-yr event
Inflow = 6.42 cfs @ 22.02 hrs, Volume= 7.465 af
Primary = 3.21 cfs @ 22.02 hrs, Volume= 3.733 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 9P : Kettle Hole
Secondary = 3.21 cfs @ 22.02 hrs, Volume= 3.733 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow

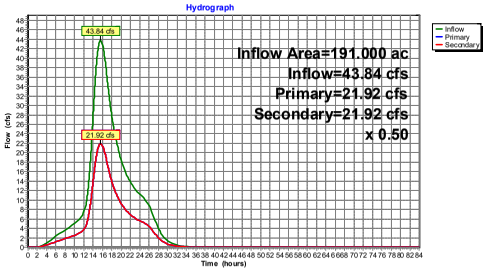


Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth = 1.83" for 200-yr event
Inflow = 43.84 cfs @ 15.53 hrs, Volume= 29.125 af
Primary = 21.92 cfs @ 15.53 hrs, Volume= 14.563 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 21.92 cfs @ 15.53 hrs, Volume= 14.563 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

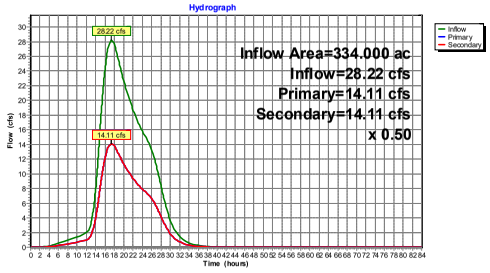


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth = 0.89" for 200-yr event
Inflow = 28.22 cfs @ 17.29 hrs, Volume= 24.855 af
Primary = 14.11 cfs @ 17.29 hrs, Volume= 12.427 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 12P : Maple Springs Road Dam
Secondary = 14.11 cfs @ 17.29 hrs, Volume= 12.427 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow

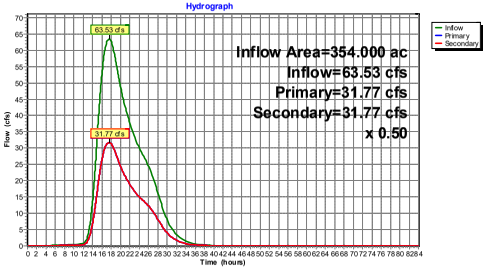


Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth = 1.69" for 200-yr event
Inflow = 63.53 cfs @ 17.59 hrs, Volume= 49.965 af
Primary = 31.77 cfs @ 17.59 hrs, Volume= 24.982 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 31.77 cfs @ 17.59 hrs, Volume= 24.982 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow

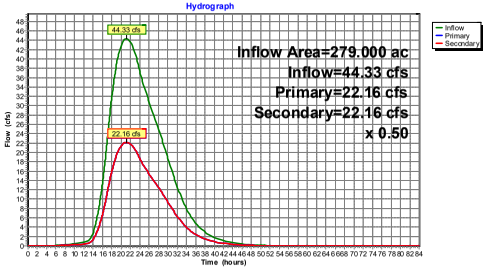


Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth = 2.00" for 200-yr event
Inflow = 44.33 cfs @ 21.17 hrs, Volume= 46.581 af
Primary = 22.16 cfs @ 21.17 hrs, Volume= 23.290 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 13.1P : Bogs_L_US
Secondary = 22.16 cfs @ 21.17 hrs, Volume= 23.290 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow

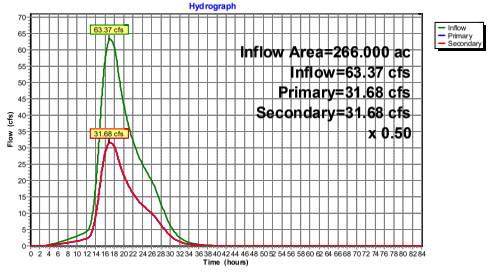


Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth = 2.17" for 200-yr event
Inflow = 63.37 cfs @ 16.87 hrs, Volume= 48.126 af
Primary = 31.68 cfs @ 16.87 hrs, Volume= 24.063 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 31.68 cfs @ 16.87 hrs, Volume= 24.063 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow



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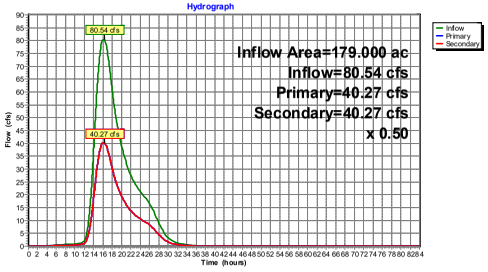
Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth = 3.34" for 200-yr event
Inflow = 80.54 cfs @ 16.33 hrs, Volume= 49.828 af
Primary = 40.27 cfs @ 16.33 hrs, Volume= 24.914 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 15.1P : Bogs_N_US
Secondary = 40.27 cfs @ 16.33 hrs, Volume= 24.914 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow

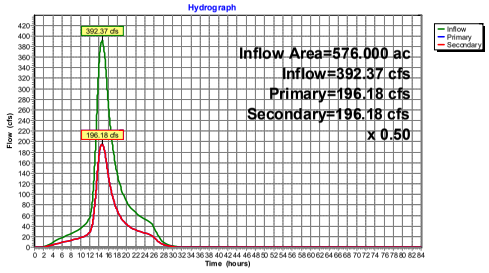


Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 3.96" for 200-yr event
Inflow = 392.37 cfs @ 14.78 hrs, Volume= 190.237 af
Primary = 196.18 cfs @ 14.78 hrs, Volume= 95.118 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 196.18 cfs @ 14.78 hrs, Volume= 95.118 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow

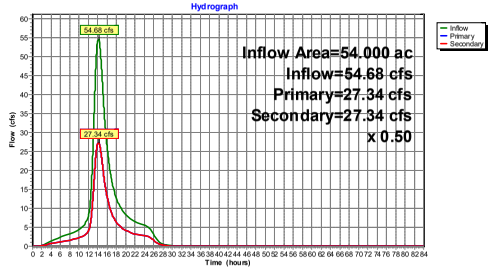


Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 4.94" for 200-yr event
Inflow = 54.68 cfs @ 14.25 hrs, Volume= 22.224 af
Primary = 27.34 cfs @ 14.25 hrs, Volume= 11.112 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 27.34 cfs @ 14.25 hrs, Volume= 11.112 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=4.06"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=453.50 cfs 240.447 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=3.20"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=116.65 cfs 50.879 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=2.92"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=177.34 cfs 122.584 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=4.22"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=154.37 cfs 55.501 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=4.44"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=575.47 cfs 248.623 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=3.31"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=64.73 cfs 50.224 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=2.67"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=55.57 cfs 42.082 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=1.30"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=10.06 cfs 11.292 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=2.36"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=58.41 cfs 37.571 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=1.32"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=45.41 cfs 36.792 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=2.34"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=92.21 cfs 69.037 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=2.70"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=61.32 cfs 62.774 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=2.86"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=87.22 cfs 63.393 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=4.25"
Tc=300.0 min CN=56/98 Runoff=105.30 cfs 63.375 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=4.84"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=494.75 cfs 232.367 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=5.94"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=67.56 cfs 26.727 af

Pond 1P: Halfway Pond Peak Elev=65.28' Storage=598.315 af Inflow=455.70 cfs 255.720 af
Primary=13.90 cfs 73.536 af Secondary=0.00 cfs 0.000 af Outflow=13.90 cfs 73.536 af

Pond 2P: Kennard Res Peak Elev=58.48' Storage=28.628 af Inflow=121.96 cfs 128.580 af
Primary=47.13 cfs 121.588 af Secondary=0.00 cfs 0.000 af Outflow=47.13 cfs 121.588 af

Pond 3P: Fawn Pond Peak Elev=60.74' Storage=77.742 af Inflow=154.87 cfs 58.972 af
Primary=6.65 cfs 28.352 af Tertiary=0.00 cfs 0.000 af Outflow=6.65 cfs 28.352 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=48.89' Storage=96.602 af Inflow=229.88 cfs 283.631 af
Primary=93.29 cfs 268.986 af Secondary=0.00 cfs 0.000 af Outflow=93.29 cfs 268.986 af

Pond 5P: Glen Charlie Pond Peak Elev=35.16' Storage=221.087 af Inflow=594.53 cfs 532.187 af
Primary=139.98 cfs 473.380 af Secondary=0.82 cfs 0.633 af Tertiary=3.43 cfs 6.448 af Outflow=144.24 cfs 480.462 af

Pond 6.1P: Ortalani Reservoir Peak Elev=34.49' Storage=5.109 af Inflow=4.25 cfs 7.081 af
Outflow=1.02 cfs 3.907 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=24.21' Storage=26.191 af Inflow=64.75 cfs 54.131 af
Primary=23.89 cfs 49.110 af Secondary=5.54 cfs 1.910 af Outflow=29.43 cfs 51.020 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=18.48' Storage=2.951 af Inflow=29.43 cfs 51.020 af
Primary=28.77 cfs 50.646 af Secondary=0.00 cfs 0.000 af Outflow=28.77 cfs 50.646 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=22.09' Storage=4.319 af Inflow=139.98 cfs 473.380 af
Primary=139.91 cfs 472.137 af Secondary=0.00 cfs 0.000 af Outflow=139.91 cfs 472.137 af

Pond 7P: Little Five Mile Pond Peak Elev=59.88' Storage=25.007 af Inflow=56.16 cfs 46.177 af
Outflow=55.63 cfs 46.127 af

Pond 8P: Five Mile Pond Peak Elev=53.26' Storage=36.992 af Inflow=55.63 cfs 46.127 af
Primary=6.13 cfs 23.734 af Secondary=0.00 cfs 0.000 af Outflow=6.13 cfs 23.734 af

Pond 9P: Kettle Hole Peak Elev=55.22' Storage=9.780 af Inflow=10.36 cfs 13.375 af
Outflow=10.28 cfs 13.383 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=30.85' Storage=22.069 af Inflow=60.44 cfs 78.854 af
Primary=30.48 cfs 75.109 af Secondary=0.00 cfs 0.000 af Outflow=30.48 cfs 75.109 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=23.50' Storage=55.131 af Inflow=143.93 cfs 195.512 af
Primary=84.81 cfs 193.962 af Secondary=0.00 cfs 0.000 af Outflow=84.81 cfs 193.962 af

Pond 12P: Maple Springs Road Dam Peak Elev=40.37' Storage=11.197 af Inflow=46.41 cfs 43.734 af
Primary=33.70 cfs 43.730 af Secondary=0.00 cfs 0.000 af Outflow=33.70 cfs 43.730 af

Pond 13.1P: Bogs_L_US Peak Elev=31.97' Storage=0.881 af Inflow=62.22 cfs 69.022 af
Primary=62.15 cfs 69.024 af Secondary=0.00 cfs 0.000 af Outflow=62.15 cfs 69.024 af

Pond 13.2P: Bogs_L_DS Peak Elev=28.03' Storage=1.421 af Inflow=62.15 cfs 69.024 af
Primary=60.76 cfs 69.026 af Secondary=0.00 cfs 0.000 af Outflow=60.76 cfs 69.026 af

Pond 14P: Bogs_M - 2.7sm Peak Elev=19.29' Storage=37.339 af Inflow=186.47 cfs 331.935 af
Primary=160.80 cfs 331.642 af Secondary=0.00 cfs 0.000 af Outflow=160.80 cfs 331.642 af

Pond 15.1P: Bogs_N_US Peak Elev=27.58' Storage=21.534 af Inflow=105.90 cfs 67.540 af
Primary=66.41 cfs 67.535 af Tertiary=0.00 cfs 0.000 af Outflow=66.41 cfs 67.535 af

Pond 15.2P: Bogs_N_DS Peak Elev=21.48' Storage=34.570 af Inflow=66.41 cfs 67.535 af
Primary=28.96 cfs 64.472 af Tertiary=0.00 cfs 0.000 af Outflow=28.96 cfs 64.472 af

Pond 16.1: Mill Pond Dam -PC Peak Elev=16.12' Storage=799.125 af Inflow=689.21 cfs 1,400.142 af
ary=342.11 cfs 1,079.056 af Secondary=39.76 cfs 213.832 af Tertiary=0.00 cfs 0.000 af Outflow=381.86 cfs 1,292.888 af

Pond 16.3: Downstream Weir Peak Elev=10.14' Storage=12,280 cf Inflow=342.11 cfs 1,079.033 af
Outflow=342.11 cfs 1,079.012 af

Pond 17B: Proposed Bridge Peak Elev=10.21' Storage=12,422 cf Inflow=342.11 cfs 1,079.056 af
518.0" x 127.0" Box Culvert n=0.013 L=60.0' S=0.0000 '/' Outflow=342.11 cfs 1,079.033 af

Link 23L: Inflow Inflow=657.21 cfs 1,177.991 af
Primary=657.21 cfs 1,177.991 af

Link A1: 1/2 Flow x 0.50 Inflow=453.50 cfs 240.447 af
Primary=226.75 cfs 120.224 af Secondary=226.75 cfs 120.224 af

Link B1: 1/2 Flow x 0.50 Inflow=116.65 cfs 50.879 af
Primary=58.32 cfs 25.439 af Secondary=58.32 cfs 25.439 af

Link C1: 1/2 Flow x 0.50 Inflow=177.34 cfs 122.584 af
Primary=88.67 cfs 61.292 af Secondary=88.67 cfs 61.292 af

Link D1: 1/2 Flow x 0.50 Inflow=154.37 cfs 55.501 af
Primary=77.18 cfs 27.751 af Secondary=77.18 cfs 27.751 af

Link E1: 1/2 Flow x 0.50 Inflow=575.47 cfs 248.623 af
Primary=287.73 cfs 124.311 af Secondary=287.73 cfs 124.311 af

Link F1: 1/2 Flow x 0.50 Inflow=64.73 cfs 50.224 af
Primary=32.36 cfs 25.112 af Secondary=32.36 cfs 25.112 af

Link G1: 1/2 Flow x 0.50 Inflow=55.57 cfs 42.082 af
Primary=27.79 cfs 21.041 af Secondary=27.79 cfs 21.041 af

Link H1: 1/2 Flow x 0.50 Inflow=10.06 cfs 11.292 af
Primary=5.03 cfs 5.646 af Secondary=5.03 cfs 5.646 af

Link I1: 1/2 Flow x 0.50 Inflow=58.41 cfs 37.571 af
Primary=29.20 cfs 18.786 af Secondary=29.20 cfs 18.786 af

Link JL: 1/2 Flow x 0.50 Inflow=45.41 cfs 36.792 af
Primary=22.71 cfs 18.396 af Secondary=22.71 cfs 18.396 af

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Link KL: 1/2 Flow x 0.50 Inflow=92.21 cfs 69.037 af
Primary=46.10 cfs 34.519 af Secondary=46.10 cfs 34.519 af

Link LL: 1/2 Flow x 0.50 Inflow=61.32 cfs 62.774 af
Primary=30.66 cfs 31.387 af Secondary=30.66 cfs 31.387 af

Link ML: 1/2 Flow x 0.50 Inflow=87.22 cfs 63.393 af
Primary=43.61 cfs 31.697 af Secondary=43.61 cfs 31.697 af

Link NL: 1/2 Flow x 0.50 Inflow=105.30 cfs 63.375 af
Primary=52.65 cfs 31.687 af Secondary=52.65 cfs 31.687 af

Link OL: 1/2 Flow x 0.50 Inflow=494.75 cfs 232.367 af
Primary=247.37 cfs 116.183 af Secondary=247.37 cfs 116.183 af

Link PL: 1/2 Flow x 0.50 Inflow=67.56 cfs 26.727 af
Primary=33.78 cfs 13.364 af Secondary=33.78 cfs 13.364 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 1,413.668 af Average Runoff Depth = 3.43"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

Summary for Subcatchment A: A

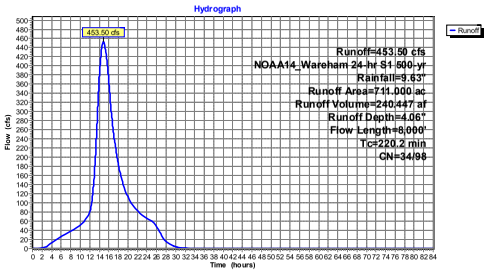
Runoff = 453.50 cfs @ 14.92 hrs, Volume= 240.447 af, Depth= 4.06"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 711.000	56	"33.99% imp"
469.331	34	66.01% Pervious Area
241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



Summary for Subcatchment B: B

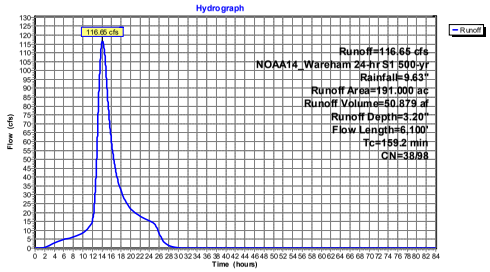
Runoff = 116.65 cfs @ 14.15 hrs, Volume= 50.879 af, Depth= 3.20"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 191.000	49	"18.54% imp"
155.589	38	81.46% Pervious Area
35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



Summary for Subcatchment C: C

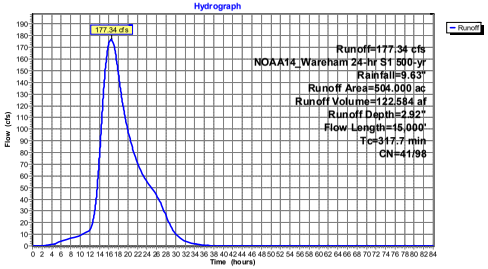
Runoff = 177.34 cfs @ 16.59 hrs, Volume= 122.584 af, Depth= 2.92"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 504.000	47	"10.54% imp"
450.878	41	89.46% Pervious Area
53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



Summary for Subcatchment D: D

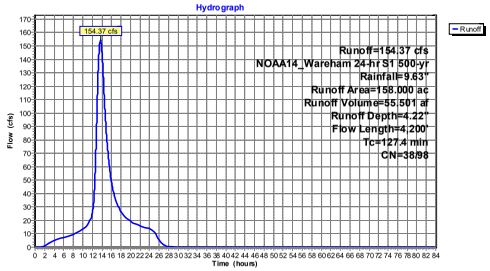
Runoff = 154.37 cfs @ 13.73 hrs, Volume= 55.501 af, Depth= 4.22"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 158.000	57	"31.94% imp"
107.535	38	68.06% Pervious Area
50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



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Summary for Subcatchment E: E

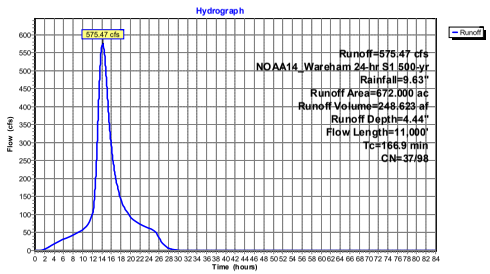
Runoff = 575.47 cfs @ 14.28 hrs, Volume= 248.623 af, Depth= 4.44"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 672.000	59	*35.91% imp*
430.685	37	64.09% Pervious Area
241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



Summary for Subcatchment F: F

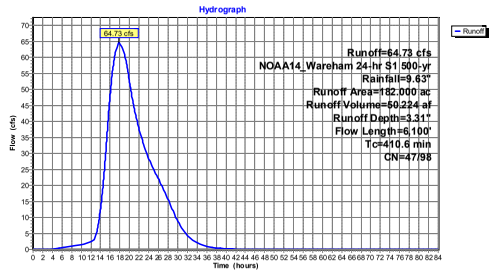
Runoff = 64.73 cfs @ 17.79 hrs, Volume= 50.224 af, Depth= 3.31"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 182.000	50	*6.11% imp*
170.880	47	93.89% Pervious Area
11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



Summary for Subcatchment G: G

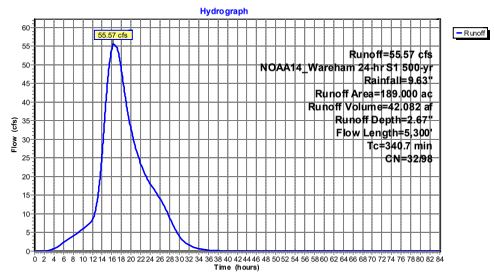
Runoff = 55.57 cfs @ 16.28 hrs, Volume= 42.082 af, Depth= 2.67"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 189.000	45	*19.09% imp*
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



Summary for Subcatchment H: H

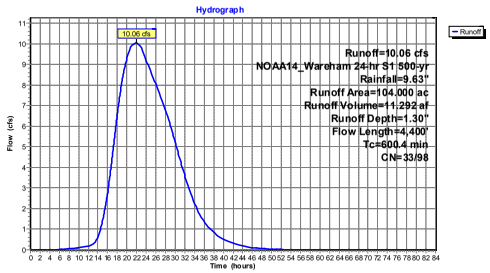
Runoff = 10.06 cfs @ 22.01 hrs, Volume= 11.292 af, Depth= 1.30"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 104.000	34	*1.27% imp*
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

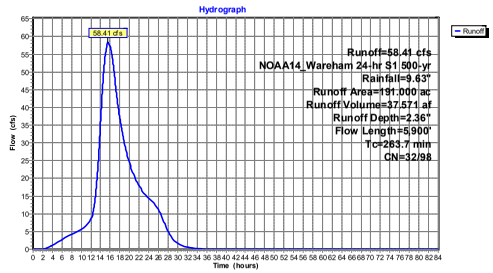
Runoff = 58.41 cfs @ 15.53 hrs, Volume= 37.571 af, Depth= 2.36"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 191.000	42	*15.34% imp*
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



Summary for Subcatchment J: J

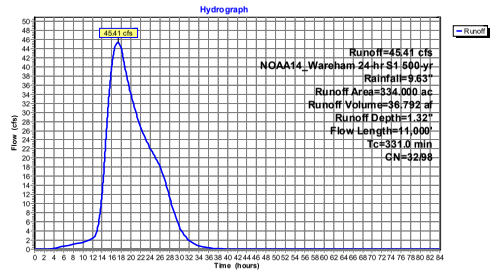
Runoff = 45.41 cfs @ 17.29 hrs, Volume= 36.792 af, Depth= 1.32"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 334.000	34	*2.83% imp*
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Proposal No. 606352-136278
A00840 - 620

Summary for Subcatchment K: K

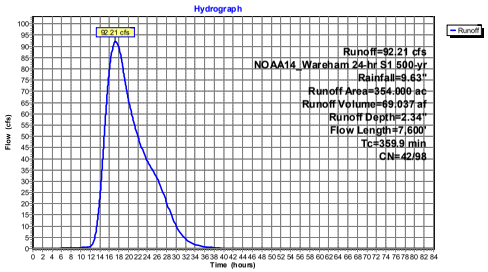
Runoff = 92.21 cfs @ 17.20 hrs, Volume= 69.037 af, Depth= 2.34"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 354.000	42	"0.83% imp"
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



Summary for Subcatchment L: L

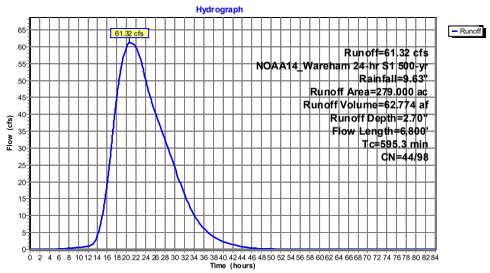
Runoff = 61.32 cfs @ 20.51 hrs, Volume= 62.774 af, Depth= 2.70"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 279.000	45	"2.43% imp"
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



Summary for Subcatchment M: M

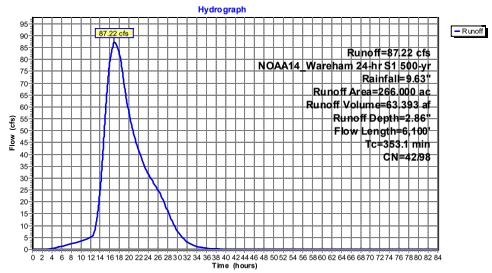
Runoff = 87.22 cfs @ 16.87 hrs, Volume= 63.393 af, Depth= 2.86"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 266.000	47	"8.14% imp"
244.348	42	91.86% Pervious Area
21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



Summary for Subcatchment N: N

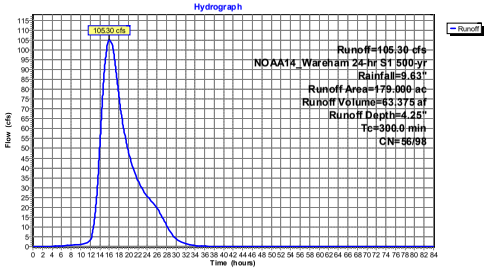
Runoff = 105.30 cfs @ 16.00 hrs, Volume= 63.375 af, Depth= 4.25"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 179.000	57	"3.17% imp"
173.326	56	96.83% Pervious Area
5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

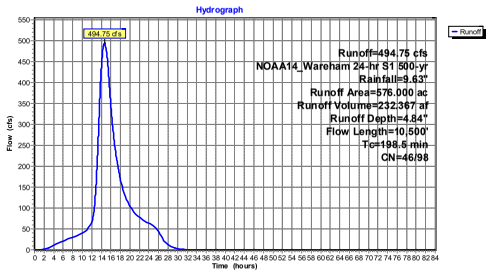
Runoff = 494.75 cfs @ 14.78 hrs, Volume= 232.367 af, Depth= 4.84"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 576.000	62	"31.1% imp"
396.864	46	68.90% Pervious Area
179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



Summary for Subcatchment P: P

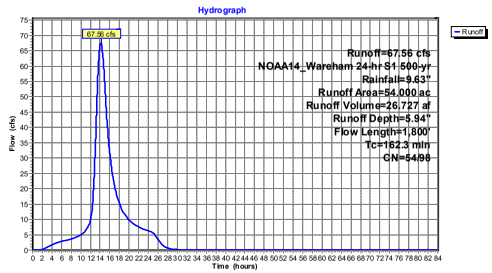
Runoff = 67.56 cfs @ 14.25 hrs, Volume= 26.727 af, Depth= 5.94"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 500-yr Rainfall=9.63"

Area (ac)	CN	Description
* 54.000	71	"38.05% imp"
33.453	54	61.95% Pervious Area
20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Proposal No. 606352-136278
A00840 - 621

Summary for Pond 1P: Halfway Pond

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth > 4.32" for 500-yr event
Inflow = 455.70 cfs @ 14.92 hrs, Volume= 255.720 af, Incl. 2.20 cfs Base Flow
Outflow = 13.90 cfs @ 28.43 hrs, Volume= 73.536 af, Atten= 97%, Lag= 810.6 min
Primary = 13.90 cfs @ 28.43 hrs, Volume= 73.536 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 65.28' @ 28.43 hrs Storage= 598.315 af (227.705 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,754.0 min (2,826.7 - 1,072.7)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

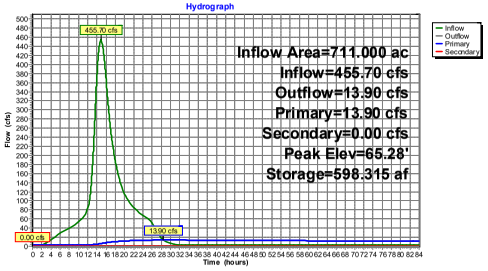
Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=13.93 cfs @ 28.43 hrs HW=65.28' TW=58.08' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 13.93 cfs @ 3.63 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 1P: Halfway Pond



Summary for Pond 2P: Kennard Res

Inflow Area = 902.000 ac, 30.72% Impervious, Inflow Depth > 1.71" for 500-yr event
Inflow = 121.96 cfs @ 14.15 hrs, Volume= 128.580 af, Incl. 0.60 cfs Base Flow
Outflow = 47.13 cfs @ 17.47 hrs, Volume= 121.588 af, Atten= 61%, Lag= 199.3 min
Primary = 47.13 cfs @ 17.47 hrs, Volume= 121.588 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 58.48' @ 17.47 hrs Storage= 28.628 af (24.628 af above start)

Plug-Flow detention time= 543.1 min calculated for 117.588 af (91% of inflow)
Center-of-Mass det. time= 233.9 min (2,312.9 - 2,079.0)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

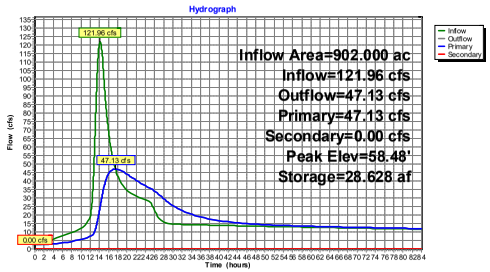
Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=47.11 cfs @ 17.47 hrs HW=58.48' TW=48.26' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 47.11 cfs @ 3.93 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.30' TW=46.77' (Dynamic Tailwater)
└**1=TOD** (Controls 0.00 cfs)

Pond 2P: Kennard Res



Summary for Pond 3P: Fawn Pond

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth > 4.48" for 500-yr event
Inflow = 154.87 cfs @ 13.73 hrs, Volume= 58.972 af, Incl. 0.50 cfs Base Flow
Outflow = 6.65 cfs @ 25.84 hrs, Volume= 28.352 af, Atten= 96%, Lag= 726.9 min
Primary = 6.65 cfs @ 25.84 hrs, Volume= 28.352 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 60.74' @ 25.84 hrs Storage= 77.742 af (50.022 af above start)

Plug-Flow detention time= 4,803.2 min calculated for 0.632 af (1% of inflow)
Center-of-Mass det. time= 1,662.0 min (2,660.7 - 998.8)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

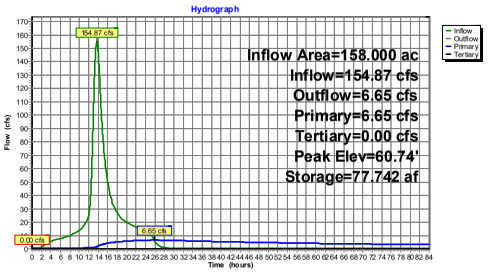
Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=6.65 cfs @ 25.84 hrs HW=60.74' TW=48.89' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 6.65 cfs @ 3.98 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=59.83' TW=46.77' (Dynamic Tailwater)
└**2=TOD South** (Controls 0.00 cfs)

Pond 3P: Fawn Pond



Proposal No. 606352-136278
A00840 - 622

Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow Area = 1,564.000 ac, 24.34% Impervious, Inflow Depth > 2.18" for 500-yr event
Inflow = 229.88 cfs @ 16.59 hrs, Volume= 283.631 af, Incl. 1.60 cfs Base Flow
Outflow = 93.29 cfs @ 25.02 hrs, Volume= 268.986 af, Atten= 59%, Lag= 505.8 min
Primary = 93.29 cfs @ 25.02 hrs, Volume= 268.986 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 48.89' @ 25.02 hrs Storage= 96.602 af (86.882 af above start)

Plug-Flow detention time= 741.5 min calculated for 259.266 af (91% of inflow)
Center-of-Mass det. time= 426.6 min (2,274.1 - 1,847.5)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

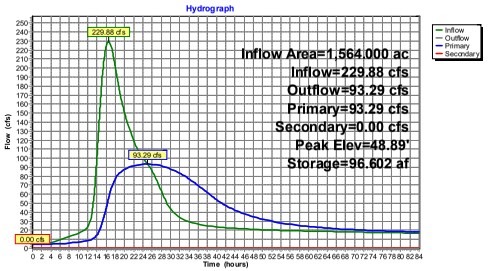
Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=93.30 cfs @ 25.02 hrs HW=48.89' TW=35.16' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Orifice Controls 93.30 cfs @ 6.41 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=46.77' TW=33.99' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 4P: Bessey Bog Res - 2.4sm



Summary for Pond 5P: Glen Charlie Pond

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 2.86" for 500-yr event
Inflow = 594.53 cfs @ 14.28 hrs, Volume= 532.187 af, Incl. 2.10 cfs Base Flow
Outflow = 144.24 cfs @ 25.44 hrs, Volume= 480.462 af, Atten= 76%, Lag= 669.7 min
Primary = 139.98 cfs @ 25.44 hrs, Volume= 473.380 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 0.82 cfs @ 25.44 hrs, Volume= 0.633 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 3.43 cfs @ 25.44 hrs, Volume= 6.448 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 35.16' @ 25.44 hrs Storage= 221.087 af (194.962 af above start)

Plug-Flow detention time= 1,179.5 min calculated for 454.331 af (85% of inflow)
Center-of-Mass det. time= 712.2 min (2,366.5 - 1,654.3)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00

Elev. (feet) 41.00 40.00 39.00 37.70 37.70 41.00

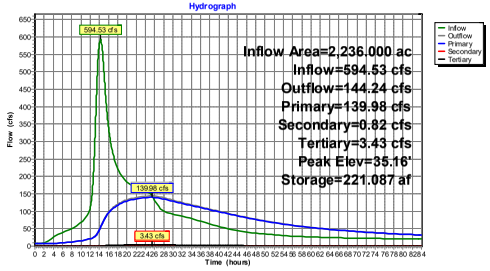
#6	Tertiary	34.50'	**24.0" W x 12.0" H Vert. NE Culvert** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=139.93 cfs @ 25.44 hrs HW=35.16' TW=22.09' (Dynamic Tailwater)
└**1=Spillway** (Weir Controls 139.93 cfs @ 4.44 fps)
└**2=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.81 cfs @ 25.44 hrs HW=35.16' TW=34.35' (Dynamic Tailwater)
└**3=SE Dike** (Controls 0.00 cfs)
└**4=SE Culvert** (Orifice Controls 0.81 cfs @ 1.28 fps)

Tertiary OutFlow Max=3.43 cfs @ 25.44 hrs HW=35.16' TW=34.35' (Dynamic Tailwater)
└**5=NE Dike** (Controls 0.00 cfs)
└**6=NE Culvert** (Orifice Controls 3.43 cfs @ 2.60 fps)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 4.25 cfs @ 25.44 hrs, Volume= 7.081 af
Outflow = 1.02 cfs @ 44.66 hrs, Volume= 3.907 af, Atten= 76%, Lag= 1,153.3 min
Primary = 1.02 cfs @ 44.66 hrs, Volume= 3.907 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 34.49' @ 44.66 hrs Storage= 5.109 af

Plug-Flow detention time= 1,756.0 min calculated for 3.907 af (55% of inflow)
Center-of-Mass det. time= 1,353.4 min (3,138.9 - 1,785.4)

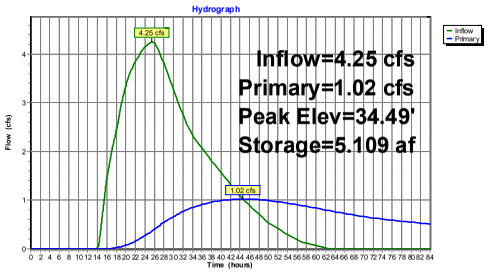
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=1.01 cfs @ 44.66 hrs HW=34.49' TW=23.27' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 1.01 cfs @ 1.73 fps)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



Proposal No. 606352-136278
A00840 - 623

Summary for Pond 6.2P: Maple Sping Bogs US

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 3.57" for 500-yr event
Inflow = 64.75 cfs @ 17.79 hrs, Volume= 54.131 af
Outflow = 29.43 cfs @ 23.77 hrs, Volume= 51.020 af, Atten= 55%, Lag= 358.8 min
Primary = 23.89 cfs @ 23.77 hrs, Volume= 49.110 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 5.54 cfs @ 23.77 hrs, Volume= 1.910 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 24.21' @ 23.77 hrs Storage= 26.191 af

Plug-Flow detention time= 795.5 min calculated for 51.019 af (94% of inflow)
Center-of-Mass det. time= 667.8 min (2,043.4 - 1,375.5)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

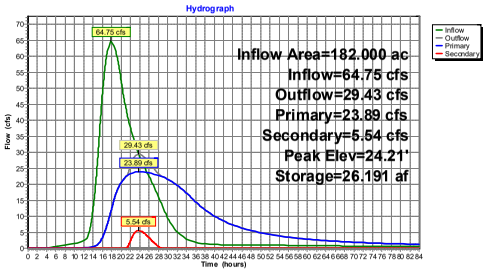
Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=23.89 cfs @ 23.77 hrs HW=24.21' TW=18.45' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 23.89 cfs @ 4.78 fps)

Secondary OutFlow Max=5.54 cfs @ 23.77 hrs HW=24.21' TW=18.45' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 5.54 cfs @ 0.66 fps)

Pond 6.2P: Maple Sping Bogs US



Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 3.36" for 500-yr event
Inflow = 29.43 cfs @ 23.77 hrs, Volume= 51.020 af
Outflow = 28.77 cfs @ 24.74 hrs, Volume= 50.646 af, Atten= 2%, Lag= 58.1 min
Primary = 28.77 cfs @ 24.74 hrs, Volume= 50.646 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 18.48' @ 24.74 hrs Storage= 2.951 af

Plug-Flow detention time= 98.9 min calculated for 50.645 af (99% of inflow)
Center-of-Mass det. time= 77.5 min (2,120.9 - 2,043.4)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

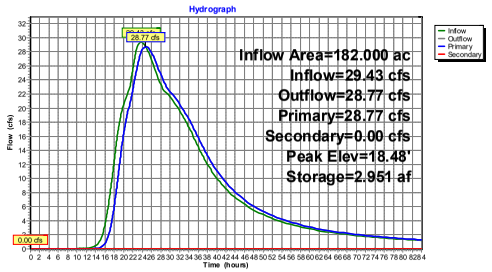
Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=28.77 cfs @ 24.74 hrs HW=18.48' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 28.77 cfs @ 3.90 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 2.54" for 500-yr event
Inflow = 139.98 cfs @ 25.44 hrs, Volume= 473.380 af
Outflow = 139.91 cfs @ 25.73 hrs, Volume= 472.137 af, Atten= 0%, Lag= 17.1 min
Primary = 139.91 cfs @ 25.73 hrs, Volume= 472.137 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 22.09' @ 25.73 hrs Storage= 4.319 af (3.872 af above start)

Plug-Flow detention time= 27.3 min calculated for 471.689 af (100% of inflow)
Center-of-Mass det. time= 15.6 min (2,390.8 - 2,375.2)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

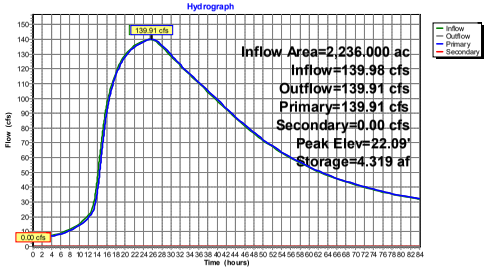
Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

Primary OutFlow Max=139.91 cfs @ 25.73 hrs HW=22.09' TW=0.00' (Dynamic Tailwater)
└**1=Bridge/Spillway** (Weir Controls 139.91 cfs @ 5.34 fps)
└**3=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.49' TW=22.70' (Dynamic Tailwater)
└**2=Culvert to Bogs** (Controls 0.00 cfs)
└**4=TOD_Bogs** (Controls 0.00 cfs)

Pond 6P: Maple Springs Dam - 3.5sm



Proposal No. 606352-136278

A00840 - 624

Summary for Pond 7P: Little Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 2.93" for 500-yr event
Inflow = 56.16 cfs @ 16.28 hrs, Volume= 46.177 af, Incl. 0.59 cfs Base Flow
Outflow = 55.63 cfs @ 16.95 hrs, Volume= 46.127 af, Atten= 1%, Lag= 40.3 min
Primary = 55.63 cfs @ 16.95 hrs, Volume= 46.127 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 59.88' @ 16.95 hrs Storage= 25.007 af (2.847 af above start)

Plug-Flow detention time= 737.1 min calculated for 23.967 af (52% of inflow)
Center-of-Mass det. time= 49.6 min (1,293.0 - 1,243.4)

Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

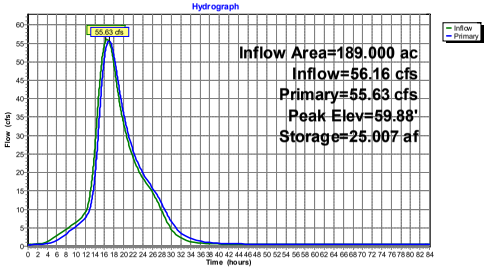
Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=55.63 cfs @ 16.95 hrs HW=59.88' TW=52.45' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 55.63 cfs @ 0.79 fps)

Pond 7P: Little Five Mile Pond

Hydrograph



Summary for Pond 8P: Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 2.93" for 500-yr event
Inflow = 55.63 cfs @ 16.95 hrs, Volume= 46.127 af
Outflow = 6.13 cfs @ 30.27 hrs, Volume= 23.734 af, Atten= 89%, Lag= 799.3 min
Primary = 6.13 cfs @ 30.27 hrs, Volume= 23.734 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 53.26' @ 30.27 hrs Storage= 36.992 af

Plug-Flow detention time= 1,876.2 min calculated for 23.734 af (51% of inflow)
Center-of-Mass det. time= 1,522.5 min (2,815.5 - 1,293.0)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

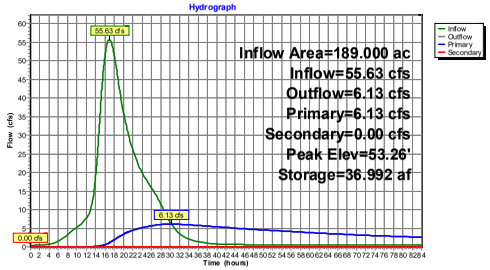
Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=6.12 cfs @ 30.27 hrs HW=53.26' TW=30.69' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 6.12 cfs @ 3.81 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=51.90' TW=29.60' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 8P: Five Mile Pond

Hydrograph



Summary for Pond 9P: Kettle Hole

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth > 1.54" for 500-yr event
Inflow = 10.36 cfs @ 22.01 hrs, Volume= 13.375 af, Incl. 0.30 cfs Base Flow
Outflow = 10.28 cfs @ 22.37 hrs, Volume= 13.383 af, Atten= 1%, Lag= 21.5 min
Primary = 10.28 cfs @ 22.37 hrs, Volume= 13.383 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.22' @ 22.37 hrs Storage= 9.780 af (0.830 af above start)

Plug-Flow detention time= 1,381.9 min calculated for 4.433 af (33% of inflow)
Center-of-Mass det. time= 66.5 min (1,709.7 - 1,643.3)

Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

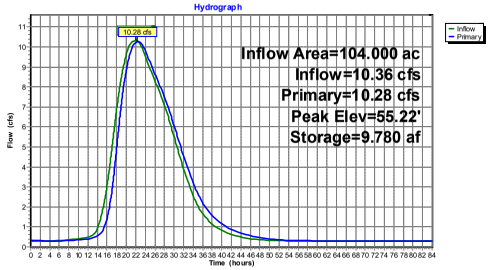
Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=10.28 cfs @ 22.37 hrs HW=55.22' TW=30.85' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 10.28 cfs @ 0.59 fps)

Pond 9P: Kettle Hole

Hydrograph



Proposal No. 606352-136278
A00840 - 625

Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow Area = 484.000 ac, 13.78% Impervious, Inflow Depth > 1.96" for 500-yr event
Inflow = 60.44 cfs @ 15.53 hrs, Volume= 78.854 af, Incl. 0.60 cfs Base Flow
Outflow = 30.48 cfs @ 23.66 hrs, Volume= 75.109 af, Atten= 50%, Lag= 488.0 min
Primary = 30.48 cfs @ 23.66 hrs, Volume= 75.109 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1.500 af
Peak Elev= 30.85' @ 23.66 hrs Storage= 22.069 af (20.569 af above start)

Plug-Flow detention time= 609.6 min calculated for 73.608 af (93% of inflow)
Center-of-Mass det. time= 379.9 min (2,156.9 - 1,777.0)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LiDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
35.00	115.000
36.50	160.000
40.00	300.000

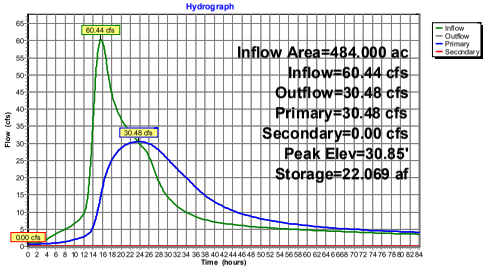
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=30.48 cfs @ 23.66 hrs HW=30.85' TW=23.45' (Dynamic Tailwater)
└**1=Drop Inlet Spillway** (Weir Controls 30.48 cfs @ 3.93 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.60' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 10P: Maple Springs Brook Dam - 0.8sm



Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow Area = 1,172.000 ac, 6.75% Impervious, Inflow Depth > 2.00" for 500-yr event
Inflow = 143.93 cfs @ 18.00 hrs, Volume= 195.512 af, Incl. 1.10 cfs Base Flow
Outflow = 84.81 cfs @ 26.32 hrs, Volume= 193.962 af, Atten= 41%, Lag= 499.8 min
Primary = 84.81 cfs @ 26.32 hrs, Volume= 193.962 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 23.50' @ 26.32 hrs Storage= 55.131 af (52.421 af above start)

Plug-Flow detention time= 426.3 min calculated for 191,250 af (98% of inflow)
Center-of-Mass det. time= 333.7 min (2,060.6 - 1,726.8)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

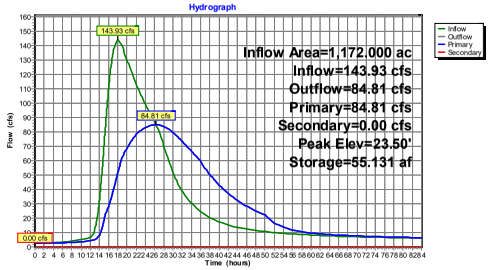
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=84.77 cfs @ 26.32 hrs HW=23.50' TW=19.28' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 84.77 cfs @ 5.64 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.26' TW=15.71' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 11P: Unnamed Road - 1.8sm



Summary for Pond 12P: Maple Springs Road Dam

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth > 1.57" for 500-yr event
Inflow = 46.41 cfs @ 17.29 hrs, Volume= 43.734 af, Incl. 1.00 cfs Base Flow
Outflow = 33.70 cfs @ 20.29 hrs, Volume= 43.730 af, Atten= 27%, Lag= 180.1 min
Primary = 33.70 cfs @ 20.29 hrs, Volume= 43.730 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 40.37' @ 20.29 hrs Storage= 11.197 af (10.117 af above start)

Plug-Flow detention time= 337.5 min calculated for 42.649 af (98% of inflow)
Center-of-Mass det. time= 223.1 min (1,644.2 - 1,421.1)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

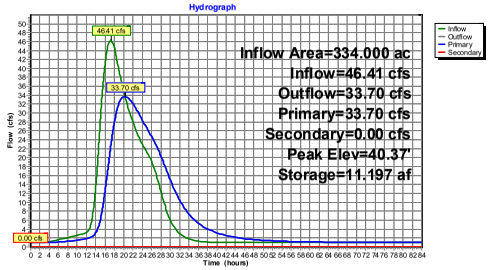
Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=33.68 cfs @ 20.29 hrs HW=40.37' TW=23.20' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 33.68 cfs @ 4.98 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=38.68' TW=21.26' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 12P: Maple Springs Road Dam



Proposal No. 606352-136278
A00840 - 626

Summary for Pond 13.1P: Bogs_L_US

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 2.97" for 500-yr event
Inflow = 62.22 cfs @ 20.51 hrs, Volume= 69.022 af, Incl. 0.90 cfs Base Flow
Outflow = 62.15 cfs @ 20.88 hrs, Volume= 69.024 af, Atten= 0%, Lag= 22.3 min
Primary = 62.15 cfs @ 20.88 hrs, Volume= 69.024 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 31.97' @ 20.81 hrs Storage= 0.881 af (0.827 af above start)

Plug-Flow detention time= 14.5 min calculated for 68.969 af (100% of inflow)
Center-of-Mass det. time= 10.6 min (1,543.3 - 1,532.6)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

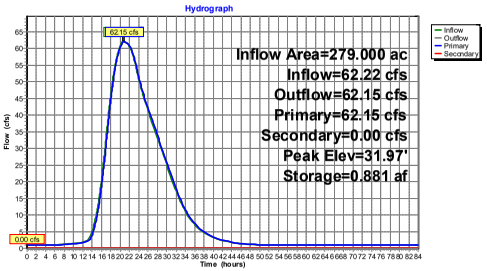
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=62.14 cfs @ 20.88 hrs HW=31.97' TW=28.01' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 62.14 cfs @ 5.04 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.65' TW=25.75' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.1P: Bogs_L_US



Summary for Pond 13.2P: Bogs_L_DS

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 2.97" for 500-yr event
Inflow = 62.15 cfs @ 20.88 hrs, Volume= 69.024 af
Outflow = 60.76 cfs @ 22.04 hrs, Volume= 69.026 af, Atten= 2%, Lag= 69.7 min
Primary = 60.76 cfs @ 22.04 hrs, Volume= 69.026 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 28.03' @ 22.04 hrs Storage= 1.421 af (1.346 af above start)

Plug-Flow detention time= 20.6 min calculated for 68.950 af (100% of inflow)
Center-of-Mass det. time= 15.3 min (1,558.5 - 1,543.3)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

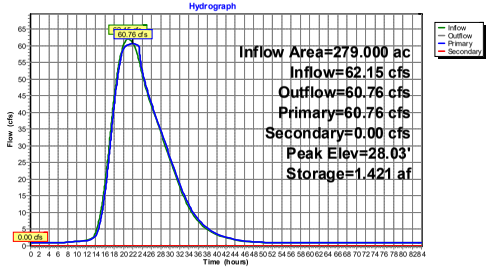
Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=60.76 cfs @ 22.04 hrs HW=28.03' TW=19.19' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 60.76 cfs @ 5.00 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.2P: Bogs_L_DS



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow Area = 1,717.000 ac, 6.26% Impervious, Inflow Depth > 2.32" for 500-yr event
Inflow = 186.47 cfs @ 19.90 hrs, Volume= 331.935 af, Incl. 0.80 cfs Base Flow
Outflow = 160.80 cfs @ 24.95 hrs, Volume= 331.642 af, Atten= 14%, Lag= 303.1 min
Primary = 160.80 cfs @ 24.95 hrs, Volume= 331.642 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 19.29' @ 24.95 hrs Storage= 37.339 af (36.274 af above start)

Plug-Flow detention time= 129.1 min calculated for 330.577 af (100% of inflow)
Center-of-Mass det. time= 110.1 min (1,906.1 - 1,796.0)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

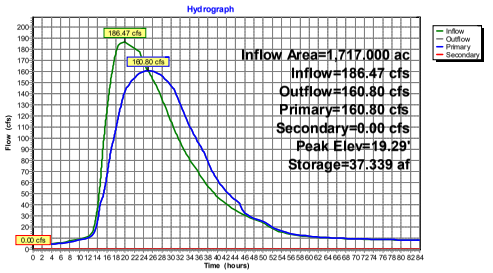
Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

Primary OutFlow Max=160.76 cfs @ 24.95 hrs HW=19.29' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 160.76 cfs @ 5.24 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.71' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 14P: Bogs_M - 2.7sm



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Summary for Pond 15.1P: Bogs_N_US

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 4.53" for 500-yr event
Inflow = 105.90 cfs @ 16.00 hrs, Volume= 67.540 af, Incl. 0.60 cfs Base Flow
Outflow = 66.41 cfs @ 18.62 hrs, Volume= 67.535 af, Atten= 37%, Lag= 157.2 min
Primary = 66.41 cfs @ 18.62 hrs, Volume= 67.535 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 27.58' @ 18.62 hrs Storage= 21.534 af (21.182 af above start)

Plug-Flow detention time= 272.3 min calculated for 67.182 af (99% of inflow)
Center-of-Mass det. time= 246.5 min (1,456.0 - 1,209.4)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

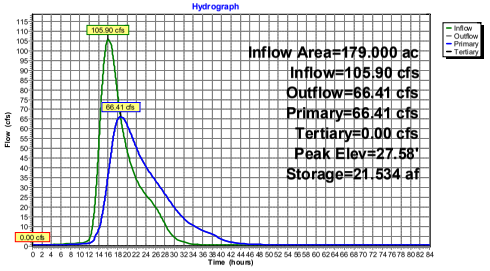
Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=66.40 cfs @ 18.62 hrs HW=27.58' TW=20.75' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 66.40 cfs @ 5.15 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.11' TW=20.11' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 15.1P: Bogs_N_US



Summary for Pond 15.2P: Bogs_N_DS

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 4.53" for 500-yr event
Inflow = 66.41 cfs @ 18.62 hrs, Volume= 67.535 af
Outflow = 28.96 cfs @ 27.41 hrs, Volume= 64.472 af, Atten= 56%, Lag= 527.2 min
Primary = 28.96 cfs @ 27.41 hrs, Volume= 64.472 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 21.48' @ 27.41 hrs Storage= 34.570 af (32.003 af above start)

Plug-Flow detention time= 938.1 min calculated for 61.905 af (92% of inflow)
Center-of-Mass det. time= 754.9 min (2,210.8 - 1,456.0)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

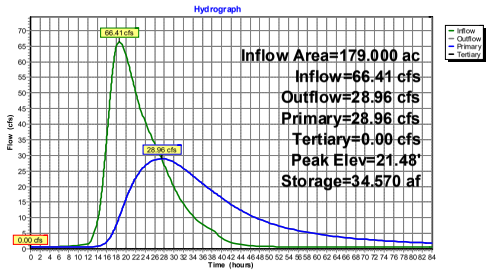
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=28.94 cfs @ 27.41 hrs HW=21.48' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 28.94 cfs @ 3.91 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS



Summary for Pond 16.1: Mill Pond Dam -PC

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 3.40" for 500-yr event
Inflow = 689.21 cfs @ 14.78 hrs, Volume= 1,400.142 af, Incl. 32.00 cfs Base Flow
Outflow = 381.86 cfs @ 28.48 hrs, Volume= 1,292.888 af, Atten= 45%, Lag= 821.9 min
Primary = 342.11 cfs @ 28.48 hrs, Volume= 1,079.056 af
Routed to Pond 17B : Proposed Bridge
Secondary = 39.76 cfs @ 28.47 hrs, Volume= 213.832 af
Routed to Pond Wr 24 :
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 17B : Proposed Bridge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 470.969 af
Peak Elev= 16.12' @ 28.48 hrs Storage= 799.125 af (328.156 af above start)

Plug-Flow detention time= 1,900.1 min calculated for 821.917 af (59% of inflow)
Center-of-Mass det. time= 471.2 min (2,487.3 - 2,016.1)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,941.850 af	**Storage** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.130
5.00	4.140
6.00	9.110
7.00	16.590
8.00	34.960
9.00	60.590
10.00	94.410
11.00	142.690
12.00	214.660
13.00	314.540
13.80	403.920
14.00	426.260
15.00	575.290
16.00	771.680
17.00	994.600
18.30	1,368.590
19.00	1,592.930
20.00	1,941.850

Device	Routing	Invert	Outlet Devices
#1	Primary	15.50'	**110.0' long x 1.5' breadth Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32
#2	Primary	13.60'	**15.0' long x 1.0' breadth Notch as SW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#3	Secondary	12.50'	**3.3' long x 1.0' breadth 3.25' Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#4	Tertiary	18.00'	**TOD, C= 2.60** Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00 Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 8	5.20'	**48.0" W x 48.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#7	Device 8	15.50'	**6.0' long x 20.00' rise MLO DownwardOpGate** 2 End Contraction(s) 5.0' Crest Height
#8	Tertiary	4.00'	**96.0" W x 48.0" H Box Culvert X 0.00** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 32.00 sf

Primary OutFlow Max=342.11 cfs @ 28.48 hrs HW=16.12' TW=10.21' (Dynamic Tailwater)
└**1=Spillway** (Weir Controls 143.09 cfs @ 2.09 fps)
└**2=Notch as SW** (Weir Controls 199.02 cfs @ 5.26 fps)

Secondary OutFlow Max=39.76 cfs @ 28.47 hrs HW=16.12' TW=15.65' (Dynamic Tailwater)
└**3=3.25' Weir** (Weir Controls 39.76 cfs @ 3.33 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.30' TW=8.48' (Dynamic Tailwater)
├**4=TOD** (Controls 0.00 cfs)
├**5=US Relief - Bypasses Dam** (Controls 0.00 cfs)
└**8=Culvert** (Controls 0.00 cfs)
└**6=Orifice/Grate** (Controls 0.00 cfs)
└**7=MLO DownwardOpGate** (Controls 0.00 cfs)

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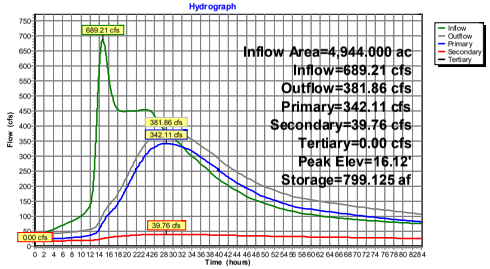
Pond 16.1: Mill Pond Dam -PC



Summary for Pond 16.3: Downstream Weir

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 2.62" for 500-yr event
Inflow = 342.11 cfs @ 28.48 hrs, Volume= 1,079.033 af
Outflow = 342.11 cfs @ 28.48 hrs, Volume= 1,079.012 af, Atten= 0%, Lag= 0.1 min
Primary = 342.11 cfs @ 28.48 hrs, Volume= 1,079.012 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 10.14' @ 28.48 hrs Surf.Area= 2,000 sf Storage= 12,280 cf (3,320 cf above start)

Plug-Flow detention time= 1.1 min calculated for 1,078.806 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,469.2 - 2,469.1)

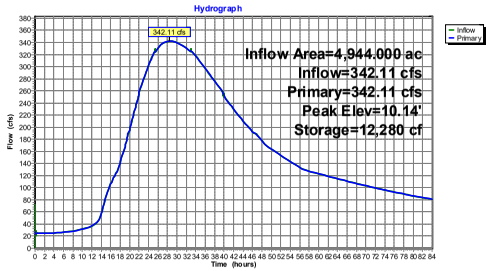
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	8.00'	**DS Weir, C= 2.60** Offset (feet) 0.00 0.00 23.00 23.00 Elev. (feet) 17.00 10.00 8.00 17.00
#2	Primary	8.00'	**27.0' long x 1.5' breadth El 8 Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32

Primary OutFlow Max=342.11 cfs @ 28.48 hrs HW=10.14' (Free Discharge)
1=DS Weir (Weir Controls 80.05 cfs @ 1.63 fps)
2=El 8 Weir (Weir Controls 262.06 cfs @ 4.54 fps)

Pond 16.3: Downstream Weir



Summary for Pond 17B: Proposed Bridge

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 2.62" for 500-yr event
Inflow = 342.11 cfs @ 28.48 hrs, Volume= 1,079.056 af
Outflow = 342.11 cfs @ 28.48 hrs, Volume= 1,079.033 af, Atten= 0%, Lag= 0.1 min
Primary = 342.11 cfs @ 28.48 hrs, Volume= 1,079.033 af
Routed to Pond 16.3 : Downstream Weir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 10.21' @ 28.48 hrs Surf.Area= 2,000 sf Storage= 12,422 cf (3,462 cf above start)

Plug-Flow detention time= 1.1 min calculated for 1,078.815 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,469.1 - 2,468.9)

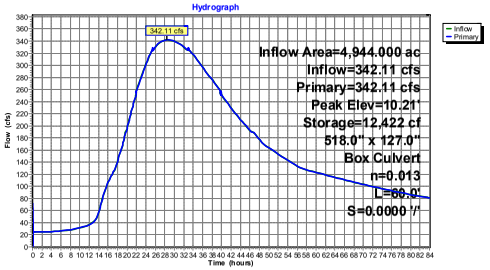
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	4.00'	**518.0" W x 127.0" H Box Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 456.85 sf

Primary OutFlow Max=342.11 cfs @ 28.48 hrs HW=10.21' TW=10.14' (Dynamic Tailwater)
1=Culvert (Inlet Controls 342.11 cfs @ 1.28 fps)

Pond 17B: Proposed Bridge

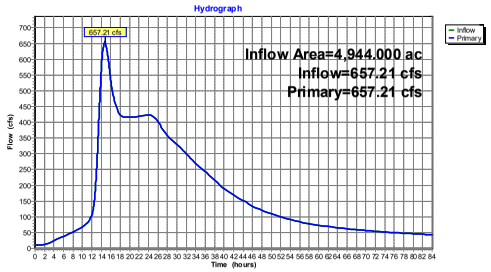


Summary for Link 23L: Inflow

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 2.86" for 500-yr event
Inflow = 657.21 cfs @ 14.78 hrs, Volume= 1,177.991 af
Primary = 657.21 cfs @ 14.78 hrs, Volume= 1,177.991 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16.1 : Mill Pond Dam -PC

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow



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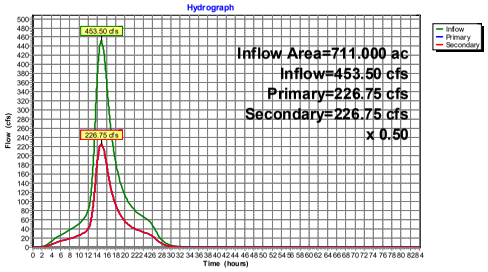
Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 4.06" for 500-yr event
Inflow = 453.50 cfs @ 14.92 hrs, Volume= 240.447 af
Primary = 226.75 cfs @ 14.92 hrs, Volume= 120.224 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 1P : Halfway Pond
Secondary = 226.75 cfs @ 14.92 hrs, Volume= 120.224 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow

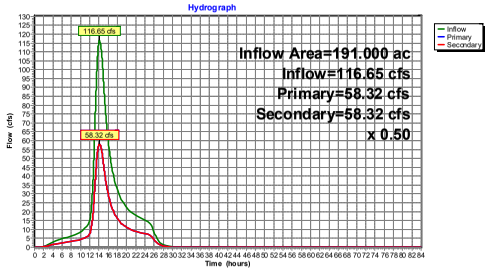


Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 3.20" for 500-yr event
Inflow = 116.65 cfs @ 14.15 hrs, Volume= 50.879 af
Primary = 58.32 cfs @ 14.15 hrs, Volume= 25.439 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 2P : Kennard Res
Secondary = 58.32 cfs @ 14.15 hrs, Volume= 25.439 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

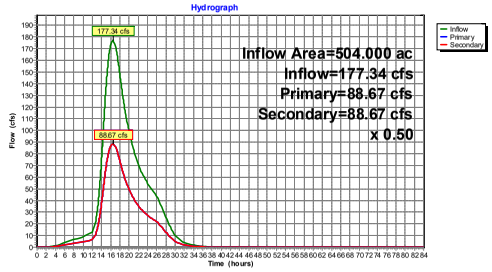


Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth = 2.92" for 500-yr event
Inflow = 177.34 cfs @ 16.59 hrs, Volume= 122.584 af
Primary = 88.67 cfs @ 16.59 hrs, Volume= 61.292 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 88.67 cfs @ 16.59 hrs, Volume= 61.292 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

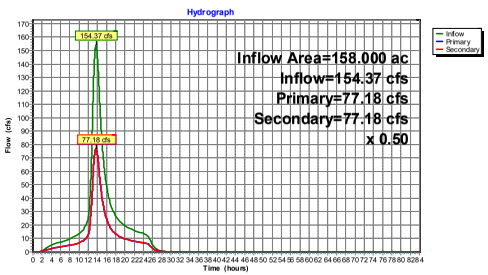


Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 4.22" for 500-yr event
Inflow = 154.37 cfs @ 13.73 hrs, Volume= 55.501 af
Primary = 77.18 cfs @ 13.73 hrs, Volume= 27.751 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 3P : Fawn Pond
Secondary = 77.18 cfs @ 13.73 hrs, Volume= 27.751 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow

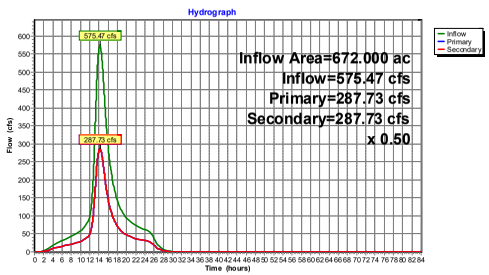


Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 4.44" for 500-yr event
Inflow = 575.47 cfs @ 14.28 hrs, Volume= 248.623 af
Primary = 287.73 cfs @ 14.28 hrs, Volume= 124.311 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 5P : Glen Charlie Pond
Secondary = 287.73 cfs @ 14.28 hrs, Volume= 124.311 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow

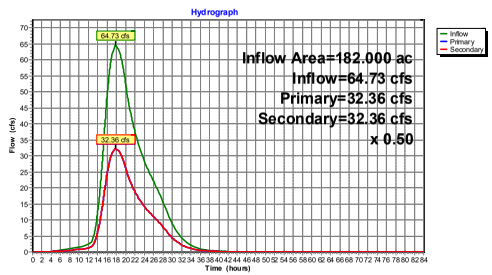


Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 3.31" for 500-yr event
Inflow = 64.73 cfs @ 17.79 hrs, Volume= 50.224 af
Primary = 32.36 cfs @ 17.79 hrs, Volume= 25.112 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 6.2P : Maple Sping Bogs US
Secondary = 32.36 cfs @ 17.79 hrs, Volume= 25.112 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow



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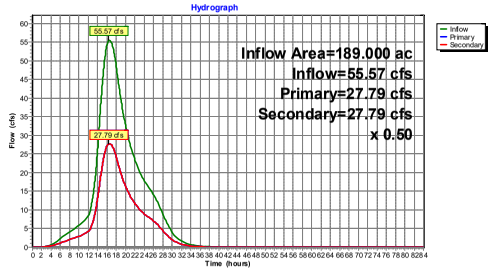
Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth = 2.67" for 500-yr event
Inflow = 55.57 cfs @ 16.28 hrs, Volume= 42.082 af
Primary = 27.79 cfs @ 16.28 hrs, Volume= 21.041 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 7P : Little Five Mile Pond
Secondary = 27.79 cfs @ 16.28 hrs, Volume= 21.041 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow

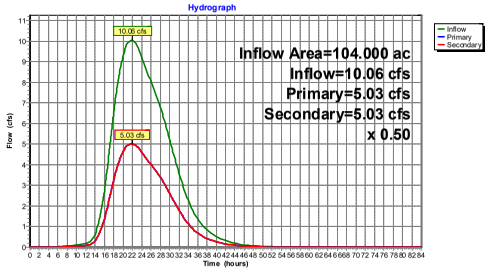


Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth = 1.30" for 500-yr event
Inflow = 10.06 cfs @ 22.01 hrs, Volume= 11.292 af
Primary = 5.03 cfs @ 22.01 hrs, Volume= 5.646 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 9P : Kettle Hole
Secondary = 5.03 cfs @ 22.01 hrs, Volume= 5.646 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow

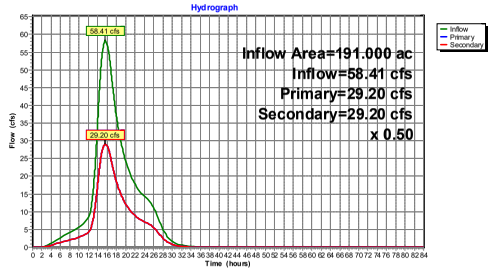


Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth = 2.36" for 500-yr event
Inflow = 58.41 cfs @ 15.53 hrs, Volume= 37.571 af
Primary = 29.20 cfs @ 15.53 hrs, Volume= 18.786 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 29.20 cfs @ 15.53 hrs, Volume= 18.786 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

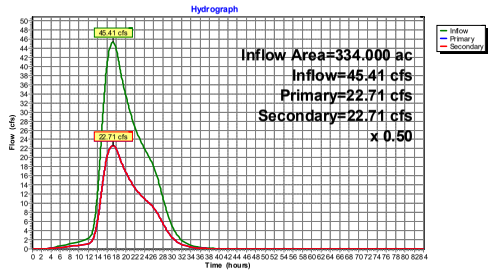


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth = 1.32" for 500-yr event
Inflow = 45.41 cfs @ 17.29 hrs, Volume= 36.792 af
Primary = 22.71 cfs @ 17.29 hrs, Volume= 18.396 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 12P : Maple Springs Road Dam
Secondary = 22.71 cfs @ 17.29 hrs, Volume= 18.396 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow

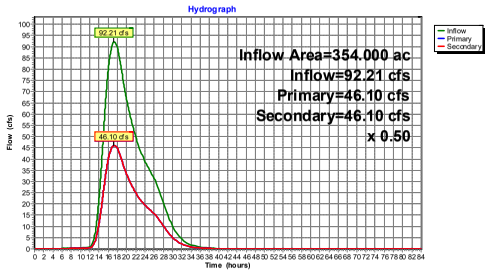


Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth = 2.34" for 500-yr event
Inflow = 92.21 cfs @ 17.20 hrs, Volume= 69.037 af
Primary = 46.10 cfs @ 17.20 hrs, Volume= 34.519 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 46.10 cfs @ 17.20 hrs, Volume= 34.519 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow

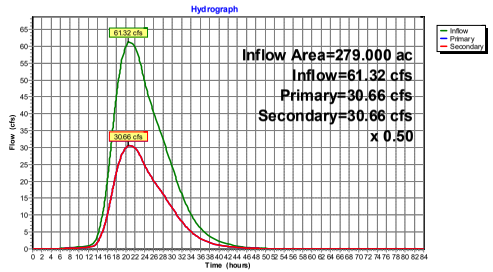


Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth = 2.70" for 500-yr event
Inflow = 61.32 cfs @ 20.51 hrs, Volume= 62.774 af
Primary = 30.66 cfs @ 20.51 hrs, Volume= 31.387 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 13.1P : Bogs_L_US
Secondary = 30.66 cfs @ 20.51 hrs, Volume= 31.387 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow



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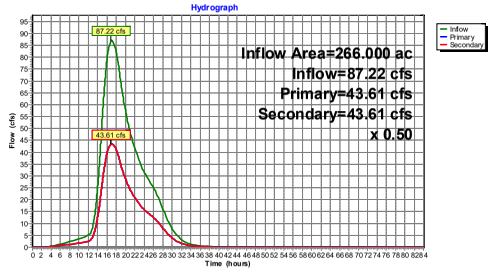
Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth = 2.86" for 500-yr event
Inflow = 87.22 cfs @ 16.87 hrs, Volume= 63.393 af
Primary = 43.61 cfs @ 16.87 hrs, Volume= 31.697 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 43.61 cfs @ 16.87 hrs, Volume= 31.697 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow

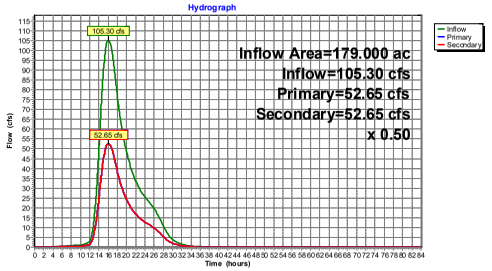


Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth = 4.25" for 500-yr event
Inflow = 105.30 cfs @ 16.00 hrs, Volume= 63.375 af
Primary = 52.65 cfs @ 16.00 hrs, Volume= 31.687 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 15.1P : Bogs_N_US
Secondary = 52.65 cfs @ 16.00 hrs, Volume= 31.687 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow

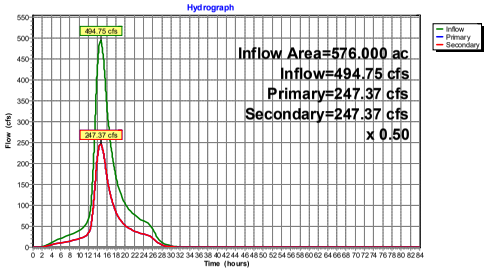


Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 4.84" for 500-yr event
Inflow = 494.75 cfs @ 14.78 hrs, Volume= 232.367 af
Primary = 247.37 cfs @ 14.78 hrs, Volume= 116.183 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 247.37 cfs @ 14.78 hrs, Volume= 116.183 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow

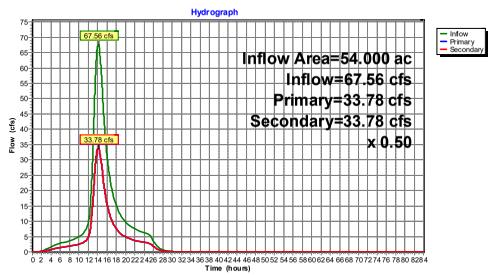


Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 5.94" for 500-yr event
Inflow = 67.56 cfs @ 14.25 hrs, Volume= 26.727 af
Primary = 33.78 cfs @ 14.25 hrs, Volume= 13.364 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 33.78 cfs @ 14.25 hrs, Volume= 13.364 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=4.66"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=532.72 cfs 276.167 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=3.77"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=143.13 cfs 60.077 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=3.50"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=219.34 cfs 147.178 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=4.86"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=183.73 cfs 63.958 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=5.09"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=677.59 cfs 285.013 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=3.96"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=79.33 cfs 60.136 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=3.16"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=67.22 cfs 49.764 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=1.70"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=13.45 cfs 14.772 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=2.83"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=72.17 cfs 44.979 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=1.71"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=62.02 cfs 47.672 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=2.90"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=118.18 cfs 85.562 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=3.30"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=76.41 cfs 76.670 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=3.45"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=108.53 cfs 76.479 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=5.00"
Tc=300.0 min CN=56/98 Runoff=126.65 cfs 74.625 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=5.57"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=583.68 cfs 267.295 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=6.76"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=78.59 cfs 30.406 af

Pond 1P: Halfway Pond Peak Elev=65.42' Storage=631.788 af Inflow=534.92 cfs 291.440 af
Primary=15.96 cfs 84.087 af Secondary=0.00 cfs 0.000 af Outflow=15.96 cfs 84.087 af

Pond 2P: Kennard Res Peak Elev=58.67' Storage=32.912 af Inflow=148.79 cfs 148.329 af
Primary=57.57 cfs 140.361 af Secondary=0.00 cfs 0.000 af Outflow=57.57 cfs 140.361 af

Pond 3P: Fawn Pond Peak Elev=60.89' Storage=84.851 af Inflow=184.23 cfs 67.429 af
Primary=8.14 cfs 33.815 af Tertiary=0.00 cfs 0.000 af Outflow=8.14 cfs 33.815 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=49.30' Storage=118.906 af Inflow=283.65 cfs 332.462 af
Primary=105.03 cfs 315.731 af Secondary=0.00 cfs 0.000 af Outflow=105.03 cfs 315.731 af

Pond 5P: Glen Charlie Pond Peak Elev=35.29' Storage=243.197 af Inflow=699.15 cfs 615.324 af
Primary=162.95 cfs 545.477 af Secondary=2.05 cfs 2.124 af Tertiary=4.53 cfs 8.949 af Outflow=169.53 cfs 556.551 af

Pond 6.1P: Ortalani Reservoir Peak Elev=34.63' Storage=7.464 af Inflow=6.58 cfs 11.073 af
Outflow=1.79 cfs 6.804 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=24.33' Storage=28.271 af Inflow=79.38 cfs 66.939 af
Primary=25.32 cfs 54.477 af Secondary=20.92 cfs 8.749 af Outflow=46.24 cfs 63.226 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=18.97' Storage=3.935 af Inflow=46.24 cfs 63.226 af
Primary=44.30 cfs 62.782 af Secondary=0.00 cfs 0.000 af Outflow=44.30 cfs 62.782 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=22.26' Storage=4.920 af Inflow=162.95 cfs 545.477 af
Primary=162.90 cfs 544.109 af Secondary=0.00 cfs 0.000 af Outflow=162.90 cfs 544.109 af

Pond 7P: Little Five Mile Pond Peak Elev=59.92' Storage=25.321 af Inflow=67.81 cfs 53.859 af
Outflow=67.26 cfs 53.809 af

Pond 8P: Five Mile Pond Peak Elev=53.45' Storage=43.056 af Inflow=67.26 cfs 53.809 af
Primary=7.67 cfs 29.304 af Secondary=0.00 cfs 0.000 af Outflow=7.67 cfs 29.304 af

Pond 9P: Kettle Hole Peak Elev=55.26' Storage=9.918 af Inflow=13.75 cfs 16.855 af
Outflow=13.69 cfs 16.863 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=31.08' Storage=26.501 af Inflow=74.69 cfs 95.312 af
Primary=38.16 cfs 91.068 af Secondary=0.00 cfs 0.000 af Outflow=38.16 cfs 91.068 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=23.90' Storage=71.149 af Inflow=186.21 cfs 238.877 af
Primary=104.87 cfs 237.085 af Secondary=0.00 cfs 0.000 af Outflow=104.87 cfs 237.085 af

Pond 12P: Maple Springs Road Dam Peak Elev=40.78' Storage=13.655 af Inflow=63.02 cfs 54.614 af
Primary=45.34 cfs 54.176 af Secondary=3.37 cfs 0.434 af Outflow=48.71 cfs 54.610 af

Pond 13.1P: Bogs_L_US Peak Elev=32.31' Storage=1.164 af Inflow=77.31 cfs 82.918 af
Primary=75.59 cfs 82.919 af Secondary=0.00 cfs 0.000 af Outflow=75.59 cfs 82.919 af

Pond 13.2P: Bogs_L_DS Peak Elev=28.32' Storage=3.666 af Inflow=75.59 cfs 82.919 af
Primary=72.18 cfs 82.921 af Secondary=0.00 cfs 0.000 af Outflow=72.18 cfs 82.921 af

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Pond 14P: Bogs_M - 2.7sm Peak Elev=19.77' Storage=52.763 af Inflow=224.73 cfs 402.039 af
Primary=192.36 cfs 401.697 af Secondary=0.00 cfs 0.000 af Outflow=192.36 cfs 401.697 af

Pond 15.1P: Bogs_N_US Peak Elev=27.99' Storage=24.742 af Inflow=127.25 cfs 78.791 af
Primary=82.79 cfs 78.785 af Tertiary=0.00 cfs 0.000 af Outflow=82.79 cfs 78.785 af

Pond 15.2P: Bogs_N_DS Peak Elev=21.69' Storage=39.496 af Inflow=82.79 cfs 78.785 af
Primary=35.37 cfs 75.566 af Tertiary=0.00 cfs 0.000 af Outflow=35.37 cfs 75.566 af

Pond 16.1: Mill Pond Dam -PC Peak Elev=16.28' Storage=833.012 af Inflow=801.06 cfs 1,604.007 af
ary=421.01 cfs 1,263.057 af Secondary=41.56 cfs 221.151 af Tertiary=0.00 cfs 0.000 af Outflow=462.57 cfs 1,484.207 af

Pond 16.3: Downstream Weir Peak Elev=10.38' Storage=12,751 cf Inflow=421.01 cfs 1,263.032 af
Outflow=421.01 cfs 1,263.009 af

Pond 17B: Proposed Bridge Peak Elev=10.47' Storage=12,948 cf Inflow=421.01 cfs 1,263.057 af
518.0" x 127.0" Box Culvert n=0.013 L=60.0' S=0.0000 '/' Outflow=421.01 cfs 1,263.032 af

Link 23L: Inflow Inflow=769.06 cfs 1,381.856 af
Primary=769.06 cfs 1,381.856 af

Link A1: 1/2 Flow x 0.50 Inflow=532.72 cfs 276.167 af
Primary=266.36 cfs 138.083 af Secondary=266.36 cfs 138.083 af

Link B1: 1/2 Flow x 0.50 Inflow=143.13 cfs 60.077 af
Primary=71.56 cfs 30.038 af Secondary=71.56 cfs 30.038 af

Link C1: 1/2 Flow x 0.50 Inflow=219.34 cfs 147.178 af
Primary=109.67 cfs 73.589 af Secondary=109.67 cfs 73.589 af

Link D1: 1/2 Flow x 0.50 Inflow=183.73 cfs 63.958 af
Primary=91.87 cfs 31.979 af Secondary=91.87 cfs 31.979 af

Link E1: 1/2 Flow x 0.50 Inflow=677.59 cfs 285.013 af
Primary=338.80 cfs 142.507 af Secondary=338.80 cfs 142.507 af

Link F1: 1/2 Flow x 0.50 Inflow=79.33 cfs 60.136 af
Primary=39.67 cfs 30.068 af Secondary=39.67 cfs 30.068 af

Link G1: 1/2 Flow x 0.50 Inflow=67.22 cfs 49.764 af
Primary=33.61 cfs 24.882 af Secondary=33.61 cfs 24.882 af

Link H1: 1/2 Flow x 0.50 Inflow=13.45 cfs 14.772 af
Primary=6.72 cfs 7.386 af Secondary=6.72 cfs 7.386 af

Link I1: 1/2 Flow x 0.50 Inflow=72.17 cfs 44.979 af
Primary=36.08 cfs 22.490 af Secondary=36.08 cfs 22.490 af

Link JL: 1/2 Flow x 0.50 Inflow=62.02 cfs 47.672 af
Primary=31.01 cfs 23.836 af Secondary=31.01 cfs 23.836 af

Link KL: 1/2 Flow x 0.50 Inflow=118.18 cfs 85.562 af
Primary=59.09 cfs 42.781 af Secondary=59.09 cfs 42.781 af

Link LL: 1/2 Flow x 0.50 Inflow=76.41 cfs 76.670 af
Primary=38.21 cfs 38.335 af Secondary=38.21 cfs 38.335 af

Link ML: 1/2 Flow x 0.50 Inflow=108.53 cfs 76.479 af
Primary=54.26 cfs 38.240 af Secondary=54.26 cfs 38.240 af

Link NL: 1/2 Flow x 0.50 Inflow=126.65 cfs 74.625 af
Primary=63.32 cfs 37.313 af Secondary=63.32 cfs 37.313 af

Link OL: 1/2 Flow x 0.50 Inflow=583.68 cfs 267.295 af
Primary=291.84 cfs 133.648 af Secondary=291.84 cfs 133.648 af

Link PL: 1/2 Flow x 0.50 Inflow=78.59 cfs 30.406 af
Primary=39.29 cfs 15.203 af Secondary=39.29 cfs 15.203 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 1,660.754 af Average Runoff Depth = 4.03"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

Summary for Subcatchment A: A

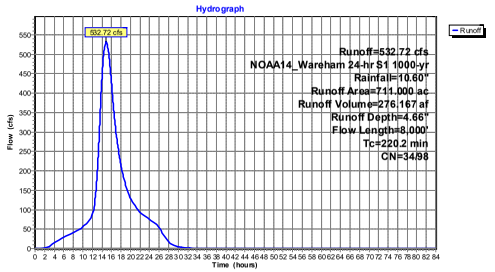
Runoff = 532.72 cfs @ 14.92 hrs, Volume= 276.167 af, Depth= 4.66"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 711.000	56	"33.99% imp"
469.331	34	66.01% Pervious Area
241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



Summary for Subcatchment B: B

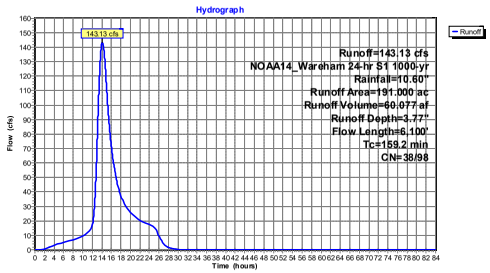
Runoff = 143.13 cfs @ 14.15 hrs, Volume= 60.077 af, Depth= 3.77"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 191.000	49	"18.54% imp"
155.589	38	81.46% Pervious Area
35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



Summary for Subcatchment C: C

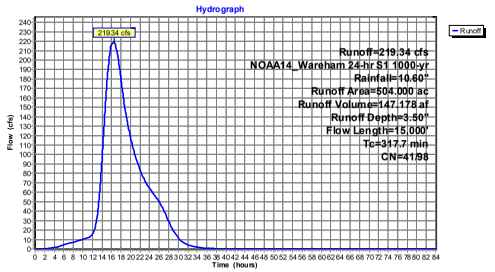
Runoff = 219.34 cfs @ 16.59 hrs, Volume= 147.178 af, Depth= 3.50"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 504.000	47	"10.54% imp"
450.878	41	89.46% Pervious Area
53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



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Summary for Subcatchment D: D

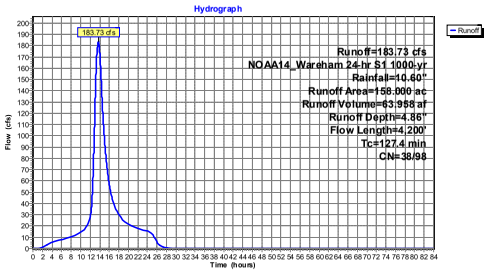
Runoff = 183.73 cfs @ 13.73 hrs, Volume= 63.958 af, Depth= 4.86"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 158.000	57	"31.94% imp"
107.535	38	68.06% Pervious Area
50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



Summary for Subcatchment E: E

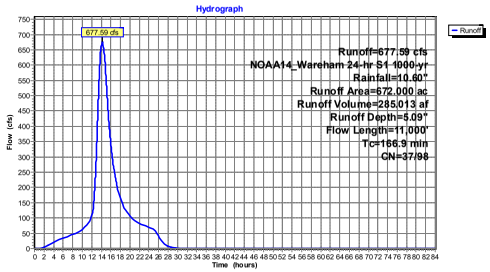
Runoff = 677.59 cfs @ 14.28 hrs, Volume= 285.013 af, Depth= 5.09"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 672.000	59	"35.91% imp"
430.685	37	64.09% Pervious Area
241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



Summary for Subcatchment F: F

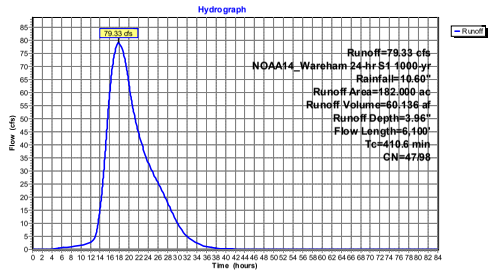
Runoff = 79.33 cfs @ 17.79 hrs, Volume= 60.136 af, Depth= 3.96"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 182.000	50	"6.11% imp"
170.880	47	93.89% Pervious Area
11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



Summary for Subcatchment G: G

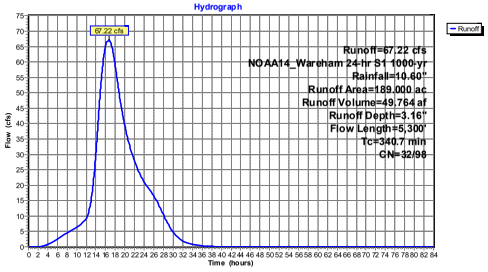
Runoff = 67.22 cfs @ 16.66 hrs, Volume= 49.764 af, Depth= 3.16"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 189.000	45	"19.09% imp"
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



Summary for Subcatchment H: H

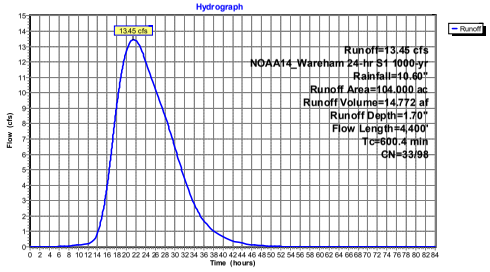
Runoff = 13.45 cfs @ 21.35 hrs, Volume= 14.772 af, Depth= 1.70"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 104.000	34	"1.27% imp"
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

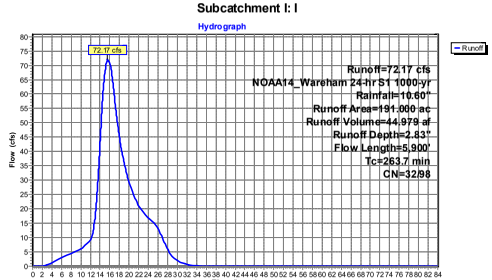
Runoff = 72.17 cfs @ 15.53 hrs, Volume= 44.979 af, Depth= 2.83"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 191.000	42	"15.34% imp"
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



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Summary for Subcatchment J: J

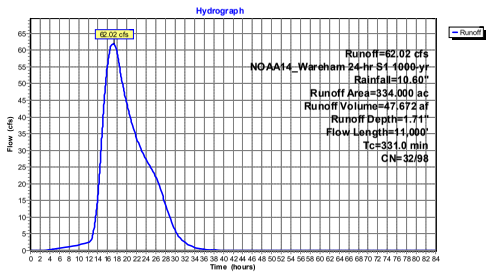
Runoff = 62.02 cfs @ 17.28 hrs, Volume= 47.672 af, Depth= 1.71"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 334.000	34	"2.83% imp"
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Summary for Subcatchment K: K

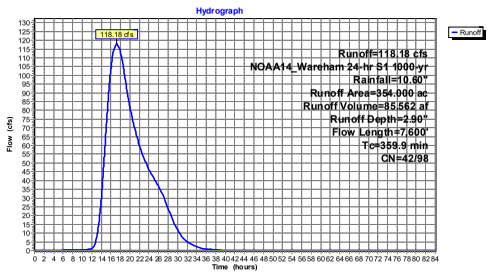
Runoff = 118.18 cfs @ 17.20 hrs, Volume= 85.562 af, Depth= 2.90"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 354.000	42	"0.83% imp"
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



Summary for Subcatchment L: L

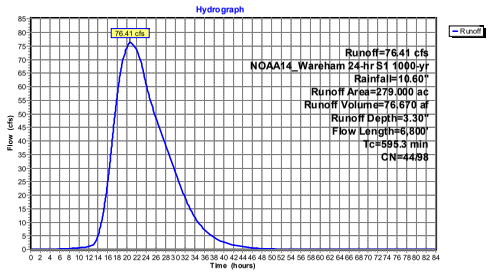
Runoff = 76.41 cfs @ 20.51 hrs, Volume= 76.670 af, Depth= 3.30"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 279.000	45	"2.43% imp"
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



Summary for Subcatchment M: M

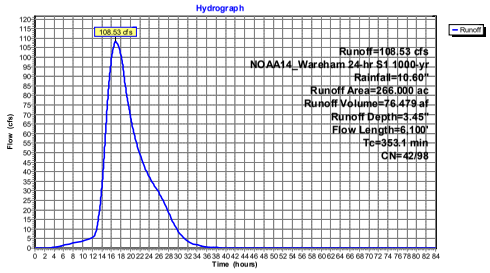
Runoff = 108.53 cfs @ 16.87 hrs, Volume= 76.479 af, Depth= 3.45"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 266.000	47	"8.14% imp"
244.348	42	91.86% Pervious Area
21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



Summary for Subcatchment N: N

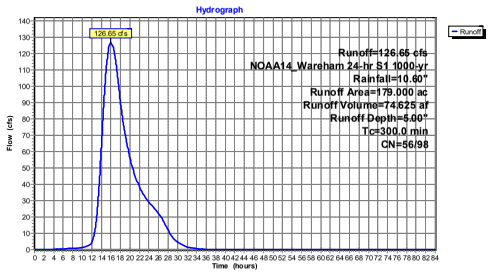
Runoff = 126.65 cfs @ 16.00 hrs, Volume= 74.625 af, Depth= 5.00"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 179.000	57	"3.17% imp"
173.326	56	96.83% Pervious Area
5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

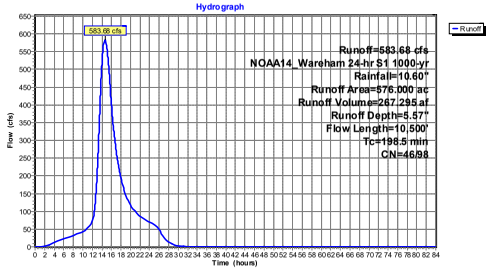
Runoff = 583.68 cfs @ 14.78 hrs, Volume= 267.295 af, Depth= 5.57"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 576.000	62	"31.1% imp"
396.864	46	68.90% Pervious Area
179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



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Summary for Subcatchment P: P

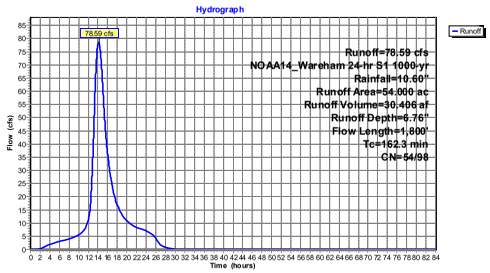
Runoff = 78.59 cfs @ 14.25 hrs, Volume= 30.406 af, Depth= 6.76"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
NOAA14_Wareham 24-hr S1 1000-yr Rainfall=10.60"

Area (ac)	CN	Description
* 54.000	71	"38.05% imp"
33.453	54	61.95% Pervious Area
20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Summary for Pond 1P: Halfway Pond

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth > 4.92" for 1000-yr event
Inflow = 534.92 cfs @ 14.92 hrs, Volume= 291.440 af, Incl. 2.20 cfs Base Flow
Outflow = 15.96 cfs @ 28.37 hrs, Volume= 84.087 af, Atten= 97%, Lag= 806.5 min
Primary = 15.96 cfs @ 28.37 hrs, Volume= 84.087 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 65.42' @ 28.37 hrs Storage= 631.788 af (261.178 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,774.4 min (2,837.0 - 1,062.6)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

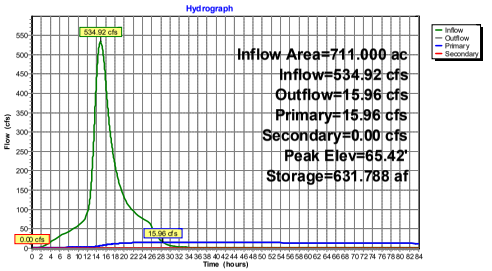
Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=15.96 cfs @ 28.37 hrs HW=65.42' TW=58.18' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 15.96 cfs @ 5.01 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

Pond 1P: Halfway Pond



Summary for Pond 2P: Kennard Res

Inflow Area = 902.000 ac, 30.72% Impervious, Inflow Depth > 1.97" for 1000-yr event
Inflow = 148.79 cfs @ 14.15 hrs, Volume= 148.329 af, Incl. 0.60 cfs Base Flow
Outflow = 57.57 cfs @ 17.26 hrs, Volume= 140.361 af, Atten= 61%, Lag= 186.6 min
Primary = 57.57 cfs @ 17.26 hrs, Volume= 140.361 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 58.67' @ 17.26 hrs Storage= 32.912 af (28.912 af above start)

Plug-Flow detention time= 518.0 min calculated for 136.359 af (92% of inflow)
Center-of-Mass det. time= 230.6 min (2,299.1 - 2,068.5)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

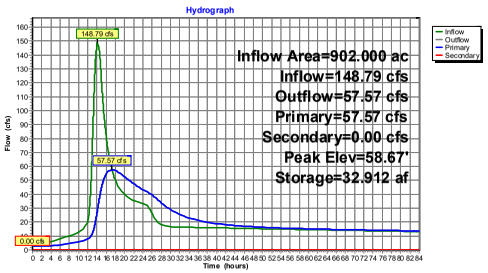
Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=57.56 cfs @ 17.26 hrs HW=58.67' TW=48.50' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 57.56 cfs @ 4.21 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.30' TW=46.77' (Dynamic Tailwater)
└**1=TOD** (Controls 0.00 cfs)

Pond 2P: Kennard Res



Summary for Pond 3P: Fawn Pond

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth > 5.12" for 1000-yr event
Inflow = 184.23 cfs @ 13.73 hrs, Volume= 67.429 af, Incl. 0.50 cfs Base Flow
Outflow = 8.14 cfs @ 25.74 hrs, Volume= 33.815 af, Atten= 96%, Lag= 720.6 min
Primary = 8.14 cfs @ 25.74 hrs, Volume= 33.815 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 60.89' @ 25.74 hrs Storage= 84.851 af (57.131 af above start)

Plug-Flow detention time= 4,055.5 min calculated for 6.095 af (9% of inflow)
Center-of-Mass det. time= 1,654.9 min (2,642.1 - 987.2)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=8.14 cfs @ 25.74 hrs HW=60.89' TW=49.30' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 8.14 cfs @ 4.19 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=59.83' TW=46.77' (Dynamic Tailwater)
└**2=TOD South** (Controls 0.00 cfs)

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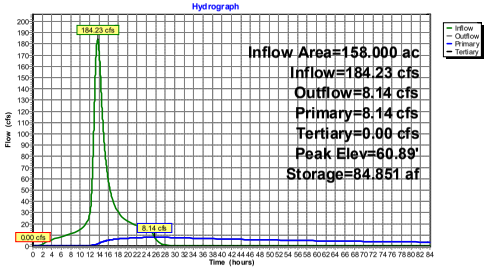
Pond 3P: Fawn Pond



Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow Area = 1,564.000 ac, 24.34% Impervious, Inflow Depth > 2.55" for 1000-yr event
Inflow = 283.65 cfs @ 16.59 hrs, Volume= 332.462 af, Incl. 1.60 cfs Base Flow
Outflow = 105.03 cfs @ 25.38 hrs, Volume= 315.731 af, Atten= 63%, Lag= 527.1 min
Primary = 105.03 cfs @ 25.38 hrs, Volume= 315.731 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 49.30' @ 25.38 hrs Storage= 118.906 af (109.186 af above start)

Plug-Flow detention time= 755.8 min calculated for 306.011 af (92% of inflow)
Center-of-Mass det. time= 466.4 min (2,291.4 - 1,825.1)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

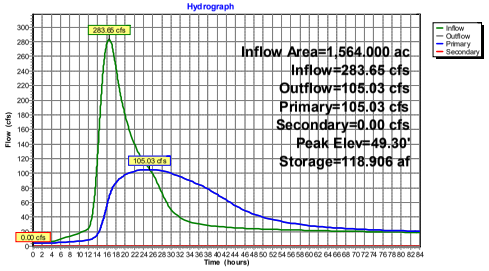
Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=105.03 cfs @ 25.38 hrs HW=49.30' TW=35.29' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Orifice Controls 105.03 cfs @ 7.22 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=46.77' TW=33.99' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 4P: Bessey Bog Res - 2.4sm



Summary for Pond 5P: Glen Charlie Pond

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 3.30" for 1000-yr event
Inflow = 699.15 cfs @ 14.28 hrs, Volume= 615.324 af, Incl. 2.10 cfs Base Flow
Outflow = 169.53 cfs @ 24.99 hrs, Volume= 556.551 af, Atten= 76%, Lag= 642.8 min
Primary = 162.95 cfs @ 24.99 hrs, Volume= 545.477 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 2.05 cfs @ 24.99 hrs, Volume= 2.124 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 4.53 cfs @ 24.99 hrs, Volume= 8.949 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 35.29' @ 24.99 hrs Storage= 243.197 af (217.072 af above start)

Plug-Flow detention time= 1,121.5 min calculated for 530.419 af (86% of inflow)
Center-of-Mass det. time= 687.9 min (2,355.9 - 1,668.0)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00

Elev. (feet) 41.00 40.00 39.00 37.70 37.70 41.00

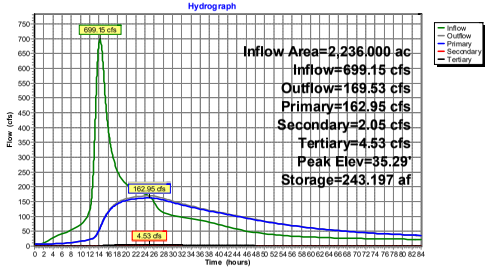
#6	Tertiary	34.50'	**24.0" W x 12.0" H Vert. NE Culvert** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=162.84 cfs @ 24.99 hrs HW=35.29' TW=22.26' (Dynamic Tailwater)
└**1=Spillway** (Weir Controls 162.84 cfs @ 4.72 fps)
└**2=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=2.03 cfs @ 24.99 hrs HW=35.29' TW=34.43' (Dynamic Tailwater)
└**3=SE Dike** (Controls 0.00 cfs)
└**4=SE Culvert** (Orifice Controls 2.03 cfs @ 1.73 fps)

Tertiary OutFlow Max=4.53 cfs @ 24.99 hrs HW=35.29' TW=34.43' (Dynamic Tailwater)
└**5=NE Dike** (Controls 0.00 cfs)
└**6=NE Culvert** (Orifice Controls 4.53 cfs @ 2.86 fps)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 6.58 cfs @ 24.99 hrs, Volume= 11.073 af
Outflow = 1.79 cfs @ 42.40 hrs, Volume= 6.804 af, Atten= 73%, Lag= 1,044.7 min
Primary = 1.79 cfs @ 42.40 hrs, Volume= 6.804 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 34.63' @ 42.40 hrs Storage= 7.464 af

Plug-Flow detention time= 1,669.1 min calculated for 6.803 af (61% of inflow)
Center-of-Mass det. time= 1,294.7 min (3,070.5 - 1,775.8)

Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=1.79 cfs @ 42.40 hrs HW=34.63' TW=23.39' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 1.79 cfs @ 2.10 fps)
└**2=TOD** (Controls 0.00 cfs)

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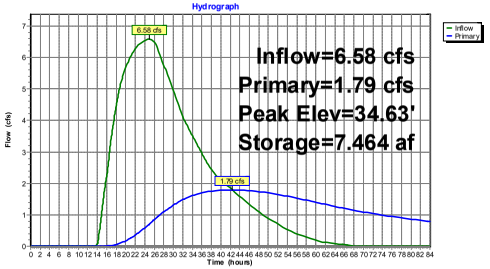
Pond 6.1P: Ortalani Reservoir



Summary for Pond 6.2P: Maple Sping Bogs US

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 4.41" for 1000-yr event
Inflow = 79.38 cfs @ 17.79 hrs, Volume= 66.939 af
Outflow = 46.24 cfs @ 21.78 hrs, Volume= 63.226 af, Atten= 42%, Lag= 239.4 min
Primary = 25.32 cfs @ 21.78 hrs, Volume= 54.477 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 20.92 cfs @ 21.78 hrs, Volume= 8.749 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 24.33' @ 21.78 hrs Storage= 28.271 af

Plug-Flow detention time= 717.1 min calculated for 63.226 af (94% of inflow)
Center-of-Mass det. time= 577.2 min (1,996.2 - 1,419.0)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

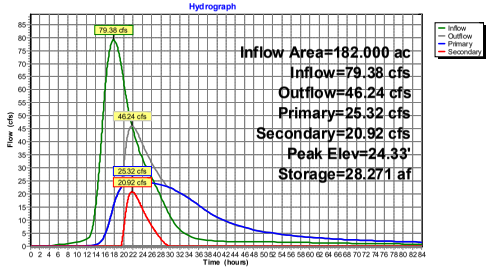
Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=25.32 cfs @ 21.78 hrs HW=24.33' TW=18.89' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 25.32 cfs @ 5.06 fps)

Secondary OutFlow Max=20.92 cfs @ 21.78 hrs HW=24.33' TW=18.89' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 20.92 cfs @ 0.82 fps)

Pond 6.2P: Maple Sping Bogs US



Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 4.17" for 1000-yr event
Inflow = 46.24 cfs @ 21.78 hrs, Volume= 63.226 af
Outflow = 44.30 cfs @ 22.73 hrs, Volume= 62.782 af, Atten= 4%, Lag= 56.8 min
Primary = 44.30 cfs @ 22.73 hrs, Volume= 62.782 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 18.97' @ 22.73 hrs Storage= 3.935 af

Plug-Flow detention time= 91.4 min calculated for 62.782 af (99% of inflow)
Center-of-Mass det. time= 70.6 min (2,066.7 - 1,996.2)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

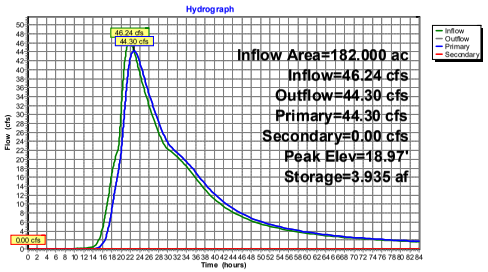
Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=44.30 cfs @ 22.73 hrs HW=18.97' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 44.30 cfs @ 4.50 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow Area = 2,236.000 ac, 27.82% Impervious, Inflow Depth > 2.93" for 1000-yr event
Inflow = 162.95 cfs @ 24.99 hrs, Volume= 545.477 af
Outflow = 162.90 cfs @ 25.25 hrs, Volume= 544.109 af, Atten= 0%, Lag= 15.4 min
Primary = 162.90 cfs @ 25.25 hrs, Volume= 544.109 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 22.26' @ 25.25 hrs Storage= 4.920 af (4.473 af above start)

Plug-Flow detention time= 26.1 min calculated for 543.656 af (100% of inflow)
Center-of-Mass det. time= 15.3 min (2,383.0 - 2,367.7)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

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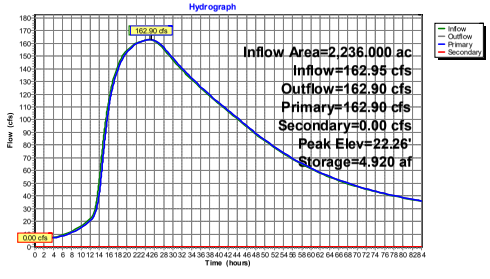
Primary OutFlow Max=162.90 cfs @ 25.25 hrs HW=22.26' TW=0.00' (Dynamic Tailwater)
└─**1=Bridge/Spillway** (Weir Controls 162.90 cfs @ 5.68 fps)
└─**3=TOD** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.49' TW=22.70' (Dynamic Tailwater)
└─**2=Culvert to Bogs** (Controls 0.00 cfs)
└─**4=TOD_Bogs** (Controls 0.00 cfs)

Pond 6P: Maple Springs Dam - 3.5sm



Summary for Pond 7P: Little Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 3.42" for 1000-yr event
Inflow = 67.81 cfs @ 16.66 hrs, Volume= 53.859 af, Incl. 0.59 cfs Base Flow
Outflow = 67.26 cfs @ 16.92 hrs, Volume= 53.809 af, Atten= 1%, Lag= 15.7 min
Primary = 67.26 cfs @ 16.92 hrs, Volume= 53.809 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 59.92' @ 16.92 hrs Storage= 25.321 af (3.161 af above start)

Plug-Flow detention time= 606.9 min calculated for 31.649 af (59% of inflow)
Center-of-Mass det. time= 46.6 min (1,273.9 - 1,227.3)

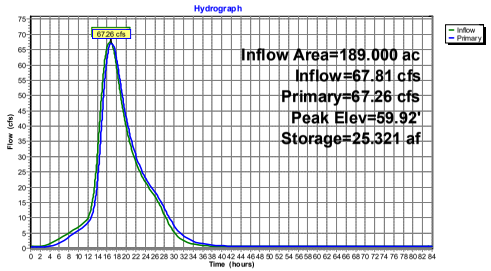
Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=67.26 cfs @ 16.92 hrs HW=59.92' TW=52.54' (Dynamic Tailwater)
└─**1=Relief** (Weir Controls 67.26 cfs @ 0.83 fps)

Pond 7P: Little Five Mile Pond



Summary for Pond 8P: Five Mile Pond

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 3.42" for 1000-yr event
Inflow = 67.26 cfs @ 16.92 hrs, Volume= 53.809 af
Outflow = 7.67 cfs @ 29.93 hrs, Volume= 29.304 af, Atten= 89%, Lag= 780.7 min
Primary = 7.67 cfs @ 29.93 hrs, Volume= 29.304 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 53.45' @ 29.93 hrs Storage= 43.056 af

Plug-Flow detention time= 1,838.8 min calculated for 29.304 af (54% of inflow)
Center-of-Mass det. time= 1,518.2 min (2,792.1 - 1,273.9)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

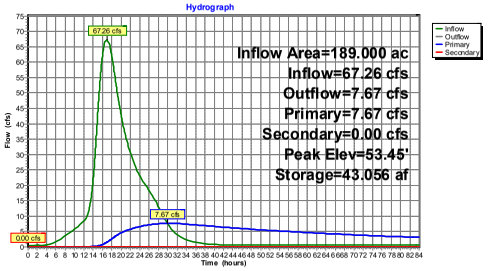
Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=7.67 cfs @ 29.93 hrs HW=53.45' TW=30.88' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 7.67 cfs @ 4.04 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=51.90' TW=29.60' (Dynamic Tailwater)
└─**2=TOD** (Controls 0.00 cfs)

Pond 8P: Five Mile Pond



Summary for Pond 9P: Kettle Hole

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth > 1.94" for 1000-yr event
Inflow = 13.75 cfs @ 21.35 hrs, Volume= 16.855 af, Incl. 0.30 cfs Base Flow
Outflow = 13.69 cfs @ 22.06 hrs, Volume= 16.863 af, Atten= 0%, Lag= 42.6 min
Primary = 13.69 cfs @ 22.06 hrs, Volume= 16.863 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.26' @ 22.06 hrs Storage= 9.918 af (0.968 af above start)

Plug-Flow detention time= 968.6 min calculated for 7.913 af (47% of inflow)
Center-of-Mass det. time= 61.3 min (1,658.9 - 1,597.5)

Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=13.69 cfs @ 22.06 hrs HW=55.26' TW=31.07' (Dynamic Tailwater)
└─**1=Relief** (Weir Controls 13.69 cfs @ 0.63 fps)

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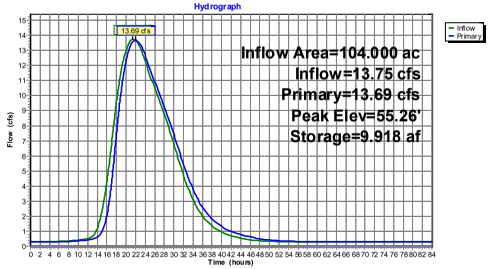
Pond 9P: Kettle Hole



Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow Area = 484.000 ac, 13.78% Impervious, Inflow Depth > 2.36" for 1000-yr event
Inflow = 74.69 cfs @ 15.53 hrs, Volume= 95.312 af, Incl. 0.60 cfs Base Flow
Outflow = 38.16 cfs @ 23.35 hrs, Volume= 91.068 af, Atten= 49%, Lag= 469.4 min
Primary = 38.16 cfs @ 23.35 hrs, Volume= 91.068 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1.500 af
Peak Elev= 31.08' @ 23.35 hrs Storage= 26.501 af (25.001 af above start)

Plug-Flow detention time= 581.0 min calculated for 89.567 af (94% of inflow)
Center-of-Mass det. time= 374.8 min (2,138.9 - 1,764.1)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LiDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
35.00	115.000
36.50	160.000
40.00	300.000

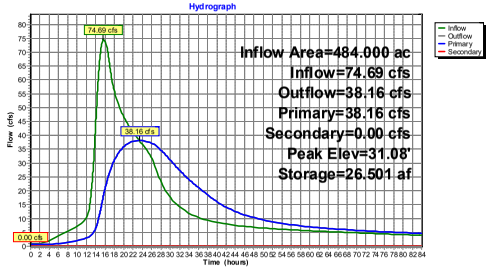
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=38.16 cfs @ 23.35 hrs HW=31.08' TW=23.84' (Dynamic Tailwater)
↳**1=Drop Inlet Spillway** (Weir Controls 38.16 cfs @ 4.26 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.60' TW=21.26' (Dynamic Tailwater)
↳**2=TOD** (Controls 0.00 cfs)

Pond 10P: Maple Springs Brook Dam - 0.8sm



Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow Area = 1,172.000 ac, 6.75% Impervious, Inflow Depth > 2.45" for 1000-yr event
Inflow = 186.21 cfs @ 18.00 hrs, Volume= 238.877 af, Incl. 1.10 cfs Base Flow
Outflow = 104.87 cfs @ 26.04 hrs, Volume= 237.085 af, Atten= 44%, Lag= 482.5 min
Primary = 104.87 cfs @ 26.04 hrs, Volume= 237.085 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 23.90' @ 26.04 hrs Storage= 71.149 af (68.439 af above start)

Plug-Flow detention time= 443.5 min calculated for 234.375 af (98% of inflow)
Center-of-Mass det. time= 363.9 min (2,056.6 - 1,692.6)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

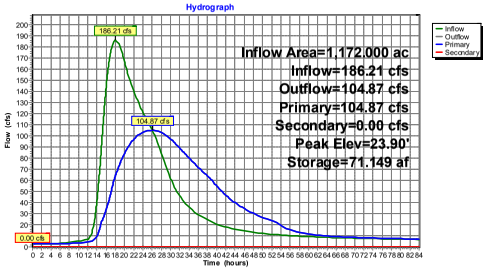
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=104.84 cfs @ 26.04 hrs HW=23.90' TW=19.77' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 104.84 cfs @ 6.02 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.26' TW=15.71' (Dynamic Tailwater)
↳**2=TOR** (Controls 0.00 cfs)

Pond 11P: Unnamed Road - 1.8sm



Summary for Pond 12P: Maple Springs Road Dam

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth > 1.96" for 1000-yr event
Inflow = 63.02 cfs @ 17.28 hrs, Volume= 54.614 af, Incl. 1.00 cfs Base Flow
Outflow = 48.71 cfs @ 19.40 hrs, Volume= 54.610 af, Atten= 23%, Lag= 126.8 min
Primary = 45.34 cfs @ 19.40 hrs, Volume= 54.176 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 3.37 cfs @ 19.40 hrs, Volume= 0.434 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 40.78' @ 19.40 hrs Storage= 13.655 af (12.575 af above start)

Plug-Flow detention time= 303.8 min calculated for 53.529 af (98% of inflow)
Center-of-Mass det. time= 212.8 min (1,584.5 - 1,371.7)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=45.34 cfs @ 19.40 hrs HW=40.78' TW=23.38' (Dynamic Tailwater)
↳**1=Sharp-Crested Rectangular Weir** (Weir Controls 45.34 cfs @ 5.62 fps)

Secondary OutFlow Max=3.37 cfs @ 19.40 hrs HW=40.78' TW=23.38' (Dynamic Tailwater)
↳**2=TOD** (Weir Controls 3.37 cfs @ 0.68 fps)

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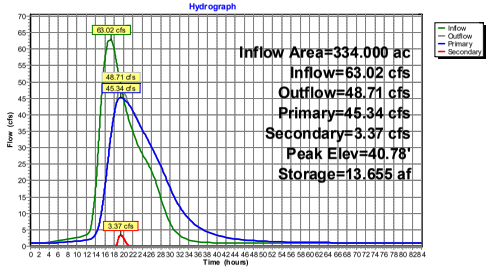
Pond 12P: Maple Springs Road Dam



Summary for Pond 13.1P: Bogs_L_US

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 3.57" for 1000-yr event
Inflow = 77.31 cfs @ 20.51 hrs, Volume= 82.918 af, Incl. 0.90 cfs Base Flow
Outflow = 75.59 cfs @ 21.68 hrs, Volume= 82.919 af, Atten= 2%, Lag= 70.3 min
Primary = 75.59 cfs @ 21.68 hrs, Volume= 82.919 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 32.31' @ 21.68 hrs Storage= 1.164 af (1.110 af above start)

Plug-Flow detention time= 13.6 min calculated for 82.864 af (100% of inflow)
Center-of-Mass det. time= 10.4 min (1,518.7 - 1,508.4)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

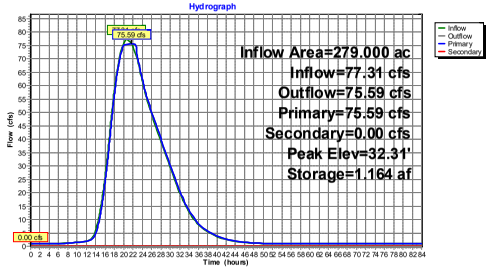
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=75.58 cfs @ 21.68 hrs HW=32.31' TW=28.28' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 75.58 cfs @ 5.38 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.65' TW=25.75' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.1P: Bogs_L_US



Summary for Pond 13.2P: Bogs_L_DS

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 3.57" for 1000-yr event
Inflow = 75.59 cfs @ 21.68 hrs, Volume= 82.919 af
Outflow = 72.18 cfs @ 22.82 hrs, Volume= 82.921 af, Atten= 5%, Lag= 68.6 min
Primary = 72.18 cfs @ 22.82 hrs, Volume= 82.921 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 28.32' @ 22.82 hrs Storage= 3.666 af (3.591 af above start)

Plug-Flow detention time= 26.4 min calculated for 82.845 af (100% of inflow)
Center-of-Mass det. time= 22.0 min (1,540.7 - 1,518.7)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

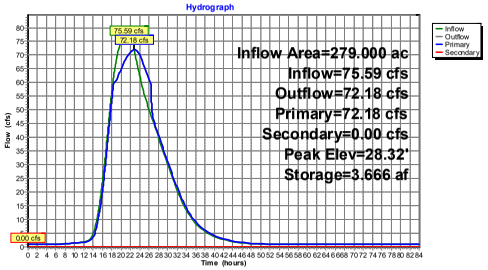
Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=72.18 cfs @ 22.82 hrs HW=28.32' TW=19.61' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 72.18 cfs @ 5.30 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.2P: Bogs_L_DS



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow Area = 1,717.000 ac, 6.26% Impervious, Inflow Depth > 2.81" for 1000-yr event
Inflow = 224.73 cfs @ 18.39 hrs, Volume= 402.039 af, Incl. 0.80 cfs Base Flow
Outflow = 192.36 cfs @ 26.38 hrs, Volume= 401.697 af, Atten= 14%, Lag= 479.3 min
Primary = 192.36 cfs @ 26.38 hrs, Volume= 401.697 af
Routed to Link 23L : Inflow
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 19.77' @ 26.38 hrs Storage= 52.763 af (51.698 af above start)

Plug-Flow detention time= 148.5 min calculated for 400.627 af (100% of inflow)
Center-of-Mass det. time= 132.4 min (1,921.6 - 1,789.2)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

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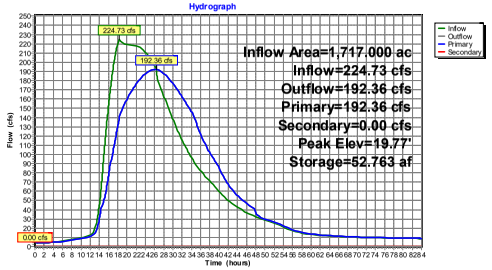
Primary OutFlow Max=192.34 cfs @ 26.38 hrs HW=19.77' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 192.34 cfs @ 5.61 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.71' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 14P: Bogs_M - 2.7sm



Summary for Pond 15.1P: Bogs_N_US

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 5.28" for 1000-yr event
Inflow = 127.25 cfs @ 16.00 hrs, Volume= 78.791 af, Incl. 0.60 cfs Base Flow
Outflow = 82.79 cfs @ 18.36 hrs, Volume= 78.785 af, Atten= 35%, Lag= 141.8 min
Primary = 82.79 cfs @ 18.36 hrs, Volume= 78.785 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 27.99' @ 18.36 hrs Storage= 24.742 af (24.390 af above start)

Plug-Flow detention time= 259.9 min calculated for 78.433 af (100% of inflow)
Center-of-Mass det. time= 237.9 min (1,428.4 - 1,190.5)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

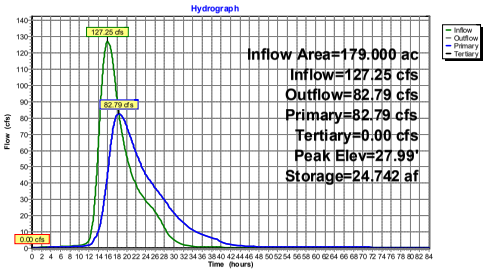
Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=82.79 cfs @ 18.36 hrs HW=27.99' TW=20.85' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 82.79 cfs @ 5.55 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.11' TW=20.11' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 15.1P: Bogs_N_US



Summary for Pond 15.2P: Bogs_N_DS

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 5.28" for 1000-yr event
Inflow = 82.79 cfs @ 18.36 hrs, Volume= 78.785 af
Outflow = 35.37 cfs @ 26.52 hrs, Volume= 75.566 af, Atten= 57%, Lag= 489.5 min
Primary = 35.37 cfs @ 26.52 hrs, Volume= 75.566 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 21.69' @ 26.52 hrs Storage= 39.496 af (36.930 af above start)

Plug-Flow detention time= 891.5 min calculated for 72.999 af (93% of inflow)
Center-of-Mass det. time= 732.6 min (2,161.0 - 1,428.4)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

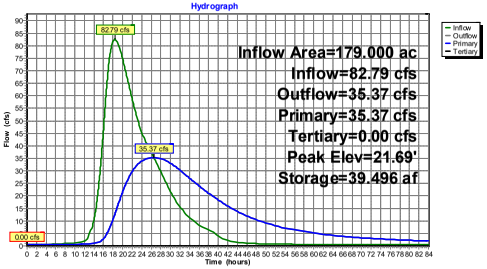
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=35.35 cfs @ 26.52 hrs HW=21.69' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 35.35 cfs @ 4.18 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS



Summary for Pond 16.1: Mill Pond Dam -PC

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 3.89" for 1000-yr event
Inflow = 801.06 cfs @ 14.78 hrs, Volume= 1,604.007 af, Incl. 32.00 cfs Base Flow
Outflow = 462.57 cfs @ 27.60 hrs, Volume= 1,484.207 af, Atten= 42%, Lag= 769.3 min
Primary = 421.01 cfs @ 27.60 hrs, Volume= 1,263.057 af
Routed to Pond 17B : Proposed Bridge
Secondary = 41.56 cfs @ 27.59 hrs, Volume= 221.151 af
Routed to Pond Wr 24 :
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 17B : Proposed Bridge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 470.969 af
Peak Elev= 16.28' @ 27.60 hrs Storage= 833.012 af (362.043 af above start)

Plug-Flow detention time= 1,690.8 min calculated for 1,013.237 af (63% of inflow)
Center-of-Mass det. time= 444.0 min (2,445.6 - 2,001.7)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,941.850 af	**Storage** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.130
5.00	4.140
6.00	9.110
7.00	16.590
8.00	34.960
9.00	60.590
10.00	94.410
11.00	142.690
12.00	214.660
13.00	314.540
13.80	403.920
14.00	426.260
15.00	575.290
16.00	771.680
17.00	994.600
18.30	1,368.590
19.00	1,592.930
20.00	1,941.850

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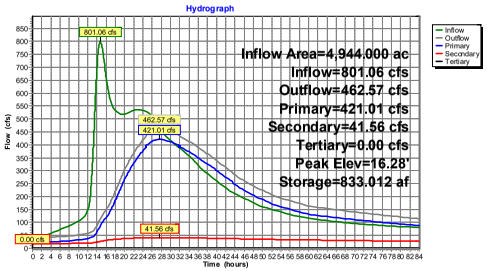
Device	Routing	Invert	Outlet Devices
#1	Primary	15.50'	**110.0' long x 1.5' breadth Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32
#2	Primary	13.60'	**15.0' long x 1.0' breadth Notch as SW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#3	Secondary	12.50'	**3.3' long x 1.0' breadth 3.25' Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#4	Tertiary	18.00'	**TOD, C= 2.60** Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00 Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 8	5.20'	**48.0" W x 48.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#7	Device 8	15.50'	**6.0' long x 20.00' rise MLO DownwardOpGate** 2 End Contraction(s) 5.0' Crest Height
#8	Tertiary	4.00'	**96.0" W x 48.0" H Box Culvert X 0.00** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 32.00 sf

Primary OutFlow Max=418.28 cfs @ 27.60 hrs HW=16.28' TW=10.47' (Dynamic Tailwater)
└**1=Spillway** (Weir Controls 200.81 cfs @ 2.36 fps)
└**2=Notch as SW** (Weir Controls 217.47 cfs @ 5.42 fps)

Secondary OutFlow Max=41.83 cfs @ 27.59 hrs HW=16.28' TW=15.80' (Dynamic Tailwater)
└**3=3.25' Weir** (Weir Controls 41.83 cfs @ 3.36 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.30' TW=8.48' (Dynamic Tailwater)
└**4=TOD** (Controls 0.00 cfs)
└**5=US Relief - Bypasses Dam** (Controls 0.00 cfs)
└**8=Culvert** (Controls 0.00 cfs)
└**6=Orifice/Grate** (Controls 0.00 cfs)
└**7=MLO DownwardOpGate** (Controls 0.00 cfs)

Pond 16.1: Mill Pond Dam -PC



Summary for Pond 16.3: Downstream Weir

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 3.07" for 1000-yr event
Inflow = 421.01 cfs @ 27.60 hrs, Volume= 1,263.032 af
Outflow = 421.01 cfs @ 27.60 hrs, Volume= 1,263.009 af, Atten= 0%, Lag= 0.1 min
Primary = 421.01 cfs @ 27.60 hrs, Volume= 1,263.009 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 10.38' @ 27.60 hrs Surf.Area= 2,000 sf Storage= 12,751 cf (3,791 cf above start)

Plug-Flow detention time= 1.0 min calculated for 1,262.802 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,422.6 - 2,422.5)

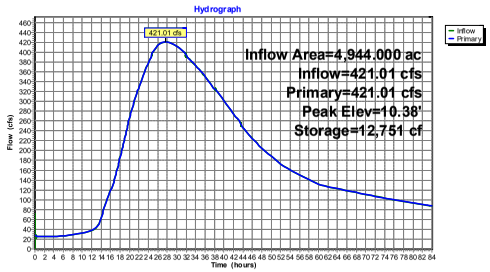
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	8.00'	**DS Weir, C= 2.60** Offset (feet) 0.00 0.00 23.00 23.00 Elev. (feet) 17.00 10.00 8.00 17.00
#2	Primary	8.00'	**27.0' long x 1.5' breadth El 8 Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32

Primary OutFlow Max=421.01 cfs @ 27.60 hrs HW=10.38' (Free Discharge)
└**1=DS Weir** (Weir Controls 102.97 cfs @ 1.88 fps)
└**2=El 8 Weir** (Weir Controls 318.04 cfs @ 4.96 fps)

Pond 16.3: Downstream Weir



Summary for Pond 17B: Proposed Bridge

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 3.07" for 1000-yr event
Inflow = 421.01 cfs @ 27.60 hrs, Volume= 1,263.057 af
Outflow = 421.01 cfs @ 27.60 hrs, Volume= 1,263.032 af, Atten= 0%, Lag= 0.1 min
Primary = 421.01 cfs @ 27.60 hrs, Volume= 1,263.032 af
Routed to Pond 16.3 : Downstream Weir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 10.47' @ 27.60 hrs Surf.Area= 2,000 sf Storage= 12,948 cf (3,988 cf above start)

Plug-Flow detention time= 1.0 min calculated for 1,262.811 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,422.5 - 2,422.3)

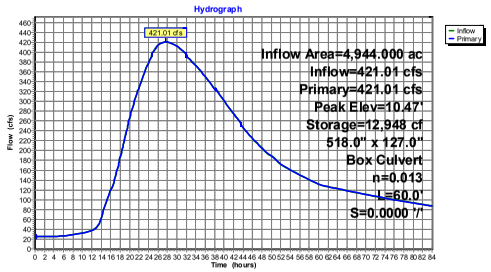
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	4.00'	**518.0" W x 127.0" H Box Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 456.85 sf

Primary OutFlow Max=421.01 cfs @ 27.60 hrs HW=10.47' TW=10.38' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 421.01 cfs @ 1.51 fps)

Pond 17B: Proposed Bridge



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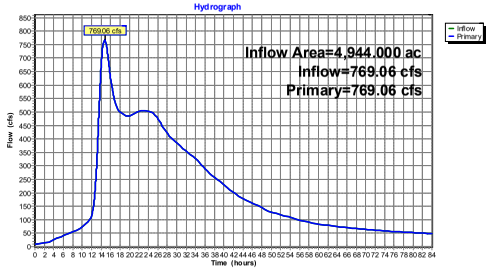
Summary for Link 23L: Inflow

Inflow Area = 4,944.000 ac, 19.13% Impervious, Inflow Depth > 3.35" for 1000-yr event
Inflow = 769.06 cfs @ 14.78 hrs, Volume= 1,381.856 af
Primary = 769.06 cfs @ 14.78 hrs, Volume= 1,381.856 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16.1 : Mill Pond Dam -PC

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow

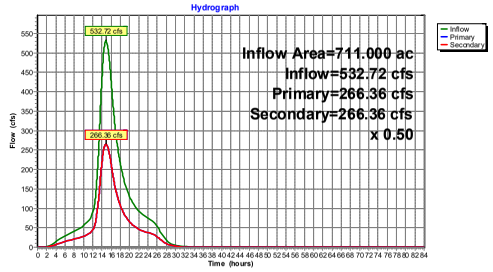


Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 4.66" for 1000-yr event
Inflow = 532.72 cfs @ 14.92 hrs, Volume= 276.167 af
Primary = 266.36 cfs @ 14.92 hrs, Volume= 138.083 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 1P : Halfway Pond
Secondary = 266.36 cfs @ 14.92 hrs, Volume= 138.083 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow

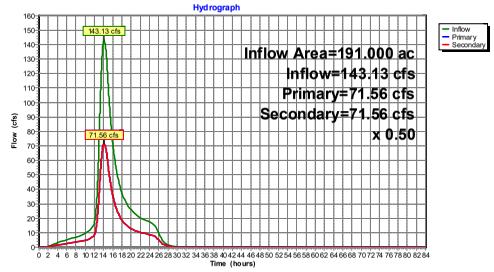


Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 3.77" for 1000-yr event
Inflow = 143.13 cfs @ 14.15 hrs, Volume= 60.077 af
Primary = 71.56 cfs @ 14.15 hrs, Volume= 30.038 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 2P : Kennard Res
Secondary = 71.56 cfs @ 14.15 hrs, Volume= 30.038 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

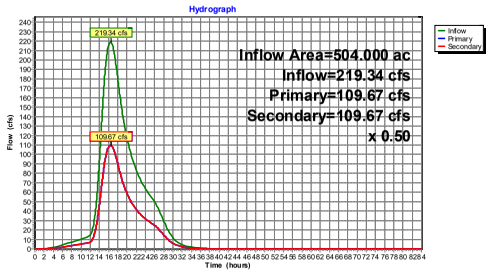


Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth = 3.50" for 1000-yr event
Inflow = 219.34 cfs @ 16.59 hrs, Volume= 147.178 af
Primary = 109.67 cfs @ 16.59 hrs, Volume= 73.589 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 109.67 cfs @ 16.59 hrs, Volume= 73.589 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

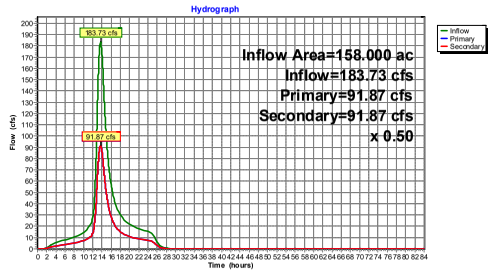


Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 4.86" for 1000-yr event
Inflow = 183.73 cfs @ 13.73 hrs, Volume= 63.958 af
Primary = 91.87 cfs @ 13.73 hrs, Volume= 31.979 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 3P : Fawn Pond
Secondary = 91.87 cfs @ 13.73 hrs, Volume= 31.979 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow

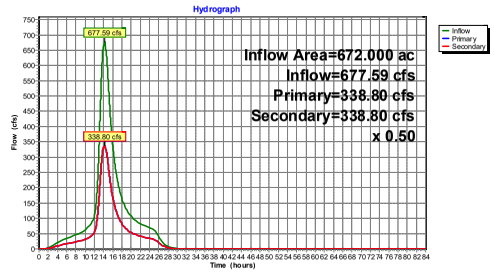


Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 5.09" for 1000-yr event
Inflow = 677.59 cfs @ 14.28 hrs, Volume= 285.013 af
Primary = 338.80 cfs @ 14.28 hrs, Volume= 142.507 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 5P : Glen Charlie Pond
Secondary = 338.80 cfs @ 14.28 hrs, Volume= 142.507 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow



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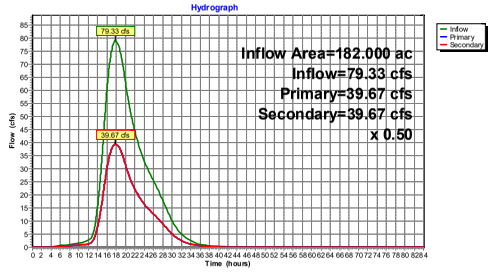
Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 3.96" for 1000-yr event
Inflow = 79.33 cfs @ 17.79 hrs, Volume= 60.136 af
Primary = 39.67 cfs @ 17.79 hrs, Volume= 30.068 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 6.2P : Maple Sping Bogs US
Secondary = 39.67 cfs @ 17.79 hrs, Volume= 30.068 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow

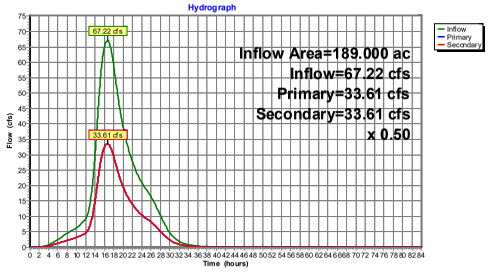


Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth = 3.16" for 1000-yr event
Inflow = 67.22 cfs @ 16.66 hrs, Volume= 49.764 af
Primary = 33.61 cfs @ 16.66 hrs, Volume= 24.882 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 7P : Little Five Mile Pond
Secondary = 33.61 cfs @ 16.66 hrs, Volume= 24.882 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow

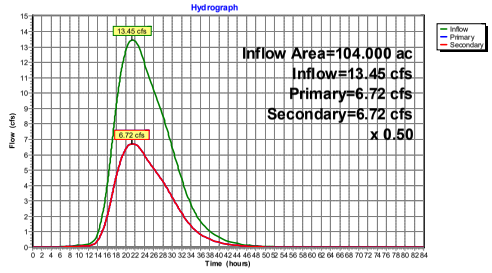


Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth = 1.70" for 1000-yr event
Inflow = 13.45 cfs @ 21.35 hrs, Volume= 14.772 af
Primary = 6.72 cfs @ 21.35 hrs, Volume= 7.386 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 9P : Kettle Hole
Secondary = 6.72 cfs @ 21.35 hrs, Volume= 7.386 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow

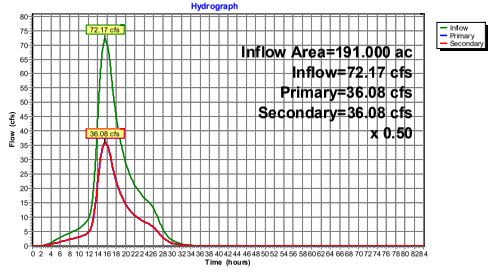


Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth = 2.83" for 1000-yr event
Inflow = 72.17 cfs @ 15.53 hrs, Volume= 44.979 af
Primary = 36.08 cfs @ 15.53 hrs, Volume= 22.490 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 36.08 cfs @ 15.53 hrs, Volume= 22.490 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

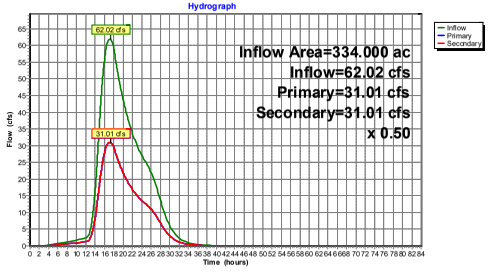


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth = 1.71" for 1000-yr event
Inflow = 62.02 cfs @ 17.28 hrs, Volume= 47.672 af
Primary = 31.01 cfs @ 17.28 hrs, Volume= 23.836 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 12P : Maple Springs Road Dam
Secondary = 31.01 cfs @ 17.28 hrs, Volume= 23.836 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow

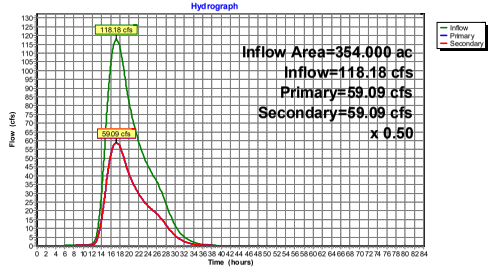


Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth = 2.90" for 1000-yr event
Inflow = 118.18 cfs @ 17.20 hrs, Volume= 85.562 af
Primary = 59.09 cfs @ 17.20 hrs, Volume= 42.781 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 59.09 cfs @ 17.20 hrs, Volume= 42.781 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow



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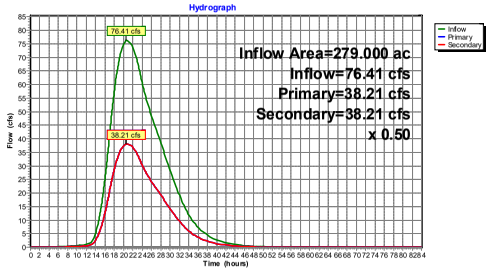
Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth = 3.30" for 1000-yr event
Inflow = 76.41 cfs @ 20.51 hrs, Volume= 76.670 af
Primary = 38.21 cfs @ 20.51 hrs, Volume= 38.335 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 13.1P : Bogs_L_US
Secondary = 38.21 cfs @ 20.51 hrs, Volume= 38.335 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow

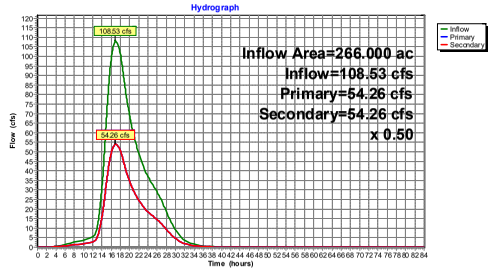


Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth = 3.45" for 1000-yr event
Inflow = 108.53 cfs @ 16.87 hrs, Volume= 76.479 af
Primary = 54.26 cfs @ 16.87 hrs, Volume= 38.240 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 54.26 cfs @ 16.87 hrs, Volume= 38.240 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow

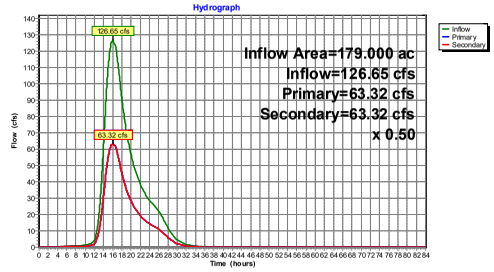


Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth = 5.00" for 1000-yr event
Inflow = 126.65 cfs @ 16.00 hrs, Volume= 74.625 af
Primary = 63.32 cfs @ 16.00 hrs, Volume= 37.313 af, Atten= 50%, Lag= 0.0 min
Routed to Pond 15.1P : Bogs_N_US
Secondary = 63.32 cfs @ 16.00 hrs, Volume= 37.313 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow

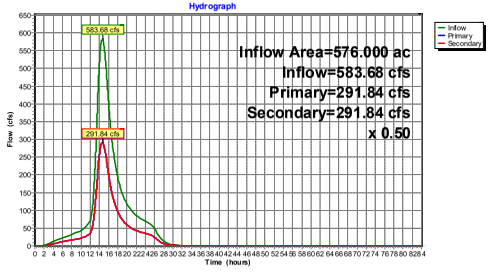


Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 5.57" for 1000-yr event
Inflow = 583.68 cfs @ 14.78 hrs, Volume= 267.295 af
Primary = 291.84 cfs @ 14.78 hrs, Volume= 133.648 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 291.84 cfs @ 14.78 hrs, Volume= 133.648 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow

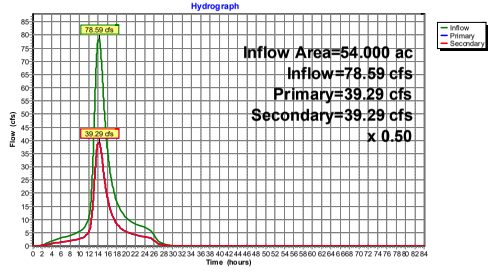


Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 6.76" for 1000-yr event
Inflow = 78.59 cfs @ 14.25 hrs, Volume= 30.406 af
Primary = 39.29 cfs @ 14.25 hrs, Volume= 15.203 af, Atten= 50%, Lag= 0.0 min
Routed to Link 23L : Inflow
Secondary = 39.29 cfs @ 14.25 hrs, Volume= 15.203 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



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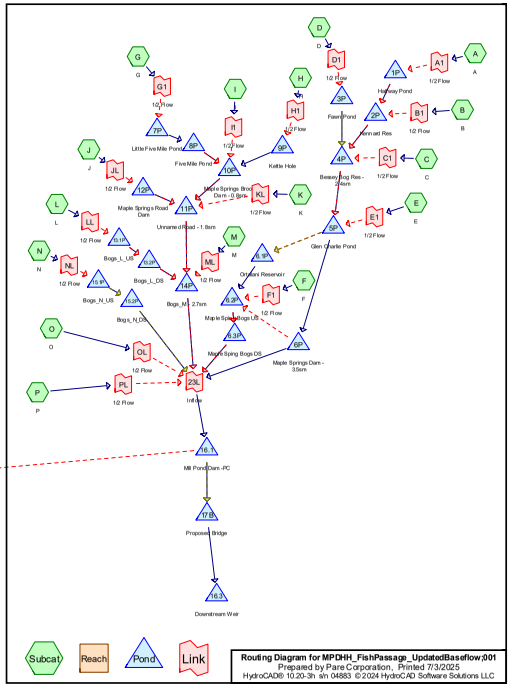

Project Notes

Copied 10 events from NOAA14_Wareham 24-hr S1 storm

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	PMP24hour	PMP-24hourWareham		Default	24.00	1	33.30	2
2	PMP72hour	PMP-72hourWareham		Default	72.00	1	39.12	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
354.000	42	"0.83% imp" (K)
104.000	34	"1.27% imp" (H)
504.000	47	"10.54% imp" (C)
191.000	42	"15.34% imp" (I)
191.000	49	"18.54% imp" (B)
189.000	45	"19.09% imp" (G)
279.000	45	"2.43% imp" (L)
334.000	34	"2.83% imp" (J)
179.000	57	"3.17% imp" (N)
576.000	62	"31.1% imp" (O)
158.000	57	"31.94% imp" (D)
711.000	56	"33.99% imp" (A)
672.000	59	"35.91% imp" (E)
54.000	71	"38.05% imp" (P)
182.000	50	"6.11% imp" (F)
266.000	47	"8.14% imp" (M)
4,944.000	**51**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
4,944.000	Other	A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P
4,944.000		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	354.000	354.000	"0.83% imp"	K
0.000	0.000	0.000	0.000	104.000	104.000	"1.27% imp"	H
0.000	0.000	0.000	0.000	504.000	504.000	"10.54% imp"	C
0.000	0.000	0.000	0.000	191.000	191.000	"15.34% imp"	I
0.000	0.000	0.000	0.000	191.000	191.000	"18.54% imp"	B
0.000	0.000	0.000	0.000	189.000	189.000	"19.09% imp"	G
0.000	0.000	0.000	0.000	279.000	279.000	"2.43% imp"	L
0.000	0.000	0.000	0.000	334.000	334.000	"2.83% imp"	J
0.000	0.000	0.000	0.000	179.000	179.000	"3.17% imp"	N
0.000	0.000	0.000	0.000	576.000	576.000	"31.1% imp"	O
0.000	0.000	0.000	0.000	158.000	158.000	"31.94% imp"	D
0.000	0.000	0.000	0.000	711.000	711.000	"33.99% imp"	A
0.000	0.000	0.000	0.000	672.000	672.000	"35.91% imp"	E
0.000	0.000	0.000	0.000	54.000	54.000	"38.05% imp"	P
0.000	0.000	0.000	0.000	182.000	182.000	"6.11% imp"	F
0.000	0.000	0.000	0.000	266.000	266.000	"8.14% imp"	M
0.000	**0.000**	**0.000**	**0.000**	**4,944.000**	**4,944.000**	**TOTAL AREA**	

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Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	1P	64.00	63.50	20.0	0.0250	0.025	36.0	36.0	0.0	
2	3P	59.50	59.00	40.0	0.0125	0.025	0.0	30.0	0.0	
3	6P	20.50	20.30	30.0	0.0067	0.035	36.0	36.0	0.0	
4	8P	51.90	51.30	30.0	0.0200	0.035	0.0	24.0	0.0	
5	11P	21.00	20.50	30.0	0.0167	0.035	96.0	72.0	0.0	
6	14P	15.20	15.00	90.0	0.0022	0.035	120.0	96.0	0.0	
7	16.1	4.00	4.00	20.0	0.0000	0.011	96.0	48.0	0.0	
8	17B	4.00	4.00	60.0	0.0000	0.013	518.0	127.0	0.0	

Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=22.93"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=2,869.55 cfs 1,358.883 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=21.98"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=892.46 cfs 349.914 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=21.96"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=1,663.71 cfs 922.324 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=23.81"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=860.07 cfs 313.439 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=24.08"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=3,236.36 cfs 1,348.332 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=23.40"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=539.07 cfs 354.916 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=19.89"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=536.08 cfs 313.189 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=17.46"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=177.40 cfs 151.298 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=19.27"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=618.94 cfs 306.787 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=17.24"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=871.90 cfs 479.793 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=21.13"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=1,058.71 cfs 623.293 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=22.03"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=597.64 cfs 512.134 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=22.01"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=829.68 cfs 487.840 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=25.67"
Tc=300.0 min CN=56/98 Runoff=704.28 cfs 382.951 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=25.74"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=2,738.42 cfs 1,235.635 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=28.00"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=299.30 cfs 125.979 af

Pond 1P: Halfway Pond Peak Elev=66.86' Storage=1,016.671 af Inflow=1,436.98 cfs 694.714 af
Primary=40.94 cfs 199.747 af Secondary=0.00 cfs 0.000 af Outflow=40.94 cfs 199.747 af

Pond 2P: Kennard Res Peak Elev=60.01' Storage=70.351 af Inflow=460.21 cfs 378.869 af
Primary=137.18 cfs 299.593 af Secondary=250.68 cfs 61.254 af Outflow=387.86 cfs 360.847 af

Pond 3P: Fawn Pond Peak Elev=62.01' Storage=160.533 af Inflow=430.54 cfs 160.190 af
Primary=21.07 cfs 77.959 af Tertiary=30.54 cfs 23.822 af Outflow=51.61 cfs 101.781 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=51.05' Storage=223.550 af Inflow=1,223.09 cfs 934.897 af
Primary=146.64 cfs 500.119 af Secondary=916.28 cfs 398.109 af Outflow=1,062.92 cfs 898.228 af

Pond 5P: Glen Charlie Pond Peak Elev=37.42' Storage=628.921 af Inflow=1,819.87 cfs 1,586.973 af
,060.65 cfs 1,434.928 af Secondary=40.25 cfs 29.251 af Tertiary=14.70 cfs 15.364 af Outflow=1,115.51 cfs 1,479.543 af

Pond 6.1P: Ortalani Reservoir Peak Elev=36.00' Storage=29.930 af Inflow=54.86 cfs 44.615 af
Outflow=15.45 cfs 36.606 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=24.98' Storage=39.584 af Inflow=356.30 cfs 247.076 af
Primary=31.98 cfs 83.040 af Secondary=321.87 cfs 157.758 af Outflow=353.84 cfs 240.798 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=22.26' Storage=39.448 af Inflow=353.84 cfs 240.798 af
Primary=191.47 cfs 212.834 af Secondary=127.81 cfs 27.216 af Outflow=319.28 cfs 240.050 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=25.53' Storage=16.637 af Inflow=1,060.65 cfs 1,434.928 af
Primary=960.80 cfs 1,399.687 af Secondary=99.62 cfs 33.011 af Outflow=1,060.42 cfs 1,432.698 af

Pond 7P: Little Five Mile Pond Peak Elev=60.36' Storage=28.855 af Inflow=268.63 cfs 160.691 af
Outflow=267.24 cfs 160.640 af

Pond 8P: Five Mile Pond Peak Elev=55.57' Storage=105.709 af Inflow=267.24 cfs 160.640 af
Primary=18.50 cfs 69.652 af Secondary=100.13 cfs 49.254 af Outflow=118.63 cfs 118.906 af

Pond 9P: Kettle Hole Peak Elev=55.72' Storage=11.525 af Inflow=89.00 cfs 77.732 af
Outflow=88.63 cfs 77.740 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=32.68' Storage=63.423 af Inflow=352.05 cfs 354.205 af
Primary=107.42 cfs 231.519 af Secondary=232.98 cfs 114.865 af Outflow=340.40 cfs 346.384 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=28.76' Storage=408.683 af Inflow=1,305.20 cfs 912.499 af
Primary=430.49 cfs 858.620 af Secondary=138.15 cfs 50.216 af Outflow=568.64 cfs 908.836 af

Pond 12P: Maple Springs Road Dam Peak Elev=41.80' Storage=20.606 af Inflow=436.95 cfs 246.839 af
Primary=78.72 cfs 90.924 af Secondary=357.89 cfs 155.907 af Outflow=436.61 cfs 246.831 af

Pond 13.1P: Bogs_L_US Peak Elev=35.10' Storage=54.747 af Inflow=299.72 cfs 262.315 af
Primary=144.86 cfs 219.399 af Secondary=120.02 cfs 42.918 af Outflow=264.57 cfs 262.316 af

Pond 13.2P: Bogs_L_DS Peak Elev=30.60' Storage=65.942 af Inflow=264.57 cfs 262.316 af
Primary=134.02 cfs 262.318 af Secondary=0.00 cfs 0.000 af Outflow=134.02 cfs 262.318 af

Pond 14P: Bogs_M - 2.7sm Peak Elev=24.61' Storage=282.903 af Inflow=831.58 cfs 1,420.628 af
Primary=600.70 cfs 1,419.687 af Secondary=1.60 cfs 0.223 af Outflow=601.40 cfs 1,419.910 af

Pond 15.1P: Bogs_N_US Peak Elev=29.41' Storage=76.764 af Inflow=352.74 cfs 195.641 af
Primary=121.84 cfs 163.323 af Tertiary=138.94 cfs 32.312 af Outflow=260.78 cfs 195.635 af

Pond 15.2P: Bogs_N_DS Peak Elev=23.36' Storage=89.606 af Inflow=260.78 cfs 195.635 af
Primary=95.24 cfs 190.818 af Tertiary=0.00 cfs 0.000 af Outflow=95.24 cfs 190.818 af

Pond 16.1: Mill Pond Dam -PC Peak Elev=17.82' Storage=1,230.129 af Inflow=2,067.05 cfs 4,153.424 af
:1,670.01 cfs 3,684.137 af Secondary=61.01 cfs 274.621 af Tertiary=0.00 cfs 0.000 af Outflow=1,731.02 cfs 3,958.759 af

Pond 16.3: Downstream Weir Peak Elev=13.38' Storage=18,759 cf Inflow=1,670.01 cfs 3,684.102 af
Outflow=1,670.01 cfs 3,684.069 af

Pond 17B: Proposed Bridge Peak Elev=14.05' Storage=20,096 cf Inflow=1,670.01 cfs 3,684.137 af
518.0" x 127.0' Box Culvert n=0.013 L=60.0' S=0.0000 '/' Outflow=1,670.01 cfs 3,684.102 af

Link 23L: Inflow Inflow=2,035.05 cfs 3,931.272 af
Primary=2,035.05 cfs 3,931.272 af

Link A1: 1/2 Flow x 0.50 Inflow=2,869.55 cfs 1,358.883 af
Primary=1,434.78 cfs 679.441 af Secondary=1,434.78 cfs 679.441 af

Link B1: 1/2 Flow x 0.50 Inflow=892.46 cfs 349.914 af
Primary=446.23 cfs 174.957 af Secondary=446.23 cfs 174.957 af

Link C1: 1/2 Flow x 0.50 Inflow=1,663.71 cfs 922.324 af
Primary=831.85 cfs 461.162 af Secondary=831.85 cfs 461.162 af

Link D1: 1/2 Flow x 0.50 Inflow=860.07 cfs 313.439 af
Primary=430.04 cfs 156.719 af Secondary=430.04 cfs 156.719 af

Link E1: 1/2 Flow x 0.50 Inflow=3,236.36 cfs 1,348.332 af
Primary=1,618.18 cfs 674.166 af Secondary=1,618.18 cfs 674.166 af

Link F1: 1/2 Flow x 0.50 Inflow=539.07 cfs 354.916 af
Primary=269.54 cfs 177.458 af Secondary=269.54 cfs 177.458 af

Link G1: 1/2 Flow x 0.50 Inflow=536.08 cfs 313.189 af
Primary=268.04 cfs 156.595 af Secondary=268.04 cfs 156.595 af

Link H1: 1/2 Flow x 0.50 Inflow=177.40 cfs 151.298 af
Primary=88.70 cfs 75.649 af Secondary=88.70 cfs 75.649 af

Link I1: 1/2 Flow x 0.50 Inflow=618.94 cfs 306.787 af
Primary=309.47 cfs 153.394 af Secondary=309.47 cfs 153.394 af

Link JL: 1/2 Flow x 0.50 Inflow=871.90 cfs 479.793 af
Primary=435.95 cfs 239.897 af Secondary=435.95 cfs 239.897 af

Link KL: 1/2 Flow x 0.50 Inflow=1,058.71 cfs 623.293 af
Primary=529.36 cfs 311.647 af Secondary=529.36 cfs 311.647 af

Link LL: 1/2 Flow x 0.50 Inflow=597.64 cfs 512.134 af
Primary=298.82 cfs 256.067 af Secondary=298.82 cfs 256.067 af

Link ML: 1/2 Flow x 0.50 Inflow=829.68 cfs 487.840 af
Primary=414.84 cfs 243.920 af Secondary=414.84 cfs 243.920 af

Link NL: 1/2 Flow x 0.50 Inflow=704.28 cfs 382.951 af
Primary=352.14 cfs 191.475 af Secondary=352.14 cfs 191.475 af

Link OL: 1/2 Flow x 0.50 Inflow=2,738.42 cfs 1,235.635 af
Primary=1,369.21 cfs 617.818 af Secondary=1,369.21 cfs 617.818 af

Link PL: 1/2 Flow x 0.50 Inflow=299.30 cfs 125.979 af
Primary=149.65 cfs 62.989 af Secondary=149.65 cfs 62.989 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 9,266.705 af Average Runoff Depth = 22.49"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

Summary for Subcatchment A: A

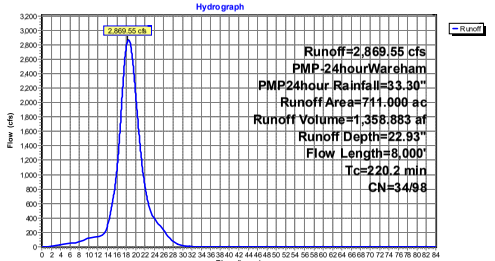
Runoff = 2,869.55 cfs @ 18.35 hrs, Volume= 1,358.883 af, Depth=22.93"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

	Area (ac)	CN	Description
*	711.000	56	"33.99% imp"
	469.331	34	66.01% Pervious Area
	241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



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Summary for Subcatchment B: B

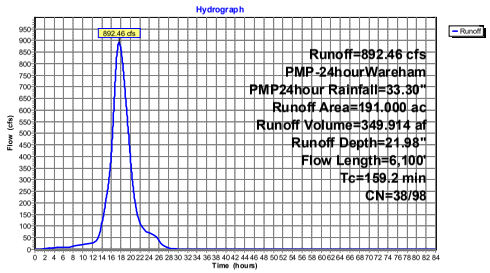
Runoff = 892.46 cfs @ 17.69 hrs, Volume= 349.914 af, Depth=21.98"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 191.000	49	"18.54% imp"
155.589	38	81.46% Pervious Area
35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



Summary for Subcatchment C: C

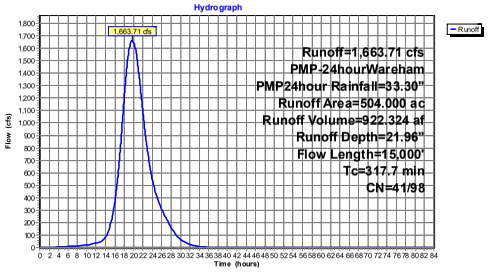
Runoff = 1,663.71 cfs @ 19.77 hrs, Volume= 922.324 af, Depth=21.96"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 504.000	47	"10.54% imp"
450.878	41	89.46% Pervious Area
53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



Summary for Subcatchment D: D

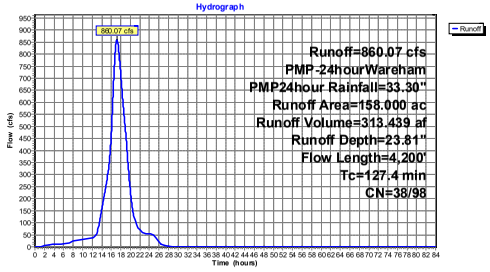
Runoff = 860.07 cfs @ 17.13 hrs, Volume= 313.439 af, Depth=23.81"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 158.000	57	"31.94% imp"
107.535	38	68.06% Pervious Area
50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



Summary for Subcatchment E: E

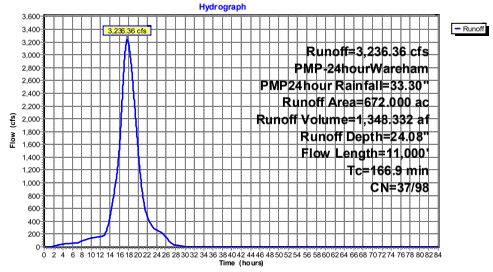
Runoff = 3,236.36 cfs @ 17.62 hrs, Volume= 1,348.332 af, Depth=24.08"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 672.000	59	"35.91% imp"
430.685	37	64.09% Pervious Area
241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



Summary for Subcatchment F: F

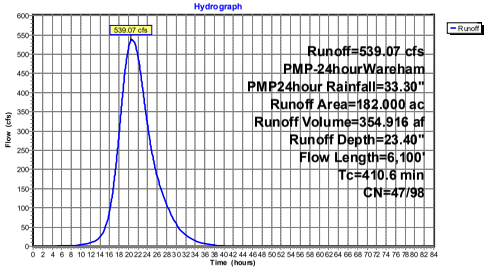
Runoff = 539.07 cfs @ 20.53 hrs, Volume= 354.916 af, Depth=23.40"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 182.000	50	"6.11% imp"
170.880	47	93.89% Pervious Area
11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



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Summary for Subcatchment G: G

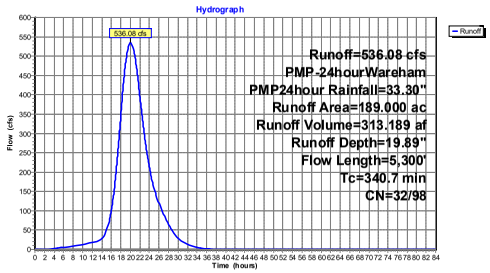
Runoff = 536.08 cfs @ 20.06 hrs, Volume= 313.189 af, Depth=19.89"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 189.000	45	"19.09% imp"
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



Summary for Subcatchment H: H

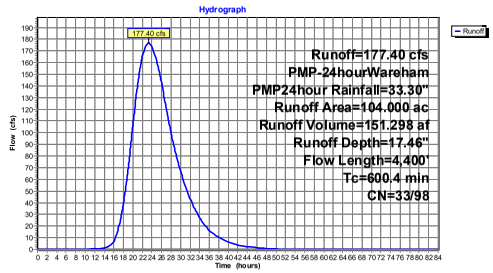
Runoff = 177.40 cfs @ 23.35 hrs, Volume= 151.298 af, Depth=17.46"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 104.000	34	"1.27% imp"
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

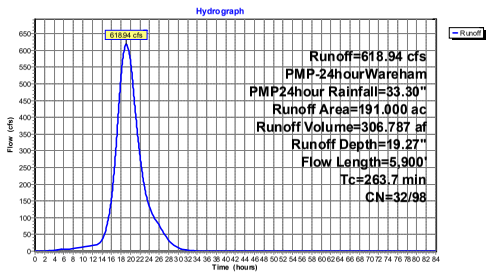
Runoff = 618.94 cfs @ 19.05 hrs, Volume= 306.787 af, Depth=19.27"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 191.000	42	"15.34% imp"
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



Summary for Subcatchment J: J

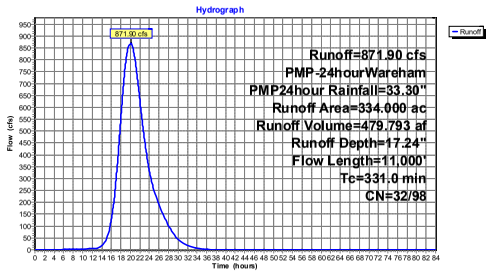
Runoff = 871.90 cfs @ 20.23 hrs, Volume= 479.793 af, Depth=17.24"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 334.000	34	"2.83% imp"
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Summary for Subcatchment K: K

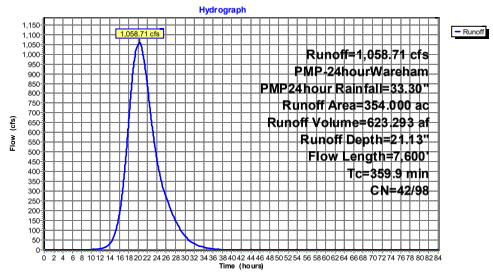
Runoff = 1,058.71 cfs @ 20.39 hrs, Volume= 623.293 af, Depth=21.13"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 354.000	42	"0.83% imp"
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



Summary for Subcatchment L: L

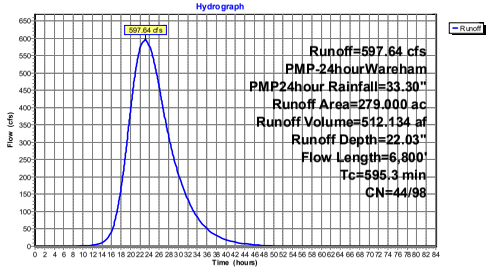
Runoff = 597.64 cfs @ 23.15 hrs, Volume= 512.134 af, Depth=22.03"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 279.000	45	"2.43% imp"
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



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Summary for Subcatchment M: M

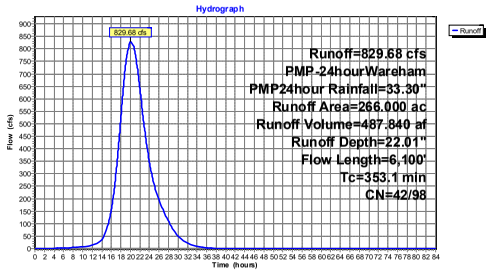
Runoff = 829.68 cfs @ 20.01 hrs, Volume= 487.840 af, Depth=22.01"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 266.000	47	"8.14% imp"
244.348	42	91.86% Pervious Area
21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



Summary for Subcatchment N: N

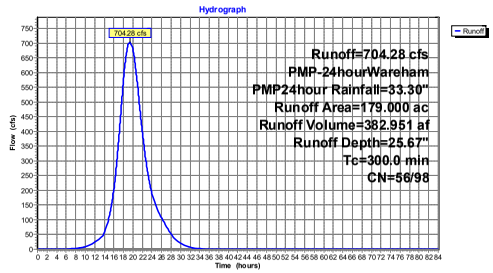
Runoff = 704.28 cfs @ 19.33 hrs, Volume= 382.951 af, Depth=25.67"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 179.000	57	"3.17% imp"
173.326	56	96.83% Pervious Area
5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

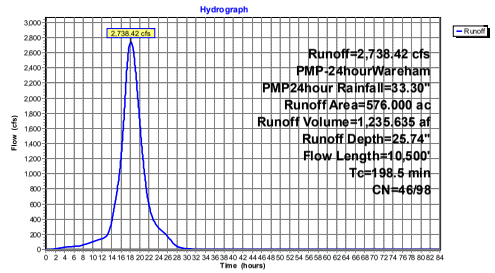
Runoff = 2,738.42 cfs @ 18.09 hrs, Volume= 1,235.635 af, Depth=25.74"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 576.000	62	"31.1% imp"
396.864	46	68.90% Pervious Area
179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



Summary for Subcatchment P: P

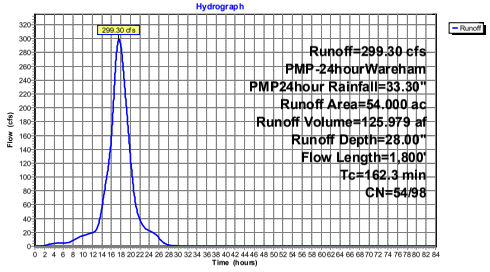
Runoff = 299.30 cfs @ 17.49 hrs, Volume= 125.979 af, Depth=28.00"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-24hourWareham PMP24hour Rainfall=33.30"

Area (ac)	CN	Description
* 54.000	71	"38.05% imp"
33.453	54	61.95% Pervious Area
20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Summary for Pond 1P: Halfway Pond

Inflow = 1,436.98 cfs @ 18.35 hrs, Volume= 694.714 af, Incl. 2.20 cfs Base Flow
Outflow = 40.94 cfs @ 27.89 hrs, Volume= 199.747 af, Atten= 97%, Lag= 572.2 min
Primary = 40.94 cfs @ 27.89 hrs, Volume= 199.747 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 66.86' @ 27.89 hrs Storage= 1,016.671 af (646.061 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,786.1 min (2,938.5 - 1,152.4)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

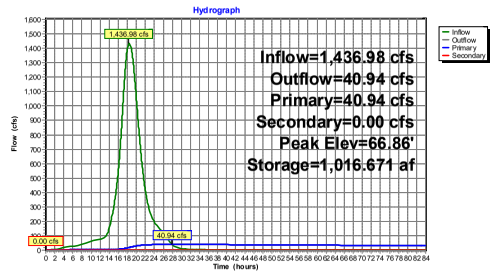
Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=40.94 cfs @ 27.89 hrs HW=66.86' TW=59.03' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 40.94 cfs @ 6.36 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
↑**2=TOR** (Controls 0.00 cfs)

Pond 1P: Halfway Pond



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Summary for Pond 2P: Kennard Res

Inflow = 460.21 cfs @ 17.69 hrs, Volume= 378.869 af, Incl. 0.60 cfs Base Flow
Outflow = 387.86 cfs @ 18.68 hrs, Volume= 360.847 af, Atten= 16%, Lag= 59.2 min
Primary = 137.18 cfs @ 18.68 hrs, Volume= 299.593 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 250.68 cfs @ 18.68 hrs, Volume= 61.254 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 60.01' @ 18.68 hrs Storage= 70.351 af (66.351 af above start)

Plug-Flow detention time= 348.3 min calculated for 356.846 af (94% of inflow)
Center-of-Mass det. time= 160.5 min (2,237.0 - 2,076.5)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

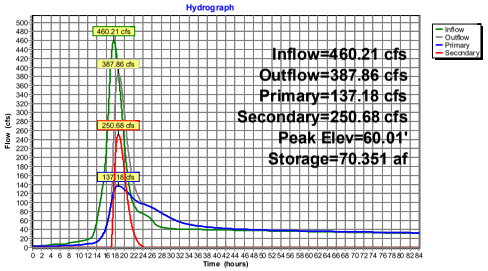
Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=137.18 cfs @ 18.68 hrs HW=60.01' TW=50.14' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Orifice Controls 137.18 cfs @ 6.46 fps)

Secondary OutFlow Max=250.65 cfs @ 18.68 hrs HW=60.01' TW=50.14' (Dynamic Tailwater)
└**1=TOD** (Weir Controls 250.65 cfs @ 1.81 fps)

Pond 2P: Kennard Res



Summary for Pond 3P: Fawn Pond

Inflow = 430.54 cfs @ 17.13 hrs, Volume= 160.190 af, Incl. 0.50 cfs Base Flow
Outflow = 51.61 cfs @ 21.10 hrs, Volume= 101.781 af, Atten= 88%, Lag= 238.4 min
Primary = 21.07 cfs @ 21.10 hrs, Volume= 77.959 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 30.54 cfs @ 21.10 hrs, Volume= 23.822 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 62.01' @ 21.10 hrs Storage= 160.533 af (132.813 af above start)

Plug-Flow detention time= 1,949.4 min calculated for 74.060 af (46% of inflow)
Center-of-Mass det. time= 1,346.0 min (2,414.8 - 1,068.7)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

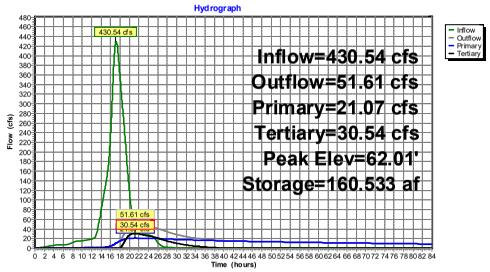
Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=21.07 cfs @ 21.10 hrs HW=62.01' TW=51.02' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 21.07 cfs @ 5.32 fps)

Tertiary OutFlow Max=30.53 cfs @ 21.10 hrs HW=62.01' TW=51.02' (Dynamic Tailwater)
└**2=TOD South** (Weir Controls 30.53 cfs @ 1.54 fps)

Pond 3P: Fawn Pond



Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow = 1,223.09 cfs @ 19.41 hrs, Volume= 934.897 af, Incl. 1.60 cfs Base Flow
Outflow = 1,062.92 cfs @ 20.60 hrs, Volume= 898.228 af, Atten= 13%, Lag= 71.1 min
Primary = 146.64 cfs @ 20.60 hrs, Volume= 500.119 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 916.28 cfs @ 20.60 hrs, Volume= 398.109 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 51.05' @ 20.60 hrs Storage= 223.550 af (213.830 af above start)

Plug-Flow detention time= 441.2 min calculated for 888.498 af (95% of inflow)
Center-of-Mass det. time= 274.5 min (2,040.6 - 1,766.1)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

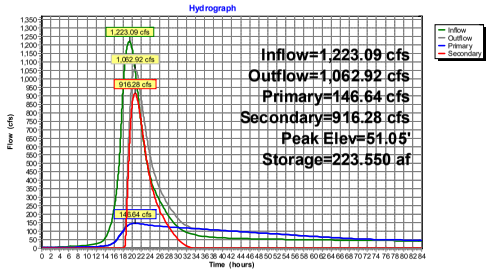
Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=146.64 cfs @ 20.60 hrs HW=51.05' TW=37.24' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Orifice Controls 146.64 cfs @ 10.08 fps)

Secondary OutFlow Max=915.81 cfs @ 20.60 hrs HW=51.05' TW=37.24' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 915.81 cfs @ 2.58 fps)

Pond 4P: Bessey Bog Res - 2.4sm



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Summary for Pond 5P: Glen Charlie Pond

Inflow = 1,819.87 cfs @ 19.57 hrs, Volume= 1,586.973 af, Incl. 2.10 cfs Base Flow
Outflow = 1,115.51 cfs @ 22.00 hrs, Volume= 1,479.543 af, Atten= 39%, Lag= 145.7 min
Primary = 1,060.65 cfs @ 22.00 hrs, Volume= 1,434.928 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 40.25 cfs @ 22.00 hrs, Volume= 29.251 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 14.70 cfs @ 21.49 hrs, Volume= 15.364 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 37.42' @ 22.00 hrs Storage= 628.921 af (602.796 af above start)

Plug-Flow detention time= 724.3 min calculated for 1,453.418 af (92% of inflow)
Center-of-Mass det. time= 467.7 min (2,100.0 - 1,632.3)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00 Elev. (feet) 41.00 40.00 39.00 37.70 37.70 41.00
#6	Tertiary	34.50'	**24.0" W x 12.0" H Vert. NE Culvert** C= 0.600

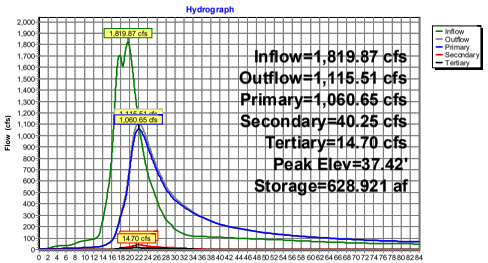
Limited to weir flow at low heads

Primary OutFlow Max=1,059.44 cfs @ 22.00 hrs HW=37.42' TW=25.53' (Dynamic Tailwater)
└─**1=Spillway** (Weir Controls 707.76 cfs @ 8.97 fps)
└─**2=TOD** (Weir Controls 351.68 cfs @ 1.49 fps)

Secondary OutFlow Max=39.88 cfs @ 22.00 hrs HW=37.42' TW=34.97' (Dynamic Tailwater)
└─**3=SE Dike** (Weir Controls 13.30 cfs @ 0.67 fps)
└─**4=SE Culvert** (Orifice Controls 26.58 cfs @ 6.64 fps)

Tertiary OutFlow Max=14.70 cfs @ 21.49 hrs HW=37.40' TW=34.85' (Dynamic Tailwater)
└─**5=NE Dike** (Controls 0.00 cfs)
└─**6=NE Culvert** (Orifice Controls 14.70 cfs @ 7.35 fps)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 54.86 cfs @ 21.97 hrs, Volume= 44.615 af
Outflow = 15.45 cfs @ 31.92 hrs, Volume= 36.606 af, Atten= 72%, Lag= 597.2 min
Primary = 15.45 cfs @ 31.92 hrs, Volume= 36.606 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 36.00' @ 31.92 hrs Storage= 29.930 af

Plug-Flow detention time= 1,178.6 min calculated for 36.606 af (82% of inflow)
Center-of-Mass det. time= 1,040.6 min (2,572.8 - 1,532.2)

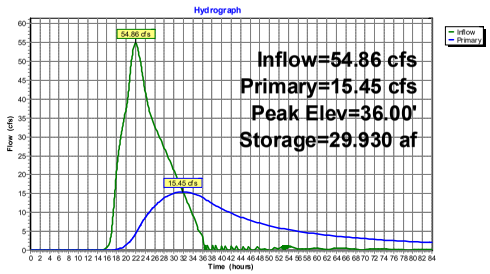
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=15.45 cfs @ 31.92 hrs HW=36.00' TW=24.28' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 15.45 cfs @ 4.30 fps)
└─**2=TOD** (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



Summary for Pond 6.2P: Maple Sping Bogs US

Inflow = 356.30 cfs @ 21.58 hrs, Volume= 247.076 af
Outflow = 353.84 cfs @ 21.86 hrs, Volume= 240.798 af, Atten= 1%, Lag= 16.9 min
Primary = 31.98 cfs @ 21.86 hrs, Volume= 83.040 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 321.87 cfs @ 21.86 hrs, Volume= 157.758 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 24.98' @ 21.86 hrs Storage= 39.584 af

Plug-Flow detention time= 280.2 min calculated for 240.798 af (97% of inflow)
Center-of-Mass det. time= 210.6 min (1,725.7 - 1,515.1)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

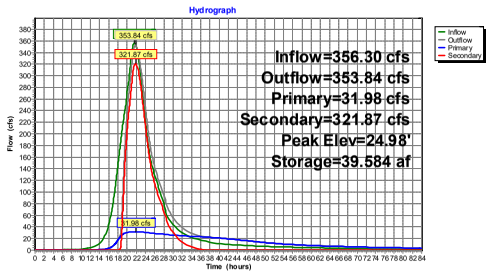
Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=31.98 cfs @ 21.86 hrs HW=24.98' TW=22.07' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 31.98 cfs @ 6.40 fps)

Secondary OutFlow Max=321.87 cfs @ 21.86 hrs HW=24.98' TW=22.07' (Dynamic Tailwater)
└─**2=TOD** (Weir Controls 321.87 cfs @ 1.28 fps)

Pond 6.2P: Maple Sping Bogs US



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Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow = 353.84 cfs @ 21.86 hrs, Volume= 240.798 af
Outflow = 319.28 cfs @ 22.86 hrs, Volume= 240.050 af, Atten= 10%, Lag= 60.0 min
Primary = 191.47 cfs @ 22.86 hrs, Volume= 212.834 af
Routed to Link 23L : Inflow
Secondary = 127.81 cfs @ 22.86 hrs, Volume= 27.216 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 22.26' @ 22.86 hrs Storage= 39.448 af

Plug-Flow detention time= 101.4 min calculated for 240.047 af (100% of inflow)
Center-of-Mass det. time= 91.3 min (1,817.0 - 1,725.7)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

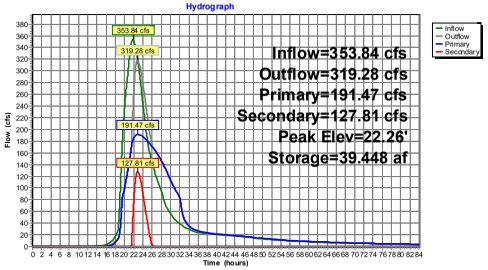
Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=191.47 cfs @ 22.86 hrs HW=22.26' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 191.47 cfs @ 7.66 fps)

Secondary OutFlow Max=127.81 cfs @ 22.86 hrs HW=22.26' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 127.81 cfs @ 1.65 fps)

Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow = 1,060.65 cfs @ 22.00 hrs, Volume= 1,434.928 af
Outflow = 1,060.42 cfs @ 22.06 hrs, Volume= 1,432.698 af, Atten= 0%, Lag= 3.6 min
Primary = 960.80 cfs @ 22.06 hrs, Volume= 1,399.687 af
Routed to Link 23L : Inflow
Secondary = 99.62 cfs @ 22.07 hrs, Volume= 33.011 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 25.53' @ 22.06 hrs Storage= 16.637 af (16.190 af above start)

Plug-Flow detention time= 18.3 min calculated for 1,432.251 af (100% of inflow)
Center-of-Mass det. time= 12.2 min (2,129.8 - 2,117.6)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

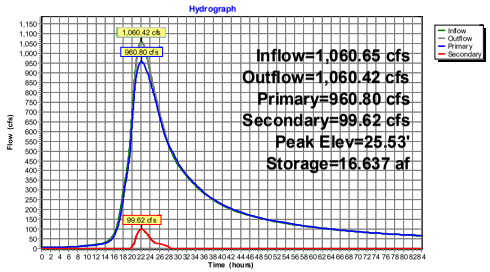
Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

Primary OutFlow Max=960.80 cfs @ 22.06 hrs HW=25.53' TW=0.00' (Dynamic Tailwater)
└**1=Bridge/Spillway** (Orifice Controls 666.01 cfs @ 15.42 fps)
└**3=TOD** (Weir Controls 294.79 cfs @ 1.88 fps)

Secondary OutFlow Max=99.62 cfs @ 22.07 hrs HW=25.53' TW=24.97' (Dynamic Tailwater)
└**2=Culvert to Bogs** (Outlet Controls 30.62 cfs @ 3.40 fps)
└**4=TOD_Bogs** (Weir Controls 69.01 cfs @ 1.46 fps)

Pond 6P: Maple Springs Dam - 3.5sm



Summary for Pond 7P: Little Five Mile Pond

Inflow = 268.63 cfs @ 20.06 hrs, Volume= 160.691 af, Incl. 0.59 cfs Base Flow
Outflow = 267.24 cfs @ 20.18 hrs, Volume= 160.640 af, Atten= 1%, Lag= 7.1 min
Primary = 267.24 cfs @ 20.18 hrs, Volume= 160.640 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 60.36' @ 20.18 hrs Storage= 28.855 af (6.695 af above start)

Plug-Flow detention time= 180.4 min calculated for 138.478 af (86% of inflow)
Center-of-Mass det. time= 27.3 min (1,313.3 - 1,286.0)

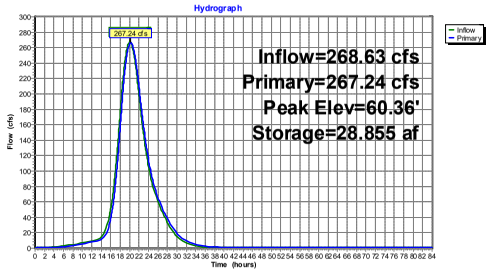
Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=267.24 cfs @ 20.18 hrs HW=60.36' TW=54.07' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 267.24 cfs @ 1.18 fps)

Pond 7P: Little Five Mile Pond



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A00840 - 654

Summary for Pond 8P: Five Mile Pond

Inflow = 267.24 cfs @ 20.18 hrs, Volume= 160.640 af
Outflow = 118.63 cfs @ 23.89 hrs, Volume= 118.906 af, Atten= 56%, Lag= 222.4 min
Primary = 18.50 cfs @ 23.89 hrs, Volume= 69.652 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 100.13 cfs @ 23.89 hrs, Volume= 49.254 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 55.57' @ 23.89 hrs Storage= 105.709 af

Plug-Flow detention time= 1,118.9 min calculated for 118.904 af (74% of inflow)
Center-of-Mass det. time= 983.5 min (2,296.8 - 1,313.3)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

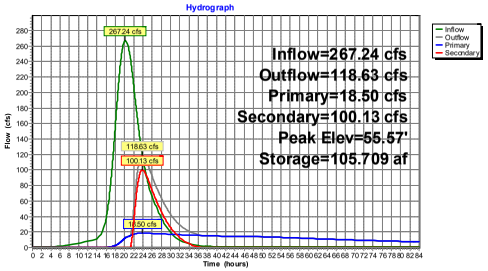
Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=18.50 cfs @ 23.89 hrs HW=55.57' TW=32.64' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 18.50 cfs @ 5.89 fps)

Secondary OutFlow Max=100.13 cfs @ 23.89 hrs HW=55.57' TW=32.64' (Dynamic Tailwater)
↳**2=TOD** (Weir Controls 100.13 cfs @ 1.37 fps)

Pond 8P: Five Mile Pond



Summary for Pond 9P: Kettle Hole

Inflow = 89.00 cfs @ 23.35 hrs, Volume= 77.732 af, Incl. 0.30 cfs Base Flow
Outflow = 88.63 cfs @ 23.47 hrs, Volume= 77.740 af, Atten= 0%, Lag= 7.0 min
Primary = 88.63 cfs @ 23.47 hrs, Volume= 77.740 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.72' @ 23.47 hrs Storage= 11.525 af (2.575 af above start)

Plug-Flow detention time= 191.9 min calculated for 68.790 af (88% of inflow)
Center-of-Mass det. time= 30.2 min (1,578.9 - 1,548.7)

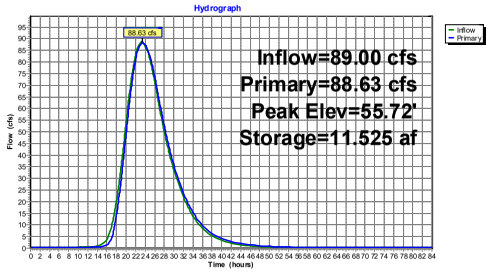
Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=88.63 cfs @ 23.47 hrs HW=55.72' TW=32.64' (Dynamic Tailwater)
↳**1=Relief** (Weir Controls 88.63 cfs @ 1.48 fps)

Pond 9P: Kettle Hole



Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow = 352.05 cfs @ 19.63 hrs, Volume= 354.205 af, Incl. 0.60 cfs Base Flow
Outflow = 340.40 cfs @ 20.10 hrs, Volume= 346.384 af, Atten= 3%, Lag= 27.9 min
Primary = 107.42 cfs @ 20.10 hrs, Volume= 231.519 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 232.98 cfs @ 20.10 hrs, Volume= 114.865 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1.500 af
Peak Elev= 32.68' @ 20.10 hrs Storage= 63.423 af (61.923 af above start)

Plug-Flow detention time= 316.5 min calculated for 344.884 af (97% of inflow)
Center-of-Mass det. time= 229.6 min (1,891.3 - 1,661.8)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LiDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
35.00	115.000
36.50	160.000
40.00	300.000

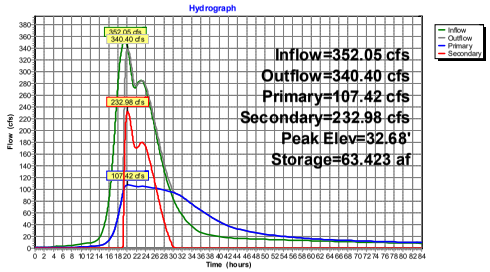
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=107.42 cfs @ 20.10 hrs HW=32.68' TW=26.17' (Dynamic Tailwater)
↳**1=Drop Inlet Spillway** (Weir Controls 107.42 cfs @ 6.29 fps)

Secondary OutFlow Max=232.98 cfs @ 20.10 hrs HW=32.68' TW=26.17' (Dynamic Tailwater)
↳**2=TOD** (Weir Controls 232.98 cfs @ 1.37 fps)

Pond 10P: Maple Springs Brook Dam - 0.8sm



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Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow = 1,305.20 cfs @ 20.19 hrs, Volume= 912.499 af, Incl. 1.10 cfs Base Flow
Outflow = 568.64 cfs @ 24.92 hrs, Volume= 908.836 af, Atten= 56%, Lag= 283.8 min
Primary = 430.49 cfs @ 24.92 hrs, Volume= 858.620 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 138.15 cfs @ 24.92 hrs, Volume= 50.216 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 28.76' @ 24.92 hrs Storage= 408.683 af (405.973 af above start)

Plug-Flow detention time= 573.4 min calculated for 906.115 af (99% of inflow)
Center-of-Mass det. time= 545.0 min (2,096.6 - 1,551.7)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

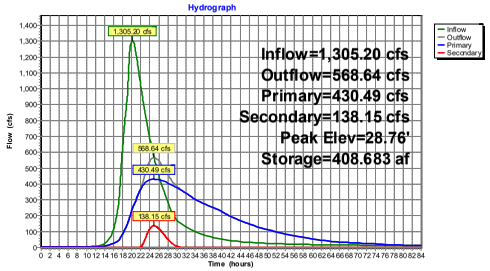
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=430.47 cfs @ 24.92 hrs HW=28.76' TW=23.99' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 430.47 cfs @ 9.24 fps)

Secondary OutFlow Max=136.53 cfs @ 24.92 hrs HW=28.76' TW=23.99' (Dynamic Tailwater)
└**2=TOR** (Weir Controls 136.53 cfs @ 1.02 fps)

Pond 11P: Unnamed Road - 1.8sm



Summary for Pond 12P: Maple Springs Road Dam

Inflow = 436.95 cfs @ 20.23 hrs, Volume= 246.839 af, Incl. 1.00 cfs Base Flow
Outflow = 436.61 cfs @ 20.24 hrs, Volume= 246.831 af, Atten= 0%, Lag= 0.7 min
Primary = 78.72 cfs @ 20.24 hrs, Volume= 90.924 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 357.89 cfs @ 20.24 hrs, Volume= 155.907 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 41.80' @ 20.24 hrs Storage= 20.606 af (19.526 af above start)

Plug-Flow detention time= 91.3 min calculated for 245.748 af (100% of inflow)
Center-of-Mass det. time= 72.1 min (1,380.1 - 1,308.0)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

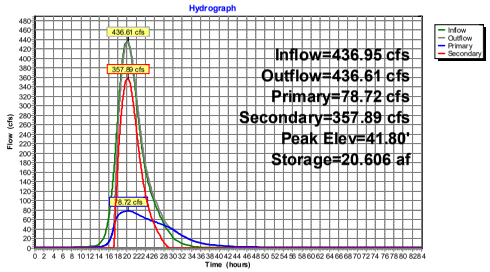
Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=78.72 cfs @ 20.24 hrs HW=41.80' TW=26.32' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 78.72 cfs @ 7.14 fps)

Secondary OutFlow Max=357.85 cfs @ 20.24 hrs HW=41.80' TW=26.32' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 357.85 cfs @ 1.98 fps)

Pond 12P: Maple Springs Road Dam



Summary for Pond 13.1P: Bogs_L_US

Inflow = 299.72 cfs @ 23.15 hrs, Volume= 262.315 af, Incl. 0.90 cfs Base Flow
Outflow = 264.57 cfs @ 25.00 hrs, Volume= 262.316 af, Atten= 12%, Lag= 110.8 min
Primary = 144.86 cfs @ 24.43 hrs, Volume= 219.399 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 120.02 cfs @ 25.01 hrs, Volume= 42.918 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 35.10' @ 25.01 hrs Storage= 54.747 af (54.693 af above start)

Plug-Flow detention time= 146.1 min calculated for 262.263 af (100% of inflow)
Center-of-Mass det. time= 145.1 min (1,668.1 - 1,523.1)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

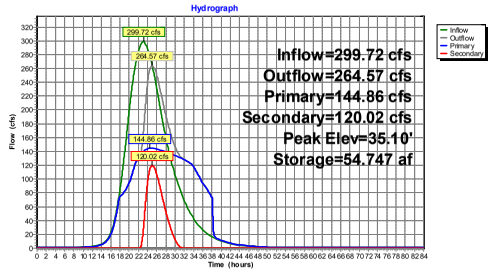
Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=144.86 cfs @ 24.43 hrs HW=35.08' TW=29.77' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 144.86 cfs @ 9.66 fps)

Secondary OutFlow Max=120.02 cfs @ 25.01 hrs HW=35.10' TW=30.06' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 120.02 cfs @ 0.87 fps)

Pond 13.1P: Bogs_L_US



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Summary for Pond 13.2P: Bogs_L_DS

Inflow = 264.57 cfs @ 25.00 hrs, Volume= 262.316 af
Outflow = 134.02 cfs @ 30.98 hrs, Volume= 262.318 af, Atten= 49%, Lag= 359.2 min
Primary = 134.02 cfs @ 30.98 hrs, Volume= 262.318 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 30.60' @ 30.98 hrs Storage= 65.942 af (65.867 af above start)

Plug-Flow detention time= 231.8 min calculated for 262.243 af (100% of inflow)
Center-of-Mass det. time= 230.3 min (1,898.5 - 1,668.1)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

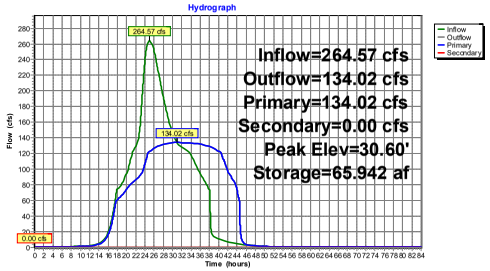
Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=134.03 cfs @ 30.98 hrs HW=30.60' TW=24.50' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 134.03 cfs @ 8.94 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.2P: Bogs_L_DS



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow = 831.58 cfs @ 24.49 hrs, Volume= 1,420.628 af, Incl. 0.80 cfs Base Flow
Outflow = 601.40 cfs @ 28.76 hrs, Volume= 1,419.910 af, Atten= 28%, Lag= 256.2 min
Primary = 600.70 cfs @ 28.76 hrs, Volume= 1,419.687 af
Routed to Link 23L : Inflow
Secondary = 1.60 cfs @ 29.91 hrs, Volume= 0.223 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 24.61' @ 28.76 hrs Storage= 282.903 af (281.838 af above start)

Plug-Flow detention time= 277.8 min calculated for 1,418.828 af (100% of inflow)
Center-of-Mass det. time= 272.3 min (2,192.3 - 1,920.0)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

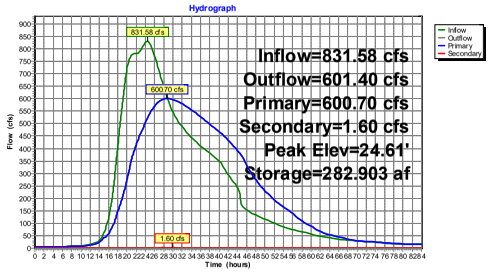
Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

Primary OutFlow Max=600.70 cfs @ 28.76 hrs HW=24.61' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 600.70 cfs @ 8.51 fps)

Secondary OutFlow Max=0.28 cfs @ 29.91 hrs HW=24.58' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 0.28 cfs @ 0.29 fps)

Pond 14P: Bogs_M - 2.7sm



Summary for Pond 15.1P: Bogs_N_US

Inflow = 352.74 cfs @ 19.33 hrs, Volume= 195.641 af, Incl. 0.60 cfs Base Flow
Outflow = 260.78 cfs @ 21.19 hrs, Volume= 195.635 af, Atten= 26%, Lag= 111.3 min
Primary = 121.84 cfs @ 21.19 hrs, Volume= 163.323 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 138.94 cfs @ 21.19 hrs, Volume= 32.312 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 29.41' @ 21.19 hrs Storage= 76.764 af (76.412 af above start)

Plug-Flow detention time= 285.1 min calculated for 195.283 af (100% of inflow)
Center-of-Mass det. time= 276.2 min (1,512.0 - 1,235.8)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

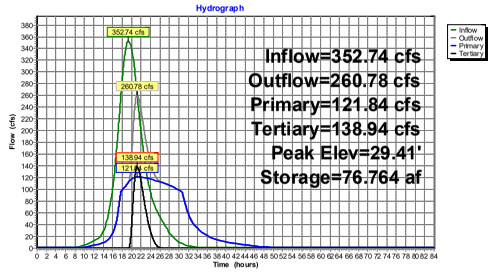
Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=121.84 cfs @ 21.19 hrs HW=29.41' TW=22.14' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 121.84 cfs @ 8.12 fps)

Tertiary OutFlow Max=138.94 cfs @ 21.19 hrs HW=29.41' TW=22.14' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 138.94 cfs @ 0.67 fps)

Pond 15.1P: Bogs_N_US



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Summary for Pond 15.2P: Bogs_N_DS

Inflow = 260.78 cfs @ 21.19 hrs, Volume= 195.635 af
Outflow = 95.24 cfs @ 30.68 hrs, Volume= 190.818 af, Atten= 63%, Lag= 569.6 min
Primary = 95.24 cfs @ 30.68 hrs, Volume= 190.818 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 23.36' @ 30.68 hrs Storage= 89.606 af (87.040 af above start)

Plug-Flow detention time= 693.1 min calculated for 188.252 af (96% of inflow)
Center-of-Mass det. time= 621.3 min (2,133.4 - 1,512.0)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

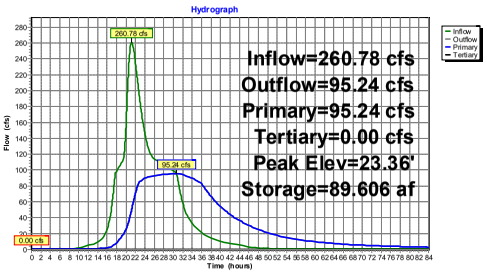
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=95.28 cfs @ 30.68 hrs HW=23.36' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 95.28 cfs @ 6.35 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS



Summary for Pond 16.1: Mill Pond Dam -PC

Inflow = 2,067.05 cfs @ 22.37 hrs, Volume= 4,153.424 af, Incl. 32.00 cfs Base Flow
Outflow = 1,731.02 cfs @ 25.39 hrs, Volume= 3,958.759 af, Atten= 16%, Lag= 181.1 min
Primary = 1,670.01 cfs @ 25.39 hrs, Volume= 3,684.137 af
Routed to Pond 17B : Proposed Bridge
Secondary = 61.01 cfs @ 25.38 hrs, Volume= 274.621 af
Routed to Pond Wr 24 :
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 17B : Proposed Bridge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 470.969 af
Peak Elev= 17.82' @ 25.39 hrs Storage= 1,230.129 af (759.160 af above start)

Plug-Flow detention time= 772.0 min calculated for 3,487.747 af (84% of inflow)
Center-of-Mass det. time= 287.9 min (2,278.4 - 1,990.4)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,941.850 af	**Storage** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.130
5.00	4.140
6.00	9.110
7.00	16.590
8.00	34.960
9.00	60.590
10.00	94.410
11.00	142.690
12.00	214.660
13.00	314.540
13.80	403.920
14.00	426.260
15.00	575.290
16.00	771.680
17.00	994.600
18.30	1,368.590
19.00	1,592.930
20.00	1,941.850

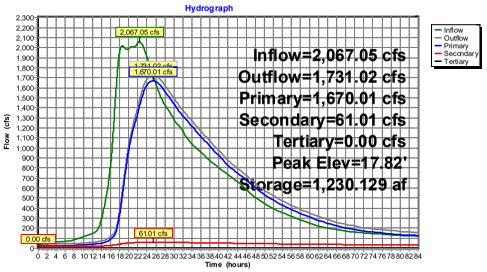
Device	Routing	Invert	Outlet Devices
#1	Primary	15.50'	**110.0' long x 1.5' breadth Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32
#2	Primary	13.60'	**15.0' long x 1.0' breadth Notch as SW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#3	Secondary	12.50'	**3.3' long x 1.0' breadth 3.25' Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#4	Tertiary	18.00'	**TOD, C= 2.60** Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00 Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 8	5.20'	**48.0" W x 48.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#7	Device 8	15.50'	**6.0' long x 20.00' rise MLO DownwardOpGate** 2 End Contraction(s) 5.0' Crest Height
#8	Tertiary	4.00'	**96.0" W x 48.0" H Box Culvert X 0.00** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 32.00 sf

Primary OutFlow Max=1,664.40 cfs @ 25.39 hrs HW=17.82' TW=14.05' (Dynamic Tailwater)
└**1=Spillway** (Weir Controls 1,238.69 cfs @ 4.86 fps)
└**2=Notch as SW** (Weir Controls 425.70 cfs @ 6.73 fps)

Secondary OutFlow Max=61.66 cfs @ 25.38 hrs HW=17.82' TW=17.34' (Dynamic Tailwater)
└**3=3.25' Weir** (Weir Controls 61.66 cfs @ 3.51 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.30' TW=8.48' (Dynamic Tailwater)
└**4=TOD** (Controls 0.00 cfs)
└**5=US Relief - Bypasses Dam** (Controls 0.00 cfs)
└**8=Culvert** (Controls 0.00 cfs)
└**6=Orifice/Grate** (Controls 0.00 cfs)
└**7=MLO DownwardOpGate** (Controls 0.00 cfs)

Pond 16.1: Mill Pond Dam -PC



Summary for Pond 16.3: Downstream Weir

Inflow = 1,670.01 cfs @ 25.39 hrs, Volume= 3,684.102 af
Outflow = 1,670.01 cfs @ 25.39 hrs, Volume= 3,684.069 af, Atten= 0%, Lag= 0.1 min
Primary = 1,670.01 cfs @ 25.39 hrs, Volume= 3,684.069 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 13.38' @ 25.39 hrs Surf.Area= 2,000 sf Storage= 18,759 cf (9,799 cf above start)

Plug-Flow detention time= 0.4 min calculated for 3,683.819 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,256.3 - 2,256.2)

Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	8.00'	**DS Weir, C= 2.60** Offset (feet) 0.00 0.00 23.00 23.00 Elev. (feet) 17.00 10.00 8.00 17.00
#2	Primary	8.00'	**27.0' long x 1.5' breadth El 8 Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32

Primary OutFlow Max=1,670.01 cfs @ 25.39 hrs HW=13.38' (Free Discharge)
└**1=DS Weir** (Weir Controls 551.62 cfs @ 4.46 fps)
└**2=El 8 Weir** (Weir Controls 1,118.39 cfs @ 7.70 fps)

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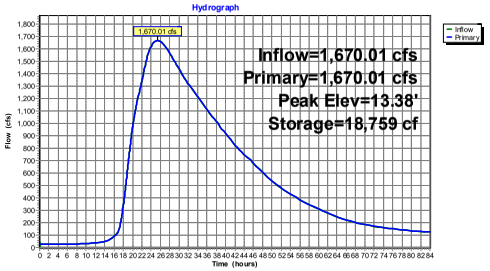
Pond 16.3: Downstream Weir



Summary for Pond 17B: Proposed Bridge

Inflow = 1,670.01 cfs @ 25.39 hrs, Volume= 3,684.137 af
Outflow = 1,670.01 cfs @ 25.39 hrs, Volume= 3,684.102 af, Atten= 0%, Lag= 0.1 min
Primary = 1,670.01 cfs @ 25.39 hrs, Volume= 3,684.102 af
Routed to Pond 16.3 : Downstream Weir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 14.05' @ 25.39 hrs Surf.Area= 2,000 sf Storage= 20,096 cf (11,136 cf above start)

Plug-Flow detention time= 0.4 min calculated for 3,683.853 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (2,256.2 - 2,256.1)

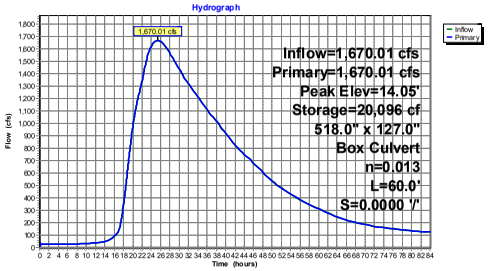
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	4.00'	**518.0" W x 127.0" H Box Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 456.85 sf

Primary OutFlow Max=1,670.01 cfs @ 25.39 hrs HW=14.05' TW=13.38' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1,670.01 cfs @ 3.85 fps)

Pond 17B: Proposed Bridge

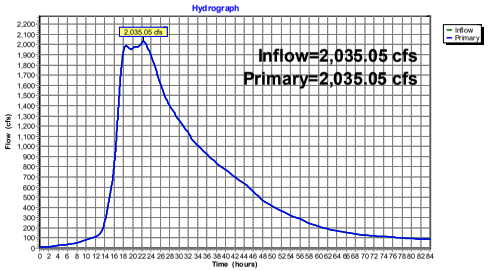


Summary for Link 23L: Inflow

Inflow = 2,035.05 cfs @ 22.37 hrs, Volume= 3,931.272 af
Primary = 2,035.05 cfs @ 22.37 hrs, Volume= 3,931.272 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16.1 : Mill Pond Dam -PC

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow

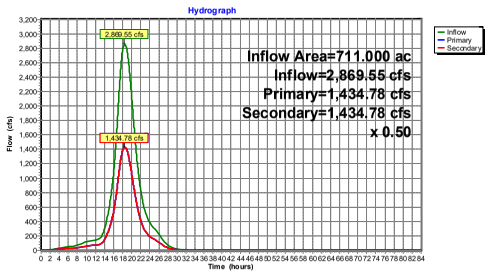


Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 22.93" for PMP24hour event
Inflow = 2,869.55 cfs @ 18.35 hrs, Volume= 1,358.883 af
Primary = 1,434.78 cfs @ 18.35 hrs, Volume= 679.441 af, Atten= 50%, Lag= 0.0 min
Secondary = 1,434.78 cfs @ 18.35 hrs, Volume= 679.441 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow

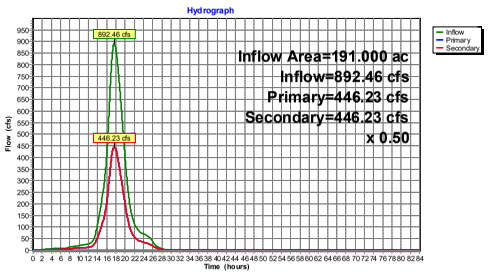


Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 21.98" for PMP24hour event
Inflow = 892.46 cfs @ 17.69 hrs, Volume= 349.914 af
Primary = 446.23 cfs @ 17.69 hrs, Volume= 174.957 af, Atten= 50%, Lag= 0.0 min
Secondary = 446.23 cfs @ 17.69 hrs, Volume= 174.957 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow



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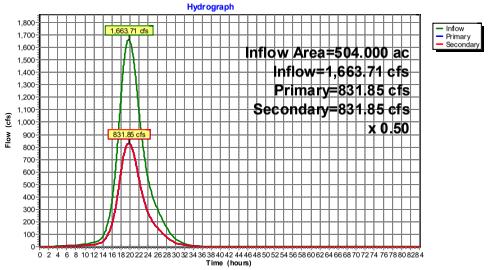
Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth = 21.96" for PMP24hour event
Inflow = 1,663.71 cfs @ 19.77 hrs, Volume= 922.324 af
Primary = 831.85 cfs @ 19.77 hrs, Volume= 461.162 af, Atten= 50%, Lag= 0.0 min
Secondary = 831.85 cfs @ 19.77 hrs, Volume= 461.162 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

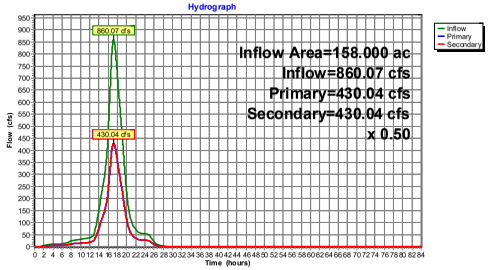


Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 23.81" for PMP24hour event
Inflow = 860.07 cfs @ 17.13 hrs, Volume= 313.439 af
Primary = 430.04 cfs @ 17.13 hrs, Volume= 156.719 af, Atten= 50%, Lag= 0.0 min
Secondary = 430.04 cfs @ 17.13 hrs, Volume= 156.719 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow

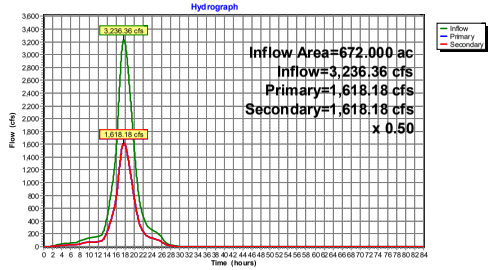


Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 24.08" for PMP24hour event
Inflow = 3,236.36 cfs @ 17.62 hrs, Volume= 1,348.332 af
Primary = 1,618.18 cfs @ 17.62 hrs, Volume= 674.166 af, Atten= 50%, Lag= 0.0 min
Secondary = 1,618.18 cfs @ 17.62 hrs, Volume= 674.166 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow

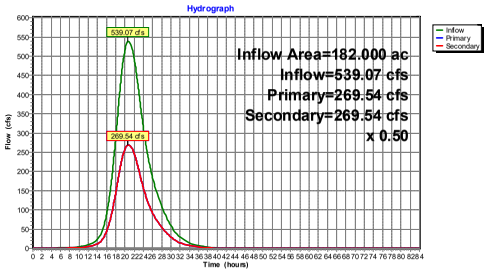


Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth = 23.40" for PMP24hour event
Inflow = 539.07 cfs @ 20.53 hrs, Volume= 354.916 af
Primary = 269.54 cfs @ 20.53 hrs, Volume= 177.458 af, Atten= 50%, Lag= 0.0 min
Secondary = 269.54 cfs @ 20.53 hrs, Volume= 177.458 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow

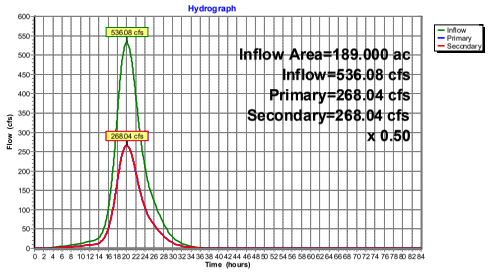


Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth = 19.89" for PMP24hour event
Inflow = 536.08 cfs @ 20.06 hrs, Volume= 313.189 af
Primary = 268.04 cfs @ 20.06 hrs, Volume= 156.595 af, Atten= 50%, Lag= 0.0 min
Secondary = 268.04 cfs @ 20.06 hrs, Volume= 156.595 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow

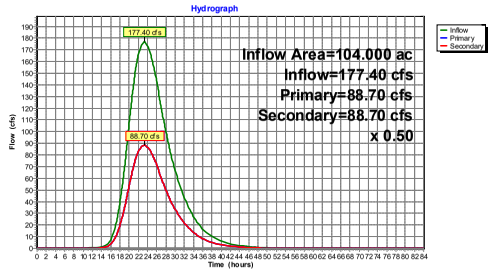


Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth = 17.46" for PMP24hour event
Inflow = 177.40 cfs @ 23.35 hrs, Volume= 151.298 af
Primary = 88.70 cfs @ 23.35 hrs, Volume= 75.649 af, Atten= 50%, Lag= 0.0 min
Secondary = 88.70 cfs @ 23.35 hrs, Volume= 75.649 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow



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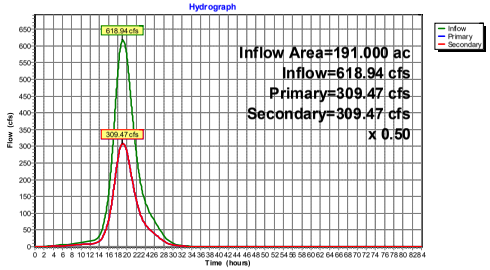
Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth = 19.27" for PMP24hour event
Inflow = 618.94 cfs @ 19.05 hrs, Volume= 306.787 af
Primary = 309.47 cfs @ 19.05 hrs, Volume= 153.394 af, Atten= 50%, Lag= 0.0 min
Secondary = 309.47 cfs @ 19.05 hrs, Volume= 153.394 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

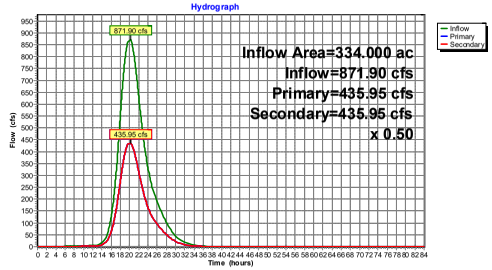


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth = 17.24" for PMP24hour event
Inflow = 871.90 cfs @ 20.23 hrs, Volume= 479.793 af
Primary = 435.95 cfs @ 20.23 hrs, Volume= 239.897 af, Atten= 50%, Lag= 0.0 min
Secondary = 435.95 cfs @ 20.23 hrs, Volume= 239.897 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow

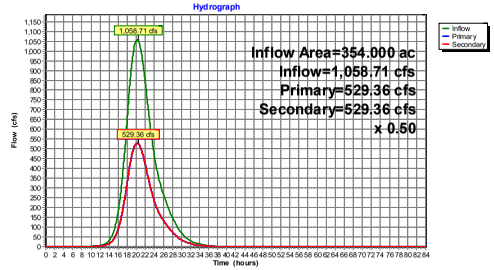


Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth = 21.13" for PMP24hour event
Inflow = 1,058.71 cfs @ 20.39 hrs, Volume= 623.293 af
Primary = 529.36 cfs @ 20.39 hrs, Volume= 311.647 af, Atten= 50%, Lag= 0.0 min
Secondary = 529.36 cfs @ 20.39 hrs, Volume= 311.647 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow

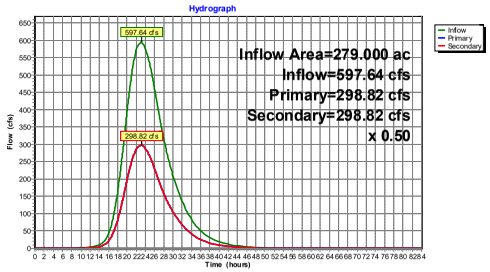


Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth = 22.03" for PMP24hour event
Inflow = 597.64 cfs @ 23.15 hrs, Volume= 512.134 af
Primary = 298.82 cfs @ 23.15 hrs, Volume= 256.067 af, Atten= 50%, Lag= 0.0 min
Secondary = 298.82 cfs @ 23.15 hrs, Volume= 256.067 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow

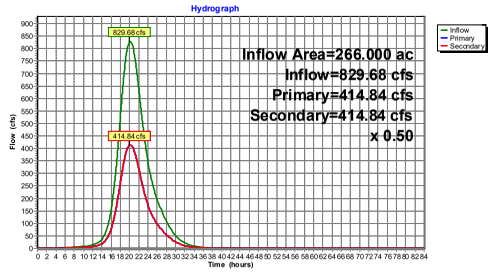


Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth = 22.01" for PMP24hour event
Inflow = 829.68 cfs @ 20.01 hrs, Volume= 487.840 af
Primary = 414.84 cfs @ 20.01 hrs, Volume= 243.920 af, Atten= 50%, Lag= 0.0 min
Secondary = 414.84 cfs @ 20.01 hrs, Volume= 243.920 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow

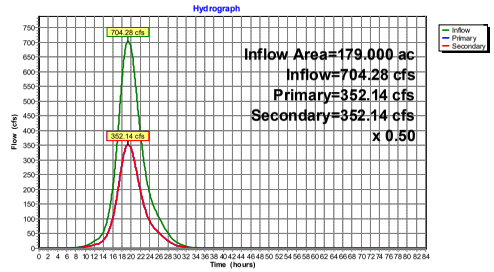


Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth = 25.67" for PMP24hour event
Inflow = 704.28 cfs @ 19.33 hrs, Volume= 382.951 af
Primary = 352.14 cfs @ 19.33 hrs, Volume= 191.475 af, Atten= 50%, Lag= 0.0 min
Secondary = 352.14 cfs @ 19.33 hrs, Volume= 191.475 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow



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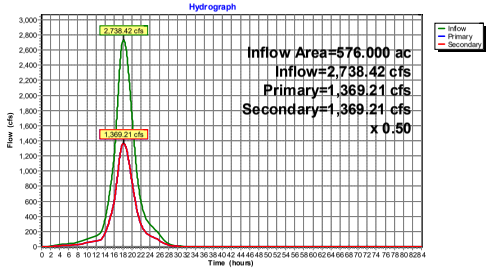
Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 25.74" for PMP24hour event
Inflow = 2,738.42 cfs @ 18.09 hrs, Volume= 1,235.635 af
Primary = 1,369.21 cfs @ 18.09 hrs, Volume= 617.818 af, Atten= 50%, Lag= 0.0 min
Secondary = 1,369.21 cfs @ 18.09 hrs, Volume= 617.818 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow

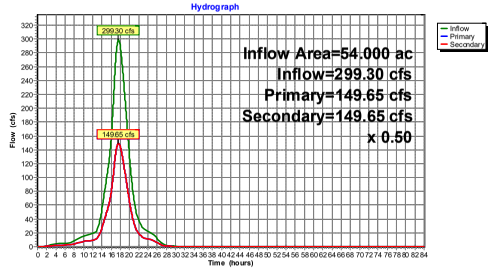


Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 28.00" for PMP24hour event
Inflow = 299.30 cfs @ 17.49 hrs, Volume= 125.979 af
Primary = 149.65 cfs @ 17.49 hrs, Volume= 62.989 af, Atten= 50%, Lag= 0.0 min
Secondary = 149.65 cfs @ 17.49 hrs, Volume= 62.989 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



Time span=0.00-84.00 hrs, dt=0.0010 hrs, 84001 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=711.000 ac 33.99% Impervious Runoff Depth=28.21"
Flow Length=8,000' Tc=220.2 min CN=34/98 Runoff=2,426.71 cfs 1,671.571 af

Subcatchment B: B Runoff Area=191.000 ac 18.54% Impervious Runoff Depth=27.28"
Flow Length=6,100' Tc=159.2 min CN=38/98 Runoff=691.53 cfs 434.241 af

Subcatchment C: C Runoff Area=504.000 ac 10.54% Impervious Runoff Depth=27.30"
Flow Length=15,000' Tc=317.7 min CN=41/98 Runoff=1,538.32 cfs 1,146.691 af

Subcatchment D: D Runoff Area=158.000 ac 31.94% Impervious Runoff Depth=29.19"
Flow Length=4,200' Tc=127.4 min CN=38/98 Runoff=602.39 cfs 384.327 af

Subcatchment E: E Runoff Area=672.000 ac 35.91% Impervious Runoff Depth=29.46"
Flow Length=11,000' Tc=166.9 min CN=37/98 Runoff=2,493.41 cfs 1,649.777 af

Subcatchment F: F Runoff Area=182.000 ac 6.11% Impervious Runoff Depth=28.86"
Flow Length=6,100' Tc=410.6 min CN=47/98 Runoff=521.73 cfs 437.759 af

Subcatchment G: G Runoff Area=189.000 ac 19.09% Impervious Runoff Depth=24.95"
Flow Length=5,300' Tc=340.7 min CN=32/98 Runoff=508.30 cfs 392.919 af

Subcatchment H: H Runoff Area=104.000 ac 1.27% Impervious Runoff Depth=22.29"
Flow Length=4,400' Tc=600.4 min CN=33/98 Runoff=188.58 cfs 193.195 af

Subcatchment I: I Runoff Area=191.000 ac 15.34% Impervious Runoff Depth=24.31"
Flow Length=5,900' Tc=263.7 min CN=32/98 Runoff=561.73 cfs 386.870 af

Subcatchment J: J Runoff Area=334.000 ac 2.83% Impervious Runoff Depth=22.15"
Flow Length=11,000' Tc=331.0 min CN=32/98 Runoff=845.68 cfs 616.506 af

Subcatchment K: K Runoff Area=354.000 ac 0.83% Impervious Runoff Depth=26.45"
Flow Length=7,600' Tc=359.9 min CN=42/98 Runoff=1,011.02 cfs 780.185 af

Subcatchment L: L Runoff Area=279.000 ac 2.43% Impervious Runoff Depth=27.29"
Flow Length=6,800' Tc=595.3 min CN=44/98 Runoff=614.50 cfs 634.520 af

Subcatchment M: M Runoff Area=266.000 ac 8.14% Impervious Runoff Depth=27.36"
Flow Length=6,100' Tc=353.1 min CN=42/98 Runoff=780.36 cfs 606.555 af

Subcatchment N: N Runoff Area=179.000 ac 3.17% Impervious Runoff Depth=31.30"
Tc=300.0 min CN=56/98 Runoff=630.13 cfs 466.852 af

Subcatchment O: O Runoff Area=576.000 ac 31.10% Impervious Runoff Depth=31.30"
Flow Length=10,500' Tc=198.5 min CN=46/98 Runoff=2,193.48 cfs 1,502.185 af

Subcatchment P: P Runoff Area=54.000 ac 38.05% Impervious Runoff Depth=33.67"
Flow Length=1,800' Tc=162.3 min CN=54/98 Runoff=220.77 cfs 151.529 af

Pond 1P: Halfway Pond Peak Elev=67.26' Storage=1,128.037 af Inflow=1,215.55 cfs 851.058 af
Primary=48.83 cfs 127.705 af Secondary=0.00 cfs 0.000 af Outflow=48.83 cfs 127.705 af

Pond 2P: Kennard Res Peak Elev=59.96' Storage=68.671 af Inflow=370.04 cfs 348.991 af
Primary=134.63 cfs 251.821 af Secondary=221.05 cfs 71.140 af Outflow=355.68 cfs 322.961 af

Pond 3P: Fawn Pond Peak Elev=62.15' Storage=170.253 af Inflow=301.69 cfs 195.634 af
Primary=22.61 cfs 52.742 af Tertiary=45.55 cfs 45.569 af Outflow=68.16 cfs 98.311 af

Pond 4P: Bessey Bog Res - 2.4sm Peak Elev=51.07' Storage=224.848 af Inflow=1,164.87 cfs 1,005.725 af
Primary=147.03 cfs 367.917 af Secondary=936.77 cfs 526.201 af Outflow=1,083.80 cfs 894.118 af

Pond 5P: Glen Charlie Pond Peak Elev=37.57' Storage=658.304 af Inflow=2,037.30 cfs 1,733.585 af
l,239.92 cfs 1,435.372 af Secondary=57.38 cfs 37.563 af Tertiary=15.04 cfs 16.157 af Outflow=1,312.09 cfs 1,489.092 af

Pond 6.1P: Ortalani Reservoir Peak Elev=36.19' Storage=33.768 af Inflow=72.19 cfs 53.720 af
Outflow=17.97 cfs 32.203 af

Pond 6.2P: Maple Sping Bogs US Peak Elev=25.04' Storage=40.864 af Inflow=415.72 cfs 312.391 af
Primary=32.51 cfs 71.356 af Secondary=379.72 cfs 220.027 af Outflow=412.24 cfs 291.382 af

Pond 6.3P: Maple Sping Bogs DS Peak Elev=22.40' Storage=42.467 af Inflow=412.24 cfs 291.382 af
Primary=197.47 cfs 235.734 af Secondary=194.90 cfs 53.300 af Outflow=392.38 cfs 289.034 af

Pond 6P: Maple Springs Dam - 3.5sm Peak Elev=25.69' Storage=17.442 af Inflow=1,239.92 cfs 1,435.372 af
Primary=1,079.95 cfs 1,368.798 af Secondary=159.76 cfs 61.308 af Outflow=1,239.71 cfs 1,430.106 af

Pond 7P: Little Five Mile Pond Peak Elev=60.33' Storage=28.677 af Inflow=254.74 cfs 200.556 af
Outflow=254.14 cfs 200.371 af

Pond 8P: Five Mile Pond Peak Elev=55.68' Storage=109.571 af Inflow=254.14 cfs 200.371 af
Primary=18.97 cfs 41.502 af Secondary=140.28 cfs 80.049 af Outflow=159.25 cfs 121.551 af

Pond 9P: Kettle Hole Peak Elev=55.75' Storage=11.614 af Inflow=94.59 cfs 98.680 af
Outflow=94.24 cfs 98.313 af

Pond 10P: Maple Springs Brook Dam - Peak Elev=32.70' Storage=63.918 af Inflow=368.42 cfs 417.464 af
Primary=108.43 cfs 225.957 af Secondary=258.99 cfs 167.795 af Outflow=367.42 cfs 393.752 af

Pond 11P: Unnamed Road - 1.8sm Peak Elev=29.11' Storage=442.283 af Inflow=1,272.15 cfs 1,104.372 af
Primary=449.61 cfs 836.390 af Secondary=295.50 cfs 133.785 af Outflow=733.01 cfs 970.176 af

Pond 12P: Maple Springs Road Dam Peak Elev=41.78' Storage=20.473 af Inflow=423.84 cfs 315.195 af
Primary=78.05 cfs 123.238 af Secondary=344.67 cfs 189.653 af Outflow=422.73 cfs 312.891 af

Pond 13.1P: Bogs_L_US Peak Elev=35.14' Storage=55.817 af Inflow=308.15 cfs 323.508 af
Primary=145.31 cfs 264.413 af Secondary=140.46 cfs 58.956 af Outflow=285.52 cfs 323.369 af

Pond 13.2P: Bogs_L_DS Peak Elev=30.84' Storage=80.586 af Inflow=285.52 cfs 323.369 af
Primary=138.76 cfs 319.117 af Secondary=0.00 cfs 0.000 af Outflow=138.76 cfs 319.117 af

Pond 14P: Bogs_M - 2.7sm Peak Elev=25.34' Storage=337.482 af Inflow=1,039.37 cfs 1,598.124 af
Primary=674.63 cfs 1,401.365 af Secondary=107.40 cfs 44.958 af Outflow=782.03 cfs 1,446.324 af

Pond 15.1P: Bogs_N_US Peak Elev=29.41' Storage=76.615 af Inflow=315.66 cfs 237.592 af
Primary=121.77 cfs 199.469 af Tertiary=136.35 cfs 36.328 af Outflow=258.12 cfs 235.798 af

Pond 15.2P: Bogs_N_DS Peak Elev=23.51' Storage=98.204 af Inflow=258.12 cfs 235.798 af
Primary=99.75 cfs 198.393 af Tertiary=0.00 cfs 0.000 af Outflow=99.75 cfs 198.393 af

Pond 16.1: Mill Pond Dam -PC Peak Elev=18.08' Storage=1,306.418 af Inflow=2,401.52 cfs 4,351.557 af
,947.56 cfs 3,625.005 af Secondary=64.57 cfs 234.432 af Tertiary=33.75 cfs 8.335 af Outflow=2,045.88 cfs 3,867.771 af

Pond 16.3: Downstream Weir Peak Elev=13.98' Storage=19,970 cf Inflow=1,981.31 cfs 3,633.196 af
Outflow=1,981.31 cfs 3,633.065 af

Pond 17B: Proposed Bridge Peak Elev=14.82' Storage=21,632 cf Inflow=1,981.31 cfs 3,633.339 af
518.0" x 127.0" Box Culvert n=0.013 L=60.0' S=0.0000 '/' Outflow=1,981.31 cfs 3,633.196 af

Link 23L: Inflow Inflow=2,369.52 cfs 4,129.405 af
Primary=2,369.52 cfs 4,129.405 af

Link A1: 1/2 Flow x 0.50 Inflow=2,426.71 cfs 1,671.571 af
Primary=1,213.35 cfs 835.785 af Secondary=1,213.35 cfs 835.785 af

Link B1: 1/2 Flow x 0.50 Inflow=691.53 cfs 434.241 af
Primary=345.77 cfs 217.121 af Secondary=345.77 cfs 217.121 af

Link C1: 1/2 Flow x 0.50 Inflow=1,538.32 cfs 1,146.691 af
Primary=769.16 cfs 573.345 af Secondary=769.16 cfs 573.345 af

Link D1: 1/2 Flow x 0.50 Inflow=602.39 cfs 384.327 af
Primary=301.19 cfs 192.163 af Secondary=301.19 cfs 192.163 af

Link E1: 1/2 Flow x 0.50 Inflow=2,493.41 cfs 1,649.777 af
Primary=1,246.70 cfs 824.889 af Secondary=1,246.70 cfs 824.889 af

Link F1: 1/2 Flow x 0.50 Inflow=521.73 cfs 437.759 af
Primary=260.87 cfs 218.880 af Secondary=260.87 cfs 218.880 af

Link G1: 1/2 Flow x 0.50 Inflow=508.30 cfs 392.919 af
Primary=254.15 cfs 196.460 af Secondary=254.15 cfs 196.460 af

Link H1: 1/2 Flow x 0.50 Inflow=188.58 cfs 193.195 af
Primary=94.29 cfs 96.597 af Secondary=94.29 cfs 96.597 af

Link I1: 1/2 Flow x 0.50 Inflow=561.73 cfs 386.870 af
Primary=280.86 cfs 193.435 af Secondary=280.86 cfs 193.435 af

Link JL: 1/2 Flow x 0.50 Inflow=845.68 cfs 616.506 af
Primary=422.84 cfs 308.253 af Secondary=422.84 cfs 308.253 af

Link KL: 1/2 Flow x 0.50 Inflow=1,011.02 cfs 780.185 af
Primary=505.51 cfs 390.093 af Secondary=505.51 cfs 390.093 af

Link LL: 1/2 Flow x 0.50 Inflow=614.50 cfs 634.520 af
Primary=307.25 cfs 317.260 af Secondary=307.25 cfs 317.260 af

Link ML: 1/2 Flow x 0.50 Inflow=780.36 cfs 606.555 af
Primary=390.18 cfs 303.278 af Secondary=390.18 cfs 303.278 af

Link NL: 1/2 Flow x 0.50 Inflow=630.13 cfs 466.852 af
Primary=315.06 cfs 233.426 af Secondary=315.06 cfs 233.426 af

Link OL: 1/2 Flow x 0.50 Inflow=2,193.48 cfs 1,502.185 af
Primary=1,096.74 cfs 751.092 af Secondary=1,096.74 cfs 751.092 af

Link PL: 1/2 Flow x 0.50 Inflow=220.77 cfs 151.529 af
Primary=110.38 cfs 75.765 af Secondary=110.38 cfs 75.765 af

Total Runoff Area = 4,944.000 ac Runoff Volume = 11,455.683 af Average Runoff Depth = 27.81"
80.87% Pervious = 3,998.017 ac 19.13% Impervious = 945.983 ac

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Summary for Subcatchment A: A

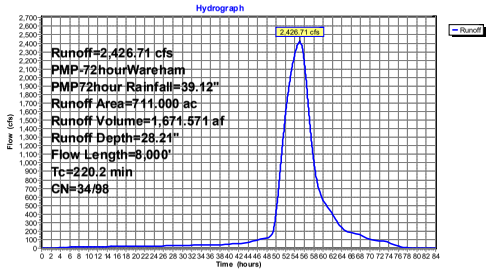
Runoff = 2,426.71 cfs @ 55.05 hrs, Volume= 1,671.571 af, Depth=28.21"
Routed to Link A1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 711.000	56	"33.99% imp"
469.331	34	66.01% Pervious Area
241.669	98	33.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
54.3	1,820	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.7	2,500		1.00		**Direct Entry,**
4.7	3,580		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
220.2	8,000	Total			

Subcatchment A: A



Summary for Subcatchment B: B

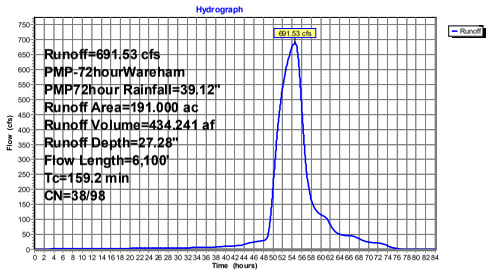
Runoff = 691.53 cfs @ 54.66 hrs, Volume= 434.241 af, Depth=27.28"
Routed to Link B1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 191.000	49	"18.54% imp"
155.589	38	81.46% Pervious Area
35.411	98	18.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.0	20	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
39.8	80	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
43.0	1,000	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.0	2,400		1.00		**Direct Entry,**
3.4	2,600		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
159.2	6,100	Total			

Subcatchment B: B



Summary for Subcatchment C: C

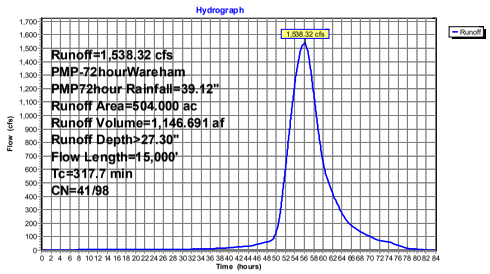
Runoff = 1,538.32 cfs @ 56.13 hrs, Volume= 1,146.691 af, Depth>27.30"
Routed to Link C1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 504.000	47	"10.54% imp"
450.878	41	89.46% Pervious Area
53.122	98	10.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.6	50	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
27.3	50	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
6.0	350	0.1500	0.97		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
133.3	4,000	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
55.4	6,650		2.00		**Direct Entry,**
5.1	3,900		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
317.7	15,000	Total			

Subcatchment C: C



Summary for Subcatchment D: D

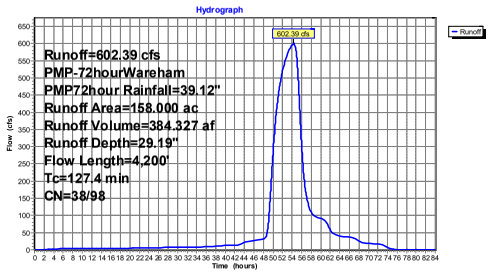
Runoff = 602.39 cfs @ 54.36 hrs, Volume= 384.327 af, Depth=29.19"
Routed to Link D1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 158.000	57	"31.94% imp"
107.535	38	68.06% Pervious Area
50.465	98	31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.4	100	0.0060	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
37.3	1,250	0.0500	0.56		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.3	850		0.50		**Direct Entry,**
3.4	2,000		9.83		**Lake or Reservoir,** Mean Depth= 3.00'
127.4	4,200	Total			

Subcatchment D: D



Summary for Subcatchment E: E

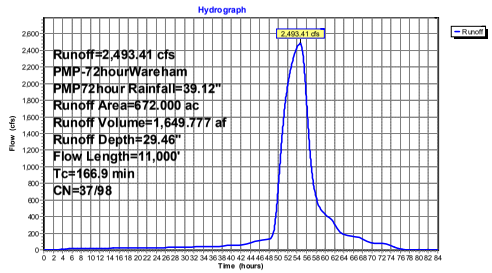
Runoff = 2,493.41 cfs @ 54.71 hrs, Volume= 1,649.777 af, Depth=29.46"
Routed to Link E1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 672.000	59	"35.91% imp"
430.685	37	64.09% Pervious Area
241.315	98	35.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	100	0.0100	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
17.7	650	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
91.7	2,750		0.50		**Direct Entry,**
9.9	7,500		12.69		**Lake or Reservoir,** Mean Depth= 5.00'
166.9	11,000	Total			

Subcatchment E: E



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Summary for Subcatchment F: F

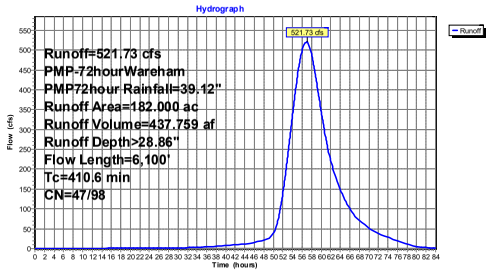
Runoff = 521.73 cfs @ 57.03 hrs, Volume= 437.759 af, Depth>28.86"
Routed to Link F1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 182.000	50	"6.11% imp"
170.880	47	93.89% Pervious Area
11.120	98	6.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.4	900	0.0560	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.0	5,100		1.00		**Direct Entry,**
410.6	6,100	Total			

Subcatchment F: F



Summary for Subcatchment G: G

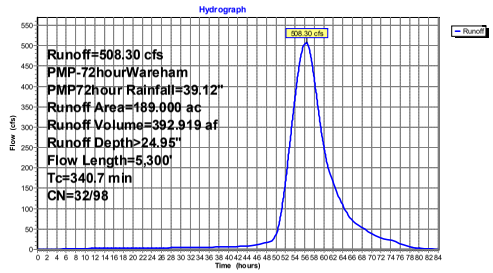
Runoff = 508.30 cfs @ 56.40 hrs, Volume= 392.919 af, Depth>24.95"
Routed to Link G1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 189.000	45	"19.09% imp"
152.920	32	80.91% Pervious Area
36.080	98	19.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
107.6	2,500	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
5.6	2,700		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
340.7	5,300	Total			

Subcatchment G: G



Summary for Subcatchment H: H

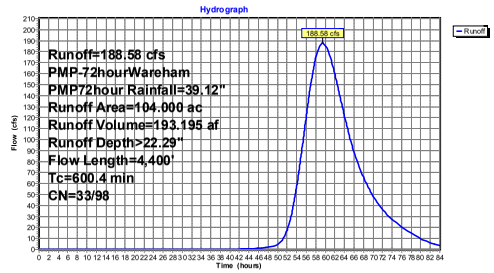
Runoff = 188.58 cfs @ 59.37 hrs, Volume= 193.195 af, Depth>22.29"
Routed to Link H1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 104.000	34	"1.27% imp"
102.679	33	98.73% Pervious Area
1.321	98	1.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
89.4	300	0.0005	0.06		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
210.8	4,000	0.0160	0.32		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
600.4	4,400	Total			

Subcatchment H: H



Summary for Subcatchment I: I

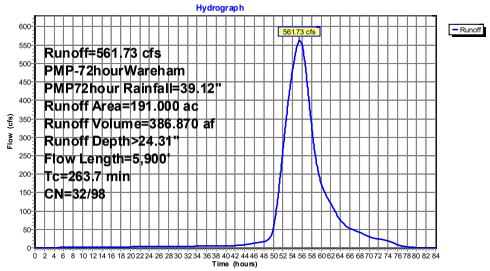
Runoff = 561.73 cfs @ 55.38 hrs, Volume= 386.870 af, Depth>24.31"
Routed to Link I1 : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 191.000	42	"15.34% imp"
161.701	32	84.66% Pervious Area
29.299	98	15.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
61.6	1,600	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
40.8	2,450		1.00		**Direct Entry,**
3.6	1,750		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
263.7	5,900	Total			

Subcatchment I: I



Summary for Subcatchment J: J

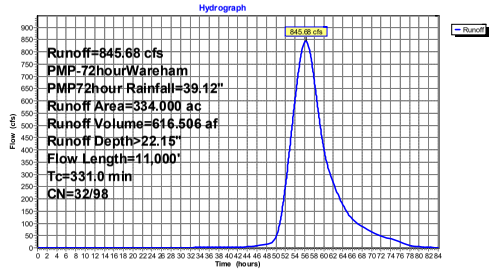
Runoff = 845.68 cfs @ 56.27 hrs, Volume= 616.506 af, Depth>22.15"
Routed to Link JL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 334.000	34	"2.83% imp"
324.548	32	97.17% Pervious Area
9.452	98	2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
227.5	100	0.0002	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
25.8	600	0.0240	0.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
75.0	9,000		2.00		**Direct Entry,**
2.7	1,300		8.02		**Lake or Reservoir,** Mean Depth= 2.00'
331.0	11,000	Total			

Subcatchment J: J



Summary for Subcatchment K: K

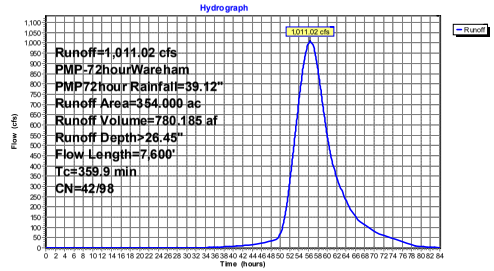
Runoff = 1,011.02 cfs @ 56.38 hrs, Volume= 780.185 af, Depth>26.45"
Routed to Link KL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 354.000	42	"0.83% imp"
351.062	42	99.17% Pervious Area
2.938	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
30.4	500	0.0120	0.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
76.7	3,000	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
133.3	4,000		0.50		**Direct Entry,**
359.9	7,600	Total			

Subcatchment K: K



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Summary for Subcatchment L: L

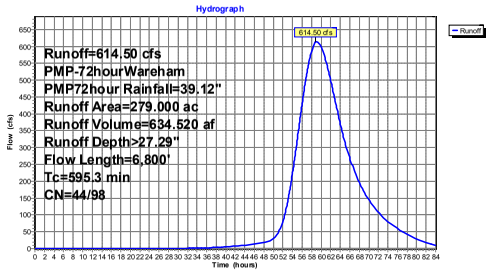
Runoff = 614.50 cfs @ 58.87 hrs, Volume= 634.520 af, Depth>27.29"
Routed to Link LL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 279.000	45	"2.43% imp"
272.220	44	97.57% Pervious Area
6.780	98	2.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.2	100	0.0001	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
185.1	3,400	0.0150	0.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
110.0	3,300		0.50		**Direct Entry,**
595.3	6,800	Total			

Subcatchment L: L



Summary for Subcatchment M: M

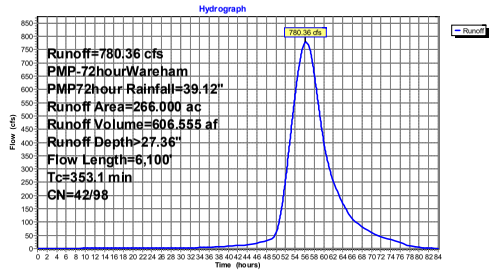
Runoff = 780.36 cfs @ 56.11 hrs, Volume= 606.555 af, Depth>27.36"
Routed to Link ML : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 266.000	47	"8.14% imp"
244.348	42	91.86% Pervious Area
21.652	98	8.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
157.7	100	0.0005	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
22.1	800	0.0580	0.60		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
173.3	5,200		0.50		**Direct Entry,**
353.1	6,100	Total			

Subcatchment M: M



Summary for Subcatchment N: N

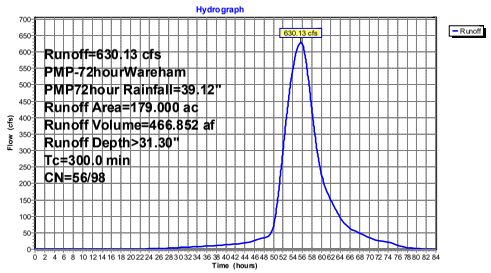
Runoff = 630.13 cfs @ 55.67 hrs, Volume= 466.852 af, Depth>31.30"
Routed to Link NL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 179.000	57	"3.17% imp"
173.326	56	96.83% Pervious Area
5.674	98	3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
300.0					**Direct Entry,**

Subcatchment N: N



Summary for Subcatchment O: O

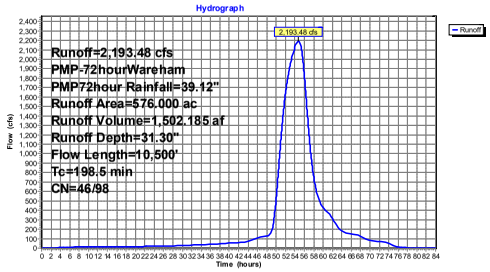
Runoff = 2,193.48 cfs @ 54.70 hrs, Volume= 1,502.185 af, Depth=31.30"
Routed to Link OL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 576.000	62	"31.1% imp"
396.864	46	68.90% Pervious Area
179.136	98	31.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
70.7	1,500	0.0200	0.35		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
8.3	8,900		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
198.5	10,500	Total			

Subcatchment O: O



Summary for Subcatchment P: P

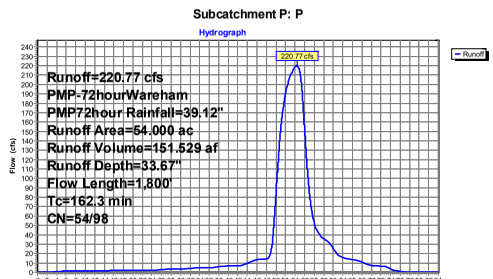
Runoff = 220.77 cfs @ 54.46 hrs, Volume= 151.529 af, Depth=33.67"
Routed to Link PL : 1/2 Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-84.00 hrs, dt= 0.001
PMP-72hourWareham PMP72hour Rainfall=39.12"

Area (ac)	CN	Description
* 54.000	71	"38.05% imp"
33.453	54	61.95% Pervious Area
20.547	98	38.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
119.5	100	0.0010	0.01		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.44"
5.0	200	0.0700	0.66		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.3	1,000	0.0080	0.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	500		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
162.3	1,800	Total			

Subcatchment P: P



Summary for Pond 1P: Halfway Pond

Inflow = 1,215.55 cfs @ 55.05 hrs, Volume= 851.058 af, Incl. 2.20 cfs Base Flow
Outflow = 48.83 cfs @ 70.77 hrs, Volume= 127.705 af, Atten= 96%, Lag= 943.3 min
Primary = 48.83 cfs @ 70.77 hrs, Volume= 127.705 af
Routed to Pond 2P : Kennard Res
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Kennard Res

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 64.37' Storage= 370.610 af
Peak Elev= 67.26' @ 70.77 hrs Storage= 1,128.037 af (757.427 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 658.6 min (3,919.2 - 3,260.6)

Volume	Invert	Avail.Storage	Storage Description
#1	62.90'	1,900.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
62.90	0.000
63.00	35.000
64.00	277.000
65.00	530.000
66.00	775.000
70.00	1,900.000

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	**36.0" W x 36.0" H Box Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 64.00' / 63.50' S= 0.0250 '/' Cc= 0.900 n= 0.025, Flow Area= 9.00 sf
#2	Secondary	67.50'	**TOR, C= 2.60** Offset (feet) 0.00 50.00 200.00 240.00 270.00 310.00 390.00 400.00 Elev. (feet) 75.00 74.00 69.00 69.00 67.50 67.50 72.00 75.00

Primary OutFlow Max=48.83 cfs @ 70.77 hrs HW=67.26' TW=58.96' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 48.83 cfs @ 6.67 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.37' TW=57.30' (Dynamic Tailwater)
└**2=TOR** (Controls 0.00 cfs)

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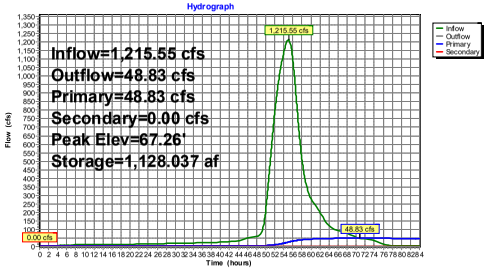
Pond 1P: Halfway Pond



Summary for Pond 2P: Kennard Res

Inflow = 370.04 cfs @ 54.66 hrs, Volume= 348.991 af, Incl. 0.60 cfs Base Flow
Outflow = 355.68 cfs @ 55.16 hrs, Volume= 322.961 af, Atten= 4%, Lag= 30.2 min
Primary = 134.63 cfs @ 55.16 hrs, Volume= 251.821 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Secondary = 221.05 cfs @ 55.16 hrs, Volume= 71.140 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 57.30' Storage= 4.000 af
Peak Elev= 59.96' @ 55.16 hrs Storage= 68.671 af (64.671 af above start)

Plug-Flow detention time= 308.4 min calculated for 318.961 af (91% of inflow)
Center-of-Mass det. time= 144.9 min (3,637.0 - 3,492.1)

Volume	Invert	Avail.Storage	Storage Description
#1	57.10'	320.000 af	**Above LiDAR Pool** Listed below

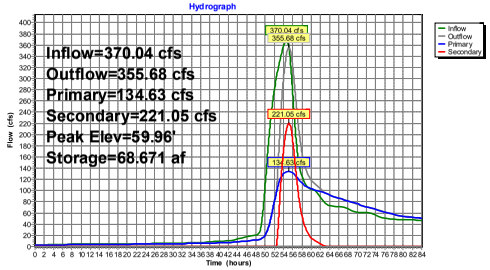
Elevation (feet)	Cum.Store (acre-feet)
57.10	0.000
57.80	14.000
59.00	40.000
60.00	70.000
61.00	120.000
62.00	160.000
63.00	210.000
65.00	320.000

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.30'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 105.00 150.00 216.00 250.00 580.00 630.00 655.00 750.00 803.00 931.00 1,015.00 Elev. (feet) 64.00 63.00 63.00 61.70 61.70 61.30 61.30 62.20 62.20 59.80 59.30 59.30 64.00
#2	Primary	57.10'	**9.0' long x 2.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 7.0' Crest Height

Primary OutFlow Max=134.64 cfs @ 55.16 hrs HW=59.96' TW=50.81' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Orifice Controls 134.64 cfs @ 6.34 fps)

Secondary OutFlow Max=220.90 cfs @ 55.16 hrs HW=59.96' TW=50.81' (Dynamic Tailwater)
└**1=TOD** (Weir Controls 220.90 cfs @ 1.73 fps)

Pond 2P: Kennard Res



Summary for Pond 3P: Fawn Pond

Inflow = 301.69 cfs @ 54.36 hrs, Volume= 195.634 af, Incl. 0.50 cfs Base Flow
Outflow = 68.16 cfs @ 57.32 hrs, Volume= 98.311 af, Atten= 77%, Lag= 178.0 min
Primary = 22.61 cfs @ 57.32 hrs, Volume= 52.742 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm
Tertiary = 45.55 cfs @ 57.32 hrs, Volume= 45.569 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.83' Storage= 27.720 af
Peak Elev= 62.15' @ 57.32 hrs Storage= 170.253 af (142.533 af above start)

Plug-Flow detention time= 1,302.0 min calculated for 70.591 af (36% of inflow)
Center-of-Mass det. time= 660.0 min (3,839.1 - 3,179.1)

Volume	Invert	Avail.Storage	Storage Description
#1	59.50'	370.000 af	**Above LiDAR Pool** Listed below

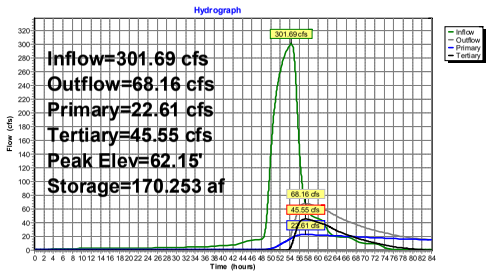
Elevation (feet)	Cum.Store (acre-feet)
59.50	0.000
60.00	42.000
61.00	90.000
62.00	160.000
65.00	370.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**30.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 59.50' / 59.00' S= 0.0125 '/' Cc= 0.900 n= 0.025, Flow Area= 4.91 sf
#2	Tertiary	61.50'	**TOD South, C= 2.60** Offset (feet) 0.00 27.00 55.00 105.00 Elev. (feet) 65.00 61.50 61.50 65.00

Primary OutFlow Max=22.62 cfs @ 57.32 hrs HW=62.15' TW=51.03' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 22.62 cfs @ 5.41 fps)

Tertiary OutFlow Max=45.53 cfs @ 57.32 hrs HW=62.15' TW=51.03' (Dynamic Tailwater)
└**2=TOD South** (Weir Controls 45.53 cfs @ 1.67 fps)

Pond 3P: Fawn Pond



Summary for Pond 4P: Bessey Bog Res - 2.4sm

Inflow = 1,164.87 cfs @ 55.66 hrs, Volume= 1,005.725 af, Incl. 1.60 cfs Base Flow
Outflow = 1,083.80 cfs @ 56.58 hrs, Volume= 894.118 af, Atten= 7%, Lag= 55.7 min
Primary = 147.03 cfs @ 56.58 hrs, Volume= 367.917 af
Routed to Pond 5P : Glen Charlie Pond
Secondary = 936.77 cfs @ 56.58 hrs, Volume= 526.201 af
Routed to Pond 5P : Glen Charlie Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 46.77' Storage= 9.720 af
Peak Elev= 51.07' @ 56.58 hrs Storage= 224.848 af (215.128 af above start)

Plug-Flow detention time= 324.8 min calculated for 884.397 af (88% of inflow)
Center-of-Mass det. time= 152.5 min (3,676.4 - 3,523.9)

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	550.000 af	**Above LiDAR Pool** Listed below

Elevation (feet)	Cum.Store (acre-feet)
46.50	0.000
47.50	36.000
48.50	75.000
49.50	130.000
50.00	155.000
51.00	220.000
52.00	290.000
55.00	550.000

Device	Routing	Invert	Outlet Devices
#1	Primary	46.50'	**10.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 10.0' Crest Height
#2	Secondary	49.70'	**TOD, C= 2.60** Offset (feet) 0.00 71.00 215.00 290.00 295.00 Elev. (feet) 52.00 49.70 49.70 50.00 52.00

Primary OutFlow Max=147.03 cfs @ 56.58 hrs HW=51.07' TW=37.43' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Orifice Controls 147.03 cfs @ 10.11 fps)

Secondary OutFlow Max=936.42 cfs @ 56.58 hrs HW=51.07' TW=37.43' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 936.42 cfs @ 2.60 fps)

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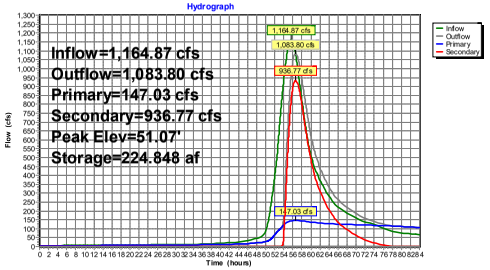
Pond 4P: Bessey Bog Res - 2.4sm



Summary for Pond 5P: Glen Charlie Pond

Inflow = 2,037.30 cfs @ 55.45 hrs, Volume= 1,733.585 af, Incl. 2.10 cfs Base Flow
Outflow = 1,312.09 cfs @ 57.83 hrs, Volume= 1,489.092 af, Atten= 36%, Lag= 142.7 min
Primary = 1,239.92 cfs @ 57.83 hrs, Volume= 1,435.372 af
Routed to Pond 6P : Maple Springs Dam - 3.5sm
Secondary = 57.38 cfs @ 57.81 hrs, Volume= 37.563 af
Routed to Pond 6.1P : Ortalani Reservoir
Tertiary = 15.04 cfs @ 57.12 hrs, Volume= 16.157 af
Routed to Pond 6.1P : Ortalani Reservoir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 33.99' Storage= 26.125 af
Peak Elev= 37.57' @ 57.83 hrs Storage= 658.304 af (632.179 af above start)

Plug-Flow detention time= 541.6 min calculated for 1,462.967 af (84% of inflow)
Center-of-Mass det. time= 323.3 min (3,771.7 - 3,448.5)

Volume	Invert	Avail.Storage	Storage Description
#1	33.80'	2,400.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
33.80	0.000
34.20	55.000
35.00	195.000
36.00	360.000
37.00	550.000
38.00	740.000
39.00	960.000
40.00	1,175.000
41.00	1,420.000
45.00	2,400.000

Device	Routing	Invert	Outlet Devices
#1	Primary	33.80'	**8.0' long x 6.00' rise Spillway X 3.00** 2 End Contraction(s) 1.0' Crest Height
#2	Primary	36.50'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 395.00 480.00 575.00 899.00 950.00 1,030.00 1,050.00 Elev. (feet) 42.00 39.00 36.50 36.50 39.50 40.00 39.50 39.50 42.00
#3	Secondary	37.00'	**SE Dike, C= 2.60** Offset (feet) 0.00 18.00 105.00 116.00 130.00 Elev. (feet) 41.00 37.90 37.00 37.60 41.00
#4	Secondary	35.00'	**48.0" W x 12.0" H Vert. SE Culvert** C= 0.600 Limited to weir flow at low heads
#5	Tertiary	37.70'	**NE Dike, C= 2.60** Offset (feet) 0.00 50.00 95.00 110.00 160.00 190.00 Elev. (feet) 41.00 40.00 39.00 37.70 37.70 41.00
#6	Tertiary	34.50'	**24.0" W x 12.0" H Vert. NE Culvert** C= 0.600

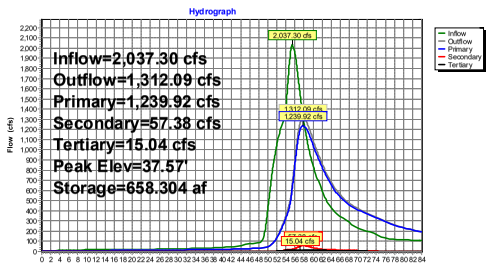
Limited to weir flow at low heads

Primary OutFlow Max=1,238.53 cfs @ 57.83 hrs HW=37.57' TW=25.69' (Dynamic Tailwater)
1=Spillway (Weir Controls 760.29 cfs @ 9.28 fps)
2=TOD (Weir Controls 478.23 cfs @ 1.55 fps)

Secondary OutFlow Max=56.92 cfs @ 57.81 hrs HW=37.57' TW=35.14' (Dynamic Tailwater)
3=SE Dike (Weir Controls 29.34 cfs @ 0.79 fps)
4=SE Culvert (Orifice Controls 27.58 cfs @ 6.89 fps)

Tertiary OutFlow Max=15.04 cfs @ 57.12 hrs HW=37.53' TW=34.92' (Dynamic Tailwater)
5=NE Dike (Controls 0.00 cfs)
6=NE Culvert (Orifice Controls 15.04 cfs @ 7.52 fps)

Pond 5P: Glen Charlie Pond



Summary for Pond 6.1P: Ortalani Reservoir

Inflow = 72.19 cfs @ 57.78 hrs, Volume= 53.720 af
Outflow = 17.97 cfs @ 67.99 hrs, Volume= 32.203 af, Atten= 75%, Lag= 612.4 min
Primary = 17.97 cfs @ 67.99 hrs, Volume= 32.203 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 36.19' @ 67.99 hrs Storage= 33.768 af

Plug-Flow detention time= 761.3 min calculated for 32.203 af (60% of inflow)
Center-of-Mass det. time= 549.2 min (4,208.4 - 3,659.2)

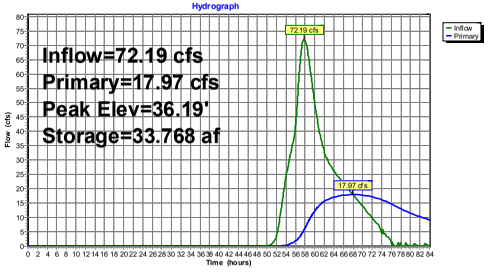
Volume	Invert	Avail.Storage	Storage Description
#1	34.20'	250.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
34.20	0.000
35.00	14.000
36.00	30.000
37.00	50.000
38.00	70.000
39.00	90.000
45.00	250.000

Device	Routing	Invert	Outlet Devices
#1	Primary	34.20'	**24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	37.40'	**TOD, C= 2.60** Offset (feet) 0.00 45.00 145.00 230.00 360.00 430.00 600.00 800.00 Elev. (feet) 42.00 38.00 37.50 38.00 38.00 37.40 37.40 42.00

Primary OutFlow Max=18.00 cfs @ 67.99 hrs HW=36.19' TW=24.40' (Dynamic Tailwater)
1=Orifice/Grate (Orifice Controls 18.00 cfs @ 4.53 fps)
2=TOD (Controls 0.00 cfs)

Pond 6.1P: Ortalani Reservoir



Summary for Pond 6.2P: Maple Sping Bogs US

Inflow = 415.72 cfs @ 57.60 hrs, Volume= 312.391 af
Outflow = 412.24 cfs @ 57.94 hrs, Volume= 291.382 af, Atten= 1%, Lag= 20.4 min
Primary = 32.51 cfs @ 57.94 hrs, Volume= 71.356 af
Routed to Pond 6.3P : Maple Sping Bogs DS
Secondary = 379.72 cfs @ 57.94 hrs, Volume= 220.027 af
Routed to Pond 6.3P : Maple Sping Bogs DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 25.04' @ 57.94 hrs Storage= 40.864 af

Plug-Flow detention time= 179.1 min calculated for 291.382 af (93% of inflow)
Center-of-Mass det. time= 107.2 min (3,697.0 - 3,589.7)

Volume	Invert	Avail.Storage	Storage Description
#1	22.70'	360.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
22.70	0.000
25.00	40.000
28.00	113.000
35.00	360.000

Device	Routing	Invert	Outlet Devices
#1	Primary	22.70'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	24.10'	**TOD, C= 2.60** Offset (feet) 0.00 32.00 180.00 390.00 440.00 500.00 Elev. (feet) 28.00 24.90 24.90 24.10 24.10 28.00

Primary OutFlow Max=32.51 cfs @ 57.94 hrs HW=25.04' TW=22.33' (Dynamic Tailwater)
1=Orifice/Grate (Orifice Controls 32.51 cfs @ 6.50 fps)

Secondary OutFlow Max=379.68 cfs @ 57.94 hrs HW=25.04' TW=22.33' (Dynamic Tailwater)
2=TOD (Weir Controls 379.68 cfs @ 1.37 fps)

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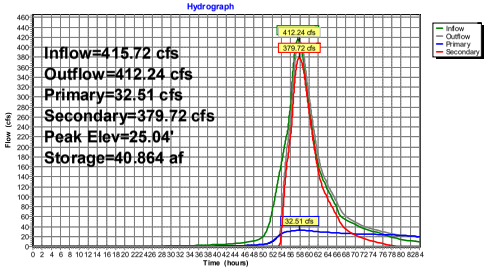
Pond 6.2P: Maple Sping Bogs US



Summary for Pond 6.3P: Maple Sping Bogs DS

Inflow = 412.24 cfs @ 57.94 hrs, Volume= 291.382 af
Outflow = 392.38 cfs @ 58.67 hrs, Volume= 289.034 af, Atten= 5%, Lag= 43.8 min
Primary = 197.47 cfs @ 58.67 hrs, Volume= 235.734 af
Routed to Link 23L : Inflow
Secondary = 194.90 cfs @ 58.67 hrs, Volume= 53.300 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 22.40' @ 58.67 hrs Storage= 42.467 af

Plug-Flow detention time= 95.2 min calculated for 289.034 af (99% of inflow)
Center-of-Mass det. time= 84.7 min (3,781.6 - 3,697.0)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	120.000 af	**Custom Stage Data** Listed below

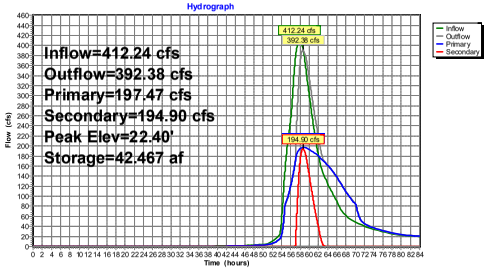
Elevation (feet)	Cum.Store (acre-feet)
17.00	0.000
20.00	6.000
21.00	19.000
22.00	34.000
23.00	55.000
26.00	120.000

Device	Routing	Invert	Outlet Devices
#1	Primary	17.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	21.80'	**TOD, C= 2.60** Offset (feet) 0.00 26.00 177.00 250.00 260.00 Elev. (feet) 28.00 21.80 21.80 24.00 28.00

Primary OutFlow Max=197.47 cfs @ 58.67 hrs HW=22.40' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 197.47 cfs @ 7.90 fps)

Secondary OutFlow Max=194.90 cfs @ 58.67 hrs HW=22.40' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 194.90 cfs @ 1.86 fps)

Pond 6.3P: Maple Sping Bogs DS



Summary for Pond 6P: Maple Springs Dam - 3.5sm

Inflow = 1,239.92 cfs @ 57.83 hrs, Volume= 1,435.372 af
Outflow = 1,239.71 cfs @ 57.88 hrs, Volume= 1,430.106 af, Atten= 0%, Lag= 3.1 min
Primary = 1,079.95 cfs @ 57.88 hrs, Volume= 1,368.798 af
Routed to Link 23L : Inflow
Secondary = 159.76 cfs @ 57.88 hrs, Volume= 61.308 af
Routed to Pond 6.2P : Maple Sping Bogs US

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.49' Storage= 0.447 af
Peak Elev= 25.69' @ 57.88 hrs Storage= 17.442 af (16.995 af above start)

Plug-Flow detention time= 16.5 min calculated for 1,429.642 af (100% of inflow)
Center-of-Mass det. time= 10.3 min (3,786.2 - 3,775.9)

Volume	Invert	Avail.Storage	Storage Description
#1	20.30'	105.000 af	**Custom Stage Data** Listed below

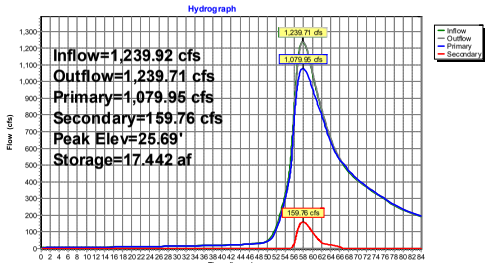
Elevation (feet)	Cum.Store (acre-feet)
20.30	0.000
22.00	4.000
23.00	7.500
24.00	10.500
25.00	14.000
26.00	19.000
27.00	23.000
28.00	28.000
29.00	34.000
30.00	40.000
40.00	105.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.30'	**15.0' long x 3.00' rise Bridge/Spillway** 2 End Contraction(s) 1.0' Crest Height
#2	Secondary	20.50'	**36.0" W x 36.0" H Box Culvert to Bogs** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 20.50' / 20.30' S= 0.0067 '/' Cc= 0.900 n= 0.035, Flow Area= 9.00 sf
#3	Primary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 10.00 115.00 150.00 215.00 260.00 260.00 Elev. (feet) 29.00 26.00 25.30 24.50 24.50 25.20 29.00
#4	Secondary	25.20'	**TOD_Bogs, C= 2.60** Offset (feet) 0.00 0.00 140.00 190.00 Elev. (feet) 29.00 25.20 25.20 29.00

Primary OutFlow Max=1,079.95 cfs @ 57.88 hrs HW=25.69' TW=0.00' (Dynamic Tailwater)
└**1=Bridge/Spillway** (Orifice Controls 688.81 cfs @ 15.94 fps)
└**3=TOD** (Weir Controls 391.13 cfs @ 2.01 fps)

Secondary OutFlow Max=159.76 cfs @ 57.88 hrs HW=25.69' TW=25.04' (Dynamic Tailwater)
└**2=Culvert to Bogs** (Outlet Controls 33.26 cfs @ 3.70 fps)
└**4=TOD_Bogs** (Weir Controls 126.50 cfs @ 1.77 fps)

Pond 6P: Maple Springs Dam - 3.5sm



Summary for Pond 7P: Little Five Mile Pond

Inflow = 254.74 cfs @ 56.40 hrs, Volume= 200.556 af, Incl. 0.59 cfs Base Flow
Outflow = 254.14 cfs @ 56.45 hrs, Volume= 200.371 af, Atten= 0%, Lag= 2.8 min
Primary = 254.14 cfs @ 56.45 hrs, Volume= 200.371 af
Routed to Pond 8P : Five Mile Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 59.52' Storage= 22.160 af
Peak Elev= 60.33' @ 56.45 hrs Storage= 28.677 af (6.517 af above start)

Plug-Flow detention time= 237.2 min calculated for 178.211 af (89% of inflow)
Center-of-Mass det. time= 30.4 min (3,446.0 - 3,415.6)

Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	170.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
56.00	0.000
57.00	5.000
58.00	11.000
59.00	18.000
60.00	26.000
61.00	34.000
62.00	45.000
65.00	88.000
70.00	170.000

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**Relief, C= 2.00** Offset (feet) 0.00 176.00 200.00 270.00 290.00 310.00 425.00 490.00 530.00 Elev. (feet) 66.00 61.00 59.80 59.50 60.50 60.50 59.50 59.50 66.00

Primary OutFlow Max=254.14 cfs @ 56.45 hrs HW=60.33' TW=54.74' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 254.14 cfs @ 1.17 fps)

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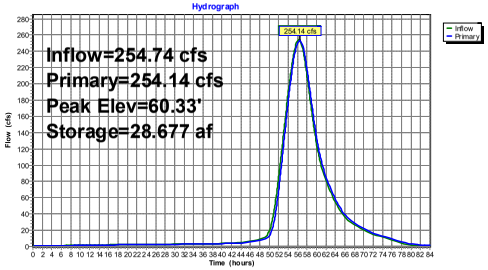
Pond 7P: Little Five Mile Pond



Summary for Pond 8P: Five Mile Pond

Inflow = 254.14 cfs @ 56.45 hrs, Volume= 200.371 af
Outflow = 159.25 cfs @ 59.36 hrs, Volume= 121.551 af, Atten= 37%, Lag= 174.7 min
Primary = 18.97 cfs @ 59.36 hrs, Volume= 41.502 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm
Secondary = 140.28 cfs @ 59.36 hrs, Volume= 80.049 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Peak Elev= 55.68' @ 59.36 hrs Storage= 109.571 af

Plug-Flow detention time= 667.8 min calculated for 121.550 af (61% of inflow)
Center-of-Mass det. time= 424.5 min (3,870.5 - 3,446.0)

Volume	Invert	Avail.Storage	Storage Description
#1	51.90'	600.000 af	**Custom Stage Data** Listed below

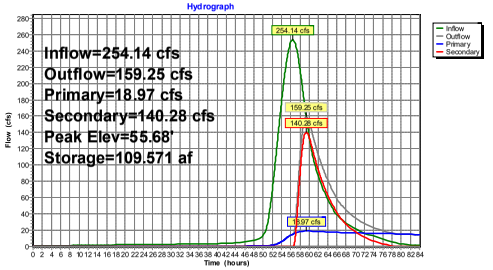
Elevation (feet)	Cum.Store (acre-feet)
51.90	0.000
53.00	29.000
54.00	60.000
55.00	87.000
56.00	120.000
60.00	250.000
70.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**24.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 51.90' / 51.30' S= 0.0200 '/' Cc= 0.900 n= 0.035, Flow Area= 3.14 sf
#2	Secondary	54.90'	**TOD, C= 2.60** Offset (feet) 0.00 25.00 80.00 105.00 290.00 300.00 345.00 400.00 411.00 Elev. (feet) 60.00 59.00 59.00 56.00 55.50 54.90 54.90 55.60 60.00

Primary OutFlow Max=18.97 cfs @ 59.36 hrs HW=55.68' TW=32.70' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 18.97 cfs @ 6.04 fps)

Secondary OutFlow Max=140.28 cfs @ 59.36 hrs HW=55.68' TW=32.70' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 140.28 cfs @ 1.42 fps)

Pond 8P: Five Mile Pond



Summary for Pond 9P: Kettle Hole

Inflow = 94.59 cfs @ 59.37 hrs, Volume= 98.680 af, Incl. 0.30 cfs Base Flow
Outflow = 94.24 cfs @ 59.54 hrs, Volume= 98.313 af, Atten= 0%, Lag= 9.8 min
Primary = 94.24 cfs @ 59.54 hrs, Volume= 98.313 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 54.98' Storage= 8.950 af
Peak Elev= 55.75' @ 59.54 hrs Storage= 11.614 af (2.664 af above start)

Plug-Flow detention time= 187.7 min calculated for 89.363 af (91% of inflow)
Center-of-Mass det. time= 24.4 min (3,735.5 - 3,711.1)

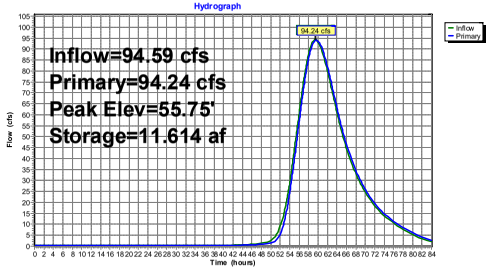
Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	230.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
50.00	0.000
53.00	4.000
55.00	9.000
57.00	16.000
59.00	23.000
61.00	32.000
63.00	41.000
65.00	55.000
67.00	71.000
69.00	86.000
71.00	107.000
80.00	230.000

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**Relief, C= 2.60** Offset (feet) 0.00 17.00 42.00 66.00 130.00 160.00 190.00 Elev. (feet) 62.00 59.50 58.50 54.90 55.30 57.30 62.00

Primary OutFlow Max=94.24 cfs @ 59.54 hrs HW=55.75' TW=32.70' (Dynamic Tailwater)
└**1=Relief** (Weir Controls 94.24 cfs @ 1.52 fps)

Pond 9P: Kettle Hole



Summary for Pond 10P: Maple Springs Brook Dam - 0.8sm

Inflow = 368.42 cfs @ 58.70 hrs, Volume= 417.464 af, Incl. 0.60 cfs Base Flow
Outflow = 367.42 cfs @ 58.86 hrs, Volume= 393.752 af, Atten= 0%, Lag= 9.6 min
Primary = 108.43 cfs @ 58.86 hrs, Volume= 225.957 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 258.99 cfs @ 58.86 hrs, Volume= 167.795 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.60' Storage= 1.500 af
Peak Elev= 32.70' @ 58.86 hrs Storage= 63.918 af (62.418 af above start)

Plug-Flow detention time= 244.9 min calculated for 392.252 af (94% of inflow)
Center-of-Mass det. time= 164.6 min (3,761.0 - 3,596.5)

Volume	Invert	Avail.Storage	Storage Description
#1	30.50'	300.000 af	**Custom Stage Data** Listed below
#2	29.50'	15.000 af	**NP to LIDAR** Listed below
		315.000 af	Total Available Storage

Elevation (feet)	Cum.Store (acre-feet)
30.50	0.000
31.50	20.000
32.00	32.000
33.00	56.000
34.00	81.000
35.00	115.000
36.50	160.000
40.00	300.000

Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
30.50	15.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**6.0' long x 5.00' rise Drop Inlet Spillway** 2 End Contraction(s) 5.0' Crest Height
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 75.00 660.00 700.00 850.00 Elev. (feet) 35.00 32.40 32.40 34.00 35.00

Primary OutFlow Max=108.43 cfs @ 58.86 hrs HW=32.70' TW=28.83' (Dynamic Tailwater)
└**1=Drop Inlet Spillway** (Weir Controls 108.43 cfs @ 6.31 fps)

Secondary OutFlow Max=258.99 cfs @ 58.86 hrs HW=32.70' TW=28.83' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 258.99 cfs @ 1.41 fps)

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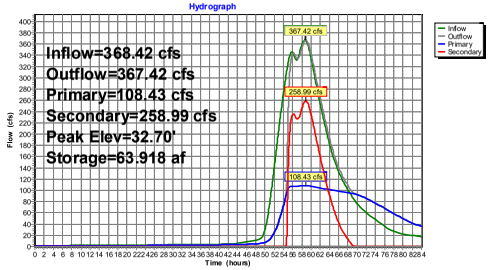
Pond 10P: Maple Springs Brook Dam - 0.8sm



Summary for Pond 11P: Unnamed Road - 1.8sm

Inflow = 1,272.15 cfs @ 56.37 hrs, Volume= 1,104.372 af, Incl. 1.10 cfs Base Flow
Outflow = 733.01 cfs @ 60.66 hrs, Volume= 970.176 af, Atten= 42%, Lag= 257.6 min
Primary = 449.61 cfs @ 59.40 hrs, Volume= 836.390 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 295.50 cfs @ 60.66 hrs, Volume= 133.785 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 21.26' Storage= 2.710 af
Peak Elev= 29.11' @ 60.66 hrs Storage= 442.283 af (439.573 af above start)

Plug-Flow detention time= 487.7 min calculated for 967.465 af (88% of inflow)
Center-of-Mass det. time= 354.6 min (3,948.5 - 3,594.0)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	1,700.000 af	**Custom Stage Data** Listed below

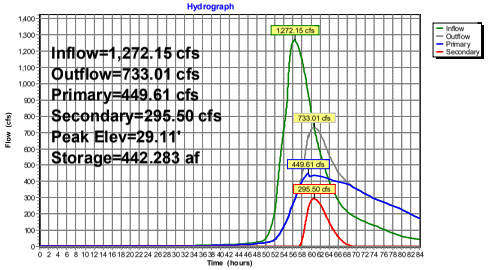
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
21.00	0.500
22.00	9.000
23.00	35.000
24.00	75.000
25.00	130.000
26.00	185.000
27.00	270.000
28.00	340.000
29.00	430.000
30.00	540.000
40.00	1,700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**96.0" W x 72.0" H Box Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.50' S= 0.0167 '/' Cc= 0.900 n= 0.035, Flow Area= 48.00 sf
#2	Secondary	27.80'	**TOR, C= 2.60** Offset (feet) 0.00 17.00 380.00 460.00 Elev. (feet) 36.00 30.50 27.80 36.00

Primary OutFlow Max=449.61 cfs @ 59.40 hrs HW=29.00' TW=23.85' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 449.61 cfs @ 9.37 fps)

Secondary OutFlow Max=295.50 cfs @ 60.66 hrs HW=29.11' TW=24.57' (Dynamic Tailwater)
└**2=TOR** (Weir Controls 295.50 cfs @ 1.19 fps)

Pond 11P: Unnamed Road - 1.8sm



Summary for Pond 12P: Maple Springs Road Dam

Inflow = 423.84 cfs @ 56.27 hrs, Volume= 315.195 af, Incl. 1.00 cfs Base Flow
Outflow = 422.73 cfs @ 56.34 hrs, Volume= 312.891 af, Atten= 0%, Lag= 4.5 min
Primary = 78.05 cfs @ 56.34 hrs, Volume= 123.238 af
Routed to Pond 11P : Unnamed Road - 1.8sm
Secondary = 344.67 cfs @ 56.34 hrs, Volume= 189.653 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 38.68' Storage= 1.080 af
Peak Elev= 41.78' @ 56.34 hrs Storage= 20.473 af (19.393 af above start)

Plug-Flow detention time= 90.6 min calculated for 311.807 af (99% of inflow)
Center-of-Mass det. time= 66.4 min (3,535.6 - 3,469.2)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	180.000 af	**Custom Stage Data** Listed below

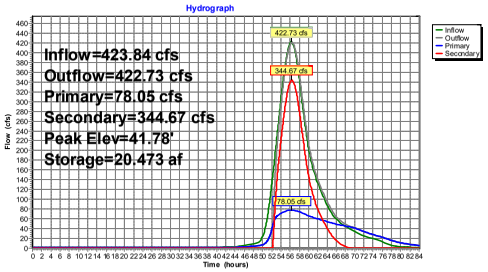
Elevation (feet)	Cum.Store (acre-feet)
38.50	0.000
39.00	3.000
40.00	9.000
41.00	15.000
42.00	22.000
43.00	32.000
45.00	50.000
55.00	180.000

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0' long x 4.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height
#2	Secondary	40.70'	**TOD, C= 2.60** Offset (feet) 0.00 28.00 140.00 175.00 235.00 250.00 320.00 370.00 470.00 Elev. (feet) 46.00 44.00 43.00 40.70 40.70 41.00 41.40 41.40 46.00

Primary OutFlow Max=78.05 cfs @ 56.34 hrs HW=41.78' TW=26.84' (Dynamic Tailwater)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 78.05 cfs @ 7.11 fps)

Secondary OutFlow Max=344.67 cfs @ 56.34 hrs HW=41.78' TW=26.84' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 344.67 cfs @ 1.96 fps)

Pond 12P: Maple Springs Road Dam



Summary for Pond 13.1P: Bogs_L_US

Inflow = 308.15 cfs @ 58.87 hrs, Volume= 323.508 af, Incl. 0.90 cfs Base Flow
Outflow = 285.52 cfs @ 60.72 hrs, Volume= 323.369 af, Atten= 7%, Lag= 110.8 min
Primary = 145.31 cfs @ 60.01 hrs, Volume= 264.413 af
Routed to Pond 13.2P : Bogs_L_DS
Secondary = 140.46 cfs @ 60.73 hrs, Volume= 58.956 af
Routed to Pond 13.2P : Bogs_L_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 29.65' Storage= 0.054 af
Peak Elev= 35.14' @ 60.73 hrs Storage= 55.817 af (55.763 af above start)

Plug-Flow detention time= 143.2 min calculated for 323.312 af (100% of inflow)
Center-of-Mass det. time= 141.8 min (3,811.7 - 3,670.0)

Volume	Invert	Avail.Storage	Storage Description
#1	29.50'	700.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
29.50	0.000
32.30	1.000
33.00	13.000
34.00	25.000
35.00	52.000
36.00	80.000
40.00	250.000
50.00	700.000

Device	Routing	Invert	Outlet Devices
#1	Primary	29.50'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	34.40'	**TOD, C= 2.60** Offset (feet) 0.00 21.00 170.00 335.00 590.00 770.00 800.00 Elev. (feet) 42.00 35.30 34.40 35.80 35.10 35.10 42.00

Primary OutFlow Max=145.31 cfs @ 60.01 hrs HW=35.11' TW=29.82' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 145.31 cfs @ 9.69 fps)

Secondary OutFlow Max=140.45 cfs @ 60.73 hrs HW=35.14' TW=30.12' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 140.45 cfs @ 0.87 fps)

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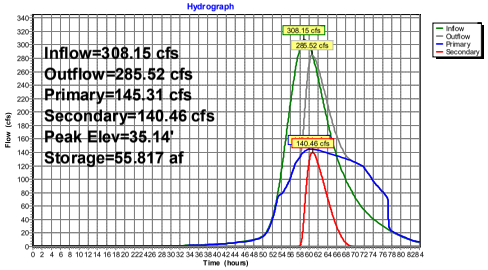
Pond 13.1P: Bogs_L_US



Summary for Pond 13.2P: Bogs_L_DS

Inflow = 285.52 cfs @ 60.72 hrs, Volume= 323.369 af
Outflow = 138.76 cfs @ 67.73 hrs, Volume= 319.117 af, Atten= 51%, Lag= 421.1 min
Primary = 138.76 cfs @ 67.73 hrs, Volume= 319.117 af
Routed to Pond 14P : Bogs_M - 2.7sm
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 14P : Bogs_M - 2.7sm

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.75' Storage= 0.075 af
Peak Elev= 30.84' @ 67.73 hrs Storage= 80.586 af (80.511 af above start)

Plug-Flow detention time= 272.6 min calculated for 319.038 af (99% of inflow)
Center-of-Mass det. time= 257.2 min (4,068.9 - 3,811.7)

Volume	Invert	Avail.Storage	Storage Description
#1	25.60'	600.000 af	**Custom Stage Data** Listed below

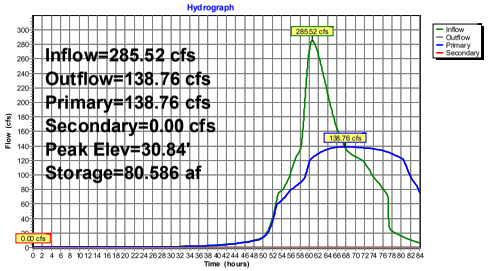
Elevation (feet)	Cum.Store (acre-feet)
25.60	0.000
28.00	1.200
28.50	5.000
29.00	17.000
30.00	30.000
31.00	90.000
32.00	130.000
33.00	185.000
35.00	300.000
40.00	600.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.60'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	32.40'	**TOD, C= 2.60** Offset (feet) 0.00 70.00 970.00 1,040.00 1,400.00 1,480.00 Elev. (feet) 36.00 32.40 32.40 32.80 32.80 36.00

Primary OutFlow Max=138.77 cfs @ 67.73 hrs HW=30.84' TW=25.06' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 138.77 cfs @ 9.25 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' TW=15.71' (Dynamic Tailwater)
└**2=TOD** (Controls 0.00 cfs)

Pond 13.2P: Bogs_L_DS



Summary for Pond 14P: Bogs_M - 2.7sm

Inflow = 1,039.37 cfs @ 60.20 hrs, Volume= 1,598.124 af, Incl. 0.80 cfs Base Flow
Outflow = 782.03 cfs @ 64.03 hrs, Volume= 1,446.324 af, Atten= 25%, Lag= 229.6 min
Primary = 674.63 cfs @ 64.03 hrs, Volume= 1,401.365 af
Routed to Link 23L : Inflow
Secondary = 107.40 cfs @ 64.03 hrs, Volume= 44.958 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 15.71' Storage= 1.065 af
Peak Elev= 25.34' @ 64.03 hrs Storage= 337.482 af (336.417 af above start)

Plug-Flow detention time= 286.6 min calculated for 1,445.241 af (90% of inflow)
Center-of-Mass det. time= 180.1 min (4,055.5 - 3,875.4)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	2,000.000 af	**Custom Stage Data** Listed below

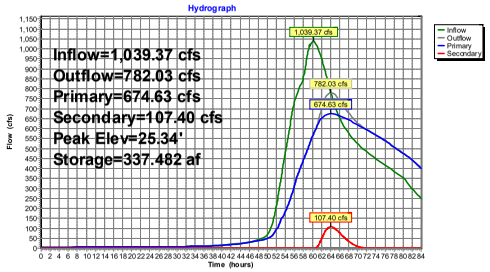
Elevation (feet)	Cum.Store (acre-feet)
15.00	0.000
17.00	3.000
18.00	12.000
19.00	28.000
20.00	60.000
21.00	95.000
22.00	130.000
23.00	180.000
24.00	240.000
25.00	310.000
26.00	390.000
27.00	480.000
28.00	575.000
29.00	650.000
40.00	2,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	15.20'	**120.0" W x 96.0" H Box Culvert** L= 90.0' Ke= 0.500 Inlet / Outlet Invert= 15.20' / 15.00' S= 0.0022 '/' Cc= 0.900 n= 0.035, Flow Area= 80.00 sf
#2	Secondary	24.50'	**TOD, C= 2.60** Offset (feet) 0.00 15.00 75.00 285.00 315.00 430.00 600.00 610.00 Elev. (feet) 34.00 29.50 28.90 25.20 24.50 25.50 31.00 34.00

Primary OutFlow Max=674.63 cfs @ 64.03 hrs HW=25.34' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 674.63 cfs @ 8.87 fps)

Secondary OutFlow Max=107.40 cfs @ 64.03 hrs HW=25.34' TW=0.00' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 107.40 cfs @ 0.99 fps)

Pond 14P: Bogs_M - 2.7sm



Summary for Pond 15.1P: Bogs_N_US

Inflow = 315.66 cfs @ 55.67 hrs, Volume= 237.592 af, Incl. 0.60 cfs Base Flow
Outflow = 258.12 cfs @ 57.30 hrs, Volume= 235.798 af, Atten= 18%, Lag= 98.2 min
Primary = 121.77 cfs @ 57.30 hrs, Volume= 199.469 af
Routed to Pond 15.2P : Bogs_N_DS
Tertiary = 136.35 cfs @ 57.30 hrs, Volume= 36.328 af
Routed to Pond 15.2P : Bogs_N_DS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 25.11' Storage= 0.352 af
Peak Elev= 29.41' @ 57.30 hrs Storage= 76.615 af (76.263 af above start)

Plug-Flow detention time= 281.2 min calculated for 235.443 af (99% of inflow)
Center-of-Mass det. time= 264.5 min (3,636.5 - 3,371.9)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	430.000 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
25.00	0.000
25.50	1.600
27.00	17.000
28.40	28.000
30.00	105.000
40.00	430.000

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	29.00'	**TOD, C= 2.60** Offset (feet) 0.00 0.00 1,200.00 1,250.00 Elev. (feet) 32.00 30.00 29.00 32.00

Primary OutFlow Max=121.77 cfs @ 57.30 hrs HW=29.41' TW=22.53' (Dynamic Tailwater)
└**1=Orifice/Grate** (Orifice Controls 121.77 cfs @ 8.12 fps)

Tertiary OutFlow Max=136.35 cfs @ 57.30 hrs HW=29.41' TW=22.53' (Dynamic Tailwater)
└**2=TOD** (Weir Controls 136.35 cfs @ 0.67 fps)

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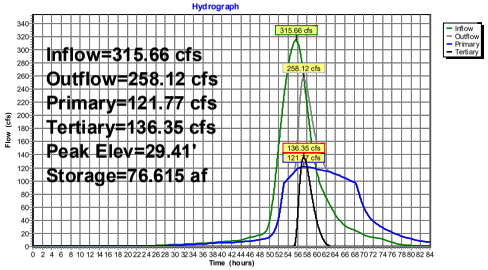
Pond 15.1P: Bogs_N_US



Summary for Pond 15.2P: Bogs_N_DS

Inflow = 258.12 cfs @ 57.30 hrs, Volume= 235.798 af
Outflow = 99.75 cfs @ 67.43 hrs, Volume= 198.393 af, Atten= 61%, Lag= 607.3 min
Primary = 99.75 cfs @ 67.43 hrs, Volume= 198.393 af
Routed to Link 23L : Inflow
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 23L : Inflow

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 20.11' Storage= 2.567 af
Peak Elev= 23.51' @ 67.43 hrs Storage= 98.204 af (95.638 af above start)

Plug-Flow detention time= 592.8 min calculated for 195.826 af (83% of inflow)
Center-of-Mass det. time= 411.5 min (4,048.0 - 3,636.5)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	800.000 af	**Custom Stage Data** Listed below

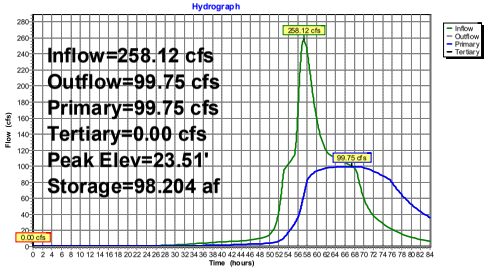
Elevation (feet)	Cum.Store (acre-feet)
20.00	0.000
23.00	70.000
25.00	180.000
35.00	800.000

Device	Routing	Invert	Outlet Devices
#1	Primary	20.00'	**60.0" W x 36.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Tertiary	25.20'	**TOD, C= 2.60** Offset (feet) 0.00 20.00 800.00 850.00 Elev. (feet) 27.00 25.20 25.20 27.00

Primary OutFlow Max=99.78 cfs @ 67.43 hrs HW=23.51' TW=0.00' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 99.78 cfs @ 6.65 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.11' TW=0.00' (Dynamic Tailwater)
└─**2=TOD** (Controls 0.00 cfs)

Pond 15.2P: Bogs_N_DS



Summary for Pond 16.1: Mill Pond Dam -PC

Inflow = 2,401.52 cfs @ 58.06 hrs, Volume= 4,351.557 af, Incl. 32.00 cfs Base Flow
Outflow = 2,045.88 cfs @ 61.65 hrs, Volume= 3,867.771 af, Atten= 15%, Lag= 215.8 min
Primary = 1,947.56 cfs @ 61.65 hrs, Volume= 3,625.005 af
Routed to Pond 17B : Proposed Bridge
Secondary = 64.57 cfs @ 61.65 hrs, Volume= 234.432 af
Routed to Pond Wr 24 :
Tertiary = 33.75 cfs @ 61.65 hrs, Volume= 8.335 af
Routed to Pond 17B : Proposed Bridge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 14.30' Storage= 470.969 af
Peak Elev= 18.08' @ 61.65 hrs Storage= 1,306.418 af (835.449 af above start)

Plug-Flow detention time= 629.2 min calculated for 3,396.760 af (78% of inflow)
Center-of-Mass det. time= 179.4 min (3,902.5 - 3,723.1)

Volume	Invert	Avail.Storage	Storage Description
#1	3.00'	1,941.850 af	**Storage** Listed below

Elevation (feet)	Cum.Store (acre-feet)
3.00	0.000
4.00	1.130
5.00	4.140
6.00	9.110
7.00	16.590
8.00	34.960
9.00	60.590
10.00	94.410
11.00	142.690
12.00	214.660
13.00	314.540
13.80	403.920
14.00	426.260
15.00	575.290
16.00	771.680
17.00	994.600
18.30	1,368.590
19.00	1,592.930
20.00	1,941.850

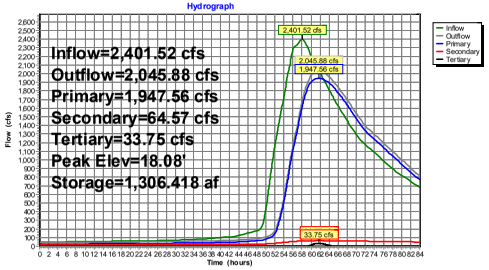
Device	Routing	Invert	Outlet Devices
#1	Primary	15.50'	**110.0' long x 1.5' breadth Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32
#2	Primary	13.60'	**15.0' long x 1.0' breadth Notch as SW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#3	Secondary	12.50'	**3.3' long x 1.0' breadth 3.25' Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#4	Tertiary	18.00'	**TOD, C= 2.60** Offset (feet) 0.00 46.00 450.00 522.00 702.00 720.00 830.00 860.00 990.00 1,090.00 Elev. (feet) 21.00 18.70 18.30 19.00 18.90 20.00 20.00 18.00 18.00 21.00
#5	Tertiary	18.00'	**US Relief - Bypasses Dam, C= 1.80** Offset (feet) 0.00 145.00 600.00 615.00 640.00 660.00 1,030.00 1,080.00 1,200.00 1,260.00 Elev. (feet) 20.00 18.00 18.00 20.00 20.00 18.60 18.60 18.00 18.00 20.00
#6	Device 8	5.20'	**48.0" W x 48.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#7	Device 8	15.50'	**6.0' long x 20.00' rise MLO DownwardOpGate** 2 End Contraction(s) 5.0' Crest Height
#8	Tertiary	4.00'	**96.0" W x 48.0" H Box Culvert X 0.00** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 32.00 sf

Primary OutFlow Max=1,947.56 cfs @ 61.65 hrs HW=18.08' TW=14.82' (Dynamic Tailwater)
├─**1=Spillway** (Weir Controls 1,501.64 cfs @ 5.28 fps)
└─**2=Notch as SW** (Weir Controls 445.92 cfs @ 6.63 fps)

Secondary OutFlow Max=64.57 cfs @ 61.65 hrs HW=18.08' TW=17.61' (Dynamic Tailwater)
└─**3=3.25' Weir** (Weir Controls 64.57 cfs @ 3.50 fps)

Tertiary OutFlow Max=33.75 cfs @ 61.65 hrs HW=18.08' TW=14.82' (Dynamic Tailwater)
├─**4=TOD** (Weir Controls 8.31 cfs @ 0.74 fps)
├─**5=US Relief - Bypasses Dam** (Weir Controls 25.43 cfs @ 0.51 fps)
└─**8=Culvert** (Controls 0.00 cfs)
├─**6=Orifice/Grate** (Controls 0.00 cfs)
└─**7=MLO DownwardOpGate** (Passes 0.00 cfs of 79.18 cfs potential flow)

Pond 16.1: Mill Pond Dam -PC



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Summary for Pond 16.3: Downstream Weir

Inflow = 1,981.31 cfs @ 61.66 hrs, Volume= 3,633.196 af
Outflow = 1,981.31 cfs @ 61.66 hrs, Volume= 3,633.065 af, Atten= 0%, Lag= 0.1 min
Primary = 1,981.31 cfs @ 61.66 hrs, Volume= 3,633.065 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 13.98' @ 61.66 hrs Surf.Area= 2,000 sf Storage= 19,970 cf (11,010 cf above start)

Plug-Flow detention time= 0.4 min calculated for 3,632.858 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (3,949.2 - 3,949.1)

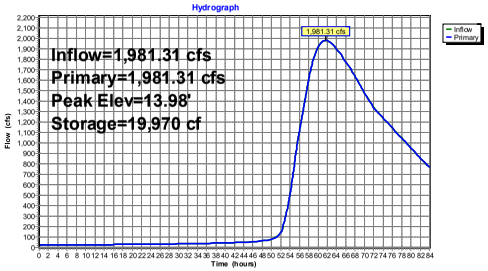
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	8.00'	**DS Weir, C= 2.60** Offset (feet) 0.00 0.00 23.00 23.00 Elev. (feet) 17.00 10.00 8.00 17.00
#2	Primary	8.00'	**27.0' long x 1.5' breadth El 8 Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.62 2.64 2.64 2.68 2.75 2.86 2.92 3.07 3.07 3.03 3.28 3.32

Primary OutFlow Max=1,981.31 cfs @ 61.66 hrs HW=13.98' (Free Discharge)
└**1=DS Weir** (Weir Controls 668.88 cfs @ 4.86 fps)
└**2=El 8 Weir** (Weir Controls 1,312.42 cfs @ 8.12 fps)

Pond 16.3: Downstream Weir



Summary for Pond 17B: Proposed Bridge

Inflow = 1,981.31 cfs @ 61.65 hrs, Volume= 3,633.339 af
Outflow = 1,981.31 cfs @ 61.66 hrs, Volume= 3,633.196 af, Atten= 0%, Lag= 0.1 min
Primary = 1,981.31 cfs @ 61.66 hrs, Volume= 3,633.196 af
Routed to Pond 16.3 : Downstream Weir

Routing by Dyn-Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs
Starting Elev= 8.48' Surf.Area= 2,000 sf Storage= 8,960 cf
Peak Elev= 14.82' @ 61.66 hrs Surf.Area= 2,000 sf Storage= 21,632 cf (12,672 cf above start)

Plug-Flow detention time= 0.4 min calculated for 3,632.990 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (3,949.1 - 3,949.1)

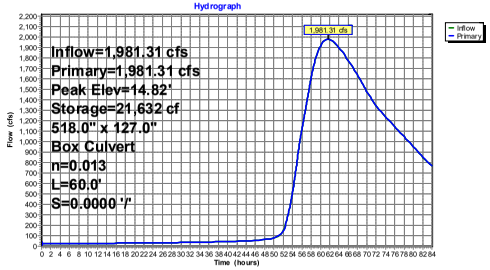
Volume	Invert	Avail.Storage	Storage Description
#1	4.00'	52,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.00	2,000	0	0
30.00	2,000	52,000	52,000

Device	Routing	Invert	Outlet Devices
#1	Primary	4.00'	**518.0" W x 127.0" H Box Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 4.00' / 4.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 456.85 sf

Primary OutFlow Max=1,981.31 cfs @ 61.66 hrs HW=14.82' TW=13.98' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1,981.31 cfs @ 4.34 fps)

Pond 17B: Proposed Bridge

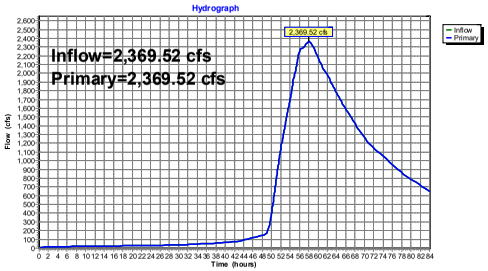


Summary for Link 23L: Inflow

Inflow = 2,369.52 cfs @ 58.06 hrs, Volume= 4,129.405 af
Primary = 2,369.52 cfs @ 58.06 hrs, Volume= 4,129.405 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 16.1 : Mill Pond Dam -PC

Primary outflow = Inflow, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link 23L: Inflow

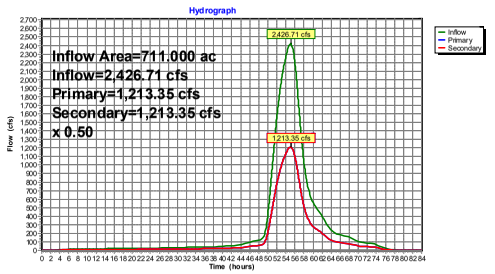


Summary for Link A1: 1/2 Flow

Inflow Area = 711.000 ac, 33.99% Impervious, Inflow Depth = 28.21" for PMP72hour event
Inflow = 2,426.71 cfs @ 55.05 hrs, Volume= 1,671.571 af
Primary = 1,213.35 cfs @ 55.05 hrs, Volume= 835.785 af, Atten= 50%, Lag= 0.0 min
Secondary = 1,213.35 cfs @ 55.05 hrs, Volume= 835.785 af
Routed to Pond 1P : Halfway Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link A1: 1/2 Flow



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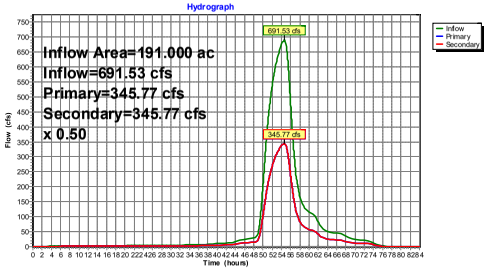
Summary for Link B1: 1/2 Flow

Inflow Area = 191.000 ac, 18.54% Impervious, Inflow Depth = 27.28" for PMP72hour event
Inflow = 691.53 cfs @ 54.66 hrs, Volume= 434.241 af
Primary = 345.77 cfs @ 54.66 hrs, Volume= 217.121 af, Atten= 50%, Lag= 0.0 min
Secondary = 345.77 cfs @ 54.66 hrs, Volume= 217.121 af
Routed to Pond 2P : Kennard Res

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link B1: 1/2 Flow

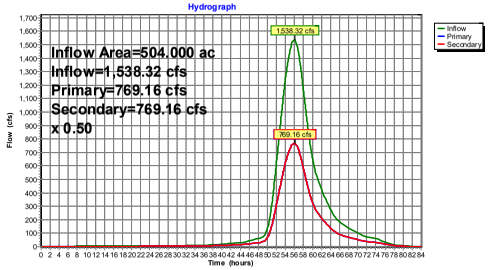


Summary for Link C1: 1/2 Flow

Inflow Area = 504.000 ac, 10.54% Impervious, Inflow Depth > 27.30" for PMP72hour event
Inflow = 1,538.32 cfs @ 56.13 hrs, Volume= 1,146.691 af
Primary = 769.16 cfs @ 56.13 hrs, Volume= 573.345 af, Atten= 50%, Lag= 0.0 min
Secondary = 769.16 cfs @ 56.13 hrs, Volume= 573.345 af
Routed to Pond 4P : Bessey Bog Res - 2.4sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link C1: 1/2 Flow

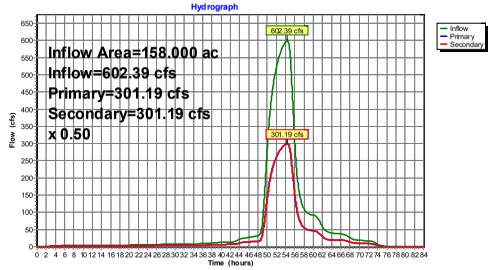


Summary for Link D1: 1/2 Flow

Inflow Area = 158.000 ac, 31.94% Impervious, Inflow Depth = 29.19" for PMP72hour event
Inflow = 602.39 cfs @ 54.36 hrs, Volume= 384.327 af
Primary = 301.19 cfs @ 54.36 hrs, Volume= 192.163 af, Atten= 50%, Lag= 0.0 min
Secondary = 301.19 cfs @ 54.36 hrs, Volume= 192.163 af
Routed to Pond 3P : Fawn Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link D1: 1/2 Flow

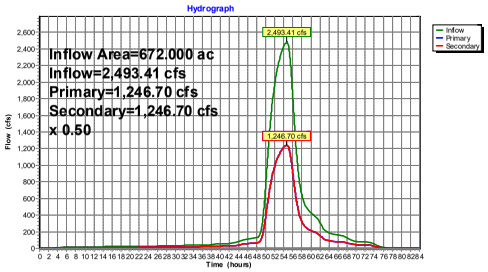


Summary for Link E1: 1/2 Flow

Inflow Area = 672.000 ac, 35.91% Impervious, Inflow Depth = 29.46" for PMP72hour event
Inflow = 2,493.41 cfs @ 54.71 hrs, Volume= 1,649.777 af
Primary = 1,246.70 cfs @ 54.71 hrs, Volume= 824.889 af, Atten= 50%, Lag= 0.0 min
Secondary = 1,246.70 cfs @ 54.71 hrs, Volume= 824.889 af
Routed to Pond 5P : Glen Charlie Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link E1: 1/2 Flow

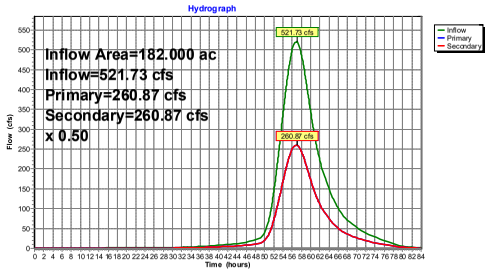


Summary for Link F1: 1/2 Flow

Inflow Area = 182.000 ac, 6.11% Impervious, Inflow Depth > 28.86" for PMP72hour event
Inflow = 521.73 cfs @ 57.03 hrs, Volume= 437.759 af
Primary = 260.87 cfs @ 57.03 hrs, Volume= 218.880 af, Atten= 50%, Lag= 0.0 min
Secondary = 260.87 cfs @ 57.03 hrs, Volume= 218.880 af
Routed to Pond 6.2P : Maple Sping Bogs US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link F1: 1/2 Flow

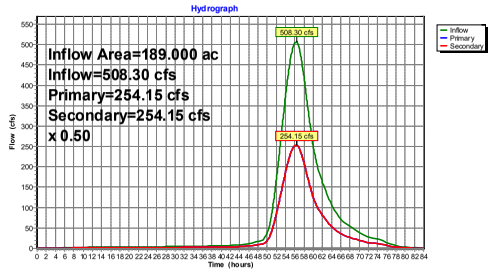


Summary for Link G1: 1/2 Flow

Inflow Area = 189.000 ac, 19.09% Impervious, Inflow Depth > 24.95" for PMP72hour event
Inflow = 508.30 cfs @ 56.40 hrs, Volume= 392.919 af
Primary = 254.15 cfs @ 56.40 hrs, Volume= 196.460 af, Atten= 50%, Lag= 0.0 min
Secondary = 254.15 cfs @ 56.40 hrs, Volume= 196.460 af
Routed to Pond 7P : Little Five Mile Pond

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link G1: 1/2 Flow



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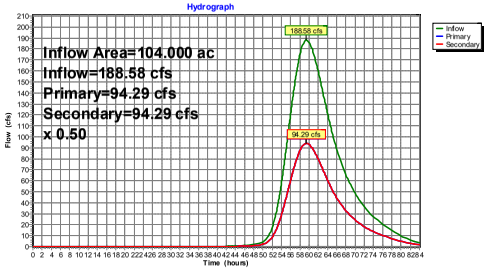
Summary for Link H1: 1/2 Flow

Inflow Area = 104.000 ac, 1.27% Impervious, Inflow Depth > 22.29" for PMP72hour event
Inflow = 188.58 cfs @ 59.37 hrs, Volume= 193.195 af
Primary = 94.29 cfs @ 59.37 hrs, Volume= 96.597 af, Atten= 50%, Lag= 0.0 min
Secondary = 94.29 cfs @ 59.37 hrs, Volume= 96.597 af
Routed to Pond 9P : Kettle Hole

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link H1: 1/2 Flow

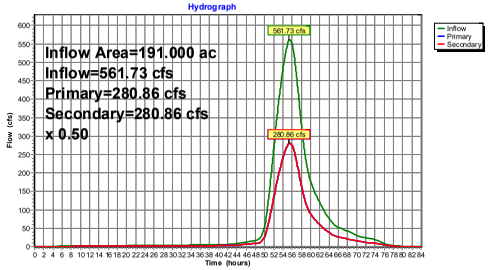


Summary for Link I1: 1/2 Flow

Inflow Area = 191.000 ac, 15.34% Impervious, Inflow Depth > 24.31" for PMP72hour event
Inflow = 561.73 cfs @ 55.38 hrs, Volume= 386.870 af
Primary = 280.86 cfs @ 55.38 hrs, Volume= 193.435 af, Atten= 50%, Lag= 0.0 min
Secondary = 280.86 cfs @ 55.38 hrs, Volume= 193.435 af
Routed to Pond 10P : Maple Springs Brook Dam - 0.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link I1: 1/2 Flow

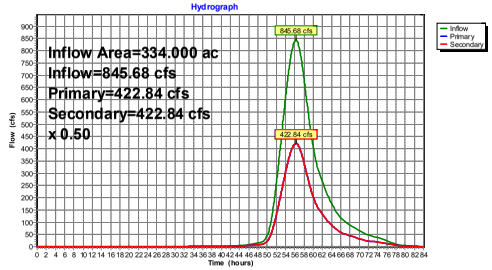


Summary for Link JL: 1/2 Flow

Inflow Area = 334.000 ac, 2.83% Impervious, Inflow Depth > 22.15" for PMP72hour event
Inflow = 845.68 cfs @ 56.27 hrs, Volume= 616.506 af
Primary = 422.84 cfs @ 56.27 hrs, Volume= 308.253 af, Atten= 50%, Lag= 0.0 min
Secondary = 422.84 cfs @ 56.27 hrs, Volume= 308.253 af
Routed to Pond 12P : Maple Springs Road Dam

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link JL: 1/2 Flow

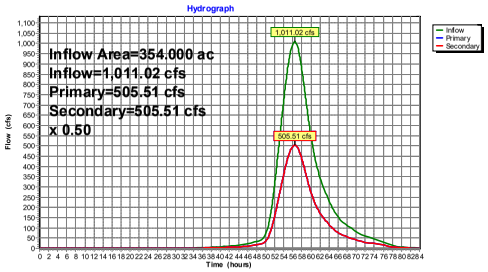


Summary for Link KL: 1/2 Flow

Inflow Area = 354.000 ac, 0.83% Impervious, Inflow Depth > 26.45" for PMP72hour event
Inflow = 1,011.02 cfs @ 56.38 hrs, Volume= 780.185 af
Primary = 505.51 cfs @ 56.38 hrs, Volume= 390.093 af, Atten= 50%, Lag= 0.0 min
Secondary = 505.51 cfs @ 56.38 hrs, Volume= 390.093 af
Routed to Pond 11P : Unnamed Road - 1.8sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link KL: 1/2 Flow

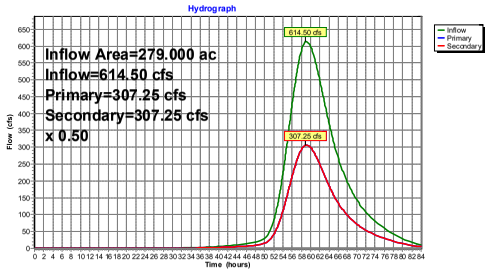


Summary for Link LL: 1/2 Flow

Inflow Area = 279.000 ac, 2.43% Impervious, Inflow Depth > 27.29" for PMP72hour event
Inflow = 614.50 cfs @ 58.87 hrs, Volume= 634.520 af
Primary = 307.25 cfs @ 58.87 hrs, Volume= 317.260 af, Atten= 50%, Lag= 0.0 min
Secondary = 307.25 cfs @ 58.87 hrs, Volume= 317.260 af
Routed to Pond 13.1P : Bogs_L_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link LL: 1/2 Flow

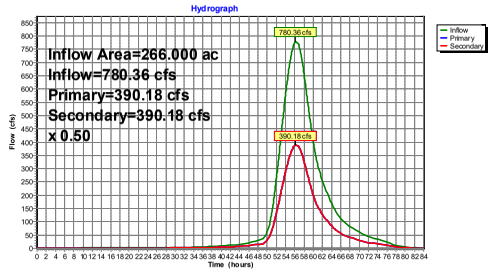


Summary for Link ML: 1/2 Flow

Inflow Area = 266.000 ac, 8.14% Impervious, Inflow Depth > 27.36" for PMP72hour event
Inflow = 780.36 cfs @ 56.11 hrs, Volume= 606.555 af
Primary = 390.18 cfs @ 56.11 hrs, Volume= 303.278 af, Atten= 50%, Lag= 0.0 min
Secondary = 390.18 cfs @ 56.11 hrs, Volume= 303.278 af
Routed to Pond 14P : Bogs_M - 2.7sm

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link ML: 1/2 Flow



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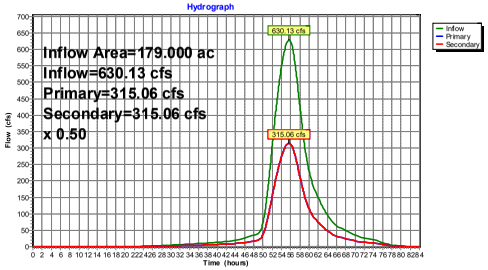
Summary for Link NL: 1/2 Flow

Inflow Area = 179.000 ac, 3.17% Impervious, Inflow Depth > 31.30" for PMP72hour event
Inflow = 630.13 cfs @ 55.67 hrs, Volume= 466.852 af
Primary = 315.06 cfs @ 55.67 hrs, Volume= 233.426 af, Atten= 50%, Lag= 0.0 min
Secondary = 315.06 cfs @ 55.67 hrs, Volume= 233.426 af
Routed to Pond 15.1P : Bogs_N_US

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link NL: 1/2 Flow

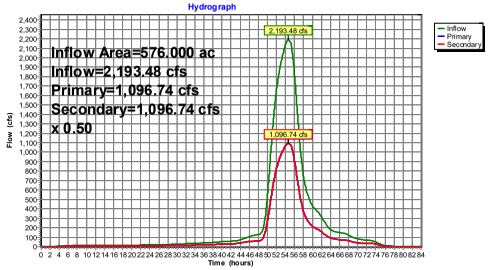


Summary for Link OL: 1/2 Flow

Inflow Area = 576.000 ac, 31.10% Impervious, Inflow Depth = 31.30" for PMP72hour event
Inflow = 2,193.48 cfs @ 54.70 hrs, Volume= 1,502.185 af
Primary = 1,096.74 cfs @ 54.70 hrs, Volume= 751.092 af, Atten= 50%, Lag= 0.0 min
Secondary = 1,096.74 cfs @ 54.70 hrs, Volume= 751.092 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link OL: 1/2 Flow

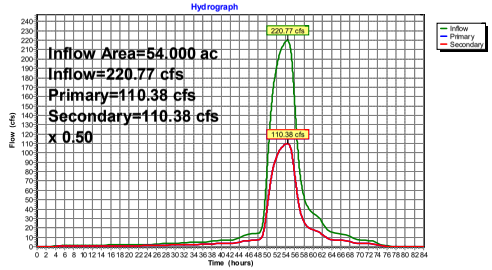


Summary for Link PL: 1/2 Flow

Inflow Area = 54.000 ac, 38.05% Impervious, Inflow Depth = 33.67" for PMP72hour event
Inflow = 220.77 cfs @ 54.46 hrs, Volume= 151.529 af
Primary = 110.38 cfs @ 54.46 hrs, Volume= 75.765 af, Atten= 50%, Lag= 0.0 min
Secondary = 110.38 cfs @ 54.46 hrs, Volume= 75.765 af
Routed to Link 23L : Inflow

Primary outflow = Inflow x 0.50, Time Span= 0.00-84.00 hrs, dt= 0.0010 hrs

Link PL: 1/2 Flow



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APPENDIX D
Wildlife Passage Design Report

Cranberry Highway (Route 28)/Mill Pond Dam over the Agawam River
Wareham, Massachusetts

WILDLIFE PASSAGE DESIGN REPORT

PROJECT No. 606352

Reconstruction of Mill Pond Dam MA00027
Route 6WB/28NB (Cranberry Highway)
Wareham, MA

Pare Project No. 22147.02

Prepared for:

Massachusetts Department of Transportation
10 Park Plaza
Boston, MA 02116

Prepared by:

PARE CORPORATION
8 Blackstone Valley Place
Lincoln, RI 02865

December 2024

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1.0 Project Purpose

As part of the reconstruction of Wareham Mill Pond Dam, Pare Corporation has been tasked with designing a replacement fish ladder that would improve the migration of several target anadromous species of marine life. During preliminary design, Pare coordinated with the Division of Marine Fisheries to determine a suitable fish ladder type to replace the existing fish ladder which is inefficient due to the limited flow range and areas susceptible to predation. The design was based on the latest guidelines available from the National Oceanic and Atmospheric Administration (NOAA), the United States Geological Service (USGS), the U.S. Fish and Wildlife Service (USFWS), and the Massachusetts Division of Marine Fisheries (MADMF), along with coordination with Massachusetts Department of Transportation (MassDOT) – Highway Division Environmental Section, and MADMF for site specific information and requirements.

This report provides information on the alternative analysis of the fish ladder performed during conceptual design, the parameters assumed based on the target species identified by MADMF, and summarizes the output data from the hydraulic analysis of the proposed passage. Based on the analysis, the geometry of the passage was designed to accommodate a range of flows and velocities so that the various target species can effectively journey from the Agawam River and into Mill Pond upstream.

2.0 DESCRIPTION OF EXISTING SITE CONDITIONS

2.1 Description of Existing Structure

Mill Pond Dam is located in Wareham, Massachusetts where the Cranberry Highway (Route 6/28) crosses the Agawam River. The resulting impoundment to the north of the dam is Agawam Mill Pond. Mill Pond Dam is a 16.5' high, 285' long earth fill embankment structure carrying U.S. Route 6 westbound and State Route 28 northbound, over the Agawam River. The dam consists of five major elements: a fish way, a primary spillway, secondary spillway, an outlet pipe, and the earth embankment. This 285' long, 16.5' high dam with a reported maximum storage capacity of 1,768 acre-feet is a Large size, Class I (High) hazard potential structure as classified by 302CMR10. An approximately 6' wide by 300' long earthen dike containing a natural bottom fish way extends Northward from the east side of the dam along the length of the dike.

Migrating fish travel upstream from the Agawam River to the fish way upstream through a fish ladder located at the base of the dam's primary spillway. The existing fish ladder is an Alaskan Steeppass type; a baffle fish ladder that is prefabricated and modular. This type of ladder is typically used in retrofits, where the lift elevation must fit within the space available which causes these type of fish ladders to be narrower and steeper. Due to its slope, the operating flow range is limited. At this location there are a combination of issues that further limit the capacity of the ladder. The configuration of the underground weir and pool fishway and transition from the steeppass make it difficult for fish to pass between the two sections. Secondly, flows from the main and auxiliary spillways can be a significant false attraction leading fish away from the fishway entrance, tiring them enough to be unable to make the rest of the journey, and making them more susceptible to predation.

2.2 Description of Cultural Resource Areas Affecting the Site

2.2.1 Historic and Archaeological Considerations

The primary cultural resource concern is the herring run along the Agawam River. The run is a popular tourist attraction and has been in operation since 1632. This must be maintained during the construction periods that coincide with migration activity. The proposed fish ladder will likely need to be operational before the existing fish ladder can be decommissioned. A concrete pad will be included in the design of the proposed fish ladder to allow harvesting of the herring by the Town. The flow would be diverted from the fish ladder onto the harvesting pad by using adjustable weirs and/or stoplogs. The harvesting pad design will also allow fish that are not chosen for harvesting to enter back into the fish ladder stream.

According to the April 2015 archaeological reconnaissance and site assessment report prepared by Archaeological and historical Services, Inc., the upstream fishway and fish ladder should be considered historically significant, in the opinion of the report authors. Care should be taken to preserve any possible historic elements and to closely match the aesthetics of the existing structures. Based on coordination with environmental and historical agencies during design several solutions were discussed to preserve the historical elements and provide a context sensitive design that suits the nature of the project area. It was agreed that by repairing the stone walls, although labor intensive, the open portion of the dike would be the most appropriate way to preserve the cultural resource. The portion under the roadway and in the downstream area will be preserved to the maximum extent practicable with repair and rehabilitation likely for certain areas, mostly anticipated under the roadway. Some portions in the downstream area will

have to be removed to accommodate the proposed fish ladder, but the materials could be repurposed elsewhere on the site.

3.0 ALTERNATIVES ANALYSIS

The proposed fish ladder will be located in the downstream area between what are now the existing auxiliary and primary spillways. The fish ladder entrance would be located downstream of the proposed bridge and will turn back to fit the steps in elevation required to transport marine species from the river to the pond. The final portion of the fish ladder would travel under the bridge along the east abutment before exiting into the impoundment, east of the proposed spillway.

The following provides a brief summary of the design options explored for the proposed fish ladder. The Pool and Weir fish ladder was selected after close coordination with MADMF to choose the most beneficial fish ladder for the marine life in the Agawam River and Mill Pond.

Alternative 1 – Denil Ladder

This type of fish ladder is a rectangular chute with baffles extending from the bottom and sides. It is most commonly used in small streams, especially in the Northeast. Due to the highly turbulent nature of Denil Fish Ladders, they provide good attraction flows, but resting pools are usually required. MADMF believes this design would suit the migratory patterns of the marine wildlife that travel in the Agawam River.

Alternative 2 – Alaskan Steeppass

This type of baffle fish ladder is a prefabricated, modular version of the Denil Ladder. It is narrower, steeper, and has a more complex baffle configuration than the Denil Ladder. Due to its slope, the operating flow range is limited. This type of ladder is typically used in retrofits, where the lift elevation must fit within the space available. This type is currently in use at Mill Pond Dam and due to the transitions for the different sections of the fish way and significant false attractions from the spillways, this type of spillway is inefficient for the types of anadromous species in the Agawam River.

Alternative 3 – Pool and Weir

This type of fish ladder includes pools separated by weirs that step up at each pool to achieve the elevation required form the entrance to the exit of the fish ladder. The ladder is designed by creating flow conditions that allow each pool to be used by the fish to recover from the energy demand required to swim through the weirs. These ladders can be designed to have a more natural appearance by designing them into the landscape using the existing stone masonry walls that will be removed as part of the spillway replacement. Due to the popularity of the herring run at this location, this option would be the most aesthetically pleasing option. This type of fish ladder has been used effectively in other communities around New England for fish passage.

Alternative 4 – Rehabilitation of the Existing Fish Ladder

This option involves complete rehabilitation and reconstruction of the existing stone masonry fish ladder, including the open and underground segments of the fishway. According to MADMF population counts of the fish ladder, this ladder is not as efficient as other alternatives. It would also be the most

expensive alternative, as repairing the stone masonry walls, the constraints within the underground portions of the fish ladder, impacts to vegetated wetlands, and the length of the open portions on the upstream side of the dam are all labor intensive.

The recommended alternative based on coordination with MADMF is the Pool and Weir fish ladder due to its effectiveness at other locations in New England for similar species and the aesthetics of this type of fish ladder. The herring run is a popular destination during the spring months and this fish ladder will provide a better viewing experience for visitors and will more closely match the natural aesthetics of the location.

4.0 TARGET SPECIES & DESIGN PARAMETERS

Based on coordination with MADMF, the species that are targeted for the design of the fish ladder are river herring (alewife and blueback herring), American shad, American eel, and white perch. Pare primarily used the design parameters in the "Nature-like Fishway Passage Design Guidelines for Atlantic Coast Diadromous Fishes" from May 2016, released jointly by NOAA, USGS, and USFWS. Pare reviewed the parameters of each species and determined the target flow velocities and pool geometry that would satisfy the requirements of all species, providing the greatest chance of survival for each species. Below is a summary of the design parameters used for each target species from the guidelines.

4.1 River Herring

4.1.1 Blueback Herring

Min. Total Length (cm)	20
Max. Total Length (cm)	31
Body Depth/Total Length Ratio	0.252
Max. Body Depth (cm)	7.8
Min. Pool Width (ft)	5
Min. Pool Depth (ft)	2
Min. Pool Length (ft)	10
Min. Weir Width (ft)	2.25
Min. Weir Depth (ft)	1
Max. Weir Velocity (ft/s)	6
Max. Fishway Slope	1:20

4.1.2 Alewife

Min. Total Length (cm)	22
Max. Total Length (cm)	38
Body Depth/Total Length Ratio	0.223
Max. Body Depth (cm)	8.9
Min. Pool Width (ft)	5
Min. Pool Depth (ft)	2.25
Min. Pool Length (ft)	10
Min. Weir Width (ft)	2.5
Min. Weir Depth (ft)	1
Max. Weir Velocity (ft/s)	6
Max. Fishway Slope	1:20

In addition to the tables above, Pare used guidance for river herring from the MADMF Diadromous Fish Passage Guidelines from September 2020. This guidance generally closely matched the NOAA, USGS, and USFWS data with some more specific information related to low flow situations on the target weir velocities and geometry of the pools and weirs. Below is a summary of that data:

Min. Pool Depth (ft)	2
Min. Weir Width (ft)	0.5
Min. Weir Depth (ft)	0.5
Max. Weir Velocity (ft/s)	6.56
Fishway Elevation Change (ft)	0.5
Max. Fishway Slope	3%

4.2 American Shad

Min. Total Length (cm)	36
Max. Total Length (cm)	76
Body Depth/Total Length Ratio	0.292
Max. Body Depth (cm)	22.2
Min. Pool Width (ft)	20
Min. Pool Depth (ft)	4
Min. Pool Length (ft)	30
Min. Weir Width (ft)	5
Min. Weir Depth (ft)	2.25
Max. Weir Velocity (ft/s)	8.25
Max. Fishway Slope	1:30

The pool geometry recommendations for shad are significantly larger than that of river herring. The pool and weir geometry proposed is under the recommended minimums for shad due to site constraints but fall between the recommendations of river herring and shad to accommodate migration of both species as much as practicable. Based on coordination with MADMF during design, meeting the requirements of this species is not as high a priority for the agency than of herring and eel. Further

coordination with MADMF will continue through final design to determine if shad can be accommodated based on site constraints of the geometry.

4.3 American Eel

4.3.1 Length Less than 15 cm

Min. Total Length (cm)	5
Max. Total Length (cm)	15
Body Depth/Total Length Ratio	0.068
Max. Body Depth (cm)	1
Min. Pool Width (ft)	3
Min. Pool Depth (ft)	1.25
Min. Pool Length (ft)	5
Min. Weir Width (ft)	0.25
Min. Weir Depth (ft)	0.25
Max. Weir Velocity (ft/s)	0.75
Max. Fishway Slope	1:20

4.3.2 Length Greater than 15 cm

Min. Total Length (cm)	15
Max. Total Length (cm)	116
Body Depth/Total Length Ratio	0.068
Max. Body Depth (cm)	7.9
Min. Pool Width (ft)	6
Min. Pool Depth (ft)	2
Min. Pool Length (ft)	10
Min. Weir Width (ft)	0.75
Min. Weir Depth (ft)	1
Max. Weir Velocity (ft/s)	1
Max. Fishway Slope	1:20

4.4 White Perch

The guidelines used to find the parameters for the other species did not include White Perch. The same guidelines provide guidance for determining the design parameters for fish species where data is not available. Based on information found on the Maine Department of Inland Fisheries and Wildlife website, it was determined that the minimum total length to be used for the calculations would be 6" long and a maximum of 12" long. Where guidance did not give specific information on how to calculate the geometry Blueback Herring parameters were used due to the similar size of the species.

Min. Total Length (in)	6
Max. Total Length (in)	12
Body Depth/Total Length Ratio	0.25
Max. Body Depth (in)	3
Min. Pool Width (ft)	5
Min. Pool Depth (ft)	2
Min. Pool Length (ft)	10
Min. Weir Width (ft)	2
Min. Weir Depth (ft)	0.75
Max. Weir Velocity (ft/s)	5.0
Max. Fishway Slope	1:20

5.0 FISH LADDER DESIGN

Pare used HEC-RAS 6.3.1 to model the fish ladder and determine the velocities at each weir and water surface elevations in each pool for a given upstream pond elevation. Each pool and weir were entered into the program to accurately depict the locations and elevations shown in the plans. To promote migration over a range of flow conditions, the elevation of the fish ladder exit was adjusted to ensure an optimal weir velocity for the target species for the normal pool elevation as well as pond elevations slightly above or below normal pool.

5.1 Pool and Weir Geometry

Available fish ladder design guidance was used to determine the length, width, and depth of each pool and associated weir dimension. The chosen dimensions are within the minimum and maximum space recommendations ranges for each target species and were optimized based on the results of the hydraulic analysis.

The downstream portion of the fish ladder consists of rectangular concrete pools separated by rectangular weirs. The concrete will be faced with a stone veneer made from reused stone from the existing downstream masonry walls being demolished for the proposed bridge, spillway, and fish ladder construction. The fish ladder entrance will match into the existing downstream walls and will create the required attraction flow for the target fish species. Due to the tidal fluctuations in the river, the entrance was evaluated for the maximum and minimum tides to ensure that the entrance to the fish ladder will not have a significant head differential during either event. At higher tides, the first few weirs will be submerged, but the pools at the entrance were aligned so that the flow through he weirs will generally pass unimpeded to keep the attraction as high as possible. Although this will have an impact on migration, this condition is temporary, a few hours at most during the higher astronomical tides.

The fish ladder then continues under the bridge, along the front of the East Abutment and daylights on the upstream side of the bridge and exits to the pond east of the proposed spillway. This upper portion consists of rectangular concrete pools and weirs that will be cast against the other bridge, spillway, and low-level outlet components. At the fish ladder exit, an adjustable gate will be configured to allow adjustment to the invert elevation of the exit and control the flow based on variations in pond surface elevations.

In addition to pools and weirs to accommodate fish migration, a harvesting pad is proposed at the first turn in the fish ladder that allows water to flow into a separate pool area of shallower depth. Access is provided by walkways around the pool for users to reach into the pad and remove the fish. The harvesting pad pool will utilize stop logs which can be manually removed to open the area and replaced to close it.

6.0 EEL PASSAGE DESIGN

Due to the low velocities required for eel passage, Pare is proposing a separate eel passage built adjacent to the fish ladder to create a better environment to accommodate eel. Pare is proposing to utilize a laterally sloped eel ramp to allow eel to pass from the downstream channel to the pond upstream. This option provides a simple design that does not require adjustment of the upstream weir to control the velocity of the flow through the ramp or additional components such as pumps to wet the ramp and baskets to capture eel to be released into the pond.

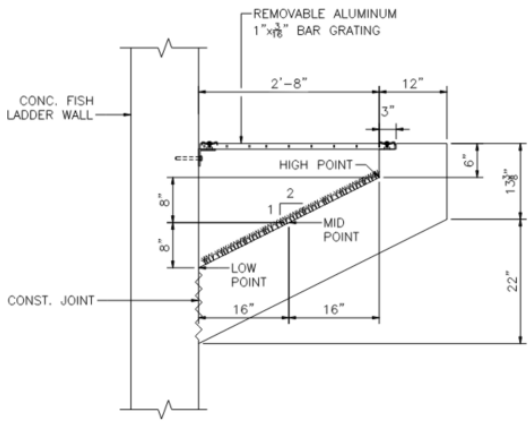

Figure 1- Eel Ramp Cross-Section

The ramp is lined with synthetic material to imitate grass that the eel can utilize to migrate up the ladder. The sloped channel allows the top few inches of the ramp, where the water velocity is lowest, to be utilized by the eel even as the pond level changes. This type of eel ramp is ideal for environments where the head water has minimal fluctuations, such as the case with Mill Pond which only fluctuates a few inches above or below normal pool. The ramp will be covered by an aluminum grate which will prevent predation and can be removed for maintenance of the ramp.

The ramp will be sloped at approximately 2:1 across the channel with the midpoint of the ramp exit set at the normal pool elevation of 14.3. The upper portion of the ramp will be level which will lower the velocity in the channel for the latter part of the journey up the fish way, then slope down the wall of the fish ladder approximately 6% to the top of the spillway slab apron on the downstream side of the dam where the eel will enter the ramp. The flow from the eel ramp will enter the river close to the entrance of the fish ladder to prevent a false attraction to another part of the downstream channel.

To direct eel to the ramp entrance, the end of the spillway apron will be covered with the synthetic grass along its vertical face across the whole channel. At the top of the vertical wall a 12-inch wide horizontal will overhang the vertical face to prevent eel from crawling up on top of the spillway slab and will continue towards the entrance of the eel ramp.

7.0 DOWNSTREAM PASSAGE

It is anticipated that downstream migration will be accommodated through the proposed spillway during normal and higher flow conditions, with the proposed fish ladder to be used during lower flow conditions. The proposed spillway has been designed with a fixed weir notch that directs flow on to a series of steps down to the spillway slab floor. The fish will enter through the main spillway notch into the top step of the spillway which will have a wall built on the edge to create a pool for downstream migrating fish to drop into and direct them to an opening in the wall of the fish ladder to allow them to travel downstream. The opening into the fish ladder will be 12-inches wide by 6" high and will be perched to allow the fish to drop into the fish ladder pool while preventing fish migrating upstream to enter the spillway pool.

The channel in the top step has been designed with a pool that will allow 48-inches of depth to prevent injuries to the fish. Likewise, the opening from the top spillway pool to the fish ladder pool will drop into a minimum 36-inch-deep pool. This arrangement should allow most fish to safely travel downstream without creating a secondary outlet in the downstream area which could act as a false attraction to fish migrating upstream in the Agawam River.

8.0 DESIGN SUMMARY

Utilizing the latest fish passage design guidance and coordination with MADMF, Pare is proposing to replace the existing Alaskan Steeppass fish ladder with a Pool and Weir fish ladder in combination with an eel ramp along an adjacent alignment. The new fish ladder has been designed to accommodate weir velocities and resting pools that will allow all target species of fish to effectively ascend the fish ladder for a range of pond water surface elevations. The proposed adjacent eel passage will utilize a laterally sloped channel to allow eel to migrate into Mill Pond by providing flow conditions more suitable for that species over the range of normal pond elevations. By providing separate passages with differing flow and geometric conditions, it is anticipated that this passage will allow the migration of the target species to grow into the future and continue the historic tradition of this herring run.

Further information on the hydraulic conditions is provided in a separate design memorandum with this design submission and will be incorporated into this report when the fish ladder design is finalized.

APPENDIX E
Control of Water Memo

Cranberry Highway (Route 28)/Mill Pond Dam over the Agawam River
Wareham, Massachusetts

Engineers | Scientists | Planners

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TEMPORARY WATER CONTROL MEASURES MEMORANDUM

Temporary water control for the proposed work at the Mill Pond (Route 28) Dam was analyzed using the H&H Model developed as part of the December 2021 Hydraulic Study Report completed for the proposed work. Based on the anticipated duration of work, the temporary water control is required to be designed to accommodate up to the 10-year storm event in accordance with the MassDOT Manual for the expected total work duration of 2-3 years. However, given that Mill Pond (Route 28) Dam is a **High** Hazard Structure, per the Office of Dam Safety requirements, the temporary water control may be required to be designed to accommodate up to the 100-year storm event. As such, the 100-year storm event was used for the purposes of evaluating control of water design.

Drawdown is not anticipated during the construction phase of this project. The impoundment will remain at the current pool elevation, El. 14.4. The control of water system anticipated for this project includes an upstream cofferdam, a downstream cofferdam to prevent tailwater backup into the work area, and utilizing the existing primary spillway and fish ladder systems to maintain the baseflows and accommodate storm flows. The auxiliary spillway will be closed for the construction of the proposed spillway. The following provides a general discussion of the upstream and downstream cofferdam.

1. ***Upstream Cofferdam:*** The cofferdam's minimum top elevation will be El. 17.5, which will provide 1.2 feet of freeboard during the 100-year storm event. With this minimum top elevation, the cofferdam is expected to retain up to 15 feet of water during the 100-year event (minimum pond bottom along cofferdam alignment is El. 2 - El. 3, the impoundment is at El. 16.3 during the 100-year event).

2. ***Downstream Cofferdam:*** The downstream cofferdam, as conceptually laid out, is approximately 150 feet in length and spans the width of the downstream channel. The cofferdam's minimum top elevation will be El. 10.0, which will provide 5.2 feet of freeboard from expected normal (every day) tailwater conditions as well as king tide and certain storm surge conditions. With this minimum top elevation, the cofferdam height will vary from less than 1 foot at either end to up to 10 feet at its highest point (minimum pond bottom along cofferdam alignment is El. 0).

   The following table provides a summary of the design data for the upstream and downstream cofferdams :

Table 1: Cofferdam Design Data

	Flood Frequency	Peak Inflow (cfs)	Peak Outflow (cfs)	WSE (ft)	Velocity (ft/s)	Freeboard (ft)	Minimum Top of Cofferdam Elevation (El. NAVD88)
US	100-year	468	155	16.3	N/A	1.2	17.5
DS	Tidal	N/A	N/A	4.8	N/A	5.2	10.0

3. ***Flood Contingency Plan:*** In addition to the control of water system and all of its components described in 1-2 above, the Contractor will also develop a flood contingency plan to be implemented in ***the*** event that a storm event that exceeds the capacity of the control of water system is forecast or occurs (greater than 100-year). This plan may include the following:
   i. Forecast monitoring, 24-hour monitoring of the site during the storm, collaborative communication between Contractor, Engineer, Owner, and Office of Dam Safety.

ii. Removal of stop logs at the primary spillway in advance of the forecast time in order to complete a pre-storm drawdown as well as provide additional capacity during the peak of the storm. Note, although such operations are not necessarily required for events less than or equal to the 100-year event, similar operations will be highly recommended to be incorporated within the Contractor's control of water / flood contingency plan during these events in efforts to limit the rise of the impoundment to the extent practical.

a. The table below provides the anticipated pool level with no operations of the stop logs (SL at El. 13.6) prior to or during the storm event.

Table 3: No Operation

Flood Frequency	Peak Inflow (cfs)	Peak Outflow (cfs)	WSE (ft)	Freeboard from the top of cofferdam (ft)
100-year	468	155	16.3	1.2
200-year	556	182	16.7	0.8
500-year	688	215	17.2	0.3
1000-year	799	238	17.6	-0.1
Negative values indicated cofferdam overtops				

b. The table below provides the anticipated pool level with 1 foot of stop logs removed (SL at El. 12.6) prior to the storm event. Note, as modeled, the operations occurred at the start of the storm, which implemented a negligible pre-storm drawdown (El. 14.4 to El. 14.3).

Table 4: 1-foot Stoplogs Removal

Flood Frequency	Peak Inflow (cfs)	Peak Outflow (cfs)	WSE (ft)	Freeboard from the top of cofferdam (ft)
100-year	468	186	15.8	1.7
200-year	556	215	16.2	1.3
500-year	688	257	16.7	0.8
1000-year	799	290	17.1	0.4

c. The table below provides the anticipated pool level with 2 feet of stop logs removed (SL at El. 11.6) prior to the storm event. Note, as modeled, the operations occurred at the start of the storm, which implemented a minimal pre-storm drawdown (El. 14.4 to El. 14.1).

Table 5: 2-foot Stoplogs Removal

Flood Frequency	Peak Inflow (cfs)	Peak Outflow (cfs)	WSE (ft)	Freeboard from the top of cofferdam (ft)
100-year	468	215	15.3	2.2
200-year	556	245	15.6	1.9
500-year	688	291	16.1	1.4
1000-year	799	328	16.5	1.0

d. The table below provides the anticipated pool level with 3-foot of stop logs removed (SL at El. 10.6) prior to the storm event. Note, as modeled, the operations occurred at the start of the storm, which implemented a minimal pre-storm drawdown (El. 14.4 to El. 13.6).

Table 6: 3-foot Stoplogs Removal

Flood Frequency	Peak Inflow (cfs)	Peak Outflow (cfs)	WSE (ft)	Freeboard from the top of cofferdam (ft)
100-year	468	240	14.6	2.9
200-year	556	277	15.0	2.5
500-year	688	325	15.4	2.1
1000-year	799	365	15.8	1.7

iii. Mobilization and installation of large capacity pumps to increase discharge capacity of the water diversion system, as needed.

iv. Stabilization of damage prone areas of the work through riprap installation or other means, as needed.

v. Modifications / improvements to cofferdam systems to allow them to accommodate the higher storm without failing due to overtopping, as needed.

vi. Implementation of dam's Emergency Action Plan if deemed necessary/warranted by the project team, closure of the road, and removal of all equipment and loose materials from the area to allow the storm to pass.

WILDLIFE PASSAGE DESIGN REPORT

PROJECT No. 606352

Reconstruction of Mill Pond Dam MA00027
Route 6WB/28NB (Cranberry Highway)
Wareham, MA

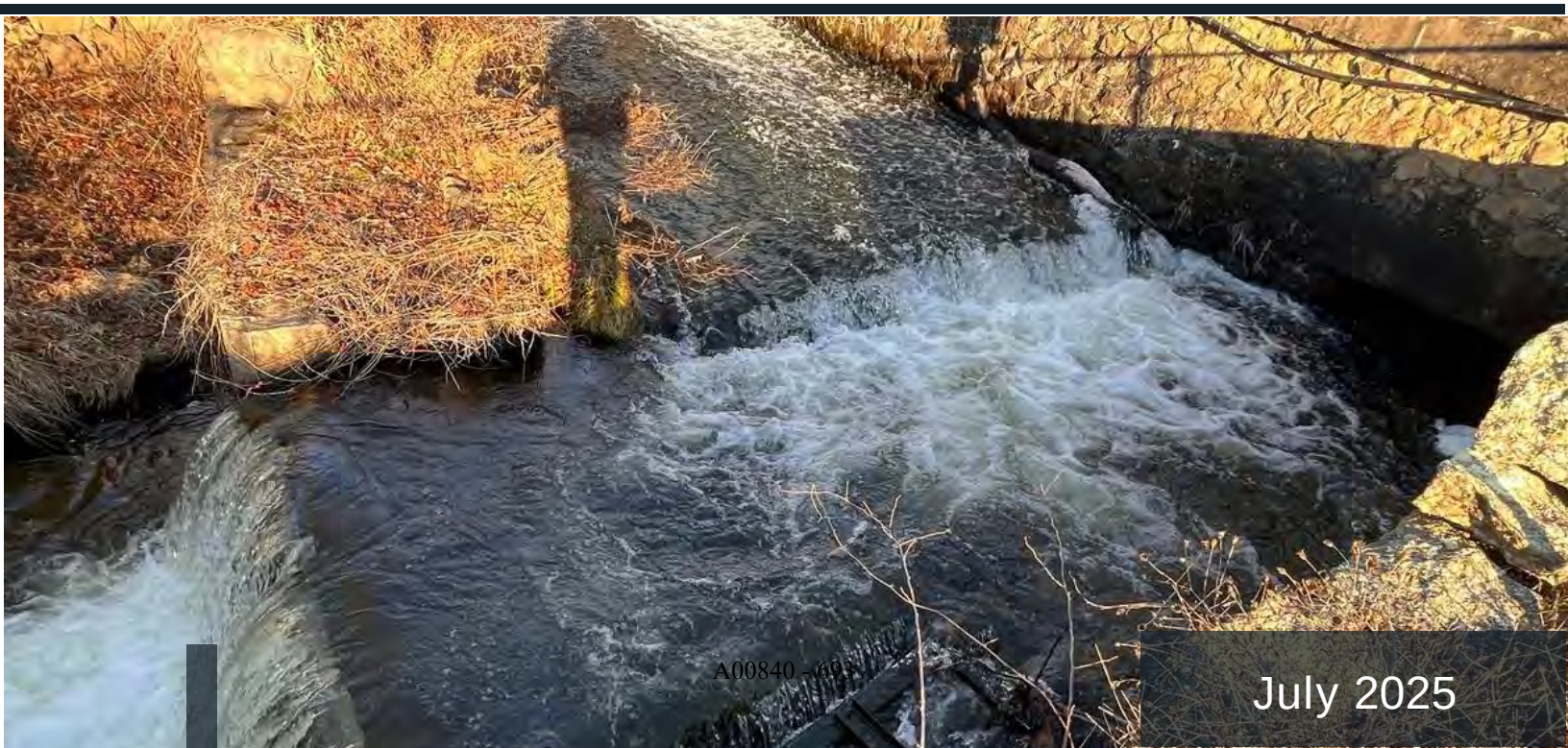
Pare Project No. 22147.02

Prepared for:

Massachusetts Department of Transportation
10 Park Plaza
Boston, MA 02116

Prepared by:

PARE CORPORATION
8 Blackstone Valley Place
Lincoln, RI 02865



July 2025

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1.0 PROJECT PURPOSE

As part of the reconstruction of Wareham Mill Pond Dam, Pare Corporation has been tasked with designing a replacement fish ladder that would improve the migration of several target anadromous species of marine life. During preliminary design, Pare coordinated with the Division of Marine Fisheries to determine a suitable fish ladder type to replace the existing fish ladder which is inefficient due to the limited flow range and areas susceptible to predation. The design was based on the latest guidelines available from the National Oceanic and Atmospheric Administration (NOAA), the United States Geological Service (USGS), the U.S. Fish and Wildlife Service (USFWS), and the Massachusetts Division of Marine Fisheries (MADMF), along with coordination with Massachusetts Department of Transportation (MassDOT) – Highway Division Environmental Section, and MADMF for site specific information and requirements.

This report provides information on the alternative analysis of the fish ladder performed during conceptual design, the parameters assumed based on the target species identified by MADMF, and summarizes the output data from the hydraulic analysis of the proposed passage. Based on the analysis, the geometry of the passage was designed to accommodate a range of flows and velocities so that the various target species can effectively journey from the Agawam River and into Mill Pond upstream.

2.0 DESCRIPTION OF EXISTING SITE CONDITIONS

2.1 Description of Existing Structure

Mill Pond Dam is located in Wareham, Massachusetts where the Cranberry Highway (Route 6/28) crosses the Agawam River. The resulting impoundment to the north of the dam is Agawam Mill Pond. Mill Pond Dam is a 16.5' high, 285' long earth fill embankment structure carrying U.S. Route 6 westbound and State Route 28 northbound, over the Agawam River. The dam consists of five major elements: a fish way, a primary spillway, secondary spillway, an outlet pipe, and the earth embankment. This 285' long, 16.5' high dam with a reported maximum storage capacity of 1,768 acre-feet is a Large size, Class I (High) hazard potential structure as classified by 302CMR10. An approximately 6' wide by 300' long earthen dike containing a natural bottom fish way extends Northward from the east side of the dam along the length of the dike.

Migrating fish travel upstream from the Agawam River to the fish way upstream through a fish ladder located at the base of the dam's primary spillway. The existing fish ladder is an Alaskan Steeppass type; a baffle fish ladder that is prefabricated and modular. This type of ladder is typically used in retrofits, where the lift elevation must fit within the space available which causes these type of fish ladders to be narrower and steeper. Due to its slope, the operating flow range is limited. At this location there are a combination of issues that further limit the capacity of the ladder. The configuration of the underground weir and pool fishway and transition from the steeppass make it difficult for fish to pass between the two sections. Secondly, flows from the main and auxiliary spillways can be a significant false attraction leading fish away from the fishway entrance, tiring them enough to be unable to make the rest of the journey, and making them more susceptible to predation.

The existing dam is shown in the following image. The existing fish ladder and fish way are highlighted in blue. The fish ladder entrance is close to the store house to the south of the site. Adult fish migrate upstream during the spring to spawn in Mill Pond and other bodies of water attached to it. Downstream migration of the juveniles and post spawn adults can be accommodated through the same fish ladder and fish way that allow upstream migration but can also reach the Agawam River via the auxiliary or main spillways.

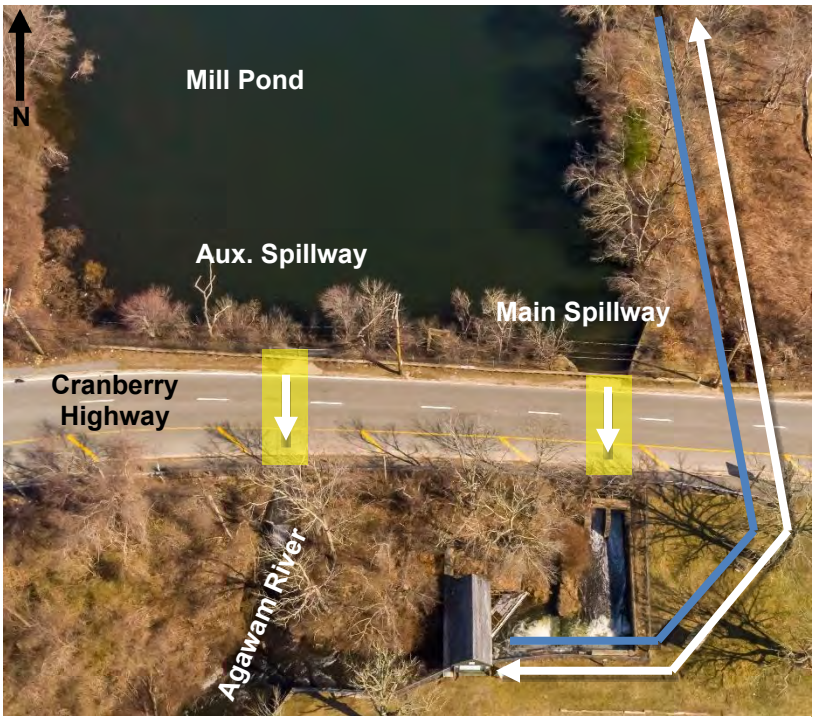

Figure 1 - Existing Conditions of Mill Pond Dam

2.2 Description of Cultural Resource Areas Affecting the Site

2.2.1 Historic and Archaeological Considerations

The primary cultural resource concern is the herring run along the Agawam River. The run is a popular tourist attraction and has been in operation since 1632. This must be maintained during the construction periods that coincide with migration activity. The proposed fish ladder will likely need to be operational before the existing fish ladder can be decommissioned. A concrete pad will be included in the design of the proposed fish ladder to allow harvesting of the herring by the Town. The flow would be diverted from the fish ladder onto the harvesting pad by using adjustable weirs and/or stoplogs. The harvesting pad design will also allow fish that are not chosen for harvesting to enter back into the fish ladder stream.

According to the April 2015 archaeological reconnaissance and site assessment report prepared by Archaeological and historical Services, Inc., the upstream fishway and fish ladder should be considered historically significant, in the opinion of the report authors. Care should be taken to preserve any possible historic elements and to closely match the aesthetics of the existing structures. Based on coordination with environmental and historical agencies during design several solutions were discussed to preserve the historical elements and provide a context sensitive design that suits the nature of the project area. It was agreed that by repairing the stone walls, although labor intensive, the open portion of the dike would be the most appropriate way to preserve the cultural resource. The portion under the roadway and in the downstream area will be preserved to the maximum extent practicable with repair and rehabilitation likely for certain areas, mostly anticipated under the roadway. Some portions in the downstream area will have to be removed to accommodate the proposed fish ladder, but the materials could be repurposed elsewhere on the site.

3.0 ALTERNATIVES ANALYSIS

The proposed fish ladder will be located in the downstream area between what are now the existing auxiliary and primary spillways. The fish ladder entrance would be located downstream of the proposed bridge and will turn back to fit the steps in elevation required to transport marine species from the river to the pond. The final portion of the fish ladder would travel under the bridge along the east abutment before exiting into the impoundment, east of the proposed spillway.

The following provides a brief summary of the design options explored for the proposed fish ladder. The Pool and Weir fish ladder was selected after close coordination with MADMF to choose the most beneficial fish ladder for the marine life in the Agawam River and Mill Pond.

Alternative 1 – Denil Ladder

This type of fish ladder is a rectangular chute with baffles extending from the bottom and sides. It is most commonly used in small streams, especially in the Northeast. Due to the highly turbulent nature of Denil Fish Ladders, they provide good attraction flows, but resting pools are usually required. MADMF believes this design would suit the migratory patterns of the marine wildlife that travel in the Agawam River.

Alternative 2 – Alaskan Steeppass

This type of baffle fish ladder is a prefabricated, modular version of the Denil Ladder. It is narrower, steeper, and has a more complex baffle configuration than the Denil Ladder. Due to its slope, the operating flow range is limited. This type of ladder is typically used in retrofits, where the lift elevation must fit within the space available. This type is currently in use at Mill Pond Dam and due to the transitions for the different sections of the fish way and significant false attractions from the spillways, this type of spillway is inefficient for the types of anadromous species in the Agawam River.

Alternative 3 – Pool and Weir

This type of fish ladder includes pools separated by weirs that step up at each pool to achieve the elevation required form the entrance to the exit of the fish ladder. The ladder is designed by creating flow conditions that allow each pool to be used by the fish to recover from the energy demand required to swim through the weirs. These ladders can be designed to have a more natural appearance by designing them into the landscape using the existing stone masonry walls that will be removed as part of the spillway replacement. Due to the popularity of the herring run at this location, this option would be the most aesthetically pleasing option. This type of fish ladder has been used effectively in other communities around New England for fish passage.

Alternative 4 – Rehabilitation of the Existing Fish Ladder

This option involves complete rehabilitation and reconstruction of the existing stone masonry fish ladder, including the open and underground segments of the fishway. According to MADMF population counts of the fish ladder, this ladder is not as efficient as other alternatives. It would also be the most expensive alternative, as repairing the stone masonry walls, the constraints within the underground portions of the fish ladder, impacts to vegetated wetlands, and the length of the open portions on the upstream side of the dam are all labor intensive.

The recommended alternative based on coordination with MADMF is the Pool and Weir fish ladder due to its effectiveness at other locations in New England for similar species and the aesthetics of this type of fish ladder. The herring run is a popular destination during the spring months and this fish ladder will provide a better viewing experience for visitors and will more closely match the natural aesthetics of the location.

4.0 TARGET SPECIES & DESIGN PARAMETERS

Based on coordination with MADMF, the species that are targeted for the design of the fish ladder are river herring (alewife and blueback herring), American shad, American eel, and white perch. Pare primarily used the design parameters in the "Nature-like Fishway Passage Design Guidelines for Atlantic Coast Diadromous Fishes" from May 2016, released jointly by NOAA, USGS, and USFWS. Pare reviewed the parameters of each species and determined the target flow velocities and pool geometry that would satisfy the requirements of all species, providing the greatest chance of survival for each species. Below is a summary of the design parameters used for each target species from the guidelines.

4.1 River Herring

4.1.1 Blueback Herring

Min. Total Length (cm)	20
Max. Total Length (cm)	31
Body Depth/Total Length Ratio	0.252
Max. Body Depth (cm)	7.8
Min. Pool Width (ft)	5
Min. Pool Depth (ft)	2
Min. Pool Length (ft)	10
Min. Weir Width (ft)	2.25
Min. Weir Depth (ft)	1
Max. Weir Velocity (ft/s)	6
Max. Fishway Slope	1:20

4.1.2 Alewife

Min. Total Length (cm)	22
Max. Total Length (cm)	38
Body Depth/Total Length Ratio	0.223
Max. Body Depth (cm)	8.9
Min. Pool Width (ft)	5
Min. Pool Depth (ft)	2.25
Min. Pool Length (ft)	10
Min. Weir Width (ft)	2.5
Min. Weir Depth (ft)	1
Max. Weir Velocity (ft/s)	6
Max. Fishway Slope	1:20

In addition to the tables above, Pare used guidance for river herring from the MADMF Diadromous Fish Passage Guidelines from September 2020. This guidance generally closely matched the NOAA, USGS, and USFWS data with some more specific information related to low flow situations on the target weir velocities and geometry of the pools and weirs. Below is a summary of that data:

Min. Pool Depth (ft)	2
Min. Weir Width (ft)	0.5
Min. Weir Depth (ft)	0.5
Max. Weir Velocity (ft/s)	6.56
Fishway Elevation Change (ft)	0.5
Max. Fishway Slope	3%

4.2 American Shad

Min. Total Length (cm)	36
Max. Total Length (cm)	76
Body Depth/Total Length Ratio	0.292
Max. Body Depth (cm)	22.2
Min. Pool Width (ft)	20
Min. Pool Depth (ft)	4
Min. Pool Length (ft)	30
Min. Weir Width (ft)	5
Min. Weir Depth (ft)	2.25
Max. Weir Velocity (ft/s)	8.25
Max. Fishway Slope	1:30

The pool geometry recommendations for shad are significantly larger than that of river herring. The pool and weir geometry proposed is under the recommended minimums for shad due to site constraints but fall between the recommendations of river herring and shad to accommodate migration of both species as much as practicable. Based on coordination with MADMF during design, meeting the requirements of this species is not as high a priority for the agency than of herring and eel. Further coordination with MADMF will continue through final design to determine if shad can be accommodated based on site constraints of the geometry.

4.3 American Eel

4.3.1 Length Less than 15 cm

Min. Total Length (cm)	5
Max. Total Length (cm)	15
Body Depth/Total Length Ratio	0.068
Max. Body Depth (cm)	1
Min. Pool Width (ft)	3
Min. Pool Depth (ft)	1.25
Min. Pool Length (ft)	5
Min. Weir Width (ft)	0.25
Min. Weir Depth (ft)	0.25
Max. Weir Velocity (ft/s)	0.75
Max. Fishway Slope	1:20

4.3.2 Length Greater than 15 cm

Min. Total Length (cm)	15
Max. Total Length (cm)	116
Body Depth/Total Length Ratio	0.068
Max. Body Depth (cm)	7.9
Min. Pool Width (ft)	6
Min. Pool Depth (ft)	2
Min. Pool Length (ft)	10
Min. Weir Width (ft)	0.75
Min. Weir Depth (ft)	1
Max. Weir Velocity (ft/s)	1
Max. Fishway Slope	1:20

4.4 White Perch

The guidelines used to find the parameters for the other species did not include White Perch. The same guidelines provide guidance for determining the design parameters for fish species where data is not available. Based on information found on the Maine Department of Inland Fisheries and Wildlife website, it was determined that the minimum total length to be used for the calculations would be 6” long and a maximum of 12” long. Where guidance did not give specific information on how to calculate the geometry Blueback Herring parameters were used due to the similar size of the species.

Min. Total Length (in)	6
Max. Total Length (in)	12
Body Depth/Total Length Ratio	0.25
Max. Body Depth (in)	3
Min. Pool Width (ft)	5
Min. Pool Depth (ft)	2
Min. Pool Length (ft)	10
Min. Weir Width (ft)	2
Min. Weir Depth (ft)	0.75
Max. Weir Velocity (ft/s)	5.0
Max. Fishway Slope	1:20

5.0 FISH LADDER DESIGN

5.1 Functionality of Proposed Fish Ladder

5.1.1 Upstream Migration

The intent of the design is to provide a fish ladder starting at the base of the proposed spillway apron that will allow adult fish migrating upstream access to spawn in Mill Pond or other areas further inland. The fish ladder is generally integral with the proposed spillway and bridge structure with a downstream potion built into the dam embankment, and an "upstream" portion that continues under the bridge to Mill Pond to the North. The image below shows the fish ladder geometry and migration path for the adult herring.

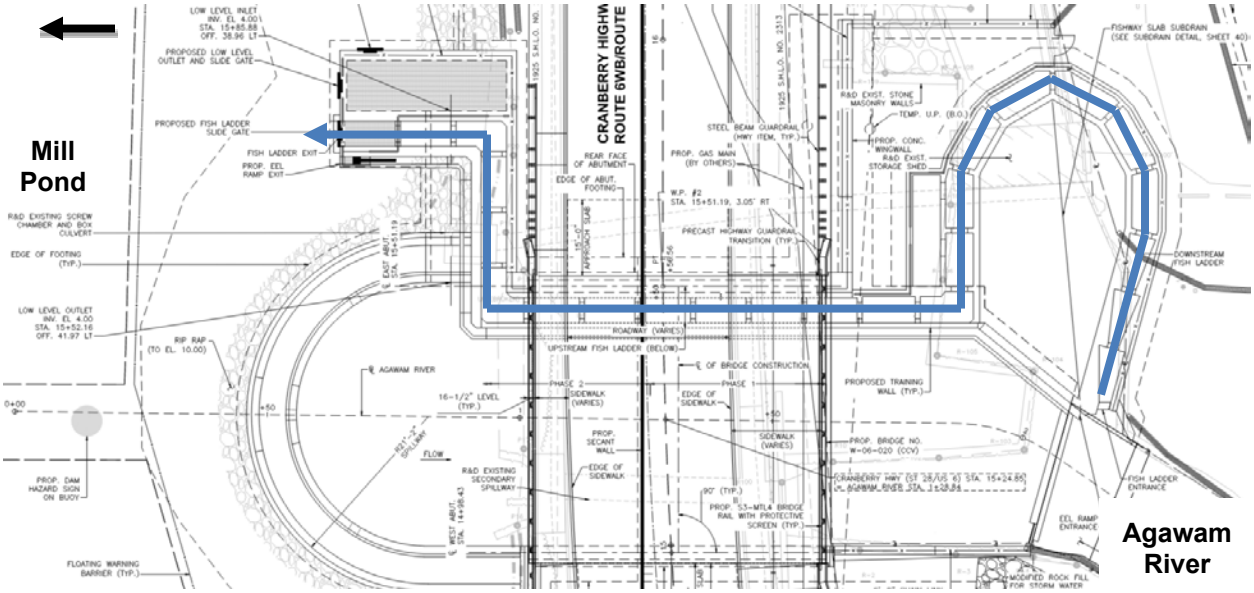

Figure 2 - Proposed Upstream Migration

5.1.2 Downstream Migration

During normal and higher flows the proposed spillway will be the primary downstream migration route, shown in red in Figure 4, for juvenile and post-spawn adults. The spillway has been designed with a notch at elevation 13.5 for normal flow conditions that will spill into pools built into the spillway apron to limit the drop to the Agawam River, shown as Pool 1 and Pool 2 in Figure 4. An interior wall will be built inside of the main spillway wall elevation 11.0 to create Pool 1 with a water depth of 7 feet, shown in Figure 3. Pool 2 is created by a wall built up to elevation 4.0 into the

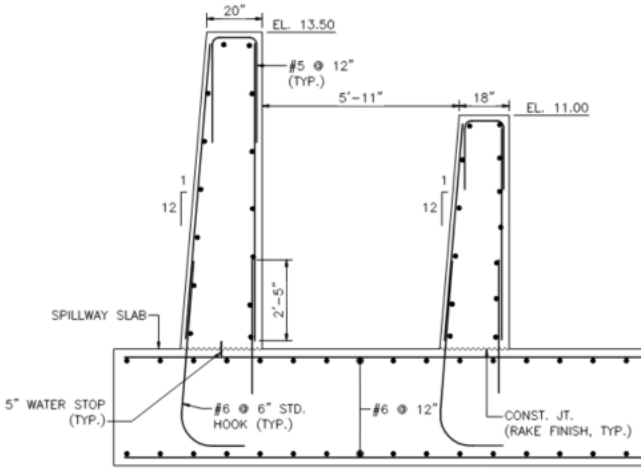

Figure 3- Proposed Spillway Section

downstream end of the apron will create a 4-foot deep pool on top of the apron for the fish to continue downstream to the Agawam River.

During rare drought or low flow conditions the secondary path for downstream migration will be the fish ladder that was used for upstream migration. This has a lower weir elevation at the entrance that the spillway which will allow for migration at pond levels approximately 2 feet below the normal pool elevations in the pond. The secondary migration pattern is shown in orange in Figure 4.

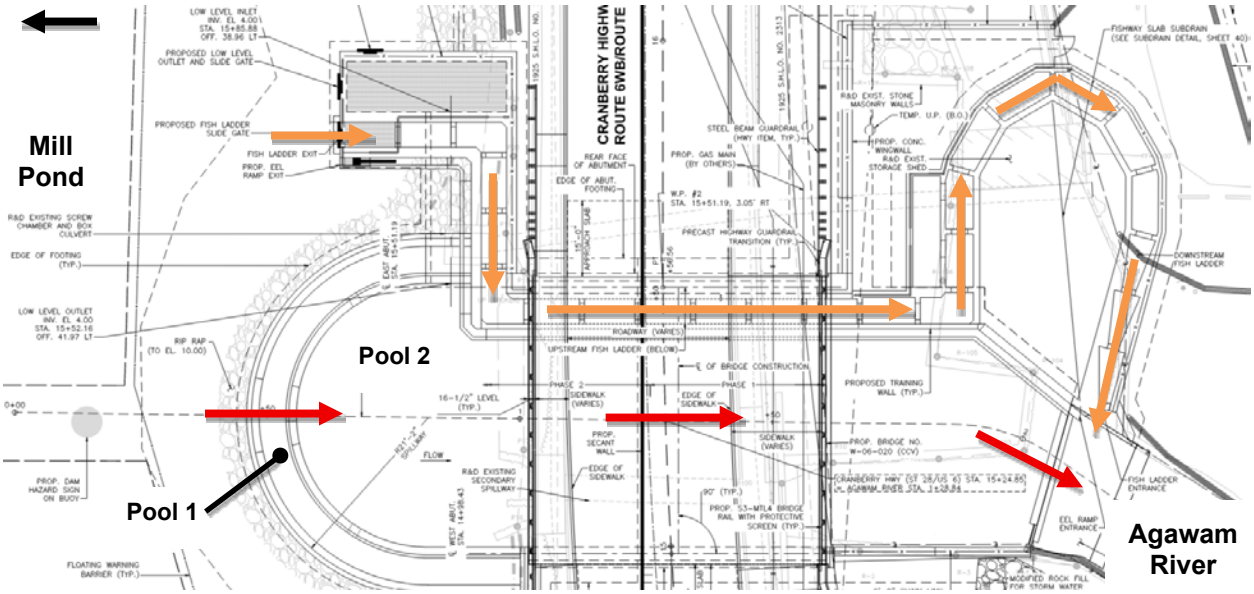

Figure 4 - Proposed Downstream Migration

5.2 Pool and Weir Geometry

Available fish ladder design guidance was used to determine the length, width, and depth of each pool and associated weir dimensions as the first iteration of the design. The chosen dimensions are within the minimum and maximum space recommendations ranges for each target species and were optimized based on the results of the hydraulic analysis.

The downstream portion of the fish ladder consists of rectangular concrete pools separated by rectangular weirs. The concrete will be faced with a stone veneer made from reused stone from the existing downstream masonry walls being demolished for the proposed bridge, spillway, and fish ladder construction. The fish ladder entrance will match into the existing downstream walls and will create the required attraction flow for the target fish species. Due to the tidal fluctuations in the river, the entrance was evaluated for the maximum and minimum tides to ensure that the entrance to the fish ladder will not have a significant head differential during either event.

The flow conditions at the entrance end of the fishway are impacted during isolated times of the tidal cycle (high tide), limited to . Pare vetted this impact as outlined within the December 20, 2024 Passage Design Memorandum. Through coordination with MADMF and USFWS, it was decided to modify the first three weirs (smaller widths of 2.9, 2.6, and 2.2) and pools (tapered geometry) in order to improve

attractiveness during these higher tailwater conditions. Although Pare did not rerun the impact analysis outlined within the December 20, 2024 memorandum after incorporating these tapered weirs and pools, Pare did assess what the impact that the tapered weirs would have on the predominant tailwater elevation and confirmed that the performance metrics of the system remained within the optimal range outlined within section 5.3 below. The tapering did result in a slight increase in velocity over these three weirs (Weir #1 = 4.5 fps, Weir #2 = 3.9 fps; Weir #3 = 3.5 fps; Weir #4 through Exit = 3.1 fps); however, all velocities remained well below the maximum velocity for this fish species (6 fps).

The fish ladder then continues under the bridge, along the front of the East Abutment and daylights on the upstream side of the bridge and exits to the pond east of the proposed spillway. This upper portion consists of rectangular concrete pools and weirs that will be cast against the other bridge, spillway, and low-level outlet components. At the fish ladder exit, an adjustable gate will be configured to allow adjustment to the invert elevation of the exit and control the flow based on variations in pond surface elevations.

In addition to pools and weirs to accommodate fish migration, a harvesting pad is proposed at the first turn in the fish ladder that allows water to flow into a separate pool area of shallower depth. Access is provided by walkways around the pool for users to reach into the pad and remove the fish. The harvesting pad pool will utilize stop logs which can be manually removed to open the area and replaced to close it.

5.3 Analysis Results

As demonstrated in the table below, the fishway as designed has optimal performance under most flow conditions including the operating range of baseflows. Specific performance metrics being depth of flow, width of flow, flow velocity, total discharge, Q_t, and energy dissipation factor (EDF).

Table 1: Flow Conditions within the Mill Pond Dam Fish Ladder (Per Design as of 5/2/24 with Updated Baseflows as of 8/20/24)

			Outflow	Pond Elev	Spwy Flow	Spwy Velocity	FL Flow	FL Depth [1]	FL Width [2]	FL Velocity [3]	Qt	EDF	Pool Depth
Hydrological Condition		CFSM	CFS	WSEL	CFS	FPS	CFS	FT	FT	FPS			FT
Targeted Parameters for Optimal Performance of Fish Passage							-	>1.0	>2.5	<6.0	>0.3	2.1[4]	>2.25
	Drought[6]	0.5	8	13.5	0	0.0	8	1.0	3.3	2.5	0.3	1.5	3.2
Operating Range of Baseflows	95%[5]	1.7	29	14.1	14	1.9	15	1.6	3.3	2.8	0.5	2.4	3.9
	50%[5]	2.6	44	14.3	26	2.9	18	1.8	3.3	3.1	0.6	2.8	4.1
	5%[6]	3.5	60	14.5	39	2.9	21	2.0	3.3	3.1	0.7	3.0	4.3
1yr	2.9" Rain Event	-	69	14.6	47	3.1	22	2.1	3.3	3.2	0.8	3.1	4.4
2yr	3.4" Rain Event	-	76	14.7	54	3.3	23	2.2	3.3	3.2	0.8	3.2	4.5
5yr	4.3" Rain Event	-	94	14.9	69	3.6	25	2.4	3.3	3.2	0.9	3.4	4.6
10yr	5.0" Rain Event	-	113	15.1	86	4.0	27	2.6	3.3	3.2	0.9	3.5	4.8
25yr	6.0" Rain Event	-	141	15.3	111	4.4	30	2.8	3.3	3.3	1.0	3.7	5.1
50yr	6.8" Rain Event	-	167	15.5	135	4.7	33	3.0	3.3	3.3	1.1	3.9	5.3
100yr	7.6" Rain Event	-	219	15.7	184	5.8	35	3.2	3.3	3.3	1.2	4.0	5.5

1) Depth of flow over each weir; depth of each pool is 2.25 feet greater than this depth.

2) Width of flow over each weir at pool level

3) Velocity of flow over each weir

4) Optimal EDF is 2.09 for River Herring. USFWS indicated it should be clost to but less than 3.0 for the full operating range

5) Obtained from Table 6: Estimated stream discharge per square mile at selected flow durations for low-flow partial-record station and discontinued streamflow-gaging station in Buzzards Bay Basin, southeastern Massachusetts, water years 1967-91 of the "Streamflow, Ground-Water Recharge and discharge, and Characteristics of Surficial Deposits in Buzzards Bay Basin, Southeastern Massachusetts . U.S. Geological Survey Water-Resources Investigations Report 95-4234", prepared in corporation with Massachusetts Department of Environmental Management, Division of Resource Conservation, Office of Water Resources.

6) Not provided within USGS reference document; cfsm values are presumed conservative assumptions

Fish ladder performance for storms greater than the 10-year storm is above the presumed optimal EDF range. The dam has additional operational capacity through the operation of the downward operating gate located within outlet chamber that could allow for that edam to accommodate these storm events at a lower peak pool elevation that in turn would result in the ability for optimal flow conditions to be maintained through the fish ladder system

6.0 EEL PASSAGE DESIGN

A separate eel passage is proposed to be built adjacent to the fish ladder to create a better environment to accommodate eel. During coordination with MADMF and USFWS, it was determined to use a pump supplied eel trap to wet the ramp and capture eel to be released into the pond by MADMF staff. MADMF has used these systems at other locations in southeastern Massachusetts with success and are familiar with the systems. The eel trap and pump system MADMF intends to use is shown below.

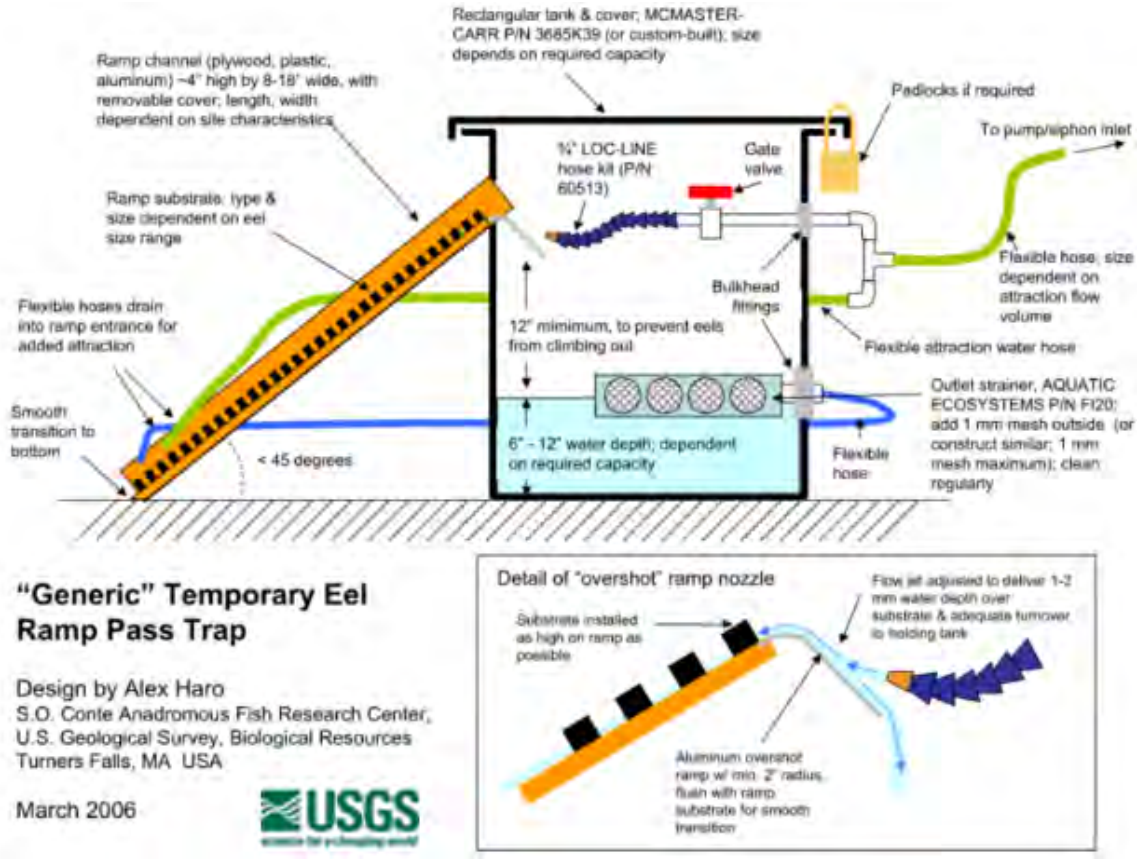

Figure 5- Eel Trap Schematic

The eel trap will be connected to the eel ramp built into the spillway and bridge structure by a removable aluminum ramp, shown in blue in Figure 6. The eel ramp will be constructed as a flat bottom concrete trough lined with synthetic material to imitate grass that the eel can utilize to migrate up the ladder. The sloped channel allows the top few inches of the ramp, where the water velocity is lowest, to be utilized by the eel even as the pond level changes. This type of eel ramp is ideal for environments where the head water has minimal fluctuations, such as the case with Mill Pond which only fluctuates a few inches above or below normal pool. The ramp will be covered by an aluminum grate which will prevent predation and can be removed for maintenance of the ramp.

To direct eel to the ramp entrance, the end of the spillway apron will be covered with the synthetic grass along its vertical face across the whole channel. At the top of the vertical wall a 12-inch wide horizontal

will overhang the vertical face to prevent eel from crawling up on top of the spillway slab and will continue towards the entrance of the eel ramp. A removable ramp from the spillway apron to the bottom of the channel was also recommended by MADMF and USFWS to further direct eel to the ramp.

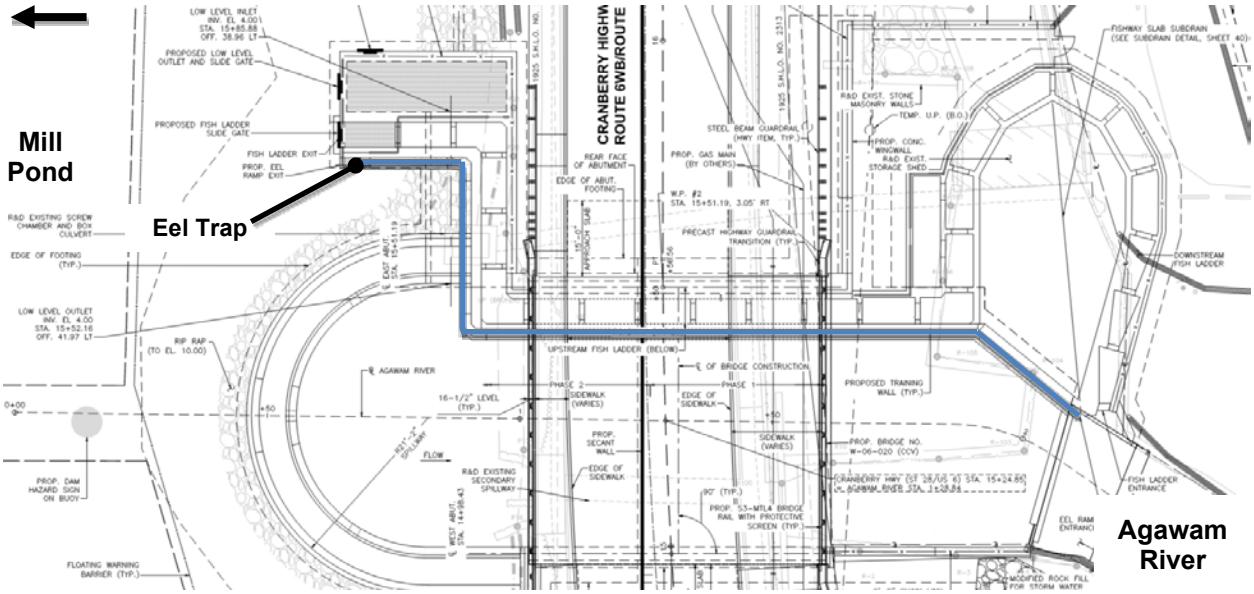

Figure 6 - Eel Ramp Alignment

7.0 DESIGN SUMMARY

Utilizing the latest fish passage design guidance and coordination with MADMF, Pare is proposing to replace the existing Alaskan Steeppass fish ladder with a Pool and Weir fish ladder in combination with an eel ramp along an adjacent alignment. The new fish ladder has been designed to accommodate weir velocities and resting pools that will allow all target species of fish to effectively ascend the fish ladder for a range of pond water surface elevations. The proposed adjacent eel passage will utilize an eel trap that will allow MADMF staff to move eel into Mill Pond by providing flow conditions more suitable for that species over the range of normal pond elevations. By providing separate passages with differing flow and geometric conditions, it is anticipated that this passage will allow the migration of the target species to grow into the future and continue the historic tradition of this herring run.

DOCUMENT A00841

MASSACHUSETTS
Department of Environmental Protection

Water Quality Certificate

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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

July 30, 2025

Massachusetts Department of Transportation Highway Division
10 Park Plaza, Room 7360
Boston, MA 02116
ATTN: Courtney Walker

RE: 401 WATER QUALITY CERTIFICATION/**CORRECTED**
BRP WW 11, Minor Fill Project
BRP WW 08, Minor Dredge
Mill Pond Dam Replacement (Bridge No. W-06-020)
Wareham, Massachusetts

401 WQC Filing Number: 25-WW26-0006-APP
USACE Application No. NAE-2007-03255
MassDOT File Number: 606352

Dear Ms. Walker:

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 June 4, 2025. 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 will replace the Mill Pond Dam at the point where the Cranberry Highway (Route 6 westbound and Route 28 northbound) crosses the Agawam River in Wareham (the Project). The project encompasses spillway and superstructure improvements, embankment work, fishway and fish ladder improvements and pedestrian and bicycle improvements. It also includes installation of scour protection, full-depth reconstruction of the approaches, and Stormwater Control Measures. Bridge No. W-06-020 is considered to be functionally obsolete and the dam/spillway is considered a high hazard structure.

Existing Conditions

Cranberry Highway carries two lanes of westbound traffic over Mill Pond Dam. The roadway consists of two 11-foot travel lanes, a 7.5-foot shoulder on the south side of the roadway, and 2-foot shoulder on the north side, and a sidewalk on each side, totaling 40 feet 9 inches. Mill Pond Dam is a 16.5-foot high,

This information is available in alternate format. Please contact MassDEP at 617-292-5500.
TTY# MassRelay Service 1-800-439-2370
MassDEP Website: www.mass.gov/dep

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285-foot-long earth fill embankment structure originally constructed in 1850 and includes a fishway, a primary spillway, a secondary spillway, and the earthen embankment. Flow outlets the dam through the primary and secondary (auxiliary) spillways which extend south under Cranberry Highway. The spillways discharge to two separate walled channels that converge to form the Agawam River. Mill Pond is upgradient of the dam.

The Agawam River is part of the Wareham River estuary and is tidally influenced up to the Mill Pond Dam. The river supports a historic fish run that includes one of the largest populations of river herring in the Buzzards Bay area. The fish run consists of a walled channel located to the east of the primary spillway. From Mill Pond, the fishway runs south along the east side of the dike to a fish ladder which in turn leads to a buried granite box culvert and then through an open channel at the outlet of the primary spillway. The fishway converges with the flow from the two spillways.

Bordering Vegetated Wetlands (BVW) are adjacent to the work area in multiple locations but will not be impacted. A majority of the project area is within the Federal Emergency Management Agency (FEMA) 1% annual chance of flooding zone (Zone AE). A portion of the Project is also located within MassWildlife's Natural Heritage and Endangered Species Program (NHESP) Estimated and Priority Habitats of Rare Species for the Shore Pygmy-weed (*Crassula aquatica*) and Long's Bittercress (*Cardamine longii*). NHESP has concluded that it is unlikely either species would be present within the work area.

The anadromous fish run includes both alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*). Alewife are listed as a species of special concern by NHESP. The Massachusetts Division of Marine Fisheries (MA DMF) determined that river herring is the target species for this fish passage improvement project with American eel (*Anguilla rostrata*) identified as the secondary species. The fish ladder will need to remain functional with sufficient flow for herring and other marine life to migrate up the Agawam River into Mill Pond through the spillway during construction.

Proposed Project

The Project will replace the existing spillway systems at the dam with a new spillway located upstream of the embankment and the 53-foot single span bridge that carries Cranberry Highway across the Agawam River. Full depth pavement reconstruction of the approaches will occur following installation of the new bridge.

The proposed bridge will provide pedestrian access throughout construction and, in the final condition, sidewalks on both the north and south sides of the roadway. Additionally, a striped buffered bike lane is proposed on the north side of the roadway to allow safer bicycle access over the dam and bridge. The new roadway will be widened by 2 feet 9 inches to incorporate the addition of this bike lane on the south side of the roadway,

In addition to the spillway and bridge work, the existing fish ladder will be replaced with a pool and weir fish ladder intended to provide improved aquatic connectivity at the site for river herring and other diadromous fish species. An eel ramp will be constructed in a similar alignment to the new fish ladder. Flow from the eel ramp will enter the river close to the entrance of the fish ladder to prevent a false attraction to another part of the downstream channel.

Impacts & Mitigation

In total, 22,088 square feet (sf) of impacts to LUW (13,017 sf permanent and 4,328 sf temporary) are required to complete the project. Impacts will primarily occur due to temporary dewatering, demolition of the existing spillway components, excavation of unsuitable materials from dewatered areas, grading, and installation of a new arched crested weir spillway and fish ladder. Widening of the spillway and bridge will create 4,086 sf of new LUW. A total of 5,283 cubic yards (cy) of dredging will occur; 4,893 cy within Mill Pond and 390 cy within the Agawam River.

Cofferdams will be installed and will remain in place for the majority of the project to minimize impacts within the waterway. In the upstream area, within Mill Pond, riprap is proposed to be installed around the arched concrete spillway. South of the proposed spillway, the stream channel will be reconstructed with 2 feet of modified rockfill, and 12 inches of natural streambed material will be placed on top. Along the floor of the fish ladder, the concrete will be lined with a stone veneer made from reused stone from the existing downstream masonry walls that are being demolished for the proposed bridge, spillway, and fish ladder construction. Along the floor of the eel passage, a synthetic material that will imitate grass will be installed to assist eels migrating up the laterally sloped passage.

The project will incorporate native upland plantings along the dike, select upstream areas outside of the dam embankment, along the downstream slopes leading to the proposed SCM, and the downstream area adjacent to the fish ladder. Large trees outside of the limits of work will be protected by tree protection devices to prevent damage to their root systems.

It is anticipated that MA DMF will continue to coordinate and collaborate with MassDOT during construction of this project. The Project will be subject to Time of Year (TOY) restrictions and other mitigation measures for diadromous fish species as prescribed by DMF and conditioned herein.

An alternatives analysis was completed in accordance with 314 CMR 9.00 and evaluated spillway design, fish ladder design and construction drawdown alternatives. The existing bridge and dam are structurally deficient and present a risk of bridge and dam failure; therefore, a no-build alternative is not practicable to meet project goals. Removal of the dam was also considered, but this alternative would result in a substantial adverse impact on the environmental resource created by the dam, including substantial adverse impacts to a significant cultural resource. The new span over the spillway will completely meet the Massachusetts Stream Crossing Standards.

The Project meets the Massachusetts Stormwater Management Standards to the maximum extent practicable (MEP) per 314 CMR 9.06(6). The widening of the bridge and surrounding approaches by 2 feet 9 inches will increase impervious surface within the Project limits by 3.8 percent (3,373 sf). The project proposes the installation of a bioretention basin with a sediment forebay in the southwest project quadrant to treat and attenuate stormwater before discharging to the Agawam River. Nine existing catch basins on site will be replaced with deep sump catch basins to increase the TSS removal on site.

Dredging will be completed to remove excess material within Mill Pond and the Agawam River for the installation of the new dam spillway and fish ladder as well as placement of riprap and natural streambed material. Sediment sample analytical results were compared to the Reportable Concentration (RC) S-1 criteria of the Massachusetts Contingency Plan (MCP). Results of the sediment

samples analyzed indicated that arsenic found within the soil exceeds the RC S-1 reporting criteria under the MCP by 8.6 parts per million (ppm). Excavated sediment can be reused on site or will be disposed of at an approved off-site facility to be determined.

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 and 9.07. Public notice was provided in the Wareham Week on March 6, 2025. 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:

    a) Application for Water Quality Certification: Reconstruction of Mill Pond Dam Route 6WB/28NB (Cranberry Highway) Wareham, MA. Prepared by Pare Corporation on behalf of MassDOT, dated February 2025, with cover letter and attachments. 401 WQC Filing Number: 25-WW26-0006-APP.

    b) MassDOT Response to MassDEP's Administrative Completeness and Technical Deficiency Review, Application No: 24-WW11-0003-APP Mill Pond Dam with attachments. Prepared by Pare Corporation on behalf of MassDOT, dated April 28, 2025.

    c) MassDOT Response to MassDEP's Second Administrative Completeness and Technical Deficiency Review Application, No: 24-WW11-0003-APP Mill Pond Dam with attachments. Prepared by Pare Corporation on behalf of MassDOT, dated June 4, 2025.

d) WILDLIFE PASSAGE DESIGN REPORT for Reconstruction of Mill Pond Dam MA00027 Route 6WB/28NB (Cranberry Highway) Wareham, MA. Prepared by Pare Corporation, dated July 2025.

e) Revised HYDRAULIC STUDY REPORT for Cranberry Highway (Route 28)/ Mill Pond Dam Over the Agawam River, Wareham, Massachusetts. Prepared by Pare Corporation, dated December 2021, Revised July 2025.

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 5. The name and contact information of the approved EM shall be provided to the Wareham Conservation Commission prior to the start of work. (Submittal)

3. A qualified **Fish Passage Engineer** with a minimum of five years of relevant professional experience in fish passage restoration projects shall be employed to oversee all in-water work as proposed in the application. The name, contact information, and qualifications of the fish passage engineer shall be provided to MassDEP for approval with a copy to the Wareham Conservation Commission prior to the Pre-Construction Meeting required in Condition 5. The fish passage engineer shall be present during specific project milestones, including but not limited to construction of the spillway, fish ladder, eel ramp, restoration of the riverbed and diversion of water to and from the fish ladder and eel ramp while under construction. **(Submittal)**

4. Prior to the Pre-Construction Meeting required in Condition 5, the applicant 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)**

5. A minimum of 21 days prior to the start of ground disturbance or vegetation clearing, MassDOT 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, a representative from the MassDOT Environmental Section and/or the District Environmental Engineer and a representative from MA DMF shall attend the Pre-Construction Meeting. **No work shall commence prior to the Pre-Construction Meeting.**

6. 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)**

7. A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan (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, MassDOT shall submit the CP/PP for review and approval. If the U.S. Environmental Protection Agency (EPA) Construction General Permit (CGP) applies, the Stormwater Pollution Prevention Plan (SWPPP) may serve as the CP/PP, provided 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)**

8. 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)**

9. The CP/PP shall identify, but shall not be limited to, staging and laydown areas in relation to BVW 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.

10. A minimum of 14 days prior to the start of work, MassDOT shall submit a Control of Water Plan for review and approval. The Plan shall include a description of proposed methods to isolate and dewater work areas within streams while maintaining stream flow, including but not limited to the method of isolation (e.g., steel sheeting or sandbag cofferdam), dewatering methods and locations and specifications for stream bypass systems as applicable. The Control of Water Plan shall include a plan depicting LUW and BVW boundaries, and the location of all relevant methods and materials which shall be located within the LUW impact areas approved herein. The plan shall meet the requirements of the CP/PP and be specific to the Project. Dewatering and stream bypasses shall be conducted under the supervision of the RE or other project staff with knowledge of these practices and comply with the applicable conditions identified herein. **(Submittal)**

11. 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.

12. Prior to the Pre-Construction Meeting, the boundaries of LUW and BVW shall be re-flagged where they are within 50 feet of the limits of work. 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 RE. All construction personnel shall be made aware of these markers.

13. Prior to any work within the 1% annual chance of flooding zone within Project limits, including mobilization or storage of equipment and materials, a Flood Contingency Plan shall be submitted to MassDEP for review and approval that includes at a minimum the following information and provisions **(Submittal)**:

    a) The RE and/or Contractor shall monitor the National Weather Service forecast daily, and upon issuance of a flood watch or flood warning for the Project area, the Flood Contingency Plan shall be implemented.

    b) Upon implementation of the Flood Contingency Plan, all construction equipment and materials located below the Base Flood Elevation (BFE) shall be removed and placed in an upland location above the BFE and outside of BVW and/or LUW.

    c) Anchored stationary equipment may remain below the BFE if demonstrated to be required and upon written approval from MassDEP. In the event semi-stationary equipment cannot be feasibly removed before the arrival of the storm, they shall be adequately secured and MassDEP shall be notified prior to the storm.

    d) A requirement to inspect and maintain all erosion and sedimentation controls, and stabilize all exposed soils as needed below the BFE prior to the storm shall be included.

    e) A plan depicting at a minimum, but not limited to, BVW and/or LUW boundaries, the Project limits, and the BFE boundary based on ground elevations shall be included.

    f) Staff and materials must be available 24 hours per day, seven days per week to implement the Flood Contingency Plan. The name, affiliation, title, email address, and phone number of each person responsible for implementing the Flood Contingency Plan shall be included.

    g) No work shall commence until the flood watch or flood warning has ended, all areas below the BFE have been inspected, and erosion and sedimentation controls are maintained as needed.

14. The Contractor shall develop an Invasive Plant Management Strategy (IPMS) to be submitted to MassDEP for review and approval prior to the Pre-Construction Meeting. The IPMS shall be implemented as approved by MassDOT. **(Submittal)**

15. If needed, use of herbicides to control invasive species shall be implemented in accordance with the approved IPMS and with the following requirements:

    a) Herbicides can only be applied by a Licensed Applicator;

    b) Applicants must provide MassDEP Material Safety Data Sheets (MSDS) of the product being used and must also keep MSDS sheets on site;

    c) Product registration in MA with Massachusetts Pesticide Product Registration Number must be confirmed with Massachusetts Department of Agricultural Resources Pesticide Division;

d) EPA Registration Number for the product must be identified;

e) Product label restricted use provisions must be followed; and

f) Applicants must contact MassDEP Wetlands Program, Dredge Unit to determine if a BRP WM 04 herbicide permit is required for any proposed application of herbicides in water bodies.

16. Final Construction Plans (the plans provided to the contractor) shall be submitted for review at least 30 days prior to the Pre-Construction Meeting. Sufficient supporting information, explanation, and documentation shall be provided to MassDEP and the Wareham Conservation Commission for any changes, and MassDEP may at its discretion require additional supporting documentation as a condition of review. Once MassDEP provides written approval, the updated set of plans shall become the "Final Plan of Record." The Plan shall be prepared and signed by a Professional Engineer in the Commonwealth of Massachusetts and shall incorporate all revisions and additions to the original plans that have been approved as discussed herein. **(Submittal)**

Construction Period

17. No more than **13,017 sf** of permanent and **4,328 sf** of temporary impacts to LUW shall occur. All work shall avoid unapproved impacts to LUW and BVW.

18. EM inspections shall occur at least once every fourteen calendar days and within 24 hours of a storm event that produces 0.5 inches or more of rain within a 24-hour period. 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.

19. The EM shall submit to MassDEP and the Wareham Conservation Commission at least one report every month during active construction and once every other 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 Wareham 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. 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.

22. Copies of CP/PP Inspection and Maintenance Log Forms shall be submitted to MassDEP within 14 days upon request.

23. The Project shall identify one individual with at least three years of experience with construction period erosion and sedimentation control to be responsible for erosion and sedimentation control inspections (CP/PP Inspector). Under the direction of the CP/PP Inspector, inspection and maintenance of erosion and sediment controls in active work areas may be performed by both the Contractor and RE or other MassDOT project staff. Maintenance is the responsibility of the Contractor; however, the permittee shall be ultimately responsible for erosion and sedimentation control failure. The EM, RE, and/or contractor shall immediately notify MassDEP and the Wareham Conservation Commission if any unauthorized discharges to BVWs, IVWs, or LUW occur.

24. 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.

25. 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.

26. Work within LUW shall be conducted in low or no-flow conditions to the extent practicable. Notice shall be provided to MassDEP and the Wareham Conservation Commission within 24 hours prior to the commencement of dewatering. Dewatering methods and location(s) shall be approved by the RE or other project staff with knowledge of these practices prior to use to ensure consistency with the approved Control of Water Plan, and shall be documented in the CP/PP. There shall be no discharge of untreated dewatered stormwater or groundwater to LUW or BVW. Any discharges shall be visibly free of sediment.

27. Additional erosion and sedimentation control materials shall be stored on-site at all times for emergencies and routine replacement. Materials shall be kept covered, dry, and accessible at all times. The CP/PP Inspector 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.

28. The Contractor shall monitor the National Weather Service forecast for updates, and upon issuance of a flood watch for the 1% annual chance of flooding zone, shall implement the flood contingency plan referenced in Condition 13.

29. 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 storm drains that discharge to wetland Resource Areas.

30. Stockpiles shall be located no less than 50 feet from LUW and BVW, catch basins, or other drainage conveyances that discharge to LUW and BVW.

31. 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 LUW and BVW and catch basins or other drainage conveyances that discharge directly or indirectly to LUW and BVW.

32. Refueling, washing, and cleaning of vehicles and other construction equipment shall not take place within 50 feet of LUW and BVW and any wash water shall be contained such that it does not drain toward LUW and BVW. MassDEP shall explicitly approve in writing any deviation to this condition for oversized stationary vehicles.

33. The contractor shall have spill containment kits on site. In the event of a release of fuels and/or oils, the local fire department, MassDEP Emergency Response and MassDEP Wetlands Program Highway Unit shall be contacted, and in addition, the MassDEP Bureau of Waste Site Cleanup shall be notified per the requirements of the Massachusetts Contingency Plan, 310 CMR 40.0000.

34. **No in-water, silt-producing work shall occur during the Time of Year (TOY) restriction between the dates of March 15th to July 15th and September 1st to November 15th. A TOY incursion waiver may be requested of MA DMF if the proposed turbidity barriers and cofferdams are installed prior to this TOY period and there is sufficient uninterrupted flow for fish passage.**

35. The Fish Passage Engineer or designee approved by MassDEP shall be on-site during cofferdam installation and dewatering to confirm no fish become entrapped within the cofferdams.

36. A MA DMF Fishway Construction Permit shall be obtained prior to construction. A copy shall be provided to MassDEP and MassDEP shall be notified of any design changes that may occur as a result of the fishway permit. **(Submittal)**

37. Construction vehicles or other vehicles or heavy equipment are prohibited from traversing over the proposed infiltration SCM to avoid compaction of soils during construction. **This area shall be demarcated by silt fence with signage, or high visibility fencing; demarcation shall occur prior to construction.** No vehicles or heavy equipment shall be permitted within the infiltration SCM following placement of the final materials without written approval from MassDEP. Proposed infiltration SCMs shall remain offline until final stabilization is achieved, unless written approval is obtained from MassDEP.

38. Construction vehicles and equipment shall not enter the BVW or LUW unless authorization is provided by way of this permit or amendment. The Contractor shall use equipment with boom reach capabilities and other measures to avoid inadvertent impacts to jurisdictional resource areas as a result of excavation, riprap placement, and/or bridge demolition materials.

39. A temporary shielding or containment system shall be in place beneath the bridge structure prior to removal and concrete excavation to prevent debris from falling into the water below. In the event that any debris accidentally enters the Agawam River, it shall be immediately retrieved. Notice shall be provided to MassDEP if debris enters the river and that it has been removed with photo-documentation (if practicable) submitted by email**.**

Dredging

40. MassDEP shall be notified one week prior to the start of dredging so that staff may inspect the work for compliance throughout the project.

41. No later than 21 days prior to commencement of dredging activity, a Dredged Material Dewatering Plan shall be submitted to MassDEP for review and approval. At a minimum, the Plan shall include but not be limited to the type of containment, method of dewatering (i.e. mechanical or by gravity), method of collecting the dewatered effluent and method of disposal. **(Submittal)**

42. All handling of contaminated sediment exceeding MCP RCS-1 criteria and authorized by this WQC shall be conducted under the direction of a Licensed Site Professional (LSP). Prior to the Pre-Construction Meeting required in Condition 5, the applicant shall provide MassDEP with the name, qualifications, and contact information of the LSP. **(Submittal)**

43. An Environmental Health & Safety Plan shall be required for the protection of workers from any exposure to known/suspected contaminants present in environmental media (including sediment which has been characterized as exceeding MCP RCS-1 criteria). A copy shall be provided to MassDEP within six weeks of the effective of this WQC or two weeks prior to the commencement of the dredging operation, whichever comes first.

44. Dredged sediment shall be sampled to determine the suitability for reuse or if offsite disposal is required. Sampling data including sampling methods and laboratory QA/QC data shall be provided to MassDEP within 48 hours once available from the analytical laboratory for review. Results of the chemical analysis shall be compared to the reuse levels in Policy COMM-97-001-Reuse and Disposal of Contaminated Soil at Massachusetts Landfills for reuse as landfill daily cover and to the Massachusetts Contingency Plan (MCP) RCS-1 criteria. The approved LSP required by Condition 42 will review the data to determine if the sediment exceeds these criteria and requires disposal at an out-of-state facility within ten calendar days. The data and LSP determination shall be submitted to MassDEP prior to transportation of this material. **(Submittal)**

45. Best Management Practices (BMPs) shall be employed by the contractor to protect resource areas located adjacent to the proposed staging/temporary dredged material stockpiling and dewatering areas. Sediment stockpiles shall be constructed in accordance with the MassDEP approved project plans, stabilized, bottom-lined if not placed on paved surfaces and securely covered with wind tear resistance tarpaulin, polyethylene sheeting or similar impermeable material at all times, and properly labeled. Stockpile covers shall be securely weighed down. Stockpiles shall also be secured to restrict access by the public and shall be set back at least 10 feet from temporary construction access roads or other areas and activities which could disturb the stockpiles and associated erosion controls; if the 10-foot setback cannot be met, then a MassDEP-approved barrier shall be provided. Inspection of the sediment containment and dewatering location and associated erosion controls shall be conducted daily and within 24 hours of a storm that produces 0.5 inches or more of rain. Any observed deficiency shall be corrected or repaired in a timely manner.

46. In the event of a precipitation or storm event, the site shall be secured beforehand in such a way as to protect resource areas and waters on site and downstream of the site, including covering of stockpiles of dredged material. Sediment stockpile areas shall be inspected in line with the frequency of the CP/PP required in Condition 7. Any observed deficiency shall be corrected or repaired in a timely manner to prevent discharge from the stockpiled material. If stormwater runoff and erosion is observed from stockpiled dredged material, additional erosion and/or damage prevention controls measures shall be implemented.

47. Dredging, stockpiling of dredged material, and offsite transport of dredged material shall be sequenced and conducted in a manner to limit stockpiling time. Sediment characterized as having concentrations exceeding the RCS-1 criteria shall not be stockpiled at the site longer than

90 days from the date of generation. Extensions may be requested to accommodate unforeseen delays subject to MassDEP approval.

48. Measures shall be in place to prevent turbid waters, due to dredging, demolition, or debris removal activities, from extending past the limits of work into the Agawam River. These measures can be items such as turbidity curtains and/or sheet piles.

49. If visual turbidity escapes the controls in place, as described in Condition 48, work shall stop immediately and MassDEP shall be notified within 24 hours. Work shall not resume until the issue is corrected and to the satisfaction of MassDEP.

50. All turbidity controls shall be inspected daily by the RE or a designated MassDOT Project Staff. If any damage is observed the controls in place will be replaced or repaired immediately.

51. If excavated sediment is disposed of off-site, MassDEP shall be notified in writing of the name and location of the upland licensed facilities accepting the dredged material for disposal or reuse for review and approval. If the licensed facility is located out of state, documentation shall be provided to MassDEP that the dredged material disposal/reuse has been approved and will be accepted by the receiving State. The dredged material shall not be transported to the facility without the concurrence of MassDEP.

52. If excavated sediment is disposed of off-site, Transportation and disposal of the dredged material shall be overseen by the LSP of record. A Bill-of-Lading (BOL) or a Material Shipping Record (MSR) shall be used to track the dredged material to the licensed disposal facility and/or proposed intermediate (stockpiling /dewatering) facility. A fully executed copy of the BOL or MSR shall be provided to MassDEP within 30 days of final shipment to the reused location or facility.

53. If excavated sediment is disposed of off-site, BMPs shall be implemented during transportation of the dredged material to the licensed receiving facility. At a minimum, when transported upon public roadways, all dredged material shall have no free liquid as determined by the Paint Filter Test or other suitably analogous methodology acceptable to MassDEP, and a tarpaulin or other means shall be used to cover the dredged material during transport.

Stream Mitigation

54. The Fish Passage Engineer 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 10 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.

55. A minimum of 14 days prior to installation of the streambed materials, the Fish Passage Engineer shall meet with the contractor to determine the suitability of stockpiled streambed material for reuse.

56. Upon completion of the LUW replication and restoration, the Fish Passage Engineer shall provide photographs and a summary of the completed work to MassDEP and the Wareham Conservation Commission. **(Submittal)**

57. 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 RE.

58. 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

59. All non-biodegradable temporary erosion controls shall be removed at the conclusion of work once the surrounding area has achieved final stabilization.

General Conditions

60. 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 tyler.lewis@mass.gov. **(Submittal)**

61. This WQC remains in effect for the same duration as the Section 404 permit that requires it.

62. No Special Condition set forth herein shall be construed or operate to prohibit MassDEP from taking enforcement against MassDOT or its contractors for any failure to comply with the terms and requirements of this WQC.

63. 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
Wetlands Program, Highway Unit
100 Cambridge Street, 8th floor
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):

1. the 401 Certification Transmittal Number;
2. the complete name of the applicant and address of the project;
3. 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;
4. 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;
5. a clear and concise statement that an adjudicatory hearing is being requested;
6. 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
7. 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

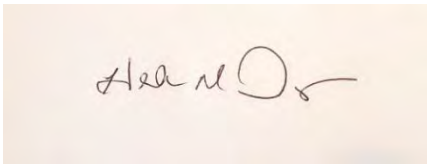
The hearing request along with a DEP Fee Transmittal Form and a valid check or money order payable to the Commonwealth of Massachusetts in the amount of one hundred dollars ($100) must be mailed to:

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 me at heidi.davis@mass.gov or Tyler Lewis at tyler.lewis@mass.gov.

Very truly yours,



Heidi M. Davis
Highway Unit Supervisor

Ecc: DEP – Maissoun Reda
USACE – Daniel Vasconcelas
MassDOT – Melissa Lenker
MassDOT – David Paulson
MA DMF – Brad Chase
MA DMF – Stephanie Berkman
Pare Corporation – Erika Klinkhammer – eklinkhammer@parecorp.com
Pare Corporation – Eric Silva – esilva@parecorp.com
Wareham Conservation Commission – Christine Santos - csantos@wareham.ma.us

ATTACHMENT A
PRE-CONSTRUCTION SUBMITTAL CHECKLIST

Dam/Bridge Replacement (W-06-020), Cranberry Highway over Agawam River
Wareham, Massachusetts

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.

Pre-Construction Meeting Date: _____

Condition	Required Submittal	Due Date	Date Submitted	Date Approved
PRE-CONSTRUCTION SUBMITTAL REQUIREMENTS				
2	Name and contact information of the EM, including specific experience & years to meet requirement.	Prior to Pre-Construction Meeting		
3	Name and contact information of the Fish Passage Engineer	Prior to the Pre-Construction Mtg		
4	Name and contact information of the RE	Prior to Pre-Construction Meeting		
6	USACE Work-Start Notification Form	14 days prior to work start		
7	CP/PP	14 days prior to work start		
8	Verification of CP/PP Training	Prior to start of work		
10	Control of Water Plan	14 days prior to work start		
13	Flood Contingency Plan	Prior to any work within 1% annual chance of flooding zone		
14	Invasive Plant Management Strategy	Prior to Pre-Construction Meeting		
16	Final Plans	30 Days Prior to Pre-Construction Meeting		
36	MA DMF Fishway Construction Permit	Prior to start of work.		

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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DOCUMENT A00870

US Fish and Wildlife Service

No Effect Concurrence Verification Letter

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To: 05/23/2025 15:39:12 UTC
Project code: 2024-0118641
Project Name: 606352 - WAREHAM- CULVERT AND DAM REPLACEMENT ON CRANBERRY HIGHWAY, MILL POND DAM OVER AGAWAM RIVER

Subject: Not Likely to Adversely Affect Concurrence verification letter for the '606352 - WAREHAM- CULVERT AND DAM REPLACEMENT ON CRANBERRY HIGHWAY, MILL POND DAM OVER AGAWAM RIVER' project under the December 13, 2024, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat, Northern Long-eared Bat, and Tricolored Bat.

To whom it may concern:

This letter records the determination of effects to federally listed (or proposed) bat species anticipated to result from the 606352 - WAREHAM- CULVERT AND DAM REPLACEMENT ON CRANBERRY HIGHWAY, MILL POND DAM OVER AGAWAM RIVER (the Project). This determination is based upon information you entered into the assisted determination key (Dkey) associated with the above referenced Programmatic Biological Opinion/Conference Opinion (PBO/PCO) in the U.S. Fish and Wildlife Service's (Service) Information for Planning and Consultation (IPaC) system on the date listed above to verify that the Project may rely on the concurrence provided in the PBO/PCO to satisfy requirements under section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (16 USC 1536), as amended.

Ensuring Accurate Determinations When Using IPaC:

The Service developed the IPaC system and this Dkey in accordance with the ESA and based on the PBO/PCO. All information submitted by the project proponent into IPaC must accurately represent the full scope and details of the Project.

Failure to accurately represent or implement the Project as detailed in the Dkey invalidates this letter. Answers to certain questions in the Dkey commit the project proponent to implementation of conservation measures that must be followed for the ESA determinations to remain valid. Carefully review this letter, your ESA requirements are <u>NOT</u> yet complete.

Determinations:

Based on the information you provided (Project Description shown below), you have determined that the Project is within the scope and adheres to the criteria of the PBO/PCO, including the adoption of applicable avoidance and minimization measures. Based on your IPaC submission and the PBO/PCO, the Project is consistent with the following effect determinations:

Species	Listing Status	Determination
Northern Long-eared Bat (*Myotis septentrionalis*)	Endangered	NLAA
Tricolored Bat (*Perimyotis subflavus*)	Proposed Endangered	NLAA

The tricolored bat is proposed for listing as endangered under the ESA, but not yet listed. For actions that may affect a proposed species, agencies cannot consult, but they can confer under the authority of section 7(a)(4) of the ESA. Such conferences can follow the procedures for a consultation and be adopted as such if the proposed species is listed. Should the tricolored bat be listed, agencies must review projects that are not yet complete, or projects with ongoing effects within the tricolored bat range that previously received a no effect or not likely to adversely affect (NLAA) determination from the key to confirm that the determination is still accurate.

The Service has 14 calendar days to notify the lead Federal action agency or designated non-federal representative if we determine that the Project does not meet the criteria for a NLAA determination under the PBO/PCO. **If the Service does not notify the lead Federal action agency or designated non-federal representative within that timeframe, you may proceed with the Project under the terms of the NLAA concurrence provided in the PBO/PCO**. 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/PCO.

If the Project is modified, or new information reveals that it may affect the Indiana bat, northern long-eared bat, or tricolored bat in a manner or to an extent not considered in the PBO/PCO, further review to conclude the requirements of ESA section 7(a)(2) may be required.

For Proposed Actions that include bridge/culvert or structure removal, replacement, and/or maintenance activities:

If your initial bridge, culvert, or structure assessment failed to detect Indiana bat, northern long-eared bat, or tricolored bat use or occupancy, yet bats are later detected prior to, or during construction, promptly notify the local Service Field Office within 2 working days of the discovery. In addition, please document whether incidental take occurred, and if so, the type (i.e. kill or harm) and amount (i.e. number of individuals) and submit documentation to the local Service Field Office within 5 working days from the completion of the bridge, culvert, or structure construction (use Appendix E - Post Assessment Discovery of Bats at Bridge/Culvert or Structure Form in the User's Guide). In these instances, potential incidental take of Indiana bats, northern long-eared bats, or tricolored bats may be exempted provided that the take is reported to

the Service. In these instances, potential incidental take of Indiana bats, northern long-eared bats, or tricolored bats may be exempted provided that the take is reported to the Service.

If the Project may affect any other federally listed or proposed species and/or designated critical habitat, additional consultation between the lead Federal action agency and this Service Field Office is required for those species/designated critical habitat. If the Project has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act may also be required. In either of these circumstances, please advise the lead Federal action agency to contact this Service Field Office

The following species may occur in your project area and **are not** covered by this determination:

- Monarch Butterfly *Danaus plexippus* Proposed Threatened
- Plymouth Redbelly Turtle = Plymouth Redbelly Cooter *Pseudemys rubriventris bangsi* Endangered

PROJECT DESCRIPTION

The following project name and description was collected in IPaC as part of the endangered species review process.

NAME

606352 - WAREHAM- CULVERT AND DAM REPLACEMENT ON CRANBERRY HIGHWAY, MILL POND DAM OVER AGAWAM RIVER

DESCRIPTION

606352 - WAREHAM- CULVERT AND DAM REPLACEMENT ON CRANBERRY HIGHWAY AT ROUTE 28 AND ROUTE 6, MILL POND DAM OVER AGAWAM RIVER

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@41.7626176,-70.67613268760982,14z

DETERMINATION KEY RESULT

Based on your answers provided, this project(s) may affect, but is not likely to adversely affect the Indiana bat, northern long-eared bat or tricolored 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 Programmatic Biological Opinion/Conference Opinion for Transportation Projects in the Range of the Indiana bat, northern long-eared bat, and tricolored bat, dated December 13, 2024.

QUALIFICATION INTERVIEW

1. Which Federal Agency is the lead federal agency the action?

   A) Federal Highway Administration (FHWA)

2. Does the Action Area intersect the species list area of the Northern long-eared bat?

   Automatically answered
   Yes

3. Does the Action Area intersect the species list area of the tricolored Bat (TCB)?

   Automatically answered
   Yes

4. Does your project's activities include raising the road profile above the tree canopy in documented habitat for the Indiana bat, NLEB, or TCB?

   Note: For the definition of documented habitat, refer to Appendix A: https://www.fws.gov/media/users-guide-range-wide-programmatic-consultation-indiana-bat-and-northern-long-eared-bat

   No

5. Is your project located within a karst area?

   No

6. Will the project include bridge, culvert, or structure removal, replacement, and/or alteration activities?

   Note: For definitions of bridge, culvert, and structure, refer to Appendix A: https://www.fws.gov/media/users-guide-range-wide-programmatic-consultation-indiana-bat-and-northern-long-eared-bat.

   Yes

7. Do your project’s activities involve tree removal/trimming, temporary lighting, new/additional permanent lighting, ground disturbance, percussives that involves noise/vibration above existing background levels, vibrations, or slash pile burning?

   Yes

8. Is there suitable summer habitat for the Indiana bat, NLEB, or TCB within the project action area?

   Note: See the Service's summer survey guidance for current definitions of suitable habitat [https://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html].

   Yes

9. Have P/A surveys for the Indiana bat, NLEB, or TCB been conducted within the suitable summer habitat located within your project action area? This refers to mist-netting or acoustic surveys, not bridge assessments.

   Note: See the Service's survey guidance https://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html

   Yes

   SUBMITTED DOCUMENTS

   - *606352_wareham2_nleb_survey_20231103.pdf https://ipac.ecosphere.fws.gov/project/SQG5HZVGUFHI5I2RN57FQV2ALM/projectDocuments/146647854*

10. Did the P/A surveys detect Indiana bats, NLEBs, or TCBs?

    Note: If Indiana bats, NLEBs, or TCBs are detected, the action area is considered **documented habitat.**

    No

11. Did the local Service Field Office verify that this P/A survey can be used to determine Indiana bat, NLEB, and TCB are **not likely to be present** within the suitable summer habitat located within your project area?

    Yes

12. Will the project include **bridge** removal, replacement, and/or alteration activities?

    Yes

13. Has a Bridge Bat Assessment been conducted **within the last 24 months** to determine if the bridge is being used by the Indiana bat, NLEB, or TCB? If yes, upload assessment.

    Note: Refer to the Service's current survey guidance for acceptable assessment practices and validity timeframe of bridge/culvert and structure bat assessments: https://www.fws.gov/library/collections/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    Yes

    SUBMITTED DOCUMENTS

    - *606352_Wareham_Bridge_Assessment.pdf https://ipac.ecosphere.fws.gov/project/SQG5HZVGUFHI5I2RN57FQV2ALM/projectDocuments/162452076*

14. Please select one of the following results of the Bridge Bat Assessment:

    c) *Indicates the **absence** of Indiana bats, NLEBs, or TCBs roosting in/under the bridge (no bats, guano, etc.)?*

15. Does the project include **culvert** removal, replacement, and/or alteration activities?

    Yes

16. Does the culvert equal or exceed 23 feet (7.0 meters) in length?

    Yes

17. Are the interior dimensions of the culvert less than 3 ft. in diameter/height?

    No

18. Has a Culvert Bat Assessment been conducted within the last 24 months to determine if the culvert is being used by the Indiana bat, NLEB, or TCB? If yes, upload assessment.

    Note: Refer to the Service's current survey guidance for acceptable assessment practices and validity timeframe of bridge/culvert and structure bat assessments: https://www.fws.gov/library/collections/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    Yes

    SUBMITTED DOCUMENTS

    - *606352_Wareham_Bridge_Assessment.pdf https://ipac.ecosphere.fws.gov/project/SQG5HZVGUFHI5I2RN57FQV2ALM/projectDocuments/162452076*

19. Please select one of the following results of the Culvert Bat Assessment:

    c) Did not detect any signs of Indiana bats, NLEBs, or TCBs roosting in/under the culvert (bats, guano, etc.)

20. Does the project include **structure** removal, replacement, and/or alteration activities?

    No

21. Does the Action Area intersect the species list area of the tricolored Bat (TCB)?

    Automatically answered
    Yes

22. Does the Action Area intersect the species list area of the northern long-eared bat (NLEB)?

    Automatically answered
    Yes

PROJECT QUESTIONNAIRE

1. Have you made a No Effect determinations for all other species included on the FWS IPaC generated species list?

   Yes

2. Have you made a May Affect determination for any other species on the FWS IPaC generated list?

   No

3. Please enter the date of the bridge assessment.

   12/12/2024

4. Please enter the date of the culvert assessment.

12/12/2024

AVOIDANCE AND MINIMIZATION MEASURES (AMMS)

This determination key result includes the commitment to implement the following Avoidance and Minimization Measures (AMMs):

GAMM1

Ensure all operators, employees, and contractors working in areas of Indiana bat, NLEB, or TCB suitable habitat are aware of all Transportation Agency environmental commitments, including all applicable AMMs.

DETERMINATION KEY DESCRIPTION: FHWA, FRA, FTA PROGRAMMATIC CONSULTATION FOR TRANSPORTATION PROJECTS AFFECTING IBAT, NLEB, OR TCB

This key was last updated in IPaC on May 21, 2025. 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) and may affect the federally listed endangered Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), and/or federally proposed endangered tricolored bat (*Perimyotis subflavus*).

This decision key should only be used to verify project applicability with the Service's Programmatic Biological Opinion/Conference Opinion for Transportation Projects in the Range of the Indiana bat, northern long-eared bat, and tricolored bat, dated December 13, 2024. The programmatic consultation limited transportation activities that may affect the covered bat species and addresses situations that are both likely and not likely to adversely affect the covered bat species. This decision key will assist in identifying the effect of a specific project/activity and the applicability of the programmatic consultation. The programmatic consultation is not intended to cover all types of transportation actions. Activities outside the scope of the programmatic consultation, or that may affect ESA-listed species other than the Indiana bat, northern long-eared bat, or tricolored bat, or their designated critical habitat, may require additional ESA Section 7 consultation.

IPAC USER CONTACT INFORMATION

Agency: Massachusetts Department of Transportation
Name: Hana Isihara
Address: 10 Park Plaza
City: Boston
State: MA
Zip: 02116
Email hana.l.isihara@dot.state.ma.us
Phone: 6178964454

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Highway Administration

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DOCUMENT A00872

M.G.L. CHAPTER 253

DAM SAFETY PERMIT

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Certified Mail No. 7019 1120 0000 5149 3490
Return Receipt Requested

M.G.L. Chapter 253
Dam Safety Permit
Permit No. 293 - 2025 - 462

Applicant

Eric Silva, PE
Pare Corporation
8 Blackstone Valley Place
Lincoln, RI 02865

On behalf of:
Massachusetts Department of Transportation, Highway Division
c/o: Carrie Lavallee, PE, Deputy Administrator and Chief Engineer
10 Park Plaza
Boston, MA 02116

Re: Rehabilitation of Cranberry Highway (Route 28) / Mill Pond Dam Over the Agawam River
National Dam ID: MA00027
Registry Location: Plymouth County Registry of Deeds, (see ROW plans)
Owner: Massachusetts Department of Transportation, Highway Division
Dam Location: Wareham

Date: October 21, 2025

Dear Mr. Silva:

Reference is made to the application dated May 15, 2025 and supplemental information provided by Pare Corporation (Pare). These were submitted for Department of Conservation and Recreation (DCR) Office of Dam Safety (ODS) regulatory review of the above-referenced dam rehabilitation project.

Permission is hereby granted under M.G.L. Chapter 253, as amended, to perform work indicated on the drawing set titled "**Wareham US 6 WB & ST 28 NB"** (119 Sheets) dated December 17, 2024, as revised June 24, 2025, and described in supporting documentation provided by Pare.

Permission is granted subject to the following conditions:

(a) At least 21 days before the start of construction, the dam owner shall provide the DCR/ODS - Permits Section a completed **DAM SAFETY IMPROVEMENTS – NOTICE OF CONSTRUCTION** (form attached) with a construction schedule and proof of recording of the Ch. 253 Permit at the Registry of Deeds in the county where the dam lies. If the Notice of Construction provided to ODS lacks a construction schedule, proof of recording of the permit, or an explanation of why permit recording is not possible, ODS will return the Notice of Construction to the dam owner indicating the Notice of Construction is incomplete and informing the owner that construction shall not commence until ODS has received a complete Notice of Construction with the required attachments.

(b) For all features of the project, the Dam Engineer (Pare) shall notify ODS of any design change from the original design submitted with the permit application due to regulatory requirements, changes in field conditions or any other unanticipated occurrence. This notification shall be a formal submittal to ODS which includes all relevant revised plans, computations and data (survey, geotechnical, etc.) supporting the design change(s). This submittal shall be forwarded to ODS by registered mail, return receipt requested, and will require an amendment to the permit. Review time may vary based upon the complexity of the design change(s), however, ODS will generally issue the permit amendment within five (5) business days of receipt of a complete design revision submittal.

(c) The Dam Engineer must report to ODS any unforeseen incidents that occur at the work site during project work. Unforeseen incidents include, but are not limited to, significant uncontrolled seepage into the work area, significant earth support failures or slope failures. The report must explain in detail what occurred, corrective measures taken to mitigate the occurrence and any impacts the occurrence may have had on the project. If the incident results in a design change, ODS must be provided revised design documents (refer to Condition (b), above).

(d) During construction, a copy of the dam's Emergency Action Plan (EAP) shall be maintained on-site by the resident engineer.

(e) The following shall be prepared by the contractor, approved by the Dam Engineer, and submitted to ODS prior to construction:

- Cofferdam designs. The cofferdams shall be carefully designed to resist anticipated forces without failing and to ensure that seepage around, under, or through the cofferdams is manageable;
- Excavation support system design and installation plan. An excavation support system to be installed around the proposed spillway's upstream footers and walls shall be carefully designed to limit the movement of pond bed material near the

excavated area and to ensure the cofferdam foundation remains stable for the duration of project construction. Proposed installation procedures for the support system shall be specified.

- A water control and diversion plan describing methods to be employed to allow work to be performed "in the dry" and to manage both the water level in Mill Pond and outflow from Agawam River while construction is in progress; and
- A flood response plan. While construction is underway, weather forecasts, stream flows and water levels shall be monitored to allow adequate time to respond to rising water levels at the construction site. If high water levels are expected, equipment and materials shall be removed from the work area and personnel evacuated. Sufficient materials and equipment required for flood response shall be maintained in a safe location at, or near, the construction site.

(f) A sufficient level of construction oversight shall be provided by the Dam Engineer to ensure the work conforms to: the project plans and specifications; the Ch. 253 Permit conditions; and generally-accepted dam construction practices as determined by the U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation and/or the U.S. Natural Resources Conservation Service.

Guidance, procedures, checklists, worksheets and references to aid in construction quality assurance are available in the United States Department of Agriculture Natural Resources Conservation Service National Engineering Handbook Part 645-Construction Inspection.

For access to a .pdf copy of NEH Part 645, please email ODS at dam.safety@mass.gov .

(g) The Dam Engineer shall invite ODS to the preconstruction meeting, another project meeting at 50% completion and the final inspection meeting. ODS reserves the right to make site visits and inspections at any time during the permit period. ODS requests the following items be addressed at the pre-construction meeting:

- Identification of the
  - resident engineer (Owner's representative overseeing the project);
  - contractor's qualified site superintendent; and
  - Dam Engineer's representative overseeing the project.
- Provide emergency contact information for the contractor and resident engineer;
- Presentation of the resident engineer's weekly work schedule and discussion of the level of construction oversight to be provided by the resident engineer;
- Water control features anticipated and the process for the Dam Engineer to either develop or approve the overall control and diversion of water plan. Flood emergency warning and response procedures must be identified;
- Level of Dam Engineer construction oversight including: identification of any critical construction items to be overseen by the Dam Engineer; procedures for the Dam Engineer's review and approval of shop drawings and other submittals; documentation of Dam Engineer's approval of any design modifications; procedures

for coordinating and scheduling the Dam Engineer's inspection of critical construction elements;

- Anticipated schedule of construction meetings and required attendees. It is expected that while construction is ongoing, weekly construction meetings will be held and attended by the Dam Engineer, the resident engineer, the contractor's superintendent and other appropriate participants; and
- Presentation of the initial construction schedule with identification and discussion of major items.

ODS shall be provided a copy of the preconstruction meeting minutes.

(h) The Dam Engineer shall provide ODS written documentation that he/she has reviewed and approved all pertinent submittals or samples concerning critical project dam features. This documentation may be in the form of a submittal log which may be submitted as part of the "as-built" report, described below.

(i) Upon completion of work the Applicant shall submit to ODS a **DAM SAFETY CERTIFICATE OF COMPLETION** (form attached). With this certificate of completion submit one bound (utilizing plastic comb bindings) as-built report with 11"x17" record drawings signed and stamped by a registered professional civil engineer with contractor's signature attesting that all work was performed according to the plans and specifications. The as-built report shall include documentation of submittals reviewed and approved by the Dam Engineer, copies of any materials or construction testing reports and color photos of construction phases and appurtenant installations. Photograph numbers, location and direction in which each photo was taken must be identified. An electronic copy (as a .pdf) of the as-built report and record drawings shall be provided to ODS via email, .ftp site or on a USB flash drive.

(j) Prior to issuance of a Certificate of Compliance, the Dam Engineer shall prepare and provide to ODS and the Dam Owner an Operation and Maintenance Manual (O&MM) for the dam. The O&MM shall describe routine maintenance tasks and operational procedures for both routine and storm conditions. The Dam Engineer shall review the contents of the O&MM with the Dam Owner to ensure understanding of the maintenance and operations recommendations outlined within.

(k) The Certificate of Completion, as-built report, O&MM and Phase I Inspection report shall be provided to ODS within 90 days of substantial completion of work unless ODS agrees to later submission of these documents. Submission of these documents is required prior to ODS issuing a Certificate of Compliance.

Any permit issued by DCR shall be subject to revocation by order of the Commissioner if the permittee fails to conform to 302 CMR 10.00, Dam Safety Rules and Regulations, provisions of this permit, or any other applicable laws and regulations.

This permit does not release the applicant from the requirements of any other regulatory authority. Such authorizations and/or notifications include, but are not limited to:

Local Conservation Commission;
Massachusetts Department of Environmental Protection (DEP);
Massachusetts Department of Fish and Game (DFG);
Massachusetts Executive Office of Environmental Affairs (EOEA), MEPA Unit; and
U.S. Army Corps of Engineers.

This permit must be recorded by the applicant at the Registry of Deeds in the county where the dam lies. Recording must be done prior to the commencement of construction and a copy of the recorded permit filed with the Office of Dam Safety.

This permit remains valid for two (2) years from the date of issue: **October 21, 2025**

Permit expiration date: **October 21, 2027**

William Salomaa, Director
DCR, Office of Dam Safety

Bryan Carignan, Permit Engineer
DCR, Office of Dam Safety

CC: Eric Silva, Pare Corporation
Carrie Lavallee, MassDOT – Highway Division

Attachments: Dam Safety Improvements – Notice of Construction form
Dam Safety Certificate of Completion form

Informational (NOT TO BE RECORDED AT REGISTRY OF DEEDS)

Excerpts from Dam Safety Rules Regulations:

302 CMR 10.09(5): Recording a Chapter 253 Permit.

A permit to construct, drawdown, repair, alter, breach or remove a dam shall be recorded at the Registry of Deeds in the county where the dam lies. Recording must be done prior to the commencement of construction and a copy of the recorded permit filed with the Commissioner.

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To: DCR, Office of Dam Safety – Permits Section
180 Beaman Street
West Boylston, MA 01583

DAM SAFETY IMPROVEMENTS - NOTICE OF CONSTRUCTION

Dam Owner/Applicant
Name:
Representative:
Address:
Phone:
Fax:
Email Address:

Project
Project location Town/City:
Dam name:
National Dam ID Number:
State Dam ID Number:
Nature of Dam Safety Improvements:
Chapter 253 Permit date of issue:
Chapter 253 Permit expiration date:
Permit Recorded at_____ Registry of Deeds
Dam Parcel Registry of Deeds Book Number:
Dam Parcel Registry of Deeds Page Number:
Recorded Permit Registry of Deeds Book Number:
Recorded Permit Registry of Deeds Page Number:
Copy of the recorded permit attached Yes ( )
Construction start date:
Construction schedule attached Yes ( )

Engineer
Company Name:
Representative:
Address:
Phone:
Fax:
Email Address:

Contractor
Company Name:
Representative:
Address:
Phone:
Fax:
Email Address :

Brief description of project, note location and dates of construction:

_____
_____
_____

By Contractor

Print name and title:_____

Signature and date:_____

By Engineer

Print name, title:_____

Signature and date:_____

By Dam Owner/Applicant

Print name and title:_____

Signature and date:_____

To: DCR, Office of Dam Safety – Permits Section
180 Beaman Street
West Boylston, MA 01583

DAM SAFETY CERTIFICATE OF COMPLETION

Dam Owner/Applicant
Name:
Representative:
Address:
Phone:
Fax:
Email Address:

Project
Project location Town/City:
Dam name:
National Dam ID Number:
State Dam ID Number:
Nature of Dam Safety Improvements:
Chapter 253 Permit date of issue:
Chapter 253 Permit expiration date:
Permit Recorded at_____ Registry of Deeds
Dam Parcel Registry of Deeds Book Number:
Dam Parcel Registry of Deeds Page Number:
Recorded Permit Registry of Deeds Book Number:
Recorded Permit Registry of Deeds Page Number:
Project completion date:

Engineer
Company Name:
Representative:
Address:
Phone:
Fax:
Email Address:

Contractor
Company Name:
Representative:
Address:
Phone:
Fax:
Email Address :

Brief description of project and dates of construction:

_____
_____
_____

Statement of project completion in accordance with plans, specifications, dam safety permit conditions and standard construction practices:

_____
_____
_____

By Contractor

Print name and title:_____

Signature and date:_____

By Engineer

Print name, title and PE stamp here:_____

Signature and date:_____

By Dam Owner/Applicant

Print name and title:_____

Signature and date:_____

DOCUMENT A00875

POLICY DIRECTIVE P-22-001
AND
POLICY DIRECTIVE P-22-002

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massDOT Massachusetts Department of Transportation Highway Division

Number: P-22-001
Date: 9/23/22

POLICY DIRECTIVE

Jonathan Gulliver (signature on original)
HIGHWAY ADMINISTRATOR

Off-Site Stockpiling of Soil from MassDOT Construction Projects

Purpose

The purpose of this Policy Directive is to formally establish a policy and procedures for managing and stockpiling soil generated and transported from MassDOT construction projects. This Policy Directive does not supersede any Federal, State, or Local regulations.

Date of Effect

This Policy Directive is effective immediately for all projects, including active construction projects.

For active construction projects and for other projects advertised prior to October 15, 2022, changes to the contract documents needed to implement the requirements of this Policy Directive will be considered on a case-by-case basis and shall be approved by the District Highway Director, as necessary.

For projects advertised on or after October 15, 2022, MassDOT will include the requirements and implementation procedures of this Policy Directive in the construction contract documents.

Policy Requirements

This policy is intended to prevent the off-site relocation of excavated soil generated from MassDOT projects to areas near residential receptors and to control potential fugitive dusts and/or contaminants. To that end, excavated soil may not be moved from the project site without knowledge of the content of the material. Knowledge may include visual field observations for presence of staining, odor, and/or debris, screening with a photoionization detector (PID), laboratory analysis, and/or site history. Pavement millings and other non-soil materials are not subject to the requirements of this Policy Directive.

Moving soil from a MassDOT project site to a temporary off-site storage location must be approved in writing by the District Highway Director.

The Contractor must select a storage location that is at least 500 feet away from residential receptors, as defined herein to include, but not be limited to, residential dwellings, residentially

zoned property, schools, daycare facilities, playgrounds, parks, recreational areas, hospitals, elderly housing and convalescent facilities.

Temporary off-site storage of excavated soil from a MassDOT project is only permissible at a location approved and permitted by MassDOT. The temporary storage location should be located within the same municipality where the soil was excavated, where possible. Stockpiled soil must be securely covered, and appropriate measures must be taken to minimize fugitive dust and erosion.

Signs indicating the source of the soil, the date the soil was generated, and contact information must be erected and maintained until the stockpiled soils are transported to a disposal facility or reused on the project site.

Implementation Procedures

To ensure that off-site storage of excavated soils is managed properly on MassDOT projects, this policy requires the following:

1. **Off-Site Stockpile Storage Locations**
    a. The Contractor shall provide proposed off-site storage locations to the Engineer for approval at least 30 days prior to transporting soil off site. Off-site storage locations should be in the same municipality as the work site.
    b. The Contractor shall keep excavated soil on site until adequately characterized to the satisfaction of the Engineer.
    c. The Contractor shall provide notification of the approved off-site storage location to the local Board of Health and the Town Manager's/Mayor's Office at least 7-days prior to transporting soil off site.
    d. The Contractor shall provide the Engineer with at least 3-days' notice prior to transporting soil off site.
    e. For off-site storage locations on MassDOT property, the Contractor is required to obtain an Access Permit through the District Permits Office prior to storage of soil or other materials. MassDOT will issue these permits at no cost to the Contractor. Information to be submitted by the Contractor as part of the permit application shall include:
        i. A description of material to be stored off-site, including available analytical data;
        ii. A figure of the location with distances to residences and residential receptors; and
        iii. Anticipated duration of temporary storage.
    f. Stockpile locations should not be within 500 feet of residential receptors (e.g., residential dwellings, residentially zoned property, schools, daycare facilities, playgrounds, parks, recreational areas, hospitals, elderly housing and convalescent facilities).
        i. If the stockpile location must be within 500 feet of residential receptors, then soil must be less than RCS-1 (per 310 CMR 40.1600) and free of potentially hazardous or regulated items.

g. For off-site storage locations on non-MassDOT property, the Contractor must notify the property owner(s) at least 7 days prior to transporting material.
h. Exceptions to these rules will be reviewed by MassDOT and may be approved by the District Highway Director on a case-by-case basis.

2. Off-Site Stockpile Management

a. The Contractor shall keep soil stockpiles on impermeable surfaces (e.g., asphalt or concrete) or on 10-mil polyethylene sheeting.
b. The Contractor shall cover soil stockpiles with 10-mil polyethylene sheeting and surround with a berm made of hay bales, straw wattles, or similar.
    i. Piles that are actively being worked on must be covered and re-secured at the end of the work shift.
c. The Contractor shall label stockpiles with signs, including:
    i. Location of origin (including any Release Tracking Numbers)
    ii. Stockpile ID number (including MassDOT District office-assigned tracking ID, if different)
    iii. Date of initial accumulation
    iv. Applicable telephone numbers for the Contractor and MassDOT.
d. The Contractor shall mitigate fugitive dust at storage locations under the direction of an appropriately trained/certified environmental professional.
e. The Contractor shall remedy noncompliance with this policy within 48 hours.
f. The Contractor shall remedy noncompliance with this policy on the SAME DAY for potentially hazardous material, as determined by the Engineer.
g. The Contractor shall handle excavated soil according to federal, state, and local regulations.
h. The Contractor shall use appropriate shipping documents for all movements of excavated soil on public roadways (e.g., Bill of Lading, Material Shipping Record, Manifest, Asbestos Waste Shipment Record, etc.).

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Proposal No. 606352-136278

massDOT
Massachusetts Department of Transportation
Highway Division

Number: P-22-002
Date: 9/23/22

POLICY DIRECTIVE

Jonathan Gulliver (signature on original)
HIGHWAY ADMINISTRATOR

Use of MassDOT Property for Staging and other Construction-Related Operations

Purpose

This Policy Directive is intended to address the use of MassDOT property by MassDOT Contractors for construction staging and other construction-related operations that are not specifically defined in the construction contract. Such use of MassDOT property will only be allowed if permitted by the District Office in accordance with 700 CMR 13.00, Approval of Access to MassDOT Highways and Other Property. This includes the use of MassDOT property for staging, laydown, and storage of equipment and materials, including soil excavated from a project site.

This Policy Directive requires the Contractor/applicant to obtain a Non-Vehicular Access Permit from MassDOT to use MassDOT property for these purposes.

This Policy Directive is effective immediately and applies to all MassDOT construction projects.

General Permit Considerations and Conditions

In addition to other normal MassDOT Access Permit procedures, MassDOT shall consider the following during the application, review, implementation and monitoring processes of Access Permits required by this Policy Directive:

- Storage and placement of the Contractor's equipment and materials should not be allowed within the clear zone of the roadway.
- Stockpiled soils should not be located within 500 feet of residential receptors, as defined herein to include, but not be limited to, residential dwellings, residentially zoned property, schools, daycare facilities, playgrounds, parks, recreational areas, hospitals, elderly housing and convalescent facilities.
- The Contractor/applicant shall identify the access/egress locations of the proposed storage areas. MassDOT will only approve locations determined to be safe for roadway users, construction workers and the general public.
- The Contractor may be required to submit a Traffic Management Plan and/or Lighting Plan for MassDOT review and approval as part of the permit application, depending on the proposed use of the area.

- The Contractor shall submit the permit application through MassDOT's online State Highway Access Permit System (SHAPS).
- MassDOT will waive the permit application fee for any application received from a MassDOT Contractor for any permit required by this Policy Directive and will waive any subsequent amendment and extension fees that may otherwise be required.
- MassDOT will review the permit application in accordance with applicable standard procedures and will apply standard permit terms and conditions, as necessary.
- The Resident Engineer will verify that the permit is approved before allowing the Contractor to use the affected area for the requested purpose.
- Areas permitted are for use by the approved applicant only and are not to be shared with or used by other vendors. Subcontractors specifically engaged with the applicant working on the specific MassDOT project will be allowed to use the area in accordance with the terms of the permit.
- Permits are issued on an annual basis and will require the Contractor to file for an extension each year to continue use.

Exemptions from Permit Requirements

Equipment and materials being used for active construction operations and located within the work zone of the construction contract are exempt from this permit requirement, provided they do not interfere with the safety or operation of the roadway or the work zone. Examples of these types of exempt uses are:

- Equipment and materials parked or stored within a protected (barriered) work zone.
- Materials placed in the work zone prior to same-day installation or use.
- Soils excavated temporarily and scheduled to be replaced, such as for trenching operations or for installation of drainage structures.

DOCUMENT B00420

PROPOSAL

WAREHAM

For: **Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River**

COMMONWEALTH OF MASSACHUSETTS

LOCATION

The work referred to herein is in the Town of WAREHAM in Plymouth County, in the Commonwealth of Massachusetts, and is shown by the locus map (Document 00331) in the Proposal Pamphlet, the work locations extend as follows:

Cranberry Highway

Beginning – Station 10+91.00 +/-
Ending –Station 22+76.00 +/-

The contract prices shall include the furnishing of all materials (except as otherwise herein specified), the performing of all the labor requisite or proper, the providing of all necessary machinery, tools, apparatus and other means of construction, the doing of all the abovementioned work in the manner set forth, described and shown in the specifications and on the drawings for the work, and in the form of contract, and the completion thereof within **1486 CALENDAR DAYS** upon receipt of a Notice to Proceed, except that if the completion date falls between December 1 and March 15 then the same number of days beyond December 1st will be extended after March 15th.

The Work of this project is described by the following Items and quantities.

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Project # 606352	Contract # 136278			
Location : WAREHAM				
Description : Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
100.4	1	STORAGE FACILITY OR BUILDING AT _____ LUMP SUM		
101.	0.7	CLEARING AND GRUBBING AT _____ PER ACRE		
102.2	1	TREE TRIMMING AT _____ LUMP SUM		
102.3	16	HERBICIDE TREATMENT OF INVASIVE PLANTS AT _____ PER HOUR		
102.33	16	INVASIVE PLANT MANAGEMENT STRATEGY AT _____ PER HOUR		
102.511	4	TREE PROTECTION - ARMORING AND PRUNING AT _____ EACH		
102.522	200	TREE AND PLANT PROTECTION FENCE - CHAIN LINK AT _____ PER FOOT		
104.	2	TREE REMOVED - DIAMETER 24 INCHES AND OVER AT _____ EACH		
107.94	400	STEEL GRATING FOR WALK AT _____ PER SQUARE FOOT		

Project # 606352	Contract # 136278			
Location : WAREHAM				
Description : Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
107.941	360	ALUMINUM GRATING FOR WALK AT _____ PER SQUARE FOOT		
107.99	1	ALUMINUM SLIDE GATES AT _____ LUMP SUM		
112.99	1	SHED DISPOSAL AT _____ LUMP SUM		
115.1	1	DEMOLITION OF BRIDGE NO. W-06-020 (9LH) AT _____ LUMP SUM		
115.2	1	DEMOLITION OF BRIDGE NO. W-06-020 (8M1) AT _____ LUMP SUM		
115.3	1	DEMOLITION OF BRIDGE NO. W-06-020 (8KD) AT _____ LUMP SUM		
115.4	1	DEMOLITION OF TEMPORARY BRIDGE AT _____ LUMP SUM		
120.1	3,130	UNCLASSIFIED EXCAVATION AT _____ PER CUBIC YARD		
123.	500	MUCK EXCAVATION AT _____ PER CUBIC YARD		

Project # 606352	Contract # 136278			
Location : WAREHAM				
Description : Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
127.1	330	REINFORCED CONCRETE EXCAVATION AT _____ PER CUBIC YARD		
140.	7,650	BRIDGE EXCAVATION AT _____ PER CUBIC YARD		
141.	5	CLASS A TRENCH EXCAVATION AT _____ PER CUBIC YARD		
141.1	200	TEST PIT FOR EXPLORATION AT _____ PER CUBIC YARD		
142.	520	CLASS B TRENCH EXCAVATION AT _____ PER CUBIC YARD		
144.	110	CLASS B ROCK EXCAVATION AT _____ PER CUBIC YARD		
146.	8	DRAINAGE STRUCTURE REMOVED AT _____ EACH		
151.	1,560	GRAVEL BORROW AT _____ PER CUBIC YARD		
151.2	2,790	GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES AT _____ PER CUBIC YARD		

Project # 606352	Contract # 136278			
Location : WAREHAM				
Description : Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
156.	1,163	CRUSHED STONE AT _____ PER TON		
160.1	280	CONTROLLED LOW-STRENGTH MATERIAL - MANUAL EXCAVATABLE (<= 100 PSI) AT _____ PER CUBIC YARD		
170.	7,320	FINE GRADING AND COMPACTING - SUBGRADE AREA AT _____ PER SQUARE YARD		
180.01	1	ENVIRONMENTAL HEALTH AND SAFETY PROGRAM AT _____ LUMP SUM		
180.02	40	PERSONAL PROTECTION LEVEL C UPGRADE AT _____ PER HOUR		
180.03	40	LICENSED SITE PROFESSIONAL SERVICES AT _____ PER HOUR		
181.11	469	DISPOSAL OF UNREGULATED SOIL AT _____ PER TON		
181.12	469	DISPOSAL OF REGULATED SOIL - IN-STATE FACILITY AT _____ PER TON		
181.13	335	DISPOSAL OF REGULATED SOIL - OUT-OF-STATE FACILITY AT _____ PER TON		

Project # 606352	Contract # 136278			
Location : WAREHAM				
Description : Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
181.14	67	DISPOSAL OF HAZARDOUS WASTE AT _____ PER TON		
182.2	5	REMOVAL OF ASBESTOS AT _____ PER FOOT		
182.3	1	ASBESTOS ABATEMENT FOR BUILDING DEMOLITION AT _____ LUMP SUM		
201.	9	CATCH BASIN AT _____ EACH		
202.	5	MANHOLE AT _____ EACH		
202.2	3	MANHOLE (9 TO 14 FOOT DEPTH) AT _____ EACH		
203.	4	SPECIAL MANHOLE AT _____ EACH		
220.	6	DRAINAGE STRUCTURE ADJUSTED AT _____ EACH		
221.	10	FRAME AND COVER AT _____ EACH		

Project # 606352	Contract # 136278			
Location : WAREHAM				
Description : Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
222.1	10	FRAME AND GRATE - MASSDOT CASCADE TYPE AT _____ EACH		
223.2	11	FRAME AND GRATE (OR COVER) REMOVED AND DISCARDED AT _____ EACH		
227.3	5	REMOVAL OF DRAINAGE STRUCTURE SEDIMENT AT _____ PER CUBIC YARD		
227.31	440	REMOVAL OF DRAINAGE PIPE SEDIMENT AT _____ PER FOOT		
227.4	10	MASONRY PLUG AT _____ PER SQUARE FOOT		
241.12	110	12 INCH REINFORCED CONCRETE PIPE CLASS III AT _____ PER FOOT		
241.15	510	15 INCH REINFORCED CONCRETE PIPE CLASS III AT _____ PER FOOT		
241.24	110	24 INCH REINFORCED CONCRETE PIPE CLASS III AT _____ PER FOOT		
243.12	16	12 INCH REINFORCED CONCRETE PIPE CLASS IV AT _____ PER FOOT		

Project # 606352	Contract # 136278			
Location : WAREHAM				
Description : Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
265.04	190	4 INCH SUBDRAIN - OPTION AT _____ PER FOOT		
265.06	180	6 INCH PIPE SUBDRAIN - OPTION AT _____ PER FOOT		
303.06	30	6 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT) AT _____ PER FOOT		
303.12	950	12 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT) AT _____ PER FOOT		
305.12	104	12 INCH DUCTILE IRON INSULATED PIPE (BRIDGE) AT _____ PER FOOT		
309.	5,800	DUCTILE IRON FITTINGS FOR WATER PIPE AT _____ PER POUND		
325.910	60	10 INCH STEEL CASING FOR GAS PIPE AT _____ PER FOOT		
347.1	90	1 INCH COPPER TUBING TYPE K AT _____ PER FOOT		
350.06	2	6 INCH GATE AND GATE BOX AT _____ EACH		

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Description : Culvert and Dam Replacement on Cranberry Highway at Route 28 and Route 6, Mill Pond Dam over Agawam River				
ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
350.12	6	12 INCH GATE AND GATE BOX AT _____ EACH		
350.99	1	24 INCH TIDE INLINE CHECK VALVE AT _____ EACH		
358.	4	GATE BOX ADJUSTED AT _____ EACH		
358.1	1	GATE BOX REMOVED AND STACKED AT _____ EACH		
363.1	3	1 INCH CORPORATION COCK AT _____ EACH		
371.12	6	12 INCH COUPLING AT _____ EACH		
373.12	40	12 INCH WATER PIPE INSULATION AT _____ PER FOOT		
376.1	2	HYDRANT - EXCLUDING COST OF HYDRANT AT _____ EACH		
376.3	1	HYDRANT - REMOVED AND STACKED AT _____ EACH		

Project # 606352	Contract # 136278			
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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
381.	3	SERVICE BOX AT _____ EACH		
381.2	3	SERVICE BOX REMOVED AND STACKED AT _____ EACH		
381.3	1	SERVICE BOX ADJUSTED AT _____ EACH		
384.	3	CURB STOP AT _____ EACH		
402.	410	DENSE GRADED CRUSHED STONE FOR SUB-BASE AT _____ PER CUBIC YARD		
415.3	2,430	PAVEMENT MICRO MILLING AT _____ PER SQUARE YARD		
440.	109,600	CALCIUM CHLORIDE FOR ROADWAY DUST CONTROL AT _____ PER POUND		
443.	90	WATER FOR ROADWAY DUST CONTROL AT _____ PER 1000 GALLONS		
450.	40	GRAVEL FOR SURFACING AT _____ PER CUBIC YARD		

Project # 606352 Contract # 136278				
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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
450.32	650	SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC - 19.0) AT _____ PER TON		
450.42	830	SUPERPAVE BASE COURSE - 37.5 (SBC - 37.5) AT _____ PER TON		
450.52	50	SUPERPAVE LEVELING COURSE - 9.5 (SLC - 9.5) AT _____ PER TON		
450.601	532	SUPERPAVE BRIDGE SURFACE COURSE - 9.5 POLYMER (SSC-B - 9.5 - P) AT _____ PER TON		
450.701	32	SUPERPAVE BRIDGE PROTECTIVE COURSE - 9.5 POLYMER (SPC-B - 9.5 - P) AT _____ PER TON		
451.	160	HMA FOR PATCHING AT _____ PER TON		
452.	870	ASPHALT EMULSION FOR TACK COAT AT _____ PER GALLON		
453.	5,330	HMA JOINT SEALANT AT _____ PER FOOT		
470.	1	HOT MIX ASPHALT BERM AT _____ PER TON		

Project # 606352	Contract # 136278			
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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
472.	230	TEMPORARY ASPHALT PATCHING AT _____ PER TON		
482.5	500	SAWCUTTING ASPHALT PAVEMENT FOR BOX WIDENING AT _____ PER FOOT		
504.	680	GRANITE CURB TYPE VA4 - STRAIGHT AT _____ PER FOOT		
504.1	150	GRANITE CURB TYPE VA4 - CURVED AT _____ PER FOOT		
505.	70	GRANITE CURB TYPE VA5 - STRAIGHT AT _____ PER FOOT		
509.	140	GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS - STRAIGHT AT _____ PER FOOT		
509.1	55	GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS - CURVED AT _____ PER FOOT		
514.	5	GRANITE CURB INLET - STRAIGHT AT _____ EACH		
515.	2	GRANITE CURB INLET - CURVED AT _____ EACH		

Project # 606352	Contract # 136278			
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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
520.	20	CONCRETE CURB TYPE VA AT _____ PER FOOT		
580.	720	CURB REMOVED AND RESET AT _____ PER FOOT		
581.	2	CURB INLET REMOVED AND RESET AT _____ EACH		
594.	680	CURB REMOVED AND DISCARDED AT _____ PER FOOT		
620.12	270	GUARDRAIL, TL-2 (SINGLE FACED) AT _____ PER FOOT		
622.1	60	GUARDRAIL - WOOD, DOUBLE RAIL AT _____ PER FOOT		
627.1	3	TRAILING ANCHORAGE AT _____ EACH		
627.82	2	GUARDRAIL TANGENT END TREATMENT, TL-2 AT _____ EACH		
627.92	1	GUARDRAIL FLARED END TREATMENT, TL-2 AT _____ EACH		

Project # 606352 Contract # 136278				
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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
628.24	4	TRANSITION TO BRIDGE RAIL AT _____ EACH		
628.314	2	TEMPORARY IMPACT ATTENUATOR, REDIRECTIVE, TL-2 AT _____ EACH		
628.4	8	TEMPORARY IMPACT ATTENUATOR, REMOVED AND RESET AT _____ EACH		
630.2	390	HIGHWAY GUARD REMOVED AND DISCARDED AT _____ PER FOOT		
645.072	230	72 INCH CHAIN LINK FENCE (PIPE TOP RAIL) (LINE POST OPTION) AT _____ PER FOOT		
655.3	220	ORNAMENTAL PICKET FENCE AND GATE AT _____ PER FOOT		
657.	1,000	TEMPORARY FENCE AT _____ PER FOOT		
665.	680	CHAIN LINK FENCE REMOVED AND STACKED AT _____ PER FOOT		
685.	40	STONE MASONRY WALL IN CEMENT MORTAR AT _____ PER CUBIC YARD		

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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
685.9	75	STONE MASONRY VENEER AT _____ PER SQUARE YARD		
690.2	40	SALVAGED GRANITE LANDSCAPE CURB AT _____ PER FOOT		
690.3	46	SALVAGED GRANITE BLOCK WALL AT _____ PER FOOT		
690.5	2	SALVAGED GRANITE PIER AT _____ EACH		
690.6	305	GRANITE CAPSTONE AT _____ PER FOOT		
690.9	150	STONE MASONRY WALL REMOVED AND REBUILT IN CEMENT MORTAR AT _____ PER CUBIC YARD		
690.91	330	STONE MASONRY REMOVED AND STACKED AT _____ PER CUBIC YARD		
697.1	10	SILT SACK AT _____ EACH		
698.3	100	GEOTEXTILE FABRIC FOR SEPARATION AT _____ PER SQUARE YARD		

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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
698.4	1,190	GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL AT _____ PER SQUARE YARD		
701.	205	CEMENT CONCRETE SIDEWALK AT _____ PER SQUARE YARD		
701.2	50	CEMENT CONCRETE PEDESTRIAN CURB RAMP AT _____ PER SQUARE YARD		
702.	260	HOT MIX ASPHALT SIDEWALK OR DRIVEWAY AT _____ PER TON		
706.7	356	SALVAGED GRANITE PLANK PAVING AT _____ PER SQUARE FOOT		
707.13	3	BENCH - 6 FEET AT _____ EACH		
708.1	2	INTERPRETIVE PANEL METAL FRAME AT _____ EACH		
708.13	2	INTERPRETIVE PANEL AT _____ EACH		
708.15	1	AGAWAM HERRING RUN SIGN AT _____ EACH		

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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
710.4	3	BOUND - PLAIN GRANITE AT _____ EACH		
711.	1	BOUND REMOVED AND RESET AT _____ EACH		
715.1	3	MAIL BOX REMOVED AND RESET AT _____ EACH		
722.1	1	SCHEDULE OF OPERATIONS (TYPE A) - FIXED PRICE $117,500 AT One Hundred Seventeen Thousand Five Hundred Dollars LUMP SUM	$117,500.00	$117,500.00
740.	49	ENGINEER'S FIELD OFFICE AND EQUIPMENT (TYPE A) AT _____ PER MONTH		
748.	1	MOBILIZATION AT _____ LUMP SUM		
751.	240	LOAM FOR ROADSIDES AT _____ PER CUBIC YARD		
751.1	550	LOAM FOR LAWNS AT _____ PER CUBIC YARD		
751.7	75	COMPOST BLANKET AT _____ PER CUBIC YARD		

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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
751.765	12	COMPOSTED MULCH OVER MODIFIED ROCKFILL AT _____ PER CUBIC YARD		
756.	1	NPDES STORMWATER POLLUTION PREVENTION PLAN AT _____ LUMP SUM		
757.02	60	BIORETENTION SOIL MEDIA AT _____ PER CUBIC YARD		
765.	2,360	SEEDING AT _____ PER SQUARE YARD		
765.21	12	ANNUAL COVER CROP FOR NATIVE SEEDING AT _____ PER POUND		
765.421	7	MID-HEIGHT GRASSLAND MIX AT _____ PER POUND		
765.442	1	ROADSIDE RIVERBANK MIX AT _____ PER POUND		
765.635	1,900	NATIVE SEEDING AND ESTABLISHMENT AT _____ PER SQUARE YARD		
767.121	1,900	SEDIMENT CONTROL BARRIER AT _____ PER FOOT		

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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
767.6	4	AGED PINE BARK MULCH AT _____ PER CUBIC YARD		
769.	440	PAVEMENT MILLING MULCH UNDER GUARD RAIL AT _____ PER FOOT		
771.1	2	EVERGREEN TREE - 3-4 FEET AT _____ EACH		
775.1	10	DECIDIOUS TREE - 1.5-2 INCH CALIPER AT _____ EACH		
775.2	2	DECIDIOUS TREE - 2-2.5 INCH CALIPER AT _____ EACH		
778.1	1	MULTISTEM TREE - 5-6 FEET AT _____ EACH		
785.1	15	LARGE SHRUB - 2-2.5 FEET AT _____ EACH		
785.2	25	SMALL SHRUB - 18-24 INCH AT _____ EACH		
813.9	1	DESIGN AND INSTALLATION OF ELECTRICAL SERVICE AT _____ LUMP SUM		

Project # 606352 Contract # 136278				
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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
832.	332	WARNING-REGULATORY AND ROUTE MARKER - ALUMINUM PANEL (TYPE A) AT _____ PER SQUARE FOOT		
841.2	2	SUPPORTS FOR GUIDE SIGN (D6-5 INCH TUBULAR POST) STEEL AT _____ EACH		
847.1	21	SIGN SUP (N/GUIDE)+RTE MKR W/1 BRKWAY POST ASSEMBLY - STEEL AT _____ EACH		
848.1	1	SIGN SUP (N/GUIDE)+RTE MKR W/2 BRKWAY POST ASSEMBLIES-STEEL AT _____ EACH		
850.41	640	ROADWAY FLAGGER AT _____ PER HOUR		
852.	430	SAFETY SIGNING FOR TRAFFIC MANAGEMENT AT _____ PER SQUARE FOOT		
852.11	200	PORTABLE BREAKAWAY BARRICADE TYPE III AT _____ PER FOOT		
852.12	4	TEMPORARY PEDESTRIAN CURB RAMP AT _____ EACH		
853.1	20	PORTABLE BREAKAWAY BARRICADE TYPE III AT _____ EACH		

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853.2	660	TEMPORARY BARRIER (TL-2) AT _____ PER FOOT		
853.21	3,390	TEMPORARY BARRIER REMOVED AND RESET AT _____ PER FOOT		
853.33	200	TEMPORARY BARRIER - LIMITED DEFLECTION (TL-3) AT _____ PER FOOT		
853.403	370	TRUCK MOUNTED ATTENUATOR AT _____ PER DAY		
853.8	540	TEMPORARY ILLUMINATION FOR WORK ZONE AT _____ PER DAY		
854.016	10,400	TEMPORARY PAVING MARKINGS - 6 INCH (PAINTED) AT _____ PER FOOT		
854.036	2,230	TEMPORARY PAVING MARKINGS - 6 INCH (TAPE) AT _____ PER FOOT		
854.1	5,160	PAVEMENT MARKING REMOVAL AT _____ PER SQUARE FOOT		
856.060	1,080	ARROW BOARD (TYPE B) AT _____ PER DAY		

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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
856.12	196	PORTABLE CHANGEABLE MESSAGE SIGN AT _____ PER DAY		
859.	65,700	REFLECTORIZED DRUM AT _____ PER DAY		
864.04	160	PAVEMENT ARROWS AND LEGENDS REFLECTORIZED WHITE (THERMOPLASTIC) AT _____ PER SQUARE FOOT		
866.106	2,150	6 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC) AT _____ PER FOOT		
866.112	890	12 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC) AT _____ PER FOOT		
867.106	1,000	6 INCH REFLECTORIZED YELLOW LINE (THERMOPLASTIC) AT _____ PER FOOT		
867.112	200	12 INCH REFLECTORIZED YELLOW LINE (THERMOPLASTIC) AT _____ PER FOOT		
874.	2	STREET NAME SIGN AT _____ EACH		
874.2	3	TRAFFIC SIGN REMOVED AND RESET AT _____ EACH		

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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
874.4	22	TRAFFIC SIGN REMOVED AND STACKED AT _____ EACH		
874.99	1	WARNING BOUYS AND SIGNS AT _____ LUMP SUM		
877.1	12	SIGN POST REMOVED AND DISCARDED AT _____ EACH		
903.	6	3000 PSI, 1.5 INCH, 470 CEMENT CONCRETE AT _____ PER CUBIC YARD		
904.3	1,130	5000 PSI, 3/4 INCH, 685 HP CEMENT CONCRETE AT _____ PER CUBIC YARD		
910.1	136,000	STEEL REINFORCEMENT FOR STRUCTURES - EPOXY COATED AT _____ PER POUND		
910.4	1,800	MECHANICAL REINFORCING BAR SPLICER AT _____ EACH		
945.99	1	SECANT WALLS AT _____ LUMP SUM		
950.1	1	TEMPORARY SHORING AT _____ LUMP SUM		

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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
960.1	920	STRUCTURAL STEEL - COATED STEEL AT _____ PER POUND		
970.	2,310	DAMP-PROOFING AT _____ PER SQUARE FOOT		
975.5	70	ALUMINUM HANDRAIL AT _____ PER FOOT		
982.9	25	ALUMINUM WEIR AT _____ EACH		
982.91	70	ALUMINUM STOP LOGS AT _____ PER FOOT		
983.1	850	RIPRAP AT _____ PER TON		
983.9	160	STREAMBED RESTORATION AT _____ PER CUBIC YARD		
986.	225	MODIFIED ROCKFILL AT _____ PER TON		
988.	50	CHANNEL PAVING AT _____ PER SQUARE YARD		

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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
991.1	1	CONTROL OF WATER - STRUCTURE NO. W-06-020 (CCV) AT _____ LUMP SUM		
992.32	1	TEMPORARY SUPPORTS FOR PIPING AT _____ LUMP SUM		
993.01	1	TEMPORARY BRIDGE STRUCTURE AT _____ LUMP SUM		
995.01	1	BRIDGE STRUCTURE, BRIDGE NO. W-06-020 (CCV) AT _____ LUMP SUM		
Total Qty:	414,368.7			