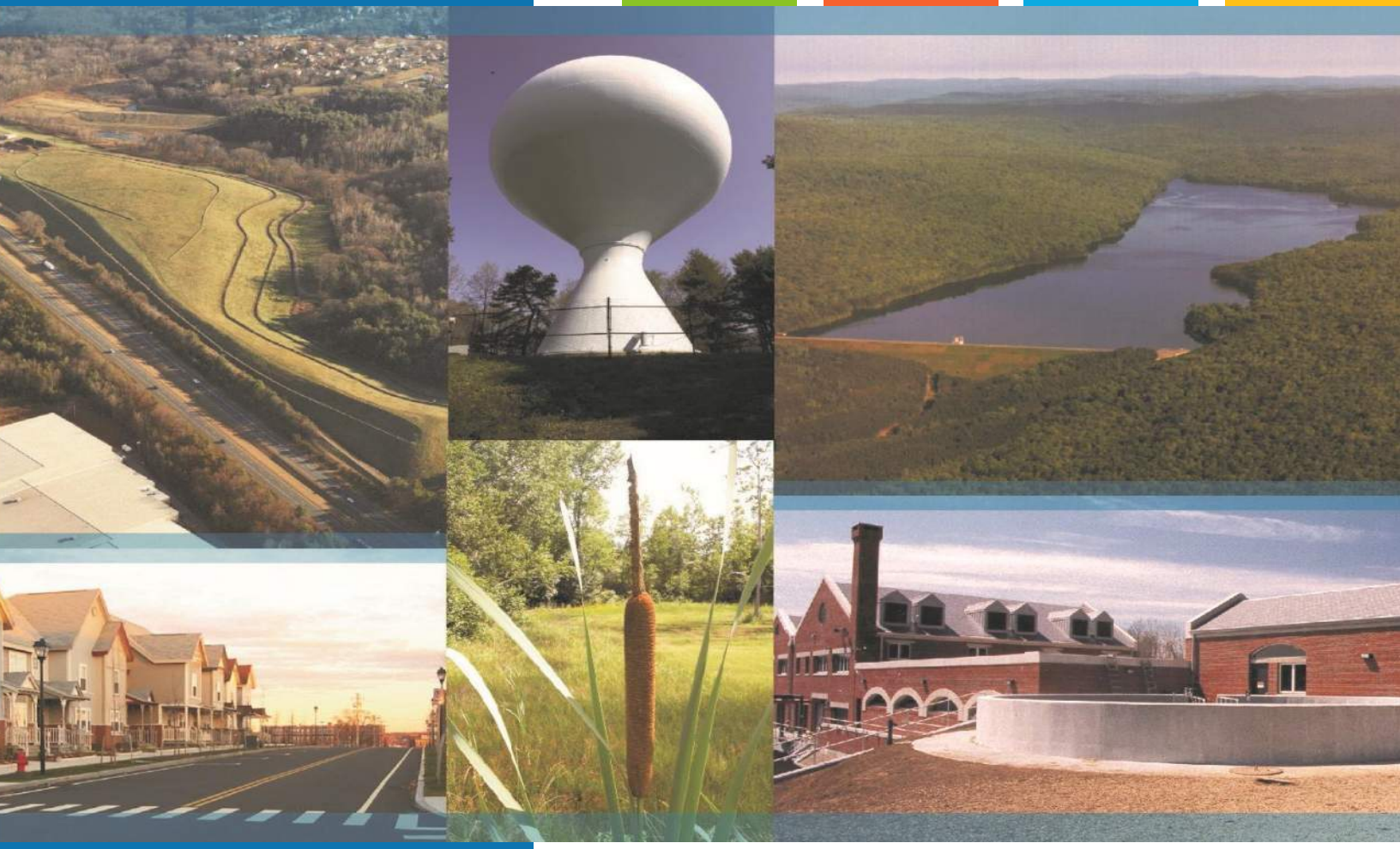

Main Street Over Cold Spring Brook
Bridge Replacement
Ashland, Massachusetts

Notice of Intent

Town of Ashland

October 2022

Tighe&Bond

100% Recyclable

A-1133-009
November 3, 2022

Becca Solomon, Conservation Agent
Ashland Conservation Commission
101 Main Street
Ashland, Massachusetts 01721

Re: **Notice of Intent**
Main Street Bridge Replacement
MassDOT Bridge A-14-010 (7NV)

Dear Conservation Agent Solomon and Members of the Commission:

On behalf of the Town of Ashland (Town), Tighe & Bond respectfully submits this Notice of Intent (NOI) for the proposed Main Street Bridge Replacement in Ashland, Massachusetts. The project consists of the replacement of the superstructure of the bridge crossing Cold Spring Brook, as well as the gas lines crossing the structure.

A 2018 inspection of the Main Street bridge crossing Cold Spring Brook found the bridge and associated utilities to be in Poor condition. MassDOT has awarded the Town a Small Bridge Grant to support construction. The proposed work is located within Bordering Land Subject to Flooding (BLSF) and the 200-foot Riverfront Area associated with Cold Spring Brook, as well as the 100-foot Buffer Zone to inland Bank and Bordering Vegetated Wetlands (BVW) and the Town of Ashland 25-foot no build and no disturbance zones. As such, this application is being filed for the Commission's review pursuant to the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40; MA WPA) and the Town of Ashland Wetlands Bylaw (Chapter 280).

Thank you in advance for your review of this NOI. Should you have any questions or require additional information, please contact me at 781-375-2573 or via email at DLMurphy@tighebond.com. We look forward to meeting with you at your next public hearing.

Very truly yours,

TIGHE & BOND, INC.

Daniel L. Murphy, PE
Project Manager

Copy: MassDEP (NERO) Division of Wetlands and Waterways
Doug Small, Highway Department, Town of Ashland

Tighe&Bond

CONTENTS

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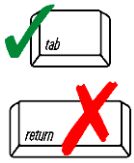
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Ashland
City/Town

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

Main Street Crossing over Cold Spring Brook — a. Street Address
Ashland — b. City/Town
01721 — c. Zip Code

Latitude and Longitude:
42.253626 — d. Latitude
-71.458115 — e. Longitude

Main Street Right-of-Way (ROW) — f. Assessors Map/Plat Number
Main Street ROW — g. Parcel /Lot Number

2. Applicant:

Doug — a. First Name
Small — b. Last Name
Town of Ashland Highway Department — c. Organization
101 Main Street — d. Street Address
Ashland — e. City/Town
MA — f. State
01721 — g. Zip Code
508-881-0120 — h. Phone Number
i. Fax Number
dsmall@ashlandmass.com — j. Email Address

3. Property owner (required if different from applicant): ☐ Check if more than one owner

a. First Name
b. Last Name
c. Organization
d. Street Address
e. City/Town
f. State
g. Zip Code
h. Phone Number
i. Fax Number
j. Email address

4. Representative (if any):

Eric Ohanian — a. First Name
b. Last Name
Tighe & Bond — c. Company
1 University Avenue, Suite 100 — d. Street Address
Westwood — e. City/Town
MA — f. State
02090 — g. Zip Code
781-708-9834 — h. Phone Number
i. Fax Number
EOhanian@tighebond.com — j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

Exempt - Municipal Project — a. Total Fee Paid
N/A — b. State Fee Paid
N/A — c. City/Town Fee Paid

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Provided by MassDEP:

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A. General Information (continued)

6. General Project Description:

This project involves the replacement of the superstructure of the existing bridge where Main Street crosses Cold Spring Brook in Ashland, Massachusetts.

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Commercial/Industrial
4. ☐ Dock/Pier
5. ☐ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☒ Transportation
9. ☐ Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☒ Yes ☐ No

If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

310 CMR 10.53(3)(i) - improvement of existing bridge
2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

Middlesex
a. County

b. Certificate # (if registered land)

Main Street ROW
c. Book

Main Street ROW
d. Page Number

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1. ☐ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
2. ☒ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Bank	1. linear feet	2. linear feet
b. ☐ Bordering Vegetated Wetland	1. square feet	2. square feet
c. ☐ Land Under Waterbodies and Waterways	1. square feet 3. cubic yards dredged	2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☒ Bordering Land Subject to Flooding	175 1. square feet 0 3. cubic feet of flood storage lost	175 2. square feet 0 4. cubic feet replaced
e. ☐ Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced
f. ☒ Riverfront Area	Cold Spring Brook - Inland 1. Name of Waterway (if available) - **specify coastal or inland**	

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☒ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: 11,100 square feet

4. Proposed alteration of the Riverfront Area:

a. total square feet	b. square feet within 100 ft.	c. square feet between 100 ft. and 200 ft.
8,000	8,000	0

5. Has an alternatives analysis been done and is it attached to this NOI? ☒ Yes ☐ No

6. Was the lot where the activity is proposed created prior to August 1, 1996? ☒ Yes ☐ No

3. ☐ Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f**. above.

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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
i. ☐ Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above 1. cubic yards dredged	
l. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4. ☐ Restoration/Enhancement

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

5. ☒ Project Involves Stream Crossings

0
a. number of new stream crossings

1
b. number of replacement stream crossings

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C. Other Applicable Standards and Requirements

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

   a. ☐ Yes ☒ No

   If yes, include proof of mailing or hand delivery of NOI to:

   Natural Heritage and Endangered Species Program
   Division of Fisheries and Wildlife
   1 Rabbit Hill Road
   Westborough, MA 01581

   August 1, 2021
   b. Date of map

   If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

   c. Submit Supplemental Information for Endangered Species Review*

      1. ☐ Percentage/acreage of property to be altered:

         (a) within wetland Resource Area _____ percentage/acreage

         (b) outside Resource Area _____ percentage/acreage

      2. ☐ Assessor's Map or right-of-way plan of site

2. ☐ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

   (a) ☐ Project description (including description of impacts outside of wetland resource area & buffer zone)

   (b) ☐ Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see https://www.mass.gov/ma-endangered-species-act-mesa-regulatory-review).
Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.
** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

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C. Other Applicable Standards and Requirements (cont'd)

(c) ☐ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review).
Make check payable to "Commonwealth of Massachusetts - NHESP" and ***mail to NHESP*** at above address

*Projects altering **10 or more acres** of land, also submit:*

(d) ☐ Vegetation cover type map of site

(e) ☐ Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. ☒ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. a. NHESP Tracking # b. Date submitted to NHESP

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. ☒ Not applicable – project is in inland resource area only b. ☐ Yes ☐ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Cohasset to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

c. ☐ Is this an aquaculture project? d. ☐ Yes ☒ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).

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C. Other Applicable Standards and Requirements (cont'd)

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

a. ☐ Yes ☒ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

b. ACEC

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

a. ☐ Yes ☒ No

6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

a. ☐ Yes ☒ No

7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

a. ☐ Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)

2. ☐ A portion of the site constitutes redevelopment

3. ☐ Proprietary BMPs are included in the Stormwater Management System.

b. ☒ No. Check why the project is exempt:

1. ☐ Single-family house

2. ☐ Emergency road repair

3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☒ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)

2. ☒ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

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Bureau of Resource Protection - Wetlands

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Provided by MassDEP:

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D. Additional Information (cont'd)

3. ☒ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

Main Street Over Cold Spring Brook Bridge Replacement
a. Plan Title

Tighe & Bond
b. Prepared By

c. Signed and Stamped by

September 2022
d. Final Revision Date

Varies - as noted
e. Scale

f. Additional Plan or Document Title

g. Date

5. ☐ If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. ☐ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. ☒ Attach NOI Wetland Fee Transmittal Form

9. ☐ Attach Stormwater Report, if needed.

E. Fees

1. ☒ Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

N/A
2. Municipal Check Number

3. Check date

N/A
4. State Check Number

5. Check date

N/A
6. Payor name on check: First Name

7. Payor name on check: Last Name

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Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Ashland
City/Town

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

John D. [illegible]
1. Signature of Applicant

11/2/22
2. Date

3. Signature of Property Owner (if different)

4. Date

David F. Murphy Jr
5. Signature of Representative (if any)

11/3/22
6. Date

For Conservation Commission:
Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:
If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

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NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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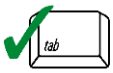

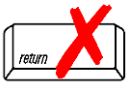

A. Applicant Information

1. Location of Project:

Main Street Crossing over Cold Spring Brook	Ashland
a. Street Address	b. City/Town
Fee Exempt - Municipal Project	N/A
c. Check number	d. Fee amount

2. Applicant Mailing Address:

Doug		Small
a. First Name		b. Last Name
Town of Ashland Highway Department		
c. Organization		
101 Main Street		
d. Mailing Address		
Ashland	MA	01721
e. City/Town	f. State	g. Zip Code
508-881-0120		dsmall@ashlandmass.com
h. Phone Number	i. Fax Number	j. Email Address

3. Property Owner (if different):

a. First Name		b. Last Name
c. Organization		
d. Mailing Address		
e. City/Town	f. State	g. Zip Code
h. Phone Number	i. Fax Number	j. Email Address

B. Fees

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

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Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
N/A			

Step 5/Total Project Fee:

Step 6/Fee Payments:

Total Project Fee:	N/A a. Total Fee from Step 5
State share of filing Fee:	N/A b. 1/2 Total Fee **less $**12.50
City/Town share of filling Fee:	N/A c. 1/2 Total Fee **plus** $12.50

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

Tighe&Bond

SECTION 1

Section 1
Introduction

The Town of Ashland Highway Department (Town) is seeking to replace the bridge on Main Street that spans Cold Brook in Ashland, Middlesex County, Massachusetts. The existing bridge is a short span concrete deck bridge supported by gravity masonry block retaining wall abutments and wingwalls, assumed to be founded on shallow spread footings typical of bridges of similar age and structure in New England.

The bridge was built in 1918 and is showing signs of significant deterioration including concrete cracking, efflorescence, and spalling as well as several areas of exposed rebar. A 2018 inspection by the Massachusetts Department of Transportation (MassDOT) found the bridge (and associated utilities) to be in Poor condition. The Town proposes to replace the superstructure of the bridge and associated utilities, and has been awarded a Small Bridge Grant from MassDOT for construction.

1.1 Project Locus

The Project Locus is comprised of the Main Street public roadway right-of-way (ROW) between 511 Main Street and 25 Oak Tree Lane, a privately-owned parcel (400 Main Street), and Ashland State Park (Property ID 014/024.0-0001-0000.0). This area consists of a 30-foot wide paved roadway, four-foot wide bituminous sidewalk, a mowed grassy easement, unmaintained forest edge, and the channel of Cold Brook where it crosses below the roadway. The Project Site, or Limits of Work, consists of approximately 11,100 square feet (sf) of land within the Project Locus. The Project Site is illustrated on Figure 3 and the Project Drawings in Appendix A of this Notice of Intent (NOI).

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SECTION 2

Section 2
Existing Environment

This section provides a description of the Project Site and surrounding area, as well as information pertaining to wetland resource areas and rare species. Figures illustrating the Project Site and surrounding area are provided in Appendix A. Site photographs are provided in Appendix B.

2.1 Cold Brook

Cold Spring Brook is shown as a perennial stream on the most current USGS topographic map of the area (Framingham Quadrangle, Massachusetts, 7.5 Minute Series, 2021). Tighe & Bond performed a USGS StreamStats evaluation of the stream from a point downstream of the Project Site. According to StreamStats, the stream has a contributing drainage area of approximately 7.94 square miles. A copy of the StreamStats report is provided in Appendix C.

The MAWPA regulations set forth the criteria for determining whether a stream is regulated as intermittent or perennial. This is set forth at 310 CMR 10.58(2)(a)(1)(b) and (c). Per 310 CMR 10.58(2)(a)(1)(a): *"A river or stream shown as perennial on the current United States Geological Survey (USGS) or more recent map provided by the Department is perennial."*

As noted above, the stream is shown as perennial on the most current USGS map and shall be presumed perennial under the MAWPA regulations.

2.2 Wetland Resource Areas

On March 16 and April 6, 2021, Tighe & Bond conducted wetland resource area investigations at the Project Site in general accordance with the Massachusetts Department of Environmental Protection (MassDEP) guidelines, 310 CMR 10.00, the United States Army Corps of Engineers *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (January 2012), and the Town of Ashland Wetlands Protection Bylaw (Chapter 280).

In addition to field investigations, Tighe & Bond reviewed available mapping of the site including the FEMA Flood Insurance Study (FIS) for Middlesex County, Massachusetts (All Jurisdictions) (25017CV004C (Cold Spring Brook flood profile 148P); revised July 6, 2016) and FEMA Flood Insurance Rate Map (FIRM) Community-Panel No. 25017C0514F (effective July 7,2014). Copies of the flood profile and FEMA FIRMette of the project area are provided in Appendix C.

The following jurisdictional wetland resource areas have been identified in the vicinity of the Project Site:

- Inland Bank/Mean Annual High Water (MAHW)
- Bordering Vegetated Wetland (BVW)
- Bordering Land Subject to Flooding (BLSF)
- Riverfront Area

The Project Site is also within the 100-foot Buffer Zone of inland Bank and BVW, as well as the 25-foot No Disturb Zone as set forth in the Ashland Wetland Protection Bylaw (Chapter 280). The wetland resource areas at and near the Project Site are summarized below in Table 2-1, and the following sections provide detailed descriptions of each wetland resource areas identified within the Project Site.

TABLE 2-1
Summary of Resource Area Flagging – Cold Spring Brook

Flag Series	Flag Numbers	Resource Area	Cowardin Classification[1]
1A	1A-1 to 1A-13*	Inland Bank/MAHW	R2UBH
1B	1B-1 to 1B-12*	Inland Bank/MAHW	R2UBH
1C	1C-1* to 1C-11	BVW	PFO1E
1D	1D-1 to 1D-2	BVW	PEM1F
1E	1E-1 to 1E-3	BVW	PEM1F
1F	1F-1 to 1F-10*	BVW	PFO1E/PEM1F

* Open-ended flag series.

[1] Sourced from the National Wetland Inventory Database

2.2.1 Inland Bank and MAHW

Inland Bank and MAHW were generally coincident within and adjacent to the Project Site. The 1A and 1B flag series define the limits of inland Bank and MAHW of Cold Spring Brook. The well-defined banks of the stream are vegetated with emergent vegetation and trees, except immediately upstream and downstream of the bridge, where the Banks have been armored with stone. The streambed consists of a combination of organic materials, cobble, and large stones.

2.2.2 Bordering Vegetated Wetlands

Flag series 1C, 1D, 1E, and 1F define the boundaries of vegetated wetlands bordering on Cold Spring Brook.

Flag series 1C defines the boundary of a forested (PFO1E) wetland directly south of the Main Street bridge. Indicators of wetland hydrology in this area included surface water, water-stained leaves, drainage patterns and the presence of hypertrophied lenticels on trees. Wetland hydrology was further demonstrated by the presence of prominent redoximorphic soil features indicating a fluctuating water table. Vegetation in Wetland 1C was dominated by red maple (*Acer rubrum*; FAC), highbush blueberry (*Vaccinium corymbosum*; FACW), redosier dogwood (*Cornus sericea*; FACW), cattail (*Typha* sp.; OBL), cinnamon fern (*Osmunda cinnamomea*; FACW), sensitive fern (*Onoclea sensibilis*; FACW), and soft rush (*Juncus effusus*; FACW).

Flag series 1D defines the boundary of a small emergent (PEM1F) wetland bordering the northern bank of Cold Spring Brook northeast of the bridge. Wetland hydrology in this area included the presence of water-stained leaves and hypertrophied lenticels. Vegetation observed in Wetland 1D included button bush (*Cephalanthus occidentalis*; OBL), glossy buckthorn (*Frangula alnus*; FAC), and tussock sedge (*Carex stricta*; OBL).

Wetland 1E is an emergent (PEM1F) wetland situated directly across the stream from Wetland 1D. Wetland hydrology was indicated by water-stained leaves and saturation to the soil surface. Soils in this location were mucky and showed evidence of iron depletion,

indicating extended periods of saturation. Vegetation in Wetland 1E was dominated by tussock sedge (*C. stricta*; OBL) and cattails (*Typha* sp.; OBL).

Flag series 1F defines the boundary of a forested (PFO1E) wetland that transitions to an extensive emergent (PEM1F) wetland west of the bridge. Wetland hydrology was indicated by the presence of surface water and water-stained leaves. Soils in this area demonstrated an accumulation of organic materials at the surface and depletion or reduction of iron in the subsurface, indicating extended periods of inundation during the growing season. Vegetation observed in Wetland 1F included button bush (*C. occidentalis*; OBL), highbush blueberry (*V. corymbosum*; FACW), tussock sedge (*C. stricta*; OBL), and cattails (*Typha* sp.; OBL).

2.2.3 Land Under Water Bodies and Waterways

LUWW within the Project Site consists of the streambed of Cold Spring Brook. The stream channel is 25 to 40 feet wide and devoid of emergent vegetation. The stream is classified as perennial with an unconsolidated organic floor (R5UB4). It's banks are well-defined, with some areas of reinforced stone embankments on either side of the bridge.

2.2.4 Bordering Land Subject to Flooding

According to the FEMA FIS for the project area, the limits of 100-year flooding at Main Street is elevation of 177.5 feet (NAVD88). The roadway surface elevation ranges from 178.16 feet northwest of the bridge to 187.47 feet southeast of the bridge. The limits of BLSF are shown on the Project Drawings provided in Appendix A. Copies of the flood profile and FEMA FIRMette of the project area are provided in Appendix C.

2.2.5 Riverfront Area

Within the Project Site the 200-foot Riverfront Area of Cold Spring Brook is comprised of paved public roadways and sidewalks, undeveloped and conserved forested land, extensive forested and emergent wetland systems, and areas of maintained lawn associated with residential and commercial properties.

Portions of the Riverfront Area of Cold Spring Brook within the Project Site (and Locus) are degraded as that term is defined at 310 CMR 10.58(5). Degraded Riverfront Area within the Project Site (and Locus) totals approximately 8,000 square feet (sf), which represents approximately 72 percent of the total Riverfront Area.

2.3 Rare Species

The Massachusetts Natural Heritage Atlas, 15th Edition (August 1, 2021) and Massachusetts Geographic Information System (MassGIS) interactive mapping tool (August 2021), were consulted during the planning and design phases of this project. According to these resources, the project site and surrounding area are not situated within the limits of mapped Priority Habitats of Rare Species or Estimated Habitats of Rare Wildlife.

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SECTION 3

Section 3
Project Description

3.1 Proposed Activities

The proposed work entails removing the existing and deteriorated superstructure of the bridge and replacing it with a new superstructure atop the original footings. The tops of the existing stone masonry abutments will be demolished and replaced with cast-in place concrete pile caps. Existing stone masonry abutments will be repointed as necessary and new micropiles drilled.

Activities associated with full depth roadway reconstruction will include sections of mill and overlay, replacement of gas and water lines, relocation of overhead electric utilities, guard rail installation, sidewalk replacement, and new curbing.

3.1.1 Construction Period BMPs

The following Best Management Practices (BMPs) will be implemented during construction to minimize the potential for erosion and sedimentation to downgradient wetland resource areas. Erosion control locations are provided on the Project Drawings. Typical details are shown on Sheet C-103 of the Project Drawings in Appendix A.

Protective measures, also referred to as BMPs, will be implemented prior to and utilized during construction activities. These measures are shown on the Project Drawings provided in Appendix A and described below.

3.1.1.1 Erosion Control Barriers

Wetland resource areas near the proposed Project Site will be protected with a row of erosion control barriers. The erosion control barriers will consist of compost filter tubes or other similarly effective devices. The proposed locations of these barriers are shown on Sheet C-103 of the Project Drawings. In addition:

- The contractor will be required to maintain a reserve supply of erosion control barriers on-site to make repairs, as necessary.
- Protective measures will be inspected after significant precipitation events. Maintenance and repairs will be conducted, as necessary.

Upon conclusion of the project, the erosion control barriers will be removed and properly disposed off-site following the stabilization of disturbed areas and Conservation Commission authorization.

3.1.1.2 Staging and Stockpiling

A staging area is proposed within the paved Main Street ROW on the southeastern end of the Limit of Work (refer to Project Drawings sheet C-101). Soil stockpiles will be surrounded by either silt fencing or haybales, then stabilized with vegetation or covered and will be located greater than 25 feet from any wetland. Typical stockpiling details are provided on Sheet C-103 of the Project Drawings.

3.1.1.3 Temporary Protective Shielding

The stream channel will be protected from falling debris during demolition and construction. Temporary shielding will be designed by the Contractor to withstand all loads to which it may be subjected (including and up to the maximum size of the superstructure), and stamped by a Professional Engineer prior to installation. No portion of the existing culvert, fencing, guardrail, or other portion of the superstructure shall be removed until the temporary protective shielding is completely in place and the Contractor has approval from the Engineer to proceed.

3.1.2 Anticipated Sequence of Construction

No work will be conducted in open or flowing water. The actual sequence of construction will be left to the discretion of the selected contractor. Based on similar projects, the proposed construction sequence includes the following:

1. Site preparation includes, but is not limited to, the following activities:
   - Post MassDEP File # sign
   - Establish traffic detours and road closure
   - Install perimeter controls
   - Install erosion and sedimentation controls
   - Clear and grub vegetation, as needed
2. Removal of existing guardrails as needed
3. Removal and disposal of existing bridge superstructure and existing water and gas lines
4. Demolition of tops of existing stone masonry abutments and replacement with cast-in-place concrete pile caps
5. Repointing of existing stone masonry abutments (as necessary)
6. Micropile drilling
7. Installation of replacement superstructure
8. Full depth roadway reconstruction and sidewalk replacement
9. Replacement of water and gas lines
10. Relocation of overhead electric utilities
11. Installation of guardrails and new curbing
12. Removal of erosion control barriers

Prior to the commencement of construction activities, minor vegetation clearing will occur to allow access to the work locations along the east and west sides of Main Street at the stream. Trees, saplings, shrubs, stumps, roots and brush, as well as loose gravel, and any other unsuitable material will be removed from the work areas. The materials will be properly disposed at an appropriate upland facility. No clearing and grubbing are proposed to occur below the top of Bank or within BVW.

3.1.3 Site Restoration

Temporary impacts to vegetated areas due to clearing activities will be re-loamed and reseeded as necessary using a seed mix that reflects existing conditions. Impacts to the roadway will be restored to existing or improved conditions.

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SECTION 4

Section 4
Regulatory Compliance

The proposed project has been designed to avoid environmental impacts where possible, minimize unavoidable impacts when practicable, and provide mitigation that is commensurate with the proposed alterations. Descriptions of the project's compliance with the regulatory requirements of the MA Wetlands Protection Act, the Town of Ashland Wetland Protection Bylaw (Chapter 280), and other pertinent local, state, and federal regulatory programs are provided in the following sections.

4.1 MA Wetlands Protection Act

The proposed project will occur within areas subject to protection and jurisdiction under the MAWPA. These areas consist of BLSF and Riverfront Area as well as the 100-foot Buffer Zone to Bank and BVW.

4.1.1 Exempt Utility Replacements

The replacement of water and gas mains within the Project Site are exempt activities as set forth at 310 CMR 10.02(2)(a)(2) which establishes an exemption for "*activities conducted to maintain, repair or replace, but not substantially change or enlarge an existing and lawfully located structure or facility used in the service of the public.*"

4.1.2 Minor Activities in the Buffer Zone

Proposed relocation of overhead electric utilities, and repaving of the Main Street roadway are exempt as minor activities within the Buffer Zone and Riverfront Area, as set forth at 310 CMR 10.02(2)(b)(2)(h), (m), and (p).

4.1.3 Limited Project Status

The Main Street Bridge at Cold Spring Brook was built in 1918 and its replacement therefore qualifies for consideration as a Limited Project per 310 CMR 10.53(3)(i):

> *"The maintenance, repair and improvement (but not substantial enlargement except when necessary to meet the Massachusetts Stream Crossing Standards) of structures, including dams and reservoirs and appurtenant works to such dams and reservoirs…buildings, piers, towers, headwalls, bridges, and culverts which existed on the effective date of 310 CMR 10.51 through 10.60 (April 1, 1983).*

On behalf of the City, we respectfully request the Commission grant Limited Project Status relative to the following performance standards:

- 310 CMR 10.58(5)(c) – Locating work closer to river (see Section 4.1.4.3)
- 310 CMR 10.58(5)(d) – Locating work outside Riverfront Area (see Section 4.1.4.4)

The discussion of design alternatives presented in Section 4.1.1.1 of this NOI is intended to serve as the alternatives analysis required of Limited Projects as set forth at 310 CMR 10.53(3).

4.1.3.1 Alternatives Analysis

As set forth at 310 CMR 10.53(3), an alternatives analysis is required when considering authorization of activities as Limited Projects. The following alternatives were considered for this project.

Alternative 1 – No Action

Due to the significantly deteriorated condition of the short span concrete deck bridge, the estimated service life is limited. Main Street is a central and highly trafficked road in the center of Ashland, and if unaddressed, the small bridge will eventually fail, cutting off a major access route to the town. Water and gas utilities serving this neighborhood are also reported to be in poor condition, exposed to the elements below the low chord of the bridge. Failure of this bridge would likely compromise these utilities as well, interrupting water and gas service to the town. It is for these reasons the Town has been awarded a small bridge grant for design of rehabilitation of the bridge. "No action" does not result in any temporary or permanent environmental impacts, nor does it address any of the crossing's deficiencies or make any improvements to the bridge and its utilities in the face of climate change.

Alternative 2 – Full Replacement

This alternative would consist of a full bridge replacement. A robust and durable full span bridge would replace the degraded superstructure and improve the life cycle of site. This option would be the most expensive, accounting for construction, design, and permitting costs with demolishing the existing foundations, retaining wall abutments, and wingwalls. This option will significantly lengthen the road closure on the highly trafficked roadway of Main Street, which experiences mostly truck traffic. To demolish and replace the substructure, significant excavation of the site is required. Disturbed embankments and dewatering, including a stream bypass, would be likely to result from full excavation as well. A full replacement will require more disturbance to traffic and the environment than necessary for the site, as the substructure has sufficient capacity to be repurposed and unaltered.

Alternative 3 – Superstructure In-Kind Replacement (preferred)

A superstructure replacement with rehabilitation and repair to abutments and wingwalls would be most cost effective for overall project design and construction based on grant funds available, while providing the Town a repaired facility addressing major concerns identified in inspection reports. A superstructure replacement mitigates the concerns with a full bridge replacement, including lowered costs and a shorter construction time to be coordinated and completed outside of peak traffic season for Main Street. Through this option, the project does not anticipate grading, dredging, dewatering, embankment, or erosion control barriers and systems. No changes to stream banks or the bankfull width are proposed for this alternative, and the sufficient, existing abutments are proposed for reuse. The existing stone masonry abutments present at the site are in suitable condition for reuse as retaining walls which helps facilitate our proposed approach of a superstructure replacement. The utilities therefore will be moved to a higher, secure location while preserving the substructure. After a review of existing information about the bridge, a discussion with MassDOT District 3, and an effort to support construction as well as reauthorization of the State's Small Bridge Program, this alternative became the preferred option. This alternative is ultimately proposed for its low life-cycle costs, durability, and no disruption to the streambed crossing and nearby wetlands.

4.1.4 Stream Crossing Replacement

The Main Street Bridge Replacement over Cold Spring Brook Project has been designed to meet the *Massachusetts River and Stream Crossing Standards* to the maximum extent practicable, taking into consideration existing conditions, site constraints and potential upstream and downstream impacts.

Per 310 CMR 10.53(8), *any person proposing the replacement of an existing stream crossing shall demonstrate to the Issuing Authority that the impacts of the crossing have been avoided where possible, and when not possible, have been minimized and that mitigation measures have been provided to contribute to the protection of the interested identified in M.G.L. c. 131, § 40. An applicant will be presumed to have made this showing if the project is designed as follows:*

(a.) If the project includes replacement of an existing non-tidal crossing, the applicant demonstrates to the satisfaction of the Issuing Authority that the crossing complies with the Massachusetts Stream Crossing Standards to the maximum extent practicable.

As noted, in order to minimize cost and impacts to resource areas, only the superstructure of the existing bridge will be replaced, resulting in unchanged geometry at the stream channel.

(b.) *If the project includes replacement of an existing tidal crossing that restricts tidal flow….*

Not applicable. Cold Spring Brook is not a tidal stream.

4.1.5 Summary of Jurisdictional Activities

Portions of the proposed project will occur within BLSF, and Riverfront Area. In addition to work within wetland resource areas, the project will also result in approximately 11,100 square feet of work within the 100-foot Buffer Zone. A summary of jurisdictional alterations is presented below in Table 4-1.

TABLE 4-1

Alterations of MA WPA Jurisdictional Resource Areas[1]

Activity	BLSF (sf)	Riverfront Area (sf)
Clearing	175	2,300
Roadway Reconstruction	-	5,700[2]
Total:	175	8,000

[1] Activity impacts may overlap across resource areas

[2] Impacts due to roadway reconstruction will occur in degraded Riverfront Area. Refer to Section 4.1.4.2.

A summary of how the project meets the pertinent General Performance Standards is presented in the following sections.

4.1.6 General Performance Standards

The following section presents the MAWPA performance standards for these wetland resource areas (in italic font) and the proposed activities' compliance with those standards (in normal font).

4.1.6.1 Bordering Land Subject to Flooding

As noted in Table 4-1, approximately 175 sf of alterations to BLSF are anticipated due to clearing activities. No loss of flood storage is anticipated as a result of this project. The Performance Standards for Bordering Land Subject to Flooding are set forth at 310 CMR 10.57(4)(a).

1. *Compensatory flood storage shall be provided for all flood storage volume that will be lost as the result of a proposed project within Bordering Land Subject to Flooding, when in the judgment of the issuing authority said loss will cause an increase or will contribute incrementally to an increase in the horizontal extent and level of flood water during peak flows. Compensatory flood storage shall mean a volume not previously used for flood storage and shall be incrementally equal to the theoretical volume of flood water at each elevation, up to and including the 100-year flood elevation, which would be displaced by the proposed project. Such compensatory volume shall have an unrestricted hydraulic connection to the same waterway or water body. Further, with respect to waterways, such compensatory volume shall be provided within the same reach of the river, stream or creek.*

   Alterations to BLSF are limited to vegetation removal and will not result in any fill or grade changes. As such, no loss of flood storage is proposed as a result of this project. Therefore, creation of compensatory flood storage is not required.

2. *Work within Bordering Land Subject to Flooding, including work required to provide the above-specified compensatory flood storage, shall not restrict flows so as to cause an increase in flood stage or velocity.*

   The activities proposed within BLSF will not restrict flows or cause any increase in flood stage or velocity. As noted above, the project will not result in any loss of flood storage and compensatory flood storage creation is not required.

3. *Work in those portions of bordering land subject to flooding found to be significant to the protection of wildlife habitat shall not impair its capacity to provide important wildlife habitat functions. Except for work which would adversely affect vernal pool habitat, a project or projects on a single lot, for which Notice(s) of Intent is filed on or after November 1, 1987, that (cumulatively) alter(s) up to 10% or 5,000 square feet (whichever is less) of land in this resource area found to be significant to the protection of wildlife habitat, shall not be deemed to impair its capacity to provide important wildlife habitat functions. Additional alterations beyond the threshold, or altering vernal pool habitat, may be permitted if they will have no adverse effects on wildlife habitat, as determined by procedures contained in 310 CMR 10.60.*

   The proposed project will result in less than 5,000 sf of alteration of BLSF. As such, a Wildlife Habitat Evaluation is not required.

4.1.4.2 Riverfront Area

Cold Spring Brook is shown as perennial on the most recent USGS topographic map therefore has an associated 200-foot Riverfront Area. As noted in Table 4-1, approximately 8,000 sf of impacts are anticipated in Riverfront Area. This includes 6,000 sf of impacts to existing degraded Riverfront Area resulting from roadway reconstruction and 2,000 sf of impacts due to vegetation clearing in unpaved but maintained areas of the Main Street ROW. The Performance Standards for Riverfront Area are set forth at 310 CMR 10.58(4) and (5).

This section describes how the proposed project satisfies the Riverfront redevelopment provisions at 310 CMR 10.58(5). The performance standards are provided below in italics, while the details of project design follow.

(a) At a minimum, proposed work shall result in an improvement over existing conditions of the capacity of the riverfront area to protect the interests identified in M.G.L. c. 131 § 40. When a lot is previously developed but no portion of the riverfront area is degraded, the requirements of 310 CMR 10.58(4) shall be met.

The proposed project is located within an existing degraded roadway and consists of improvement to the existing stream crossing. Work proposed will have no negative impacts on the interests identified in M.G.L. c. 131 § 40 and the replacement of severely deteriorated infrastructure will reduce the threat of bridge failure and associated impacts to resource areas.

(b) Stormwater management is provided according to standards established by the Department.

The proposed project will not generate additional stormwater runoff, increase impervious area, or create a new point source discharge. Per the Recommended Final Decision issued July 29, 2016 in the Matter of Berkshire Community College Docket No. WET-2015-023 from the MassDEP Office of Appeals and Dispute Resolution, it was ruled that 310 CMR 10.05(6)(k) through (q) do not apply to a project that does not proposed a "point source" or "stormwater discharge" within Resource Areas or their Buffer Zones. As such, this standard has been satisfied.

(c) Within 200-foot riverfront area, proposed work shall not be located closer to the river than existing conditions or 100 feet, whichever is less, or not closer than existing conditions within 25-foot riverfront areas, except in accordance with 310 CMR 10.58(5)(f) or (g).

The proposed superstructure replacement cannot be placed further from the resource area as it is conveying the resource under Main Street. The Town respectfully requests that the Ashland Conservation Commission waive this requirement under Limited Project status.

(d) Proposed work, including expansion of existing structures, shall be located outside the riverfront area or toward the riverfront area boundary and away from the river, except in accordance with 310 CMR 10.58(5)(f) or (g).

Due to the nature of the project, replacement of the superstructure over existing footings, locating the work outside of Riverfront Areas is not practicable. The Town respectfully requests that the Ashland Conservation Commission waive this requirement under Limited Project status.

(e) The area of proposed work shall not exceed the amount of degraded area, provided that the proposed work may alter up to 10% if the degraded area is less than 10% of the riverfront area, except in accordance with 310 CMR 10.58(5)(f) or (g).

The proposed bridge replacement project will not increase the amount of degraded area.

(f) When an applicant proposed restoration on-site of degraded riverfront area, alteration may be allowed notwithstanding the criteria of 310 CMR 10.58(c), (d) and (e) at a ratio in square feet of at least 1:1 of restored area to area of alteration not conforming to the criteria. Areas immediately along the river shall be selected

for restoration. Alteration not conforming to the criteria shall begin at the riverfront area boundary. Restoration shall include

1. *removal of all debris, but retaining any trees or other mature vegetation;*
2. *grading to a topography which reduces runoff and increases infiltration;*
3. *coverage by topsoil at a depth consistent with natural conditions at the site; and*
4. *seeding and planting with an erosion control seed mixture, followed by plantings of herbaceous and woody species appropriate to the site.*

All impacts to Riverfront Area will occur in already maintained areas, primarily consisting of grass, and will be restored in situ. See Section 3.1.3 for more detail.

(g) When an applicant proposes mitigation either on-site or in the riverfront area within the same general area of the river basin, alteration may be allowed notwithstanding the criteria of 310 CMR 10.58(c), (d), or (e) at a ratio in square feet of at least 2:1 mitigation area to area of alteration not conforming to the criteria or an equivalent level of environmental protection where square footage is not a relevant measure. Alteration not conforming to the criteria shall begin at the riverfront area boundary. Mitigation may include off-site restoration of riverfront areas, conservation restrictions under M.G.L. c. 184 §§ 31 to 33 to preserve undisturbed riverfront area that could otherwise be altered under 310 CMR 10.00, the purchase of development rights within the riverfront area, the restoration of bordering vegetated wetland, projects to remedy an existing adverse impact on the interests identified in M.G.L. c. 131 § 40 for which the applicant is not legally responsible, or similar activities undertaken voluntarily by the applicant which will support a determination by the issuing authority of no significant adverse impact. Preference shall be given to potential mitigation projects, if any, identified in a River Basin Plan approved by the Secretary of the Executive Office of Environmental Affairs.

As previously noted, alterations to Riverfront Area will be limited to maintained areas and will be restored in situ.

4.1.7 Abutter Notification

Abutters have been notified in accordance with 310 CMR 10.05(4). Copies of the abutter notification form and list of abutters are provided in Appendix E.

4.1.8 Stormwater Management Standard

The proposed project will not generate additional stormwater runoff, increase impervious area, or create a new point source discharge. Per the Recommended Final Decision issued July 29, 2016 in the Matter of Berkshire Community College Docket No. WET-2015-023 from the MassDEP Office of Appeals and Dispute Resolution, it was ruled that 310 CMR 10.05(6)(k) through (q) do not apply to a project that does not propose a "point source" or "stormwater discharge" within Resource Areas or their Buffer Zones. As such, the project is not subject to the stormwater standards.

4.2 Ashland Wetlands Protection Bylaw

Work is proposed within areas subject to the Ashland Wetlands Protection Bylaw, Chapter 280, and its implementing regulations. The local wetlands bylaw requires that any project

undertaken within one hundred (100) horizontal feet from the boundaries of all Protected Resource Areas requires conservation commission approval. The proposed work will occur within Cold Spring Brook and the 25-foot No Disturb Zone, as well as the 100-foot Buffer Zone of Protected Resource Areas.

The City respectfully requests the Ashland Conservation Commission grant a variance for work in these areas per Section 280-9. As described in this NOI, due to the nature of the project it is not feasible to site the work outside resource areas and local setbacks and buffer zones.

4.3 Ashland Stormwater Bylaw

Activities resulting in the disturbance of land and the creation of stormwater runoff are regulated under the Ashland Stormwater Bylaw (Chapter 247). As all work proposed will be performed in accordance with the terms of an Order of Conditions issued by the Conservation Commission, these activities are exempt as set forth at Section 247-7(G).

4.4 Other Pertinent Regulatory Programs

4.4.1 NPDES Construction General Permit

Construction activities will not result in the cumulative disturbance of one (1) or more acres of land. As such, the project does not require coverage under the NPDES Construction General Permit (CGP).

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APPENDIX A

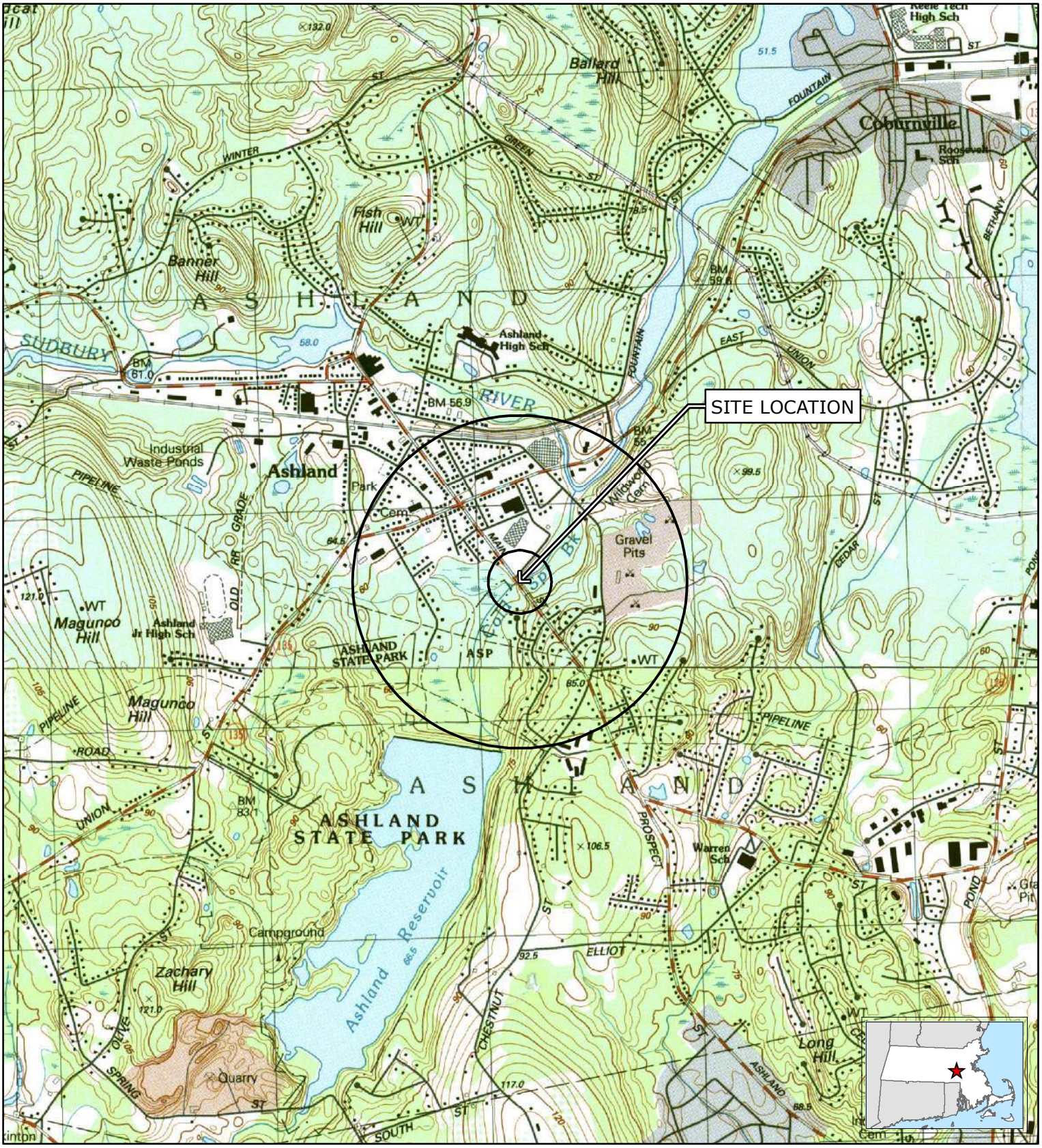

FIGURE 1
SITE LOCATION

Main Street Bridge over
Cold Spring Brook
Ashland, Massachusetts

September 2022

Tighe&Bond

Based on USGS Topographic Map for
Framingham, MA Revised 1987. Contour Equals 3-Meters. [Site Quad]
Holliston, MA Revised 1987. Contour Equals 3-Meters.
Circles indicate 500-foot and half-mile radii

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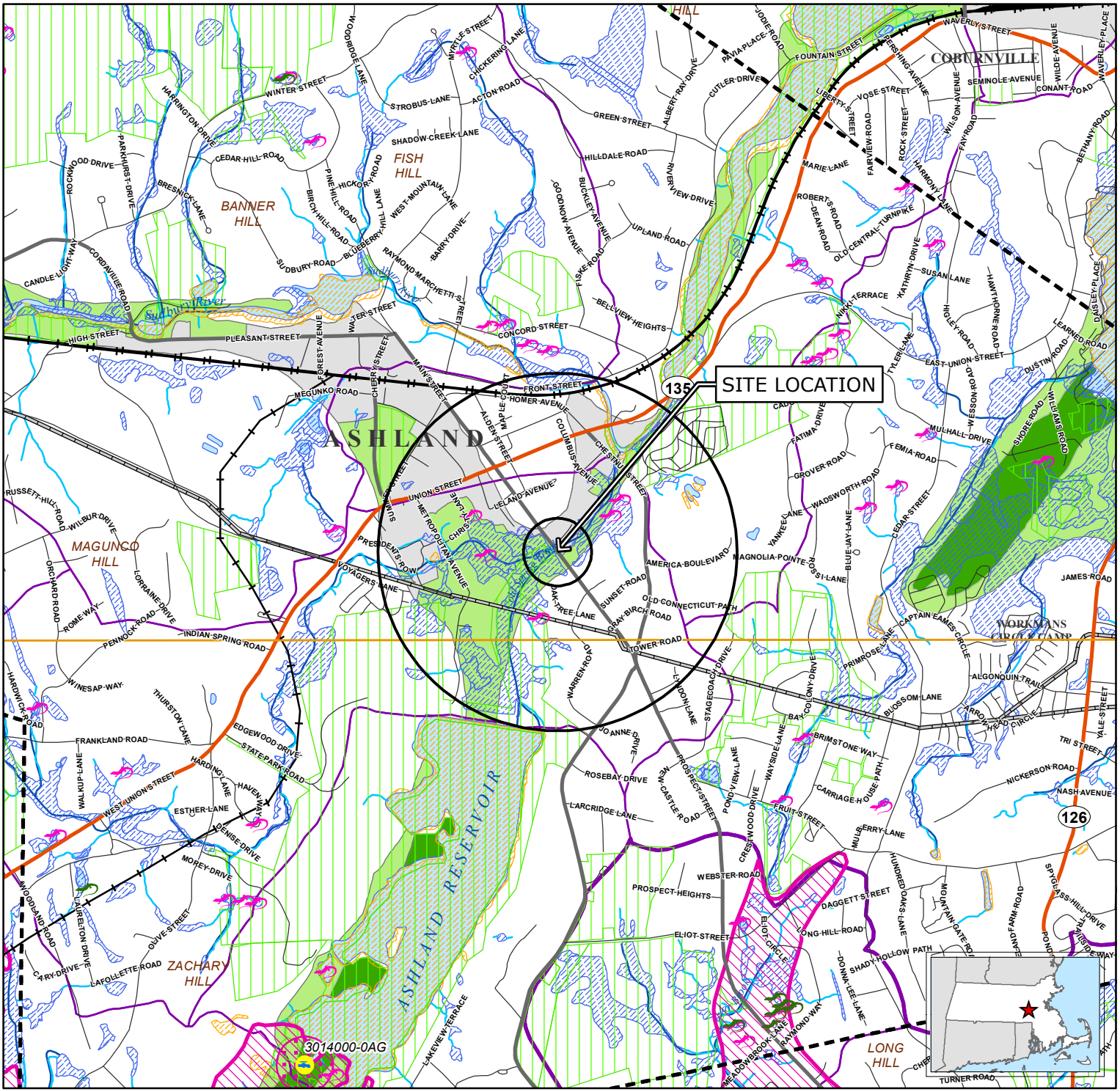


Legend

- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- Non-Landfill Solid Waste Sites
- Proposed Well
- Emergency Surface Water
- Community Public Water Supply - Surface Water
- Community Public Water Supply - Groundwater
- Non-Community Non-Transient Public Water Supply
- Non-Community Transient Public Water Supply
- Limited Access Highway
- Multi-Lane Highway, NOT Limited Access
- Other Numbered Highway
- Major Road - Collector
- Minor Street or Road
- Aquaducts
- Hydrologic Connections
- Stream/Intermittent Stream
- Powerline
- Pipeline
- Track or Trail
- Trains
- Public Surface Water Supply Protection Area (Zone A)
- DEP Approved Wellhead Protection Area (Zone I)
- DEP Approved Wellhead Protection Area (Zone II)
- DEP Interim Wellhead Protection Area (IWPA)
- Protected and Recreational Open Space
- Solid Waste Landfill
- Area of Critical Environmental Concern (ACEC)
- NHESP Priority Habitats for Rare Species
- NHESP Estimated Habitats for Rare Wildlife
- EPA Designated Sole Source Aquifer
- Major Drainage Basin
- Sub Drainage Basin
- MassDEP Open Water
- MassDEP Inland Wetlands
- MassDEP Coastal Wetlands
- MassDEP Not Interpreted Wetlands
- Public Surface Water Supply (PSWS)
- Water Bodies
- Non-Potential Drinking Water Source Area - High Yield
- Non-Potential Drinking Water Source Area - Medium Yield
- Potentially Productive Medium Yield Aquifer
- Potentially Productive High Yield Aquifer
- County Boundary
- Town Boundary
- USGS Quadrangle Sheet Boundary

1:24,000

0 1,000 2,000

Feet

N

FIGURE 2
PRIORITY RESOURCES

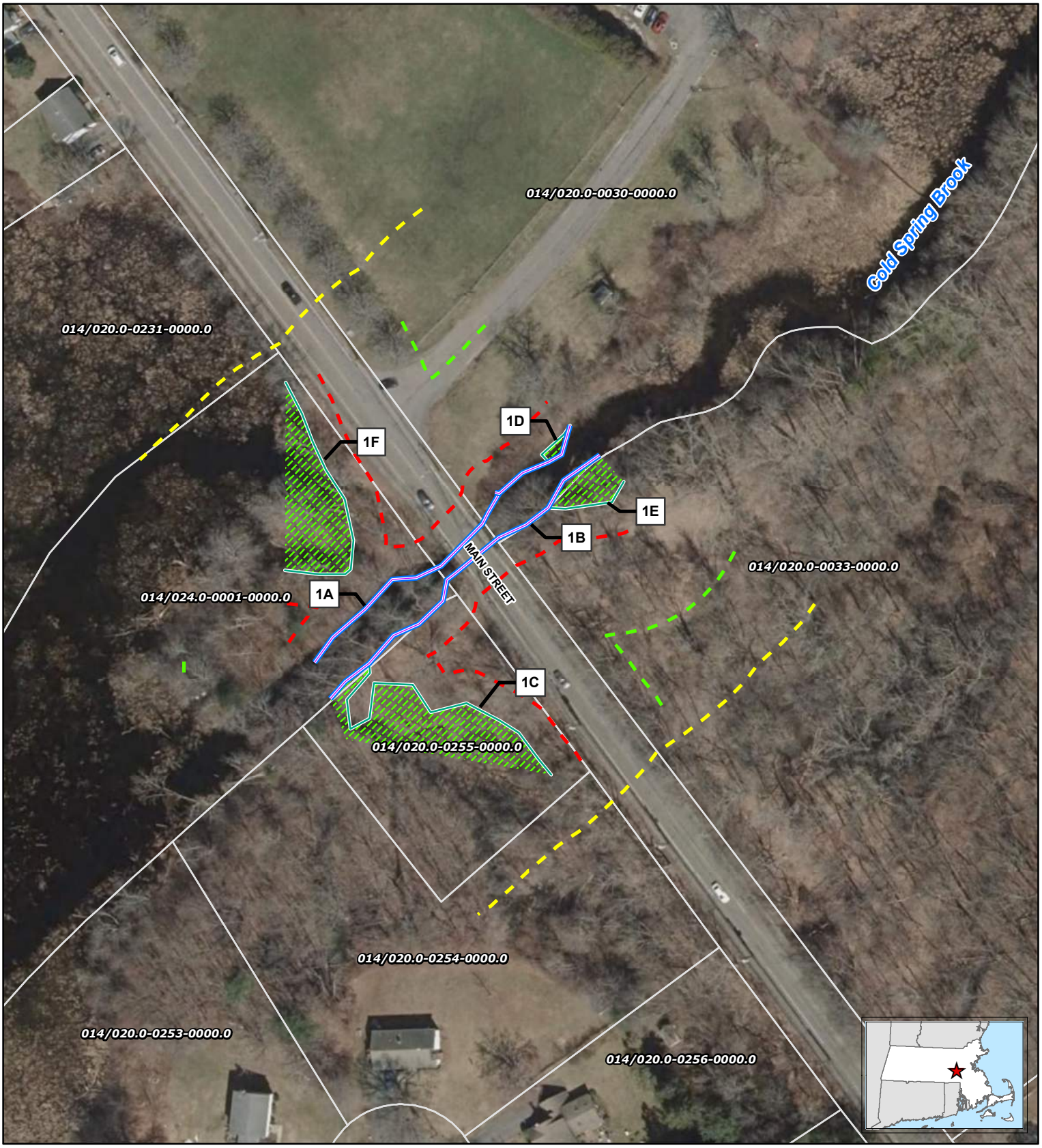
Main Street Bridge over
Cold Spring Brook
Ashland, Massachusetts

Data source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology
Circles indicate 500-foot and half-mile radii.
Data valid as of September 2022.

September 2022

Tighe&Bond

V:\Projects\A\A1133\MXD\MainSt_Bridge_AshlandMA_Resource.mxd [Exported By: EMDrake, 9/22/2022, 11:51:35 AM]



Legend

- Bank/MAHW
- Wetland Boundary
- 25-foot Buffer Zone
- 100-foot Buffer Zone
- Riverfront Area
- Wetland Area
- Parcel Boundary

Tighe&Bond

Based on MassGIS Color Orthophotography (2019)
Parcels (FY2021) downloaded from MassGIS and are approximate.

1:1,200

0 50 100

Feet

N

FIGURE 3
SITE PLAN

Main Street Bridge over
Cold Spring Brook
Ashland, Massachusetts

September 2022

V:\Projects\A\A1133\MXD\MainSt_Bridge_AshlandMA_Aerial.mxd [Exported By: EMDrake, 9/22/2022, 11:50:19 AM]

A-1133

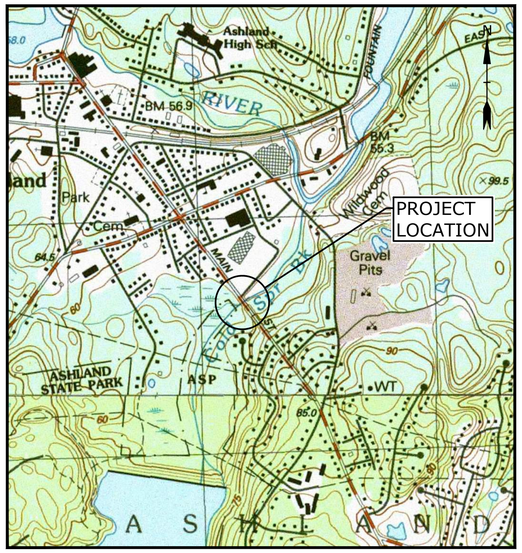
TOWN OF ASHLAND, MASSACHUSETTS

MAIN STREET OVER COLD SPRING BROOK BRIDGE REPLACEMENT

MASSDOT BR. NO. A-14-010, BIN NO. 7NV

SEPTEMBER 2022

LIST OF DRAWINGS		
SHEET NO.	DRAWING NO.	DRAWING TITLE
1		COVER SHEET
2	G-001	GENERAL NOTES, LEGEND, AND ABBREVIATIONS
3	C-101	EXISTING CONDITIONS AND DEMOLITION PLAN
4	C-102	SITE PLAN
5	C-103	CONSTRUCTION DETAILS
6	C-104	TEMPORARY TRAFFIC CONTROL PLAN
7	S-001	BRIDGE KEY PLAN. PROFILES, LOCUS, & INDEX
8	S-002	BRIDGE NOTES
9	S-003	BORING LOGS & BORING NOTES (SHEET 1 OF 2)
10	S-004	BORING LOGS & BORING NOTES (SHEET 2 OF 2)
11	S-101	GENERAL BRIDGE PLAN
12	S-102	BRIDGE ELEVATIONS
13	S-103	ABUTMENT PLAN AND DETAILS
14	S-104	BRIDGE SECTIONS
15	S-105	BRIDGE DETAILS
16	R-101	CT-TL2 BARRIER DETAILS (SHEET 1 OF 2)
17	R-102	CT-TL2 BARRIER DETAILS (SHEET 2 OF 2)
18	R-103	TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION FOR CT-TL2 BARRIER
19	R-104	PRECAST HIGHWAY GUARDRAIL TRANSITION DETAILS
20	R-105	GUARDRAIL TRANSITION TO BRIDGE RAIL (FACE OF CURB)
21	R-106	HIGHWAY GUARDRAIL DETAILS (SHEET 1 OF 2)
22	R-107	HIGHWAY GUARDRAIL DETAILS (SHEET 2 OF 2)
23	R-108	MISCELLANEOUS DETAILS



LOCATION MAP
SCALE: 1" = 1000'

PREPARED BY:

Tighe&Bond

PREPARED FOR:

TOWN OF ASHLAND, MASSACHUSETTS

DOUG SMALL, SUPERINTENDENT, HIGHWAY DEPARTMENT

PERMIT SET
NOT FOR CONSTRUCTION

COMPLETE SET 23 SHEETS

BASE PLAN NOTES

1. THE EXISTING CONDITIONS INFORMATION SHOWN ON THE DRAWINGS IS BASED ON SURVEY DRAWINGS PROVIDED BY WSP USA INC. TITLED "EXISTING CONDITIONS PLAN MAIN STREET BRIDGE OVER COLD SPRING BROOK ASHLAND, MASSACHUSETTS" AND DATED MARCH 10, 2021.
2. UTILITY LOCATIONS SHOWN WERE PLOTTED FROM INFORMATION SUPPLIED BY RESPECTIVE UTILITY COMPANIES AND DATA OBTAINED FROM FIELD SURVEYS AND AS BUILT DRAWINGS. THE ACCURACY AND COMPLETENESS OF SUBSURFACE INFORMATION SHOWN ON THESE DRAWINGS IS NOT GUARANTEED. DETERMINE THE LOCATIONS AND ELEVATIONS OF ALL UTILITIES WHICH MAY AFFECT CONSTRUCTION OPERATIONS.
3. THE DRAWINGS ARE BASED ON THE FOLLOWING DATUMS: HORIZONTAL - NORTH AMERICAN DATUM OF 1983, MASSACHUSETTS STATE PLANE, MAINLAND ZONE, US FEET; VERTICAL - THE NORTH AMERICAN VERTICAL DATUM OF 1988.
4. THE EXISTING CONDITIONS SHOWN ARE APPROXIMATE. FIELD VERIFY EXISTING CONDITIONS.
5. WETLAND RESOURCE AREAS WERE DELINEATED BY TIGHE & BOND, INC. ON MARCH 16 AND APRIL 6, 2021.
6. THE LIMIT OF BORDERING LAND SUBJECT TO FLOODING (BLSF) IS BASED ON THE FEMA FLOOD INSURANCE STUDY (FIS) FOR MIDDLESEX COUNTY, MASSACHUSETTS (ALL JURISDICTIONS; 25017CV004C, REVISED JULY 6, 2016) COLD SPRING BROOK FLOOD PROFILE (148P) AND FEMA FLOOD INSURANCE RATE MAP (FIRM) COMMUNITY-PANEL NO. 25017C0514F (EFFECTIVE July 7,2014).

GENERAL NOTES

1. NOTIFY DIGSAFE AT 1-888-344-7233 AND OTHER UTILITY OWNERS IN THE AREA NOT ON THE (DIGSAFE) LIST AT LEAST 72 HOURS PRIOR TO ANY DIGGING, TRENCHING, ROCK REMOVAL, DEMOLITION, BORING, BACKFILLING, GRADING, LANDSCAPING, OR ANY OTHER EARTH MOVING OPERATIONS.
2. LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE. IN ADDITION, SOME UTILITIES MAY NOT BE SHOWN. DETERMINE THE EXACT LOCATION OF UTILITIES BY TEST PIT OR OTHER METHODS, AS NECESSARY TO PREVENT DAMAGE TO UTILITIES AND/OR INTERRUPTIONS IN UTILITY SERVICE. PERFORM TEST PIT EXCAVATIONS AND OTHER INVESTIGATIONS TO LOCATE UTILITIES, AND PROVIDE THIS INFORMATION TO THE ENGINEER, PRIOR TO CONSTRUCTING THE PROPOSED IMPROVEMENTS. LOCATE ALL EXISTING UTILITIES TO BE CROSSED BY HAND EXCAVATION.
3. NOT ALL OF THE UTILITY SERVICES TO BUILDINGS ARE SHOWN. THE CONTRACTOR SHALL ANTICIPATE THAT EACH PROPERTY HAS SERVICE CONNECTIONS FOR THE VARIOUS UTILITIES.
4. BOLD TEXT AND LINES INDICATE PROPOSED WORK. LIGHT TEXT AND LINES INDICATE APPROXIMATE EXISTING CONDITIONS.
5. TIGHE & BOND ASSUMES NO RESPONSIBILITY FOR ANY ISSUES, LEGAL OR OTHERWISE, RESULTING FROM CHANGES MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM TIGHE & BOND.
6. EXCAVATE ADDITIONAL TEST PITS TO LOCATE EXISTING UTILITIES AS DIRECTED OR APPROVED BY THE ENGINEER.
7. NOTIFY THE ENGINEER OF ANY UTILITIES IDENTIFIED DURING CONSTRUCTION THAT ARE NOT SHOWN ON THE DRAWINGS OR THAT DIFFER IN SIZE OR MATERIAL.
8. THE CONTRACTOR IS RESPONSIBLE FOR SITE SAFETY; COORDINATION WITH THE OWNER, ALL SUBCONTRACTORS, AND WITH OTHER CONTRACTORS WORKING WITHIN THE LIMITS OF WORK, THE MEANS AND METHODS OF CONSTRUCTING THE PROPOSED WORK.
9. OBTAIN, PAY FOR AND COMPLY WITH PERMITS, NOTICES AND FEES NECESSARY TO COMPLETE THE WORK. ARRANGE AND PAY FOR NECESSARY INSPECTIONS AND APPROVALS FROM THE JURISDICTIONAL AUTHORITIES.
10. SHORE UTILITY TRENCHES WHERE FIELD CONDITIONS DICTATE AND/OR WHERE REQUIRED BY LOCAL, STATE AND FEDERAL HEALTH AND SAFETY CODES.
11. FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO CONSTRUCTION. IF FIELD CONDITIONS ARE OBSERVED THAT VARY SIGNIFICANTLY FROM THOSE SHOWN ON THE DRAWINGS, IMMEDIATELY NOTIFY THE ENGINEER IN WRITING FOR RESOLUTION OF THE CONFLICTING INFORMATION.
12. PROTECT AND MAINTAIN ALL UTILITIES IN THE AREAS UNDER CONSTRUCTION DURING THE WORK. LEAVE ALL PIPES AND STRUCTURES WITHIN THE LIMITS OF THE CONTRACT IN A CLEAN AND OPERABLE CONDITION AT THE COMPLETION OF THE WORK. TAKE ALL NECESSARY PRECAUTIONS TO PREVENT SAND AND SILT FROM DISTURBED AREAS FROM ENTERING THE DRAINAGE SYSTEM.
13. NOTIFY THE ENGINEER IN WRITING OF ANY CONFLICT, ERROR, AMBIGUITY, OR DISCREPANCY WITH THE PLANS OR BETWEEN THE PLANS AND ANY APPLICABLE LAW, REGULATION, CODE, STANDARD SPECIFICATION, OR MANUFACTURER'S INSTRUCTIONS.
14. THE CONTRACTOR IS RESPONSIBLE FOR SUPPORT OF EXISTING UTILITIES AND REPAIR OR REPLACEMENT COSTS OF UTILITIES DAMAGED DURING CONSTRUCTION, WHETHER ABOVE OR BELOW GRADE. REPLACE DAMAGED UTILITIES IMMEDIATELY AT NO ADDITIONAL COST TO THE OWNER AND AT NO COST TO THE PROPERTY OWNER.
15. TAKE NECESSARY MEASURES AND PROVIDE CONTINUOUS BARRIERS OF SUFFICIENT TYPE, SIZE, AND STRENGTH TO PREVENT ACCESS TO ALL WORK AND STAGING AREAS AT THE COMPLETION OF EACH DAYS WORK.
16. NO OPEN TRENCHES WILL BE ALLOWED OVER NIGHT. THE USE OF ROAD PLATES TO PROTECT THE EXCAVATION WILL BE CONSIDERED UPON REQUEST, BUT BACKFILLING IS PREFERRED. ALL REQUESTS MUST BE MADE IN WRITING TO THE DEPARTMENT OF PUBLIC WORKS DIRECTOR.
17. THE CONTRACTOR IS RESPONSIBLE FOR ALL NECESSARY TRAFFIC CONTROL/SAFETY DEVICES TO ENSURE SAFE VEHICULAR AND PEDESTRIAN ACCESS THROUGH THE WORK AREA, OR FOR SAFELY IMPLEMENTING DETOURS AROUND THE WORK AREA. A COPY OF THE TRAFFIC CONTROL PLAN MUST BE SUBMITTED TO THE DPW ENGINEER PRIOR TO COMMENCING WORK. PERFORM TRAFFIC CONTROL IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED TRAFFIC CONTROL PLAN.
18. MAINTAIN EMERGENCY ACCESS TO ALL PROPERTIES WITHIN THE PROJECT AREA AT ALL TIMES DURING CONSTRUCTION.
19. WHEN WORKING IN THE ROAD, PROVIDE THE OWNER AND LOCAL FIRE/POLICE/SCHOOL AUTHORITIES A DETAILED PLAN OF APPROACH INDICATING METHODS OF PROPOSED TRAFFIC ROUTING ON A DAILY BASIS. PROVIDE COORDINATION TO ENSURE COMMUNICATION AND COORDINATION BETWEEN THE OWNER, CONTRACTOR AND LOCAL FIRE/POLICE/SCHOOL AUTHORITIES THROUGHOUT THE CONSTRUCTION PERIOD.
20. REMOVE AND DISPOSE OF ALL CONSTRUCTION-RELATED WASTE MATERIALS AND DEBRIS IN STRICT ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL LAWS.
21. THE TERM "DEMOLISH" USED ON THE DRAWINGS MEANS TO REMOVE AND DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS.
22. THE TERM "ABANDON" USED ON THE DRAWINGS MEANS TO LEAVE IN PLACE AND TAKE APPROPRIATE MEASURES TO DECOMMISSION AS SPECIFIED OR NOTED ON THE DRAWINGS.
23. ALL PROPOSED WORK MAY BE ADJUSTED IN THE FIELD BY THE OWNER'S PROJECT REPRESENTATIVE TO MEET EXISTING CONDITIONS.

EROSION CONTROL AND RESOURCE AREA PROTECTION NOTES

1. PROVIDE ALL EROSION CONTROL MEASURES SHOWN, SPECIFIED, REQUIRED BY PERMIT, AND/OR REQUIRED BY THE ENGINEER PRIOR TO ANY CONSTRUCTION OR IMMEDIATELY UPON REQUEST. MAINTAIN SUCH CONTROL MEASURES UNTIL FINAL SURFACE TREATMENTS ARE IN PLACE AND/OR UNTIL PERMANENT VEGETATION IS ESTABLISHED. INSPECT AFTER EACH RAINSTORM AND DURING MAJOR STORM EVENTS TO CONFIRM THAT ALL SEDIMENTATION AND EROSION CONTROL MEASURES REQUIRED ARE IN PLACE AND EFFECTIVE.
2. PRIOR TO STARTING WORK, CLEARLY STAKE WORK LIMITS. DO NOT DISTURB VEGETATION AND TOPSOIL BEYOND THE PROPOSED LIMITS. COORDINATE WITH THE ENGINEER FOR LOCATIONS OF TEMPORARY STOCKPILING OF TOPSOIL DURING CONSTRUCTION.
3. INSTALL SILT SACKS OR OTHER APPROVED SEDIMENTATION BARRIERS IN/AT ALL CATCH BASINS IN THE PROJECT AREA.
4. COMPACT, STABILIZE, AND LOAM AND SEED SIDE SLOPES, SHOULDER AREAS AND DISTURBED VEGETATED AREAS IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND AS REQUIRED BY PERMITS. GRADE SIDE SLOPES, SHOULDER AREAS AND DISTURBED VEGETATED AREAS TO A MAXIMUM SLOPE OF 3 HORIZONTAL TO 1 VERTICAL (3H:1V), WHERE POSSIBLE. PROVIDE BIODEGRADABLE EROSION CONTROL BLANKETS TO PREVENT EROSION WHERE SLOPES ARE STEEPER THAN 3H:1V.
5. REMOVE AND PROPERLY DISPOSE OF SILT TRAPPED AT BARRIERS IN UPLAND AREAS OUTSIDE BUFFER ZONES. REMOVE MATERIALS DEPOSITED IN ANY TEMPORARY SETTLING BASINS AT THE COMPLETION OF THE PROJECT. RESTORE ALL DISTURBED AREAS TO THEIR PRECONSTRUCTION CONDITION.
6. SWEEP, COLLECT, REMOVE AND DISPOSE OF ANY SEDIMENT TRACKED ONTO PUBLIC RIGHT-OF-WAYS AT THE END OF EACH DAY.
7. LOAM AND SEED ALL DISTURBED VEGETATED AREAS TO ESTABLISH COVER AND STABILIZATION AS SOON AS POSSIBLE FOLLOWING DISTURBANCE.
8. MAINTAIN AN ADDITIONAL SUPPLY OF EROSION CONTROL MEASURES ON-SITE FOR EMERGENCY REPAIRS.
9. STORE FUEL, OIL, PAINT, OR OTHER HAZARDOUS MATERIALS IN A SECONDARY CONTAINER AND REMOVE TO A SECURE LOCKED AND COVERED AREA DURING NON-WORK HOURS.
10. PROVIDE A SUPPLY OF ABSORBENT SPILL RESPONSE MATERIALS SUCH AS BOOMS, BLANKETS, AND OIL ABSORBENT MATERIALS AT THE CONSTRUCTION SITE AT ALL TIMES TO CLEAN UP POTENTIAL SPILLS OF HAZARDOUS MATERIALS. IMMEDIATELY REPORT SPILLS OF HAZARDOUS MATERIALS TO THE STATE ENVIRONMENTAL AGENCY, ASHLAND FIRE DEPARTMENT (508-881-2323), AND THE ASHLAND DEPARTMENT OF PUBLIC WORKS (508-881-0120).

LEGEND

DESCRIPTION	EXISTING	PROPOSED
PROPERTY LINE		
RIGHT-OF-WAY LINE		
EASEMENT LINE		
LIMITS OF WORK		
INTERMEDIATE CONTOURS		
INDEX CONTOURS	25	25
SPOT GRADE	X 141.2	+ 32.0
STORM DRAIN	SD SD	SD
WATER	W W	W W
OVERHEAD ELECTRIC	OE OE	OE OE
TELEPHONE SERVICE	T T	T T
GAS SERVICE	G G	G G
EDGE OF PAVEMENT		
DIRT ROAD		
SIDEWALK		
GUARDRAIL		
METAL BEAM RAIL		
GAS SERVICE STRUCTURES	VALVE	VALVE
ELECTRIC SERVICE STRUCTURES	UP #	UP #
TREELINE		
TREE	EVERGREEN DECIDUOUS	EVERGREEN DECIDUOUS

LEGEND

RESOURCE AREAS	
TOP OF BANK/MAHW	
BORDERING LAND SUBJECT TO FLOODING (BLSF)	
25-FOOT NO DISTURBANCE ZONE (LOCAL)	
100-FOOT BUFFER ZONE	
200-FOOT RIVERFRONT AREA	
VEGETATED WETLAND LIMIT	
WETLAND FLAG	WF–

ABBREVIATIONS

ABDN('D)	ABANDON(ED)
BIT	BITUMINOUS
BL	BASELINE
BOT	BOTTOM
CL	CENTERLINE
CLF	CHAIN LINK FENCE
CONC	CONCRETE
CY	CUBIC YARD
DIA	DIAMETER
E	EAST
EF	EACH FACE
EG	EXISTING GRADE
EL/ELEV	ELEVATION
ELEC	ELECTRIC
EP	EDGE OF PAVEMENT
EW	EACH WAY
EXIST	EXISTING
G	GAS
HMA	HOT MIX ASPHALT
IN	INCHES
INV	INVERT
LT	LEFT
MAX	MAXIMUM
MIN	MINIMUM
MISC	MISCELLANEOUS
N	NORTH
NTS	NOT TO SCALE
N/A	NOT APPLICABLE
OC	ON CENTER
OH	OVERHEAD
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PVMT	PAVEMENT
R	RADIUS
RT	RIGHT
R&D	REMOVE AND DISPOSE
S	SOUTH
SF	SQUARE FOOT
TYP	TYPICAL
UP	UTILITY POLE
W	WATER

Tighe&Bond

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_G.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

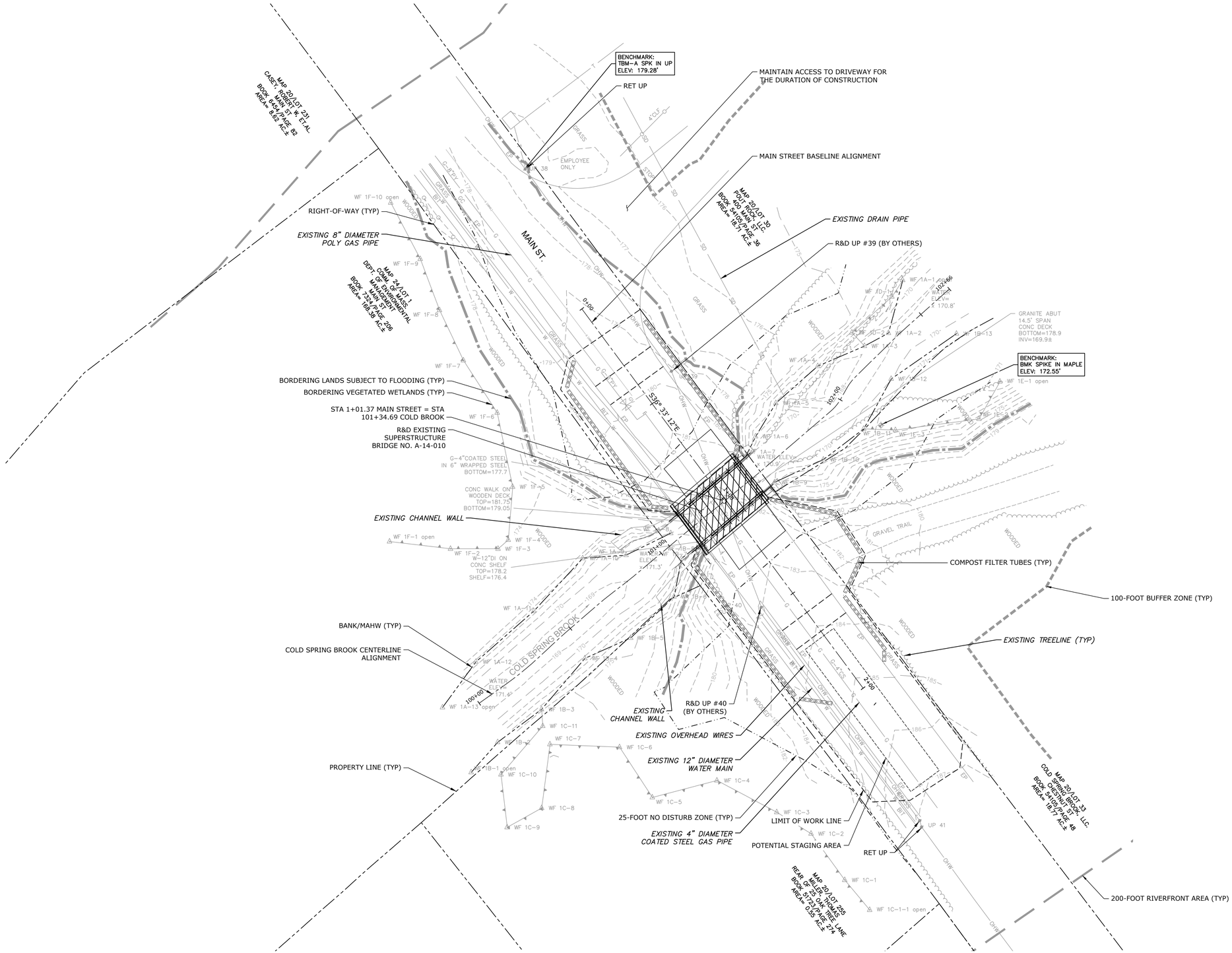
GENERAL NOTES, LEGEND, AND ABBREVIATIONS

SCALE: NO SCALE

G-001

SHEET 2 OF 23

Last Saved: 9/22/2022
Plotted On: Sep 25, 2022 - 2:24pm By: DFeltly
Tighe & Bond: J:\A\A1133 Ashland, MA\009 Main Street Over Cold Brook\Drawings_Figures\AutoCAD\Sheet\A-1113-009_G.dwg



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Tighe&Bond

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_C.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

C-101
SHEET 3 OF 23

Last Saved: 9/22/2022
Plotted On: Sep 25, 2022 2:24pm By: DFelly
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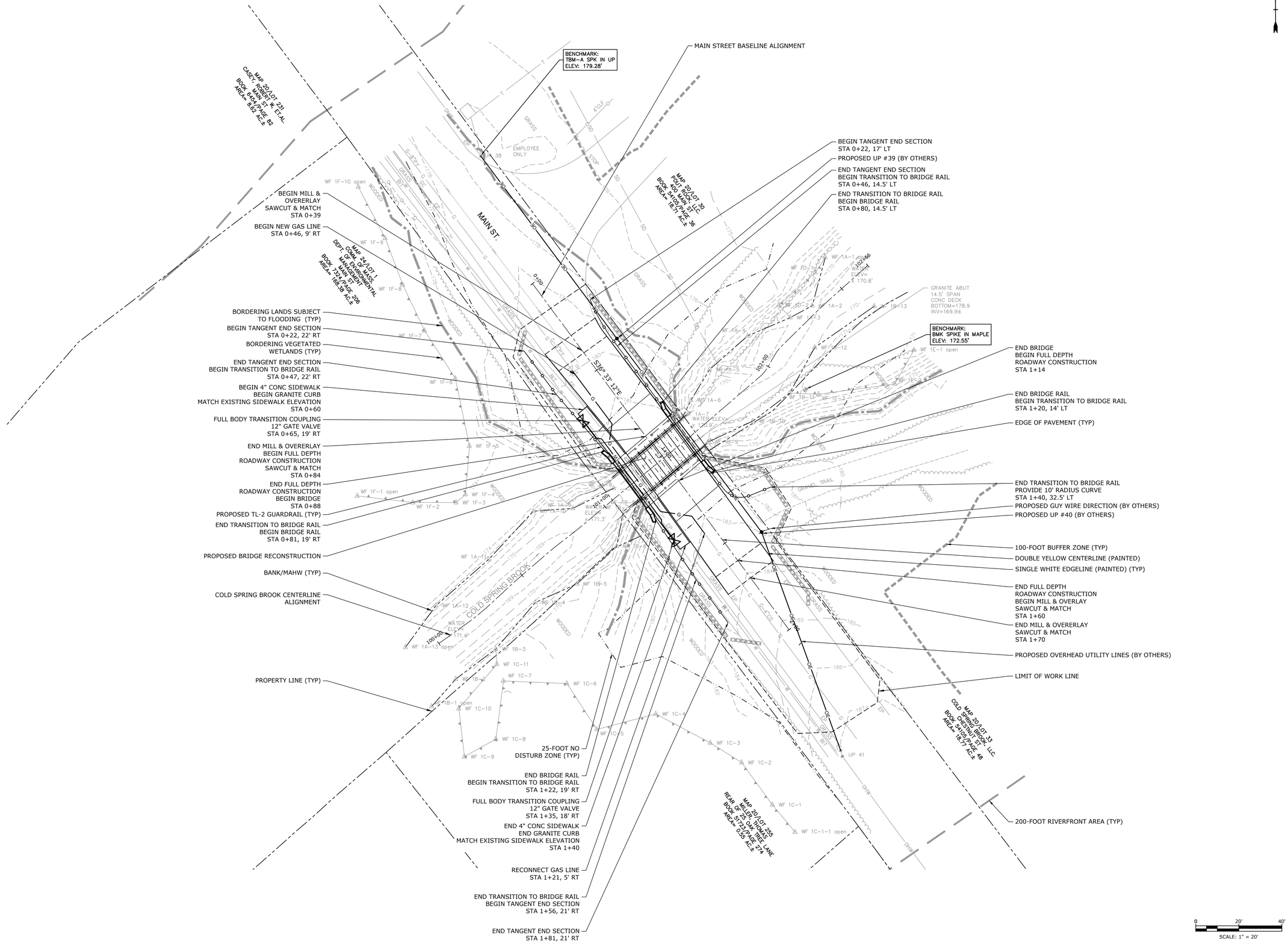

Tighe&Bond

PERMIT SET
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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_C.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

SITE PLAN

SCALE: 1" = 20'

C-102
SHEET 4 OF 23

Last Saved: 9/22/2022
Plotted On:Sep 25, 2022,2:25pm By: DFelty
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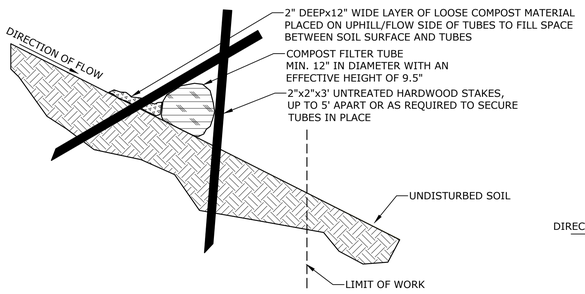
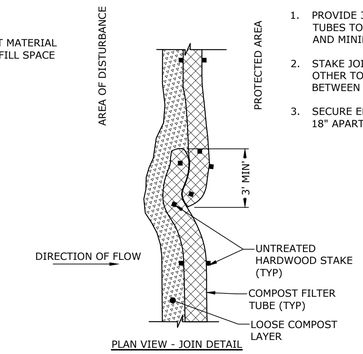


SECTION VIEW



PLAN VIEW - JOIN DETAIL

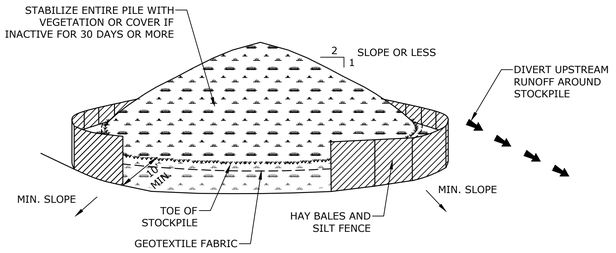
NOTES:

1. PROVIDE 3' MINIMUM OVERLAP AT ENDS OF TUBES TO JOIN IN A CONTINUOUS BARRIER AND MINIMIZE UNIMPEDED FLOW.
2. STAKE JOINING TUBES SNUGLY AGAINST EACH OTHER TO PREVENT UNFILTERED FLOW BETWEEN THEM.
3. SECURE ENDS OF TUBES WITH STAKES SPACED 18" APART THROUGH TOPS OF TUBES.

COMPOST FILTER TUBE NOTES:

1. PROVIDE A MINIMUM TUBE DIAMETER OF 12" FOR SLOPES UP TO 50' IN LENGTH WITH A SLOPE RATIO OF 3H:1V OR STEEPER. LONGER SLOPES OF 3H:1V MAY REQUIRE LARGER TUBE DIAMETER OR ADDITIONAL COURSING OF FILTER TUBES TO CREATE A FILTER BERM. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR SITUATION WITH LONGER SLOPES OR STEEPER SLOPES.
2. INSTALL TUBES ALONG CONTOURS AND PERPENDICULAR TO SHEET OR CONCENTRATED FLOW.
3. DO NOT INSTALL IN PERENNIAL, EPHEMERAL OR INTERMITTENT STREAMS.
4. CONFIGURE TUBES AROUND EXISTING SITE FEATURES TO MINIMIZE SITE DISTURBANCE AND MAXIMIZE CAPTURE AREA OF STORMWATER RUN-OFF.
5. TUBES FOR COMPOST FILTERS SHALL BE JUTE MESH OR APPROVED BIODEGRADABLE MATERIAL. ADDITIONAL TUBES SHALL BE USED AT THE DIRECTION OF THE ENGINEER.
6. TAMP TUBES IN PLACE TO ENSURE GOOD CONTACT WITH SOIL SURFACE. IT IS NOT NECESSARY TO TRENCH TUBES INTO EXISTING GRADE.
7. WHEN STAKING IS NOT POSSIBLE, SUCH AS WHEN TUBES MUST BE PLACED ON PAVEMENT, HEAVY CONCRETE OR CINDER BLOCKS CAN BE USED BEHIND TUBES UP TO 5' APART OR AS REQUIRED TO SECURE TUBES IN PLACE.
8. PROVIDE 3' MINIMUM OVERLAP AT ENDS OF TUBES TO JOIN IN A CONTINUOUS BARRIER AND MINIMIZE UNIMPEDED FLOW.
9. STAKE JOINING TUBES SNUGLY AGAINST EACH OTHER TO PREVENT UNFILTERED FLOW BETWEEN THEM.
10. SECURE ENDS OF TUBES WITH STAKES SPACED 18" APART THROUGH TOPS OF TUBES.
11. SEDIMENT BUILDUP UPSLOPE OF EROSION CONTROLS EQUAL TO OR GREATER THAN HALF THE EFFECTIVE HEIGHT OF SILT SOCK SHOULD BE REMOVED AND LOOSE COMPOST MATERIAL REPLACED AS NECESSARY.

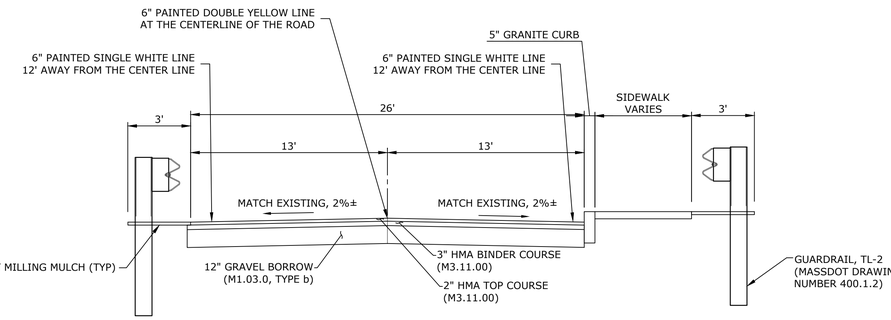
COMPOST FILTER TUBES
NO SCALE



INSTALLATION NOTES:

1. AREA CHOSEN FOR STOCKPILING OPERATIONS SHALL BE DRY AND STABLE.
2. MAXIMUM SLOPE OF STOCKPILE SHALL BE 2H:1V.
3. UPON COMPLETION OF SOIL STOCKPILING, EACH PILE SHALL BE SURROUNDED WITH EITHER SILT FENCING AND HAYBALES, THEN STABILIZED WITH VEGETATION OR COVERED.
4. SOIL STOCKPILES ON IMPERVIOUS SURFACES SHOULD BE AVOIDED IF POSSIBLE.
5. SOIL STOCKPILES LOCATED ON AN IMPERVIOUS SURFACE WITHIN THE ROADWAY CORRIDOR SHALL NOT SIT OVERNIGHT.
6. SOIL STOCKPILES SHALL BE LOCATED A MINIMUM OF 50 FEET FROM ANY WETLANDS OR STORMWATER INFRASTRUCTURE THAT ACCEPTS SURFACE FLOW.

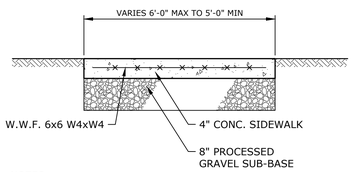
SOIL STOCKPILING
NO SCALE



NOTES:

1. PROVIDE A CONTINUOUS HMA PAVEMENT SECTION FROM THE TOP OF THE PROPOSED STRUCTURE TO THE PROPOSED ROADWAY ELEVATION. HMA BINDER COURSE THICKNESS WILL VARY OVER THE PROPOSED BRIDGE STRUCTURE. NO GRAVEL BORROW SHALL BE INSTALLED OVER THE PROPOSED STRUCTURE.
2. REFER TO STRUCTURAL DRAWINGS FOR BRIDGE RAIL LOCATIONS.

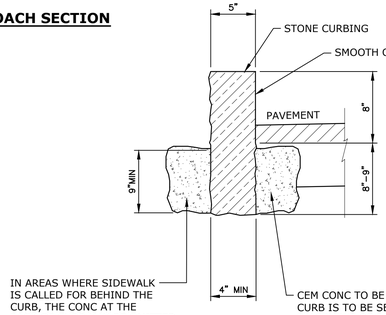
TYPICAL ROADWAY APPROACH SECTION
NO SCALE



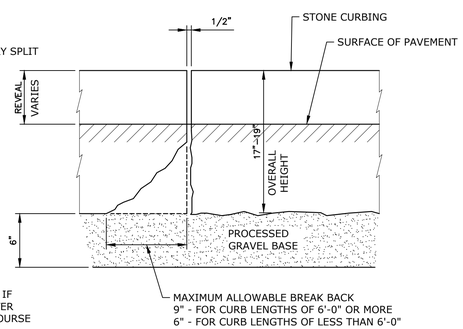
NOTES:

1. WALK TO HAVE 1/4" RADIUS TOOLED DUMMY JOINT 1/4 OF THE THICKNESS OF THE SIDEWALK IN DEPTH EVERY 5 L.F. OF WALK.
2. WALK TO HAVE 1/2" WIDE NON-EXTRUDING PREFORMED EXPANSION JOINT EVERY 20 L.F. OF WALK.

CONCRETE SIDEWALK
NO SCALE

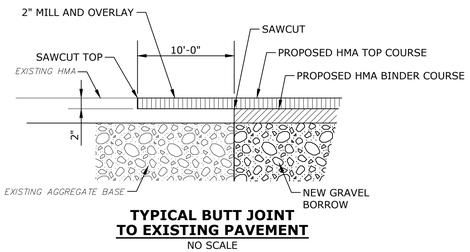


SECTION

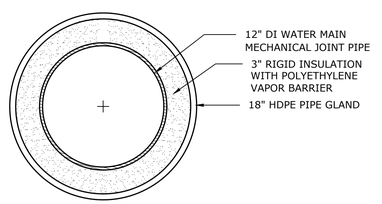


ELEVATION

GRANITE CURB
NO SCALE



TYPICAL BUTT JOINT TO EXISTING PAVEMENT
NO SCALE



NOTES:

1. INSULATED WATER MAIN IS REQUIRED WHERE THE WATER MAIN HAS LESS THAN 5' OF COVER.
2. WATER MAIN BENDS LOCATED IN AREAS WITH LESS THAN 5' OF COVER SHALL BE INSULATED.

INSULATED WATERMAIN
NO SCALE

SIZE (IN.)	FITTING	* MINIMUM RESTRAINED LENGTH, FT. ( ) INDICATES POLYWRAPPED
12"	45° BEND	28 (32)
12"	CAP (DEAD END)	142 (202)
12"	45° VERTICAL UP BEND	28 (32)
12"	45° VERTICAL DOWN BEND	59 (84)

* MINIMUM RESTRAINED LENGTH BASED ON DIPRA, "THRUST RESTRAINT DESIGN FOR DUCTILE IRON PIPE," 7TH EDITION, 2016.

FOLLOWING CONDITIONS APPLY:
SOIL TYPE: SAND SILT
MAX. PRESSURE: 200psi
LAYING CONDITIONS: TYPE 2
BURIED DEPTH: 5'

MINIMUM RESTRAINED LENGTHS FOR DI PIPE

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_C.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

CONSTRUCTION DETAILS

SCALE: AS SHOWN

C-103
SHEET 5 OF 23

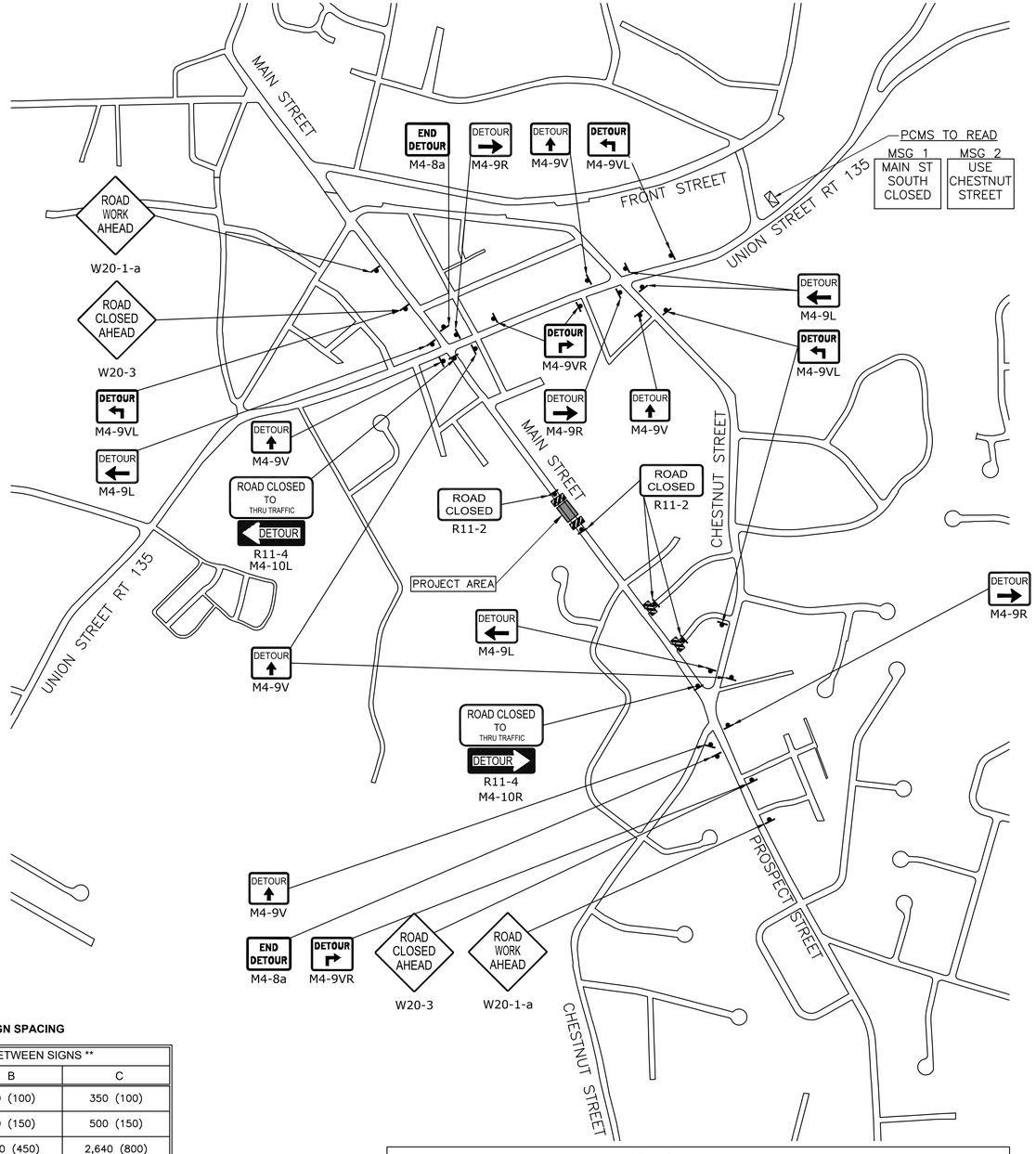
Last Saved: 9/22/2022
Plotted On: Nov 02, 2022 - 2:05pm By: DFelly
Tighe & Bond: J:\A\A1113 Ashland, MA\009 Main Street Over Cold Brook\Drawings, Figures\AutoCAD\Sheet\A-1113-009_C.dwg

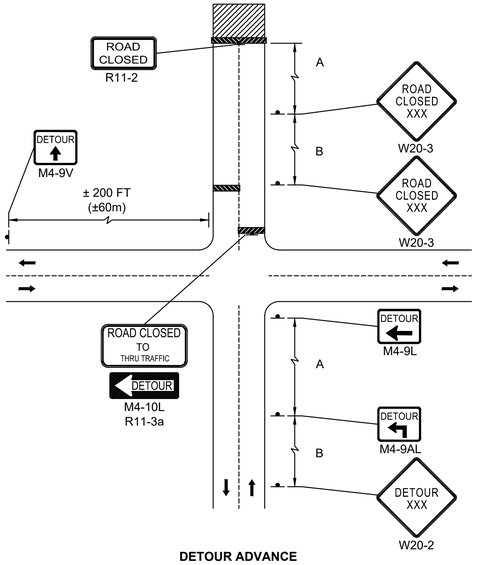
NOTES:

1. TEMPORARY FENCING AND BARRIERS SHALL BE DEPLOYED ON SITE DURING THE ROADWAY CLOSURE TO PREVENT ACCESS TO THE CROSSING.
2. NO THRU TRAFFIC SHALL BE PERMITTED UNTIL THE BRIDGE STRUCTURE AND GUARDRAILS HAVE BEEN INSTALLED.
3. PLACEMENT OF SIGNS TO BE COORDINATED WITH THE ENGINEER, DEPARTMENT OF PUBLIC WORKS, POLICE DEPARTMENT, AND FIRE DEPARTMENT (ASHLAND, MASSACHUSETTS).
4. ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
5. ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
6. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
7. TEMPORARY CONSTRUCTION SIGNING, BARRICADES, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
8. SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES" AND/OR "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
9. NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT, AND SIMILAR OPERATIONS.
10. THE FIRST FIVE PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH TYPE A LIGHTS.
11. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
12. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
13. MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
14. MINIMUM LANE WIDTH IS TO BE 10 FEET UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
15. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.
16. TWO-WAY TRAFFIC SHALL BE RESTORED AT THE END OF THE PROJECT.
17. THE CONTRACTOR SHALL PROVIDE ALL SIGNAGE, BARRICADES, POLICE DETAILS AND OTHER CONTROLS AS REQUIRED FOR TRAFFIC CONTROL..

LEGEND:

- TYPE III BARRICADE
- WORK ZONE
- SIGN





DETOUR ADVANCE SIGNING

SUGGESTED WORK ZONE WARNING SIGN SPACING

ROAD TYPE	DISTANCE BETWEEN SIGNS **		
	A	B	C
LOCAL OR LOW VOLUME ROADWAYS*	350 (100)	350 (100)	350 (100)
MOST OTHER ROADWAYS*	500 (150)	500 (150)	500 (150)
FREEWAYS AND EXPRESSWAYS*	1,000 (300)	1,500 (450)	2,640 (800)

* ROAD TYPE TO BE DETERMINED BY MASSDOT OFFICE OF TRANSPORTATION PLANNING.

** DISTANCES ARE SHOWN IN FEET (METERS). THE COLUMN HEADINGS A, B, AND C ARE THE DIMENSIONS SHOWN IN THE DETAIL/ TYPICAL SETUP FIGURES. THE A DIMENSION IS THE DISTANCE FROM THE TRANSITION OR POINT OF RESTRICTION TO THE FIRST SIGN. THE B DIMENSION IS THE DISTANCE BETWEEN THE FIRST AND SECOND SIGNS. THE C DIMENSION IS THE DISTANCE BETWEEN THE SECOND AND THIRD SIGNS. (THE "THIRD" SIGN IS THE FIRST ONE TYPICALLY ENCOUNTERED BY A DRIVER APPROACHING A TEMPORARY TRAFFIC CONTROL (TTC) ZONE.)

THE "THIRD" SIGN ABOVE IS TYPICALLY REFERRED TO AS AN "ADVANCE WARNING" SIGN ON THE TTCP SETUPS. THESE ADVANCE WARNING SIGNS ARE LOCATED PRIOR TO THE PROJECT LIMITS ON ALL APPROACHES (i.e. THE W20-1 SERIES (ROAD WORK XX FT) SIGNS), AND USUALLY REMAIN FOR THE DURATION OF THE PROJECT. ADDITIONAL SIGNS (i.e. "RIGHT LANE CLOSED 1 MILE" AND "LEFT LANE CLOSED 1 MILE") HAVE BEEN SHOWN IN SOME FIGURES AS EXAMPLES OF REINFORCEMENT SIGN PLACEMENT BUT ARE USED IN RARE OCCASIONS.

THE FIRST AND SECOND WARNING SIGNS ABOVE ARE REFERRED TO AS THE OPERATIONAL (DAY-TO-DAY) WORK ZONE SIGNS AND MAY BE MOVED DEPENDING ON WHERE THE SPECIFIC ROADWAY WORK FOR THAT DAY IS LOCATED.

R2-10a SIGNS SHALL BE PLACED BETWEEN THE SECOND AND THIRD SIGNS AS DESCRIBED ABOVE.

R2-10a, R2-10e, AND W20-1 SERIES SIGNS ARE TO BE INCLUDED ON ALL DETAILS/TYPICAL SETUPS.

Based on: Table 6C-1 MUTCD LATEST EDITION

SIGN LEGEND					
CODE	DESCRIPTION	SIZE	AREA	NO.	TOTAL AREA
W20-1-a	ROAD WORK AHEAD	36"x36"	9 SF	2	18 SF
W20-3	ROAD CLOSED AHEAD	36"x36"	9 SF	2	18 SF
R11-2	ROAD CLOSED	48"x30"	10 SF	4	40 SF
R11-4	ROAD CLOSED TO THRU TRAFFIC	60"x30"	12.5 SF	2	25 SF
M4-10L	DETOUR	48"x18"	6 SF	1	6 SF
M4-10R	DETOUR	48"x18"	6 SF	1	6 SF
M4-9L	DETOUR	30"x24"	5 SF	4	20 SF
M4-9R	DETOUR	30"x24"	5 SF	3	15 SF
M4-9V	DETOUR	30"x24"	5 SF	6	30 SF
M4-9VL	DETOUR	30"x24"	5 SF	4	20 SF
M4-9VR	DETOUR	30"x24"	5 SF	3	15 SF
M4-8a	END DETOUR	30"x24"	5 SF	2	10 SF
				TOTAL =	223 SF

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

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APPROVED:	DLM

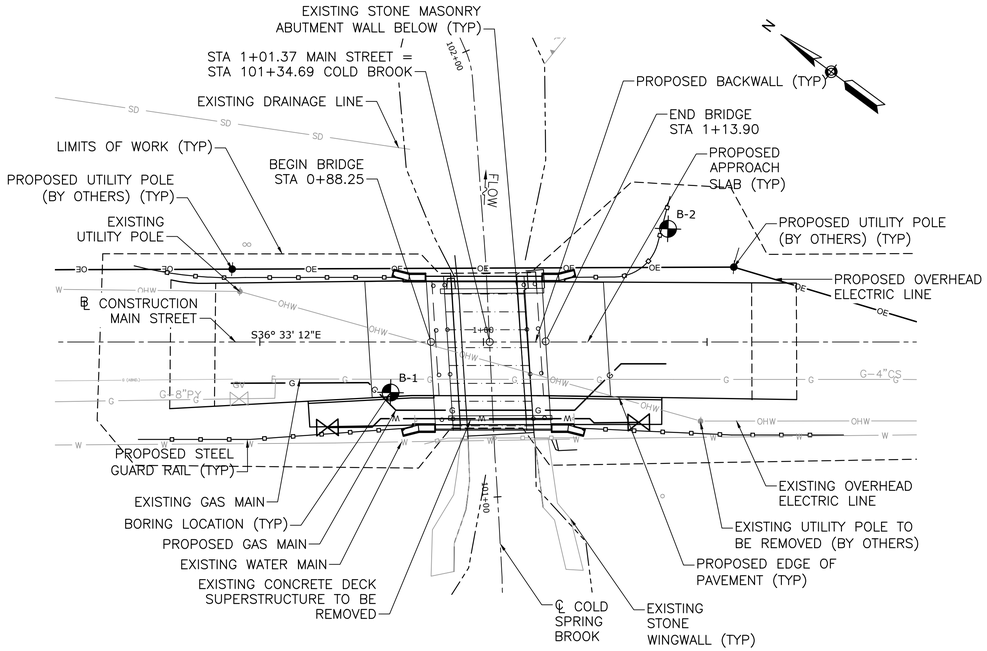
TEMPORARY TRAFFIC CONTROL PLAN

SCALE: 1" = 20'

C-104

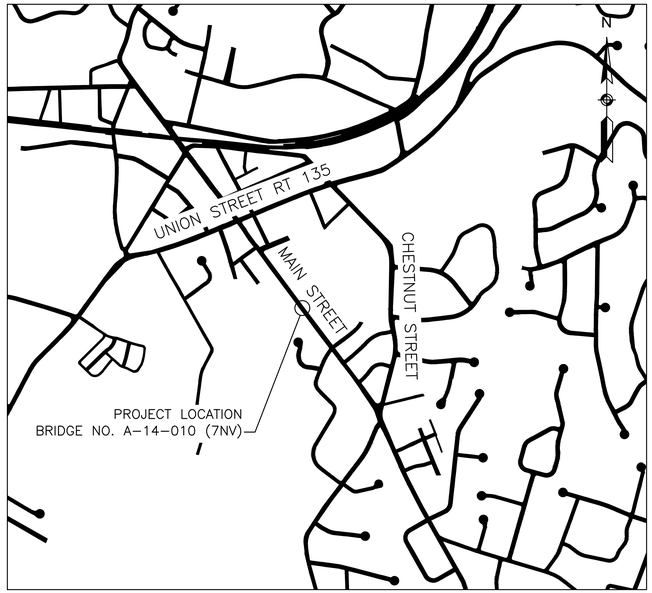
SHEET 6 OF 23

Last Saved: 9/22/2022
Plotted On: Sep 25, 2022-2:26pm By: DFelty
Tighe & Bond: J:\VA\1133 Ashland, MA\009 Main Street Over Cold Brook\Drawings_Figures\AutoCAD\Sheet\A-1113-009_C.dwg



KEY PLAN

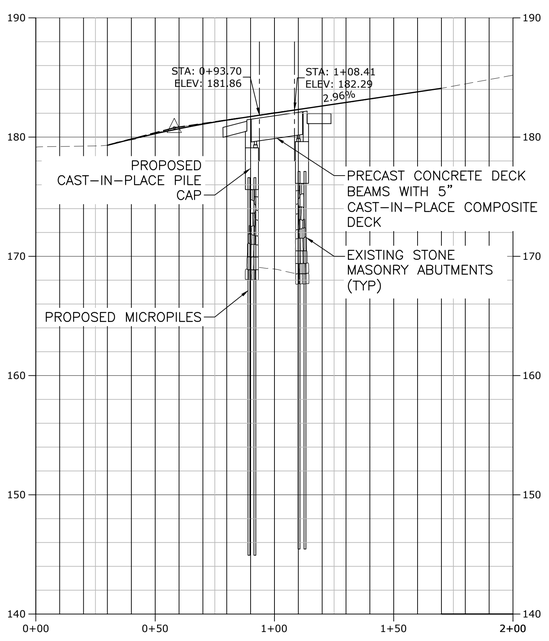
SCALE: 1/16" = 1'-0"



LOCUS PLAN

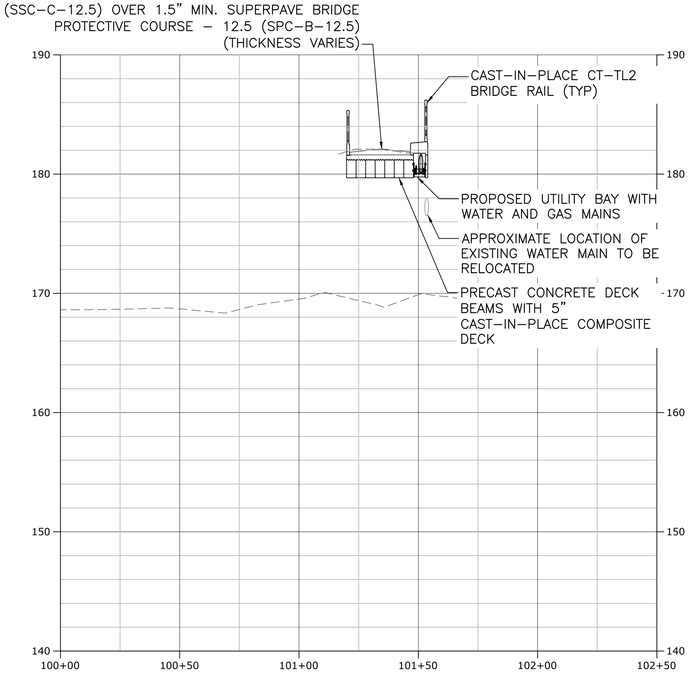
SCALE: 1" = 1000'

GENERAL NOTES	
PROJECT FILE NO.:	A1133-009
PROJECT DESCRIPTION:	PROPOSED BRIDGE
BRIDGE DESIGN LOADING:	HL-93
SURVEY:	WSP USA INC.
ELEVATION REFERENCE:	NAVD OF 1988
BENCHMARK:	T.B.M. A: SPIKE SET IN U.P., ELEV = 179.28 T.B.M. B: SPIKE SET IN U.P., ELEV = 193.59



MAIN STREET PROFILE - ℄ PROPOSED ROADWAY

HORIZ.: 1' = 30' VERT.: 1/6" = 1'



PROFILE ALONG ℄ COLD SPRING BROOK

HORIZ.: 1' = 30' VERT.: 1/6" = 1'

CHAPTER 85 SECTION 35 REVIEW AND APPROVAL NOTES:

1. IN ACCORDANCE AND COMPLIANCE WITH THE REQUIREMENTS OF CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS, THE CONTRACTOR SHALL SUBMIT TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION ALL CONSTRUCTION DRAWINGS AND DESIGN CALCULATIONS THAT SHALL BE USED TO FABRICATE AND CONSTRUCT THE STRUCTURE DENOTED ON THESE PLANS FOR REVIEW AND APPROVAL. THIS APPROVAL SHALL CONSTITUTE THE FINAL APPROVAL AS STIPULATED BY CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER _____ DATE _____

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
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DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

BRIDGE KEY PLAN, PROFILES, LOCUS, & INDEX

SCALE: AS SHOWN

S-001
SHEET 7 OF 23

Last Saved: 9/25/2022
Plotted On: Sep 25, 2022-2:05pm By: DFelty
T:\tighe & Bond\1-JAN\A1133 Ashland, MA\009 Main Street Over Cold Brook\Drawings_Figures\AutoCAD\Sheet\A-1113-009_S-001.dwg

DESIGN LOADS AND SPECIFICATIONS

1. DESIGN LOADING: HL–93

2. DESIGN METHOD: LOAD AND RESISTANCE FACTOR DESIGN (LRFD)

3. SPECIFICATIONS: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH ED., 2020 AS AMENDED
   MASSDOT 2021 STANDARD SPECIFICATIONS AS AMENDED

4. FOUNDATION DATA: ABUTMENTS:
   X–INCH DIAMTER DRILLED MICROPILES WITH A NOMINAL RESISTANCE OF XX KIPS PER PILE IN COMBINATION WITH A RESISTANCE FACTOR OF 0.XX
   PRECAST GUARD TRANSITION:
   TRANSITION BASE ON CONTROLLED DENSITY FILL (NON EXCAVATABLE) ON COMPACTED GRAVEL BORROW OR UNDISTURBED SOIL

5. REINFORCING STEEL: EPOXY COATED BARS AASHTO M31 (ASTM A 615):
   SIDEWALKS AND PRECAST GUARD TRANSITIONS

6. CONCRETE: CT–TL2 BARRIER:
   5000 PSI, ¾", 710 HP CEMENT CONCRETE
   SIDEWALKS AND PRECAST GUARD TRANSITIONS:
   5000 PSI, ¾", 685 HP CEMENT CONCRETE

7. PRECAST DECK BEAMS:
   CONCRETE STRENGTH (f'c) 5000 PSI
   CAST–IN–PLACE CONCRETE DECK STRENGTH 4000 PSI

GENERAL NOTES

1. PLANS OF EXISTING STRUCTURE ARE NOT AVAILABLE.

2. ALL EXISTING BRONZE DISCS REPRESENTING STATE BENCHMARKS OR SURVEY TRIANGULATION POINTS MUST NOT BE DISTURBED. WHEN THE WORK CALLED FOR INVOLVES DISTURBING A BRONZE DISC THE CONTRACTOR SHALL NOTIFY THE ENGINEER SUFFICIENTLY IN ADVANCE OF THE WORK TO PERMIT THE STATE TO TEMPORARILY RELOCATE THE AFFECTED MARKER.

3. ALL WORK SHALL COMPLY WITH OSHA'S LATEST STANDARDS. ALL REQUIREMENTS OF OSHA'S EXCAVATION STANDARDS SHALL BE PROVIDED BY THE CONTRACTOR INCLUDING, BUT NOT LIMITED TO, THE PROVISION FOR A COMPETENT PERSON ON SITE AND ANY REQUIRED DOCUMENTATION THAT MAY REQUIRE CERTIFICATION BY A PROFESSIONAL ENGINEER.

4. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN ALL UTILITIES FUNCTIONING PROPERLY IN THE AREAS UNDER CONSTRUCTION PRIOR TO COMPLETION OF THE PROJECT. ALL PIPES AND STRUCTURES WITHIN THE LIMITS OF THIS CONTRACT SHALL BE LEFT IN A CLEAN AND OPERABLE CONDITION AT THE COMPLETION OF WORK. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PREVENT SAND AND SILT FROM DISTURBED AREAS FROM ENTERING THE SYSTEM. CONTRACTOR IS RESPONSIBLE FOR DAMAGE SUSTAINED TO ANY EXISTING UTILITIES AND IT IS HIS/HER RESPONSIBILITY TO MAKE REPAIRS TO THE REQUIREMENTS OF THE TOWN OR RESPECTIVE UTILITY COMPANY.

5. EXISTING PROPERTY LINES ARE APPROXIMATE AND ARE BASED ON GIS DATA FROM THE TOWN OF ASHLAND.

6. THE OWNER AND ENGINEER ASSUME NO RESPONSIBILITY FOR THE LOCATION OF EXISTING UTILITIES. THE ENGINEER AND OWNER MAKE NO GUARANTEE AS TO THE UNDERGROUND CONDITIONS THAT MAY BE ENCOUNTERED.

7. PER MASSACHUSETTS LAW, CONTRACTOR SHALL CALL 1–888–DIG–SAFE, (1–888–344–7233) AND THE TOWN OF ASHLAND PRIOR TO ANY UNDERGROUND EXCAVATION ON SITE. THE DIG–SAFE SERVICE WILL FIELD LOCATE AND MARK UNDERGROUND UTILITIES IN THE FIELD. THE DIG–SAFE VERIFICATION NUMBER SHALL BE SUBMITTED TO THE TOWN OF ASHLAND PRIOR TO ANY EXCAVATION, DEMOLITION, AND REMOVAL OR CONSTRUCTION WORK.

8. ALL EXISTING CONDITIONS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. IF FIELD CONDITIONS ARE OBSERVED THAT VARY SIGNIFICANTLY FROM THOSE SHOWN ON THESE PLANS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING FOR RESOLUTION OF THE CONFLICTING INFORMATION.

9. COORDINATE RELOCATION OR SUPPORTING OF UTILITY POLES WITH THE RESPECTIVE UTILITIES.

10. ALL PERIMETER CONTROLS SHALL BE PUT IN PLACE PRIOR TO COMMENCING ANY CONSTRUCTION WORK ON SITE.

11. ANY AND ALL DEMOLISHED BUILDING MATERIALS, SURPLUS MATERIAL, WASTE FROM CLEARING AND GRUBBING ACTIVITIES, AND SITE RUBBLE SHALL BE HANDLED/DISPOSED OF BY THE CONTRACTOR OFF–SITE AT HIS EXPENSE AND IN ACCORDANCE WITH THE TOWN OF ASHLAND ORDINANCES, AND ALL APPLICABLE STATE AND FEDERAL ENVIRONMENTAL REGULATIONS.

12. THE CONTRACTOR SHALL TAKE ALL NECESSARY MEASURES TO ENSURE THAT DEBRIS DOES NOT FALL IN THE WATERWAY BELOW THE EXISTING STRUCTURE. ALL COSTS INCLUDING ERECTION, MAINTENANCE AND REMOVAL OF TEMPORARY STRUCTURES OR OTHER SUCH APPROVED METHODS, SHALL BE SUBSIDIARY TO THE APPROPRIATE ITEMS OF WORK BEING PERFORMED.

13. ALL MATERIALS AND METHODS ARE TO COMPLY WITH THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, DATED 2021, AND ITS LATEST REVISIONS.

14. ALL DISTURBED AREAS SHALL BE LOAMED & SEEDED UNLESS OTHERWISE SPECIFIED. OVER EXCAVATE LOAM & SEED AREAS AS REQUIRED TO MEET GRADE.

15. WETLAND RESOURCE AREAS WERE DELINEATED BY TIGHE & BOND ON 3/16/2021.

16. IF THERE ARE REVISIONS TO APPROVED PLANS, THE CONTRACTOR SHALL SUBMIT THESE CHANGES TO THE ENGINEER OF RECORD FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION. ONCE THESE REVISIONS ARE APPROVED BY THE MUNICIPALITY'S DESIGNER OF RECORD, THESE REVISIONS SHALL THEN BE SUBMITTED TO MASSDOT FOR FILING.

17. ALL DIMENSIONS ARE HORIZONTAL AND VERTICAL, AND ARE GIVEN AT 68 DEGREES FAHRENHEIT.

18. ALL WORK PERFORMED BY THE CONTRACTOR SHALL COMPLY WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS AND REQUIREMENTS.

19. THE CONTRACTOR SHALL REVIEW AND UNDERSTAND ALL APPLICABLE ENVIRONMENTAL PERMITS AND ENSURE THAT ALL CONSTRUCTION CONDITIONS ARE MET.

20. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION SAFETY, AND MEANS AND METHODS TO PERFORM AND COMPLETE THE WORK.

21. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING ANY DAMAGE TO PRIVATE OR PUBLIC PROPERTY OUTSIDE THE LIMITS OF CONSTRUCTION SHOWN ON THE PLANS CAUSED BY THE CONTRACTOR, AT THE SOLE COST TO THE CONTRACTOR.

22. THE CONTRACTOR MUST COORDINATE ALL WORK WITH THE TOWN OF ASHLAND, ALL UTILITY COMPANIES, THE ENGINEER, AND ANY AFFECTED ABUTTERS. WORK SHALL NOT PROCEED WITHOUT WRITTEN APPROVAL FROM THE TOWN OF ASHLAND.

23. THE CONTRACTOR SHALL SUBMIT LITERATURE (MANUFACTURER'S LITERATURE, CUT SHEETS, APPLICATION PROCEDURES, ETC.) FOR ALL PRODUCTS PROPOSED FOR USE ON THE PROJECT, FOR APPROVAL BY THE ENGINEER.

24. TAKE ALL NECESSARY MEASURES AND PROVIDE ALL NECESSARY CONTINUOUS BARRIERS OF SUFFICIENT TYPE, SIZE AND STRENGTH TO PREVENT ACCESS TO ALL OPEN EXCAVATIONS AT THE COMPLETION OF EACH DAY'S WORK.

25. STORE FUEL, OIL, PAINT, OR OTHER HAZARDOUS MATERIALS IN A SECONDARY CONTAINER AND REMOVE FROM THE SITE TO A LOCKED INDOOR AREA WITH AN IMPERVIOUS FLOOR DURING NON–WORK HOURS.

26. IMMEDIATELY REPORT SPILLS OF OIL AND/OR HAZARDOUS MATERIALS (OHM) TO THE MASSDEP. ALSO REPORT SPILLS TO ASHLAND FIRE DEPARTMENT (508–881–2323) AND ASHLAND DEPARTMENT OF PUBLIC WORKS (508–881–0120).

27. PROVIDE A SUFFICIENT SUPPLY OF ABSORBENT SPILL RESPONSE MATERIALS, SUCH AS BOOMS OR BLANKETS, AT THE CONSTRUCTION SITES AT ALL TIMES TO CLEAN UP POTENTIAL SPILLS OF HAZARDOUS MATERIALS.

28. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4", UNLESS OTHERWISE NOTED.

29. APPLY PAVEMENT JOINT ADHESIVE ALONG ALL LONGITUDINAL JOINTS BETWEEN PAVEMENT PASSES AND ALONG BRIDGE CURB LINES AND EXPANSION JOINT ARMORING PRIOR TO PLACING ALL PAVEMENT COURSES.

30. FOR BORING NOTES SEE SHEET S–003.

31. FOR HYDRAULIC DATA SEE SHEET S–001.

32. FOR ROAD CLOSURE TRAFFIC MANAGEMENT PLAN SEE SHEET C–104.

33. THE CONTRACTOR SHALL SUBMIT FINAL LOAD RATING REPORT IN ACCORDANCE WITH THE MOST RECENT VERSION OF MASSDOT LRFD BRIDGE MANUAL. SEE SPECIAL PROVISIONS FOR ADDITIONAL REQUIREMENTS.

BRIDGE REMOVAL NOTES:

1. THE CONTRACTOR'S METHOD FOR REMOVAL OF THE EXISTING SUPERSTRUCTURE SHALL BE SUBMITTED FOR DOCUMENTATION PRIOR TO THE COMMENCEMENT OF ANY REMOVAL OPERATIONS.

2. REMOVAL OF EXISTING BRIDGE STRUCTURE SHALL INCLUDE THE COMPLETE REMOVAL OF DECK SLAB SUPERSTRUCTURE, EXISTING BRIDGE RAIL, EXISTING SIDEWALK.

3. PRIOR TO REMOVAL OF EXISTING BRIDGE, THE CONTRACTOR SHALL VERIFY THAT EXISTING UTILITIES HAVE BEEN DEACTIVATED FROM SERVICE.

MICROPILE NOTES:

1. REINFORCING STEEL SHALL BE IN ACCORDANCE WITH ASTM A615 (AASHTO M31) GRADE 60 OR ASTM A722 (AASHTO M275) GRADE 75.

2. FOR CASES OF TENSILE LOADING, BAR COUPLERS, IF REQUIRED, SHALL DEVELOP THE ULTIMATE TENSILE STRESS OF THE BAR, WITHOUT ANY EVIDENCE OF FAILURE. FOR COMPRESSIVE LOADING, THE COUPLER SHALL BE COMPATIBLE WITH EFFICIENT LOAD TRANSFER AND OVERALL REINFORCEMENT PERFORMANCE REQUIREMENTS.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER DATE

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

PROJECT NO:	A1113-009
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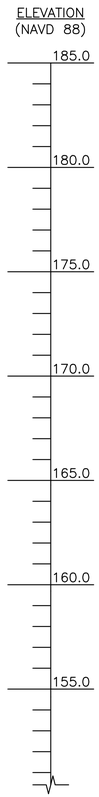
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

BRIDGE NOTES

SCALE: AS SHOWN

S-002
SHEET 8 OF 23



Tighe&Bond
Engineers | Environmental Specialists

Project: Main Street Bridge Replacement
Location: Main Street over Cold Brook, Ashland, MA
Client: Town of Ashland

Boring No. TB-1
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File No. A-1133-009
Checked by: R. Manson

		Casing	Sampler
Drilling Co.: New England Boring Contractor	Type	FJ	Split Spoon
Foreman: J. Voight	I.D./O.D. (in)	4.25/4.5	1.375/2
T&B Rep.: S. Marokhovsky	Hammer Wt.(lb)	140	140
Date Start: 05/20/21 End: 05/20/21	Hammer Fall(in)	30	30
Location See Exploration Location Plan	Rig Make/Model	Mobile B53	
GS. Elev. ±181 Datum: NAVD88	Drilling Method:	Drive & Wash	
	Hammer Type:	Auto	

Groundwater Readings

Date	Time	Depth (ft)	Casing (ft)	Sta. Time (hours)
5/20/2021	1205	11'	10'	20 minutes

Depth (ft.)	Sample No.	Recovery (in.)	Sample Depth (ft.)	Blows Per 6"	Sample Description	General Stratigraphy	Notes	Well Construction
0	S-1	18	0-2	27-19	Dense, brown, fine to coarse SAND and GRAVEL, little Silt, trace Asphalt	0.6' **ASPHALT**	1	
				19-15				
	S-2	11	2-4	15-8	Medium dense, brown, fine to coarse SAND, some Gravel, trace Silt			
				6-4				
5	S-3	15	4-6	4-3	Very loose, brown, fine to coarse SAND, little Gravel, trace Silt			
				1-1				
	S-4	12	6-8	5-6	Medium dense, tan, fine to medium SAND, little Silt, trace Gravel.	**FILL**		
				7-4				
	S-5	19	8-10	4-3	A: 14" loose, brown, fine to medium SAND, some Silt, little Gravel, trace coarse Sand			
10				3-3	B: 5" loose, black, fine to medium SAND, some Silt, trace roots			
						13'		
	S-6	20	13-15	6-3	Medium, tan-gray, SILT, little fine Sand			No Well Installed
15				4-3				
	S-7	14	18-20	3-3	Medium, gray, Clayey SILT, trace fine Sand			
				3-3				
20						**SILT**		
	S-8	19	23-25	3-3	Medium, gray, Clayey SILT			
				4-4				
25								
	S-9	22	28-30	3-3	Medium, gray, SILT			
30				3-4				

Notes:
1. Ground surface elevations taken from a plan prepared by Doucet Survey titled "A-1133-009_EXBASE" and dated July 2021.

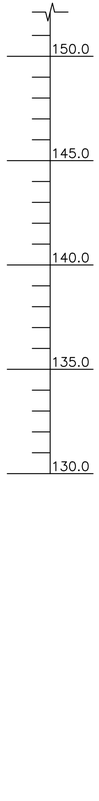
SILT	PI = 0
CLAYEY SILT	0 < PI < 4
SILT & CLAY	4 < PI < 10
CLAY & SILT	10 < PI < 20
SILTY CLAY	20 < PI < 40
CLAY	PI > 40

Proportions by Weight
TRACE (TR.) 0 - <10%
LITTLE (LI.) 10 - <20%
SOME (SO.) 20 - <35%
AND 35 - <50%

Density/Based on N-values
VERY LOOSE 0-4 bpf
LOOSE 4-10 bpf
MEDIUM DENSE 10-30 bpf
DENSE 30-50 bpf
VERY DENSE >50 bpf
bpf=blows per foot

Consistency/Based on N-values
VERY SOFT <2 bpf
SOFT 2-4 bpf
MEDIUM 4-8 bpf
STIFF 8-15 bpf
VERY STIFF 15-30 bpf
HARD >30 bpf

BORING B–1 (1 OF 2)



Tighe&Bond
Engineers | Environmental Specialists

Project: Main Street Bridge Replacement
Location: Main Street over Cold Brook, Ashland, MA
Client: Town of Ashland

Boring No. TB-1
Page 2 of 2
File No. A-1133-009
Checked by: R. Manson

Depth (ft.)	Sample No.	Recovery (in.)	Sample Depth (ft.)	Blows Per 6"	Sample Description	General Stratigraphy	Notes	Well Construction
30								
	S-10	20	33-35	3-2	Medium, gray, SILT			
35				2-3				
						SILT		
							2	
	S-11	20	38-40	4-4	Stiff, brown, Clayey SILT			No Well Installed
40				5-6				
	S-12	20	43-45	4-4	A: 10" stiff, brown, Clayey SILT, trace fine Sand	44'		
				6-7	B: 10" medium dense, brown, fine to medium SAND, little Silt			
45								
						SAND		
	S-13	12	48-50	5-6	Medium dense, brown, fine to coarse SAND, trace Silt			
				7-10			3	
50					End of Boring at 50'			
55								
60								
65								

Notes:
2. Driller noted color change from gray to tan around 37'.
3. Borehole backfilled with cuttings after completion.

SILT	PI = 0
CLAYEY SILT	0 < PI < 4
SILT & CLAY	4 < PI < 10
CLAY & SILT	10 < PI < 20
SILTY CLAY	20 < PI < 40
CLAY	PI > 40

Proportions by Weight
TRACE (TR.) 0 - <10%
LITTLE (LI.) 10 - <20%
SOME (SO.) 20 - <35%
AND 35 - <50%

Density/Based on N-values
VERY LOOSE 0-4 bpf
LOOSE 4-10 bpf
MEDIUM DENSE 10-30 bpf
DENSE 30-50 bpf
VERY DENSE >50 bpf
bpf=blows per foot

Consistency/Based on N-values
VERY SOFT <2 bpf
SOFT 2-4 bpf
MEDIUM 4-8 bpf
STIFF 8-15 bpf
VERY STIFF 15-30 bpf
HARD >30 bpf

BORING B–1 (2 OF 2)

BORING NOTES

1. LOCATION OF BORINGS SHOWN ON SHEET S–001 THUS: B–1
2. BORINGS WERE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A $1\frac{3}{8}$" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
5. BORING SAMPLES ARE STORED AT TIGHE & BOND'S OFFICE, 53 SOUTHAMPTON ROAD, WESTFIELD, MA 01085. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE DESIGN ENGINEER.
6. ALL BORINGS WERE DRILLED IN MAY 2021.
7. BORINGS WERE DRILLED BY NEW ENGLAND BORING CONTRACTORS OF DERRY, NEW HAMSHIRE.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
9. GROUNDWATER WAS MEASURED IN THE BORINGS AT THE END OF DRILLING. IT SHOULD BE NOTED THAT GROUNDWATER LEVELS CAN FLUCTUATE WITH TIDE, SEASON, PRECIPITATION, AND NEARBY CONSTRUCTION OR OTHER BELOW GRADE ACTIVITIES, SUCH AS EXCAVATION, DEWATERING, WELLS, INFILTRATION BASINS, ETC.
10. GEOTECHNICAL BORING GROUND SURFACE ELEVATIONS BASED ON DRAWING TITLED "EXISTING CONDITIONS PLAN" PREPARED BY WSP USA, INC., DATED MARCH 10, 2021.
11. ENGINEERING JUDGEMENT WAS EXERCISED IN PREPARING THE SUBSURFACE INFORMATION PRESENTED HEREIN. ANALYSIS AND INTERPRETATION OF SUBSURFACE DATA WAS PERFORMED FOR DESIGN AND ESTIMATING PURPOSES. PRESENTATION OF THE INFORMATION IN THE CONTRACT IS INTENDED TO PROVIDE THE CONTRACTOR ACCESS TO THE SAME DATA AVAILABLE TO THE OWNER. THE SUBSURFACE INFORMATION IS PRESENTED IN GOOD FAITH AND IS NOT INTENDED AS A SUBSTITUTE FOR PERSONAL INVESTIGATION, INDEPENDENT INTERPRETATION, INDEPENDENT ANALYSIS OR JUDGEMENT BY THE CONTRACTOR.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER _____ DATE _____

Tighe&Bond

PERMIT SET NOT FOR CONSTRUCTION

THIS DOCUMENT IS INCOMPLETE AND IS RELEASED TEMPORARILY FOR PROGRESS REVIEW ONLY. IT IS NOT INTENDED FOR BIDDING OR CONSTRUCTION PURPOSES.

Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

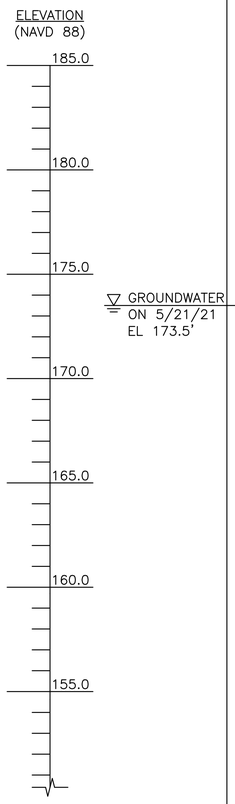
PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_S-003.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

BORING LOGS & BORING NOTES (SHEET 1 OF 2)

SCALE: AS SHOWN

S-003
SHEET 9 OF 23

Last Saved: 9/12/2022
Plotted On: Sep 25, 2022 2:06pm By: DFeltY
Tighe & Bond J:\A\A113 Ashland, MA\009 Main Street Over Cold Brook\Drawings_Figures\AutoCAD\Sheet\A-1113-009_S-003.dwg



Tighe&Bond
Engineers | Environmental Specialists

Project: Main Street Bridge Replacement
Location: Main Street over Cold Brook, Ashland, MA
Client: Town of Ashland

Boring No. TB-2
Page 1 of 2
File No. A-1133-009
Checked by: R. Manson

Drilling Co.: New England Boring Contractor
Foreman: J. Voight
T&B Rep.: S. Marokhovsky
Date Start: 05/21/21 End: 05/21/21
Location See Exploration Location Plan
GS. Elev. ±181 Datum: NAVD88

	Casing	Sampler
Type	FJ	Split Spoon
I.D./O.D. (in)	4.25/4.5	1.375/2
Hammer Wt.(lb)	140	140
Hammer Fall(in)	30	30
Rig Make/Model	Mobile B53	
Drilling Method:	Drive & Wash	
Hammer Type:	Auto	

Groundwater Readings

Date	Time	Depth (ft)	Casing (ft)	Sta. Time (hours)
5/21/2021	1350	7.5'	51'	15 minutes

Depth (ft.)	Sample No.	Recovery (in.)	Sample Depth (ft.)	Blows Per 6"	Sample Description	General Stratigraphy	Notes	Well Construction
	S-1	4	0-2	3-6	Medium dense, brown, fine SAND and GRAVEL, some leaf and other organic debris		1	
				4-6				
	S-2	6	2-4	3-3	Medium dense, brown, fine to medium SAND and GRAVEL, little Silt			
				7-32				
5	S-3	12	4-6	3-15	Medium dense, brown, fine to coarse SAND, some Gravel, little Silt			
				13-11				
	S-4	4	6-8	3-4	Loose, brown, fine to coarse SAND, some Gravel, little Silt			
				6-3				
	S-5	12	8-10	5-4	Medium, brown, SILT, trace fine to medium Sand	FILL		
10				3-9			2	
	S-6	2	13-15	38-43	Very dense, brown, fine to coarse SAND and GRAVEL, some large wood chunks		3	
				18-18				
15								No Well Installed
						18'		
	S-7	13	18-20	8-2	Loose, gray, fine to medium SAND and SILT			
				4-4				
20								
	S-8	22	23-25	2-4	Medium, gray, SILT, trace fine Sand	SILT		
				4-3				
25								
	S-9	22	28-30	2-2	Medium, tan, SILT			
30				3-4				

Notes:
1. Ground surface elevations taken from a plan prepared by Doucet Survey titled "A-1133-009_EXBASE" and dated July 2021. Rock in sample spoon tip
2. Hard obstruction beginning at 10 feet to 12 feet bgs.
3. Split spoon appeared to "bounce" most of the way down, likely to a large chunk of wood.

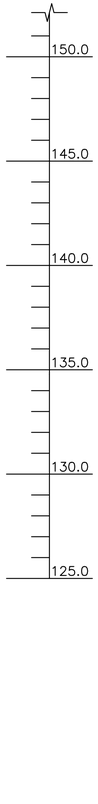
SILT	PI = 0
CLAYEY SILT	0 < PI < 4
SILT & CLAY	4 < PI < 10
CLAY & SILT	10 < PI < 20
SILTY CLAY	20 < PI < 40
CLAY	PI > 40

Proportions by Weight
TRACE (TR.) 0 - <10%
LITTLE (LI.) 10 - <20%
SOME (SO.) 20 - <35%
AND 35 - <50%

Density/Based on N-values
VERY LOOSE 0-4 bpf
LOOSE 4-10 bpf
MEDIUM DENSE 10-30 bpf
DENSE 30-50 bpf
VERY DENSE >50 bpf
bpf=blows per foot

Consistency/Based on N-values
VERY SOFT <2 bpf
SOFT 2-4 bpf
MEDIUM 4-8 bpf
STIFF 8-15 bpf
VERY STIFF 15-30 bpf
HARD >30 bpf

BORING B–2 (1 OF 2)



Tighe&Bond
Engineers | Environmental Specialists

Project: Main Street Bridge Replacement
Location: Main Street over Cold Brook, Ashland, MA
Client: Town of Ashland

Boring No. TB-2
Page 2 of 2
File No. A-1133-009
Checked by: R. Manson

Depth (ft.)	Sample No.	Recovery (in.)	Sample Depth (ft.)	Blows Per 6"	Sample Description	General Stratigraphy	Notes	Well Construction
30								
	S-10	19	33-35	2-3	Medium, tan, SILT, little fine Sand	SILT		
				5-4				
35								
						38'		
	S-11	6	38-40	4-7	Medium dense, tan, fine to coarse Sand, trace Silt			
				7-7				
40								
	S-12	0	43-45	7-5	Medium dense, fine to coarse SAND and GRAVEL, trace Silt		4	
				8-9				
45						SAND and GRAVEL		
	S-13	9	48-50	8-5	Medium dense, brown, fine to coarse SAND, some Gravel, trace Silt			
				6-8				
50								
	S-14	4	51-53	10-9	Medium dense, brown, fine to coarse SAND and GRAVEL, trace Silt			
				21-20			5	
					End of boring at 53'			
55								
60								
65								

Notes:
4. No recovery due to rock in tip. Driller advanced a 3" spoon to collect sample.
5. Borehole backfilled with cuttings after completion.

SILT	PI = 0
CLAYEY SILT	0 < PI < 4
SILT & CLAY	4 < PI < 10
CLAY & SILT	10 < PI < 20
SILTY CLAY	20 < PI < 40
CLAY	PI > 40

Proportions by Weight
TRACE (TR.) 0 - <10%
LITTLE (LI.) 10 - <20%
SOME (SO.) 20 - <35%
AND 35 - <50%

Density/Based on N-values
VERY LOOSE 0-4 bpf
LOOSE 4-10 bpf
MEDIUM DENSE 10-30 bpf
DENSE 30-50 bpf
VERY DENSE >50 bpf
bpf=blows per foot

Consistency/Based on N-values
VERY SOFT <2 bpf
SOFT 2-4 bpf
MEDIUM 4-8 bpf
STIFF 8-15 bpf
VERY STIFF 15-30 bpf
HARD >30 bpf

BORING B–2 (2 OF 2)

BORING NOTES

1. FOR BORING NOTES, SEE SHEET S–003

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER DATE

Tighe&Bond

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_S-003.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

BORING LOGS & BORING NOTES (SHEET 2 OF 2)

SCALE: AS SHOWN

S-004
SHEET 10 OF 23

Last Saved: 9/12/2022
Plotted On: Sep 25, 2022 - 2:07pm By: DFelty
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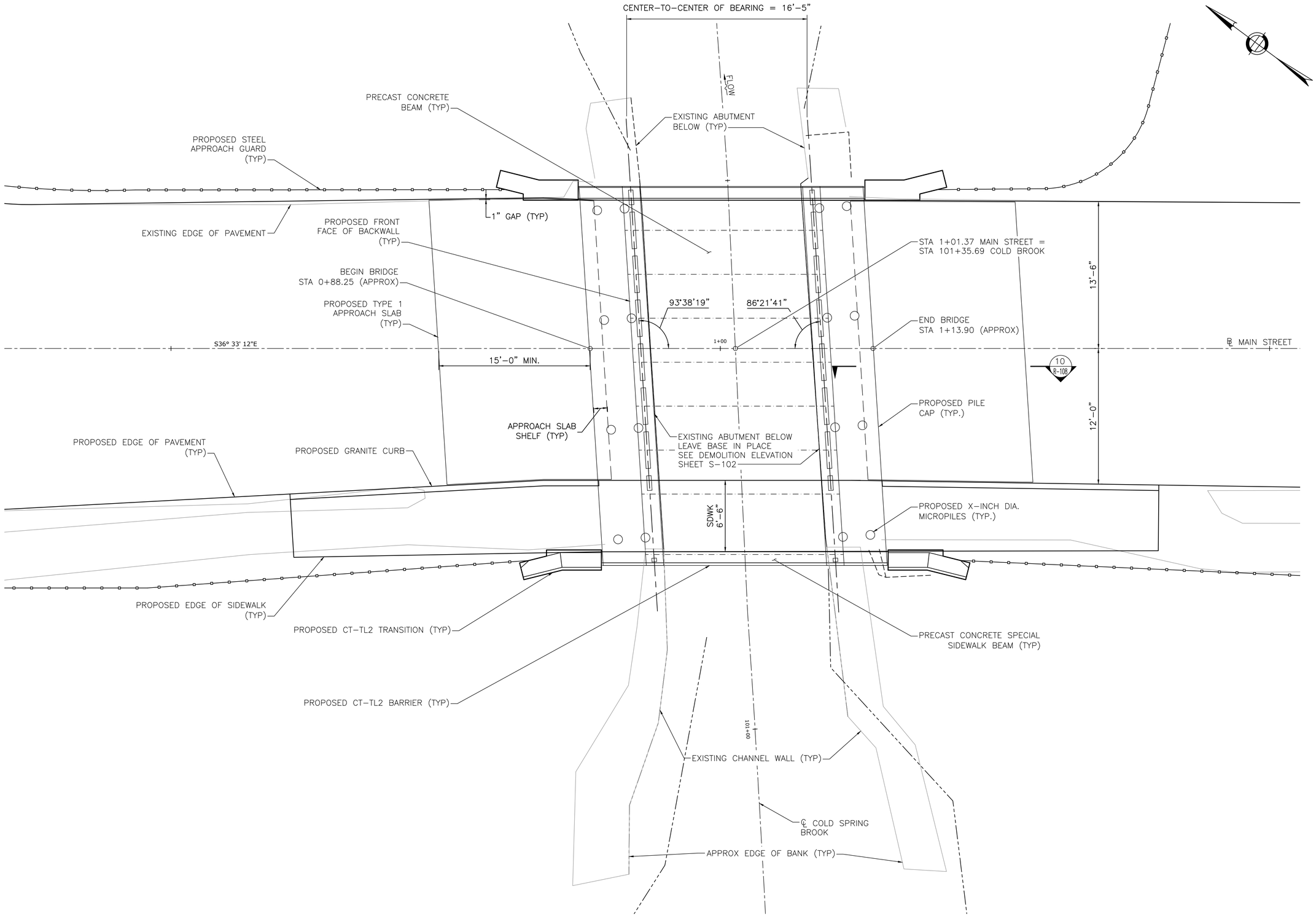

GENERAL BRIDGE PLAN

SCALE: $\frac{1}{4}$" = 1'–0"

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division

CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER _____ DATE _____

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_S.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

GENERAL BRIDGE PLAN

SCALE: AS SHOWN

S-101
SHEET 11 OF 23

Last Saved: 9/25/2022
Plotted On: Sep 25, 2022 - 2:08pm By: DFelty
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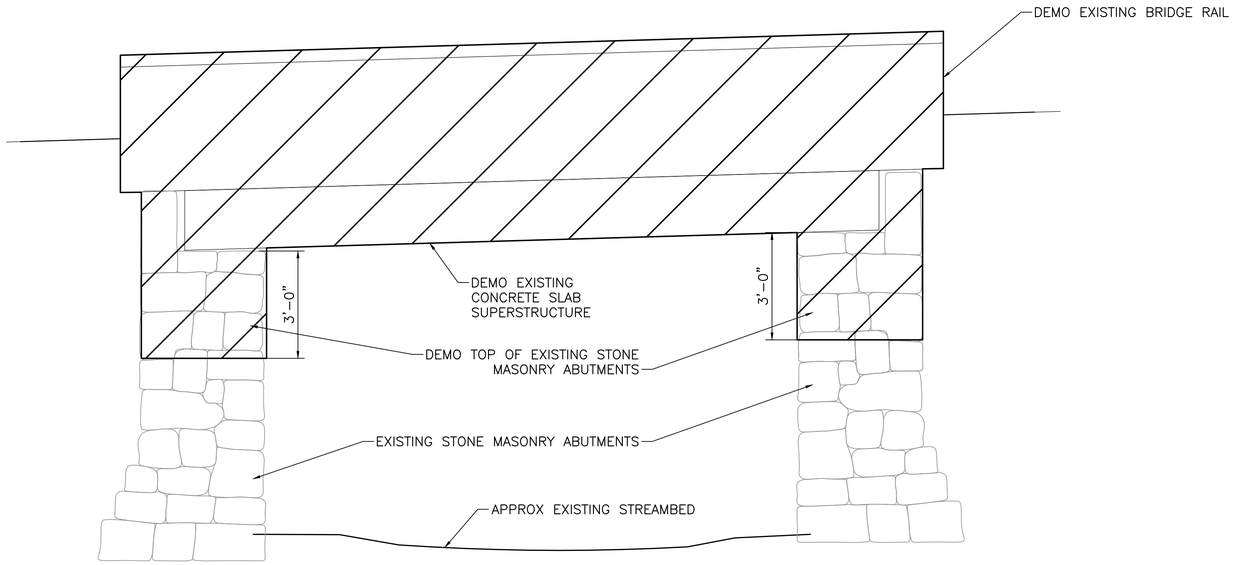
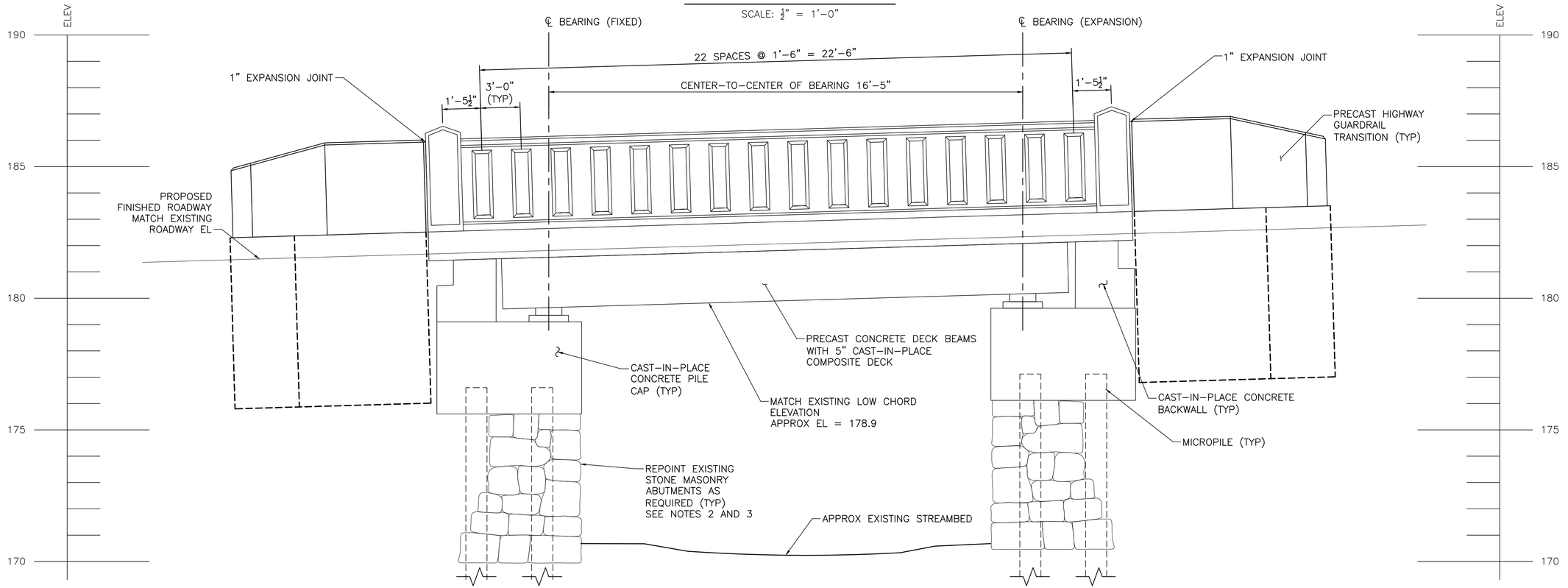


EXISTING BRIDGE ELEVATION

SCALE: $\frac{1}{2}$" = 1'-0"



PROPOSED ELEVATION (LOOKING EAST)

SCALE: $\frac{1}{2}$" = 1'-0"

NOTES:

1. CONTRACTOR TO MONITOR FRONT FACE OF GRANITE BLOCKS WHILE DRILLING MICROPILES FOR POTENTIAL BLOW OUT OF GRANITE FACE. CONTRACTOR TO REPAIR ANY DAMAGE TO EXISTING STONE MASONRY ABUTMENTS CAUSED BY MICROPILE DRILLING.
2. CONFIRM LIMITS OF REPAIR AND REPOINTING OF STONE MASONRY ABUTMENTS WITH ENGINEER PRIOR TO COMMENCING WORK
3. WORK IS NOT PERMITTED BELOW MAWH ELEVATION.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER _____ DATE _____

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

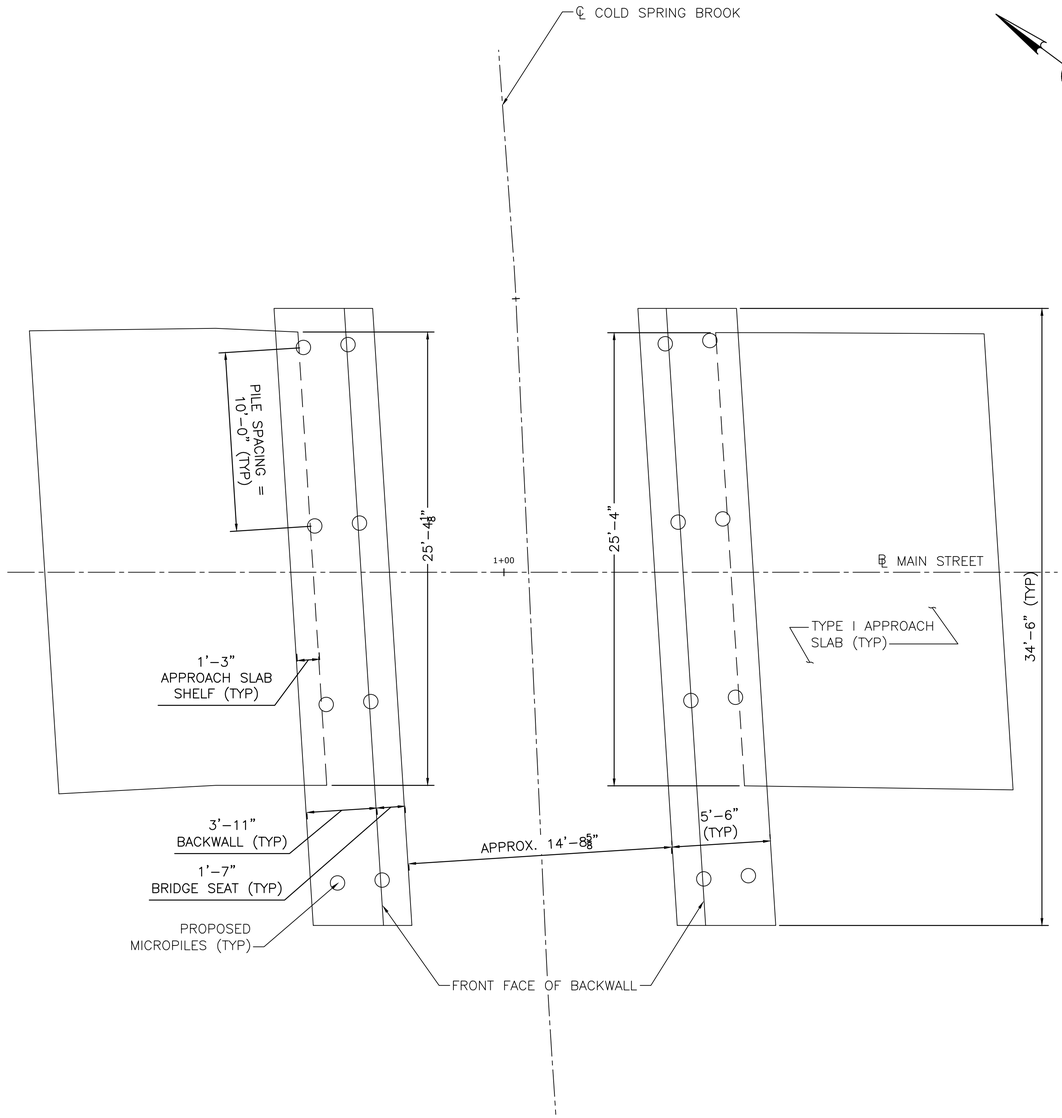
PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_S.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

BRIDGE ELEVATIONS

SCALE: AS SHOWN

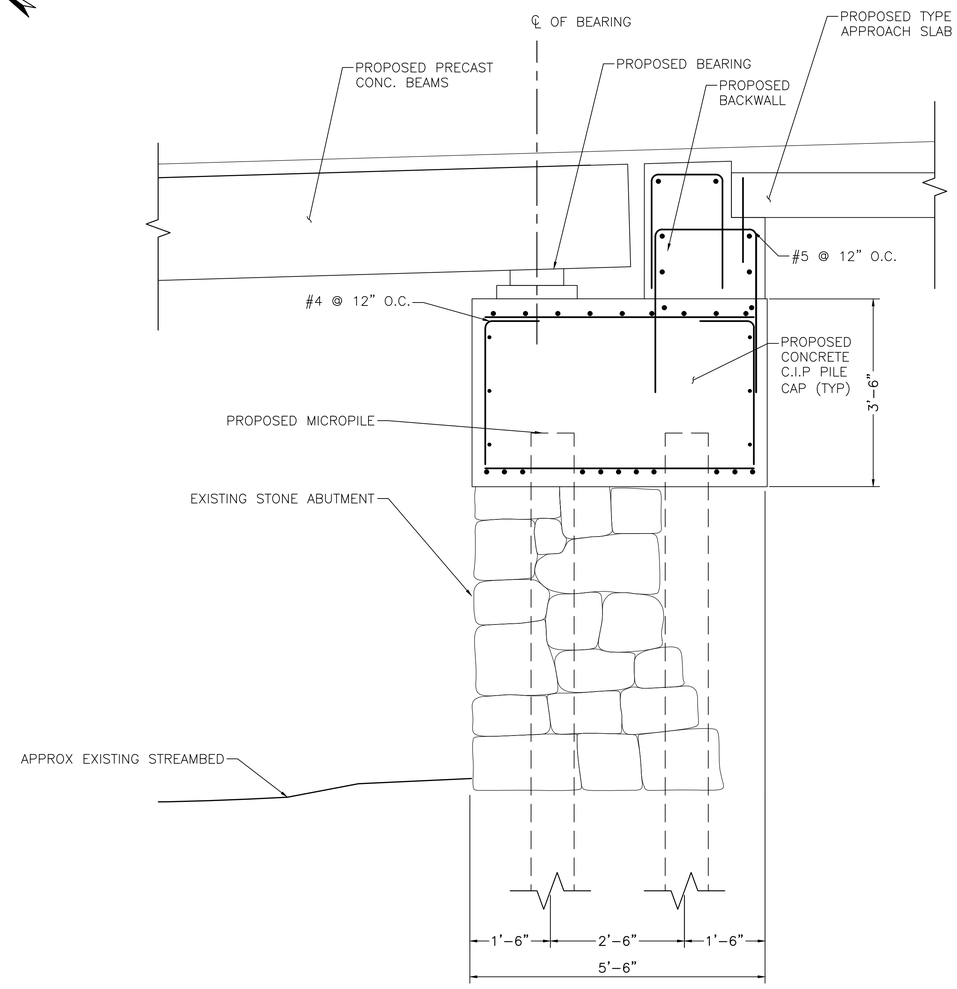
S-102
SHEET 12 OF 23

Last Saved: 9/25/2022
Plotted On: Sep 25, 2022 - 2:09pm By: DFelly
Tighe & Bond: J:\WA\1113 Ashland, MA\009 Main Street Over Cold Brook\Drawings, Figures\AutoCAD\Sheet\A-1113-009_S.dwg



ABUTMENT PLAN

SCALE: ¼" = 1'-0"



TYPICAL PILE CAP DETAIL

SCALE: ¾" = 1'-0"

NOTES:

1. CONTRACTOR TO MONITOR FRONT FACE OF GRANITE BLOCKS WHILE DRILLING MICROPILES FOR POTENTIAL BLOW OUT OF GRANITE FACE. CONTRACTOR TO REPAIR ANY DAMAGE TO EXISTING STONE MASONRY ABUTMENTS CAUSED BY MICROPILE DRILLING.
2. WORK IS NOT PERMITTED BELOW MAWH ELEVATION.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER _____ DATE _____

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_S.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

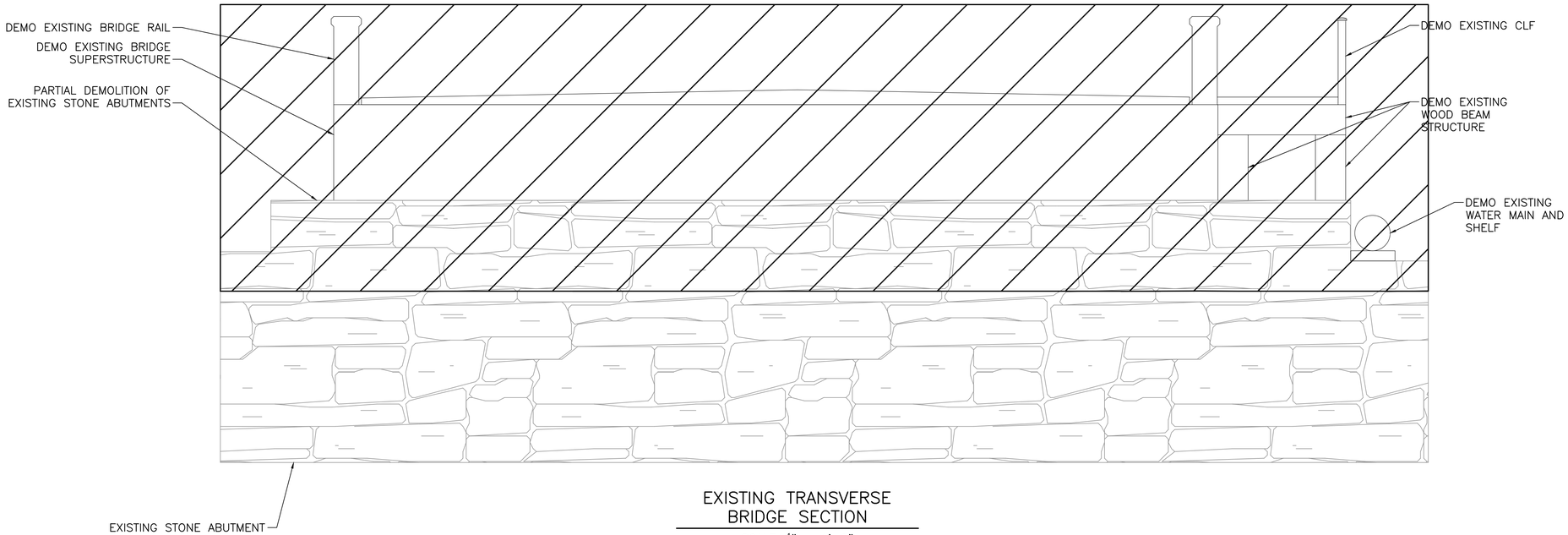
ABUTMENT PLAN AND DETAILS

SCALE: AS SHOWN

S-103

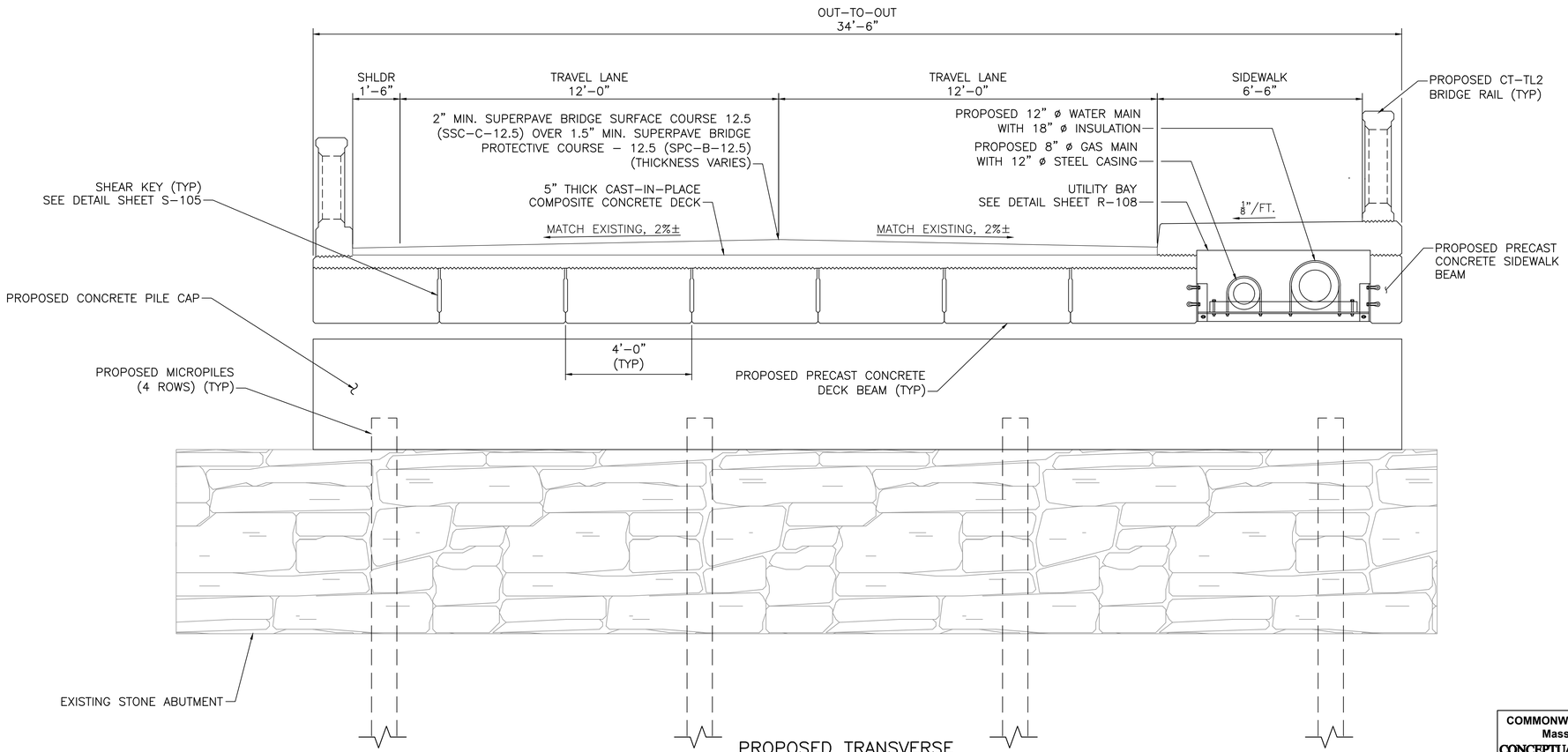
SHEET 13 OF 23

Last Saved: 9/25/2022
Plotted On: Sep 25, 2022-2:09pm By: DFelty
Tighe & Bond: J:\VA\1133 Ashland, MA\009 Main Street Over Cold Brook\Drawings_Figures\AutoCAD\Sheet\A-1113-009_S.dwg



EXISTING TRANSVERSE BRIDGE SECTION

SCALE: $\frac{1}{2}$" = 1'–0"



PROPOSED TRANSVERSE BRIDGE SECTION

SCALE: $\frac{1}{2}$" = 1'–0"

Tighe&Bond

PERMIT SET NOT FOR CONSTRUCTION

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_S.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

BRIDGE SECTIONS

SCALE: AS SHOWN

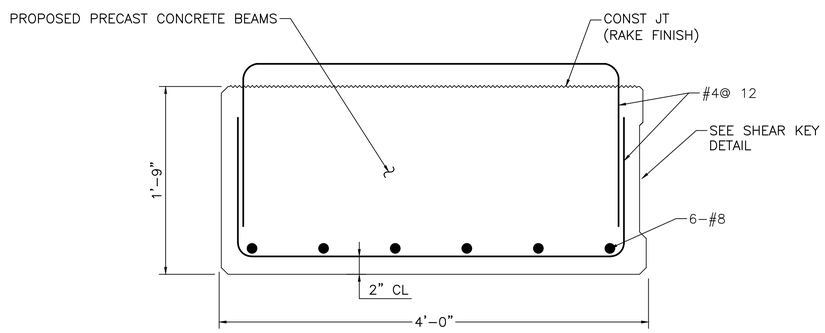
S-104

SHEET 14 OF 23

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

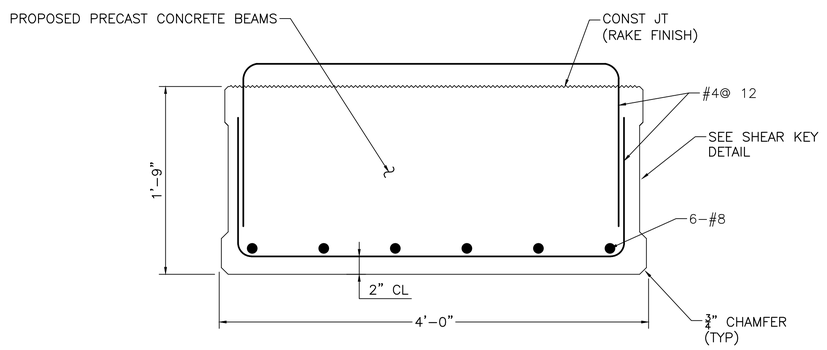
STATE BRIDGE ENGINEER — DATE

Last Saved: 9/25/2022
Plotted On: Sep 25, 2022-2:10pm By: DFelty
Tighe & Bond: J:\A\A1133 Ashland, MA\009 Main Street Over Cold Brook\Drawings_Figures\AutoCAD\Sheet\A-1113-009_S.dwg



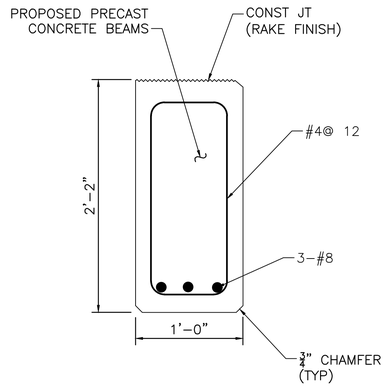
TYPICAL EXTERIOR BEAM SECTION

SCALE: 1½" = 1'–0"



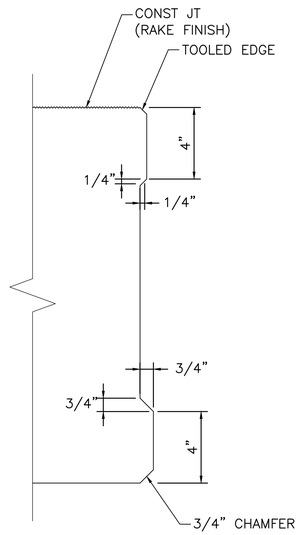
TYPICAL INTERIOR BEAM SECTION

SCALE: 1½" = 1'–0"



SPECIAL SIDEWALK BEAM SECTION

SCALE: 1½" = 1'–0"



TYPICAL SHEAR KEY DETAIL

SCALE: ⅜" = 1'–0"

PRECAST BEAM NOTES:

1. THE TOP OF ALL BEAMS SHALL BE GIVEN A RAKE FINISH (¼" AMPLITUDE) ACROSS THE WIDTH (PERPENDICULAR TO THE BEAM AXIS

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_S.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

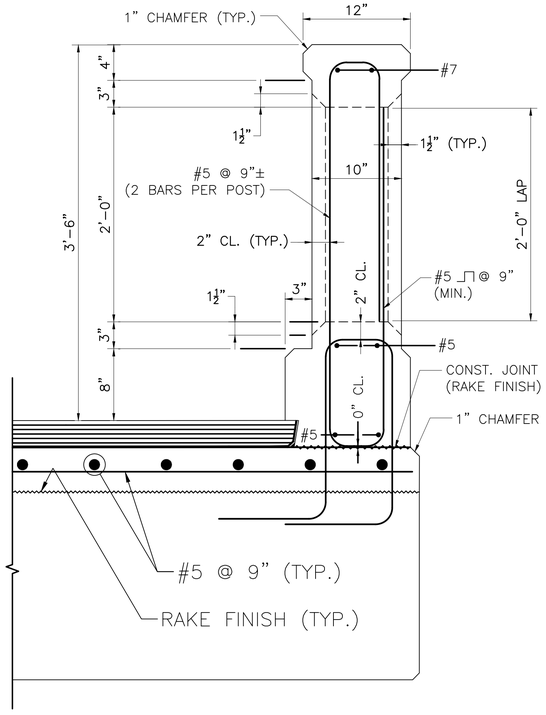
BRIDGE DETAILS

SCALE: AS SHOWN

S-105

SHEET 15 OF 23

Last Saved: 9/25/2022
Plotted On: Sep 25, 2022-2:11pm By: DFelty
Tighe & Bond: J:\WA\1133 Ashland, MA\009 Main Street Over Cold Brook\Drawings_Figures\AutoCAD\Sheet\A-1113-009_S.dwg

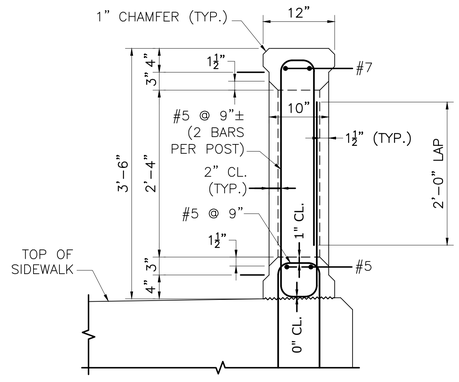


NOTE:

BEAM REINFORCEMENT NOT SHOWN FOR CLARITY. FOR REINFORCEMENT IN BEAM SEE SHEET S-105.

CT-TL2 BARRIER SECTION THRU SAFETY CURB (MASSDOT 9.2.1)

SCALE: 1½" = 1'-0"

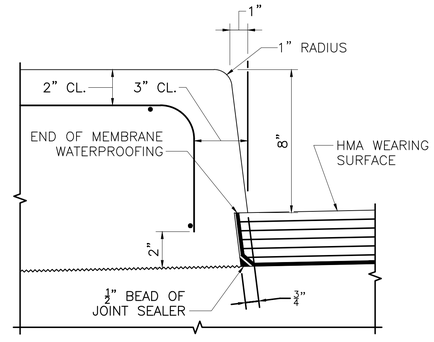


NOTE:

FOR SIDEWALK REINFORCEMENT SEE SECTION THRU SIDEWALK.

CT-TL2 BARRIER SECTION THRU BARRIER AT SIDEWALK (MASSDOT 9.2.7)

SCALE: 1" = 1'-0"



NOTE:

DIMENSIONS AT THE FACE OF CURB ARE THE SAME FOR THE SAFETY CURB.

FACE OF SIDEWALK CURB DETAILS (MASSDOT 9.8.1)

SCALE: 3" = 1'-0"

MASSDOT STANDARD DETAILS:
MASSDOT 2013 LRFD BRIDGE MANUAL,
PART II CONVENTIONAL CONSTRUCTION,
PRECAST HIGHWAY GUARDRAIL TRANSITION DETAILS
CT-TL2 BARRIER DETAILS

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
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STATE BRIDGE ENGINEER — DATE

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

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CT-TL2 BARRIER HIGHWAY GUARDRAIL DETAILS (SHEET 1 OF 2)

SCALE: AS SHOWN

R-101
SHEET 16 OF 23

Last Saved: 9/20/2022
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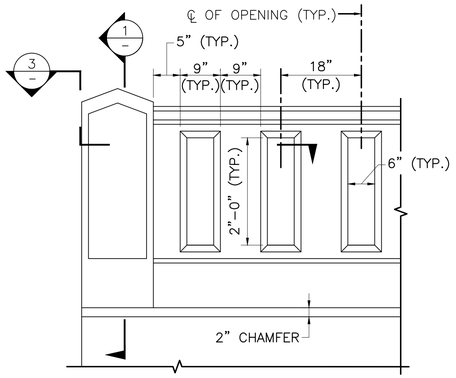
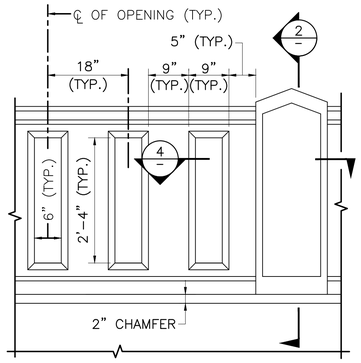


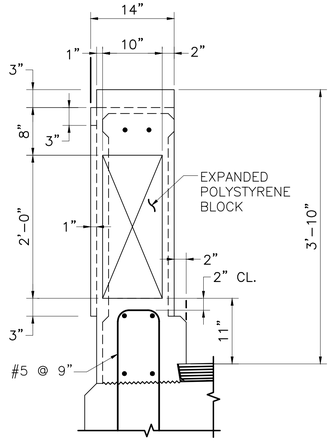
CT-TL2 BARRIER EXTERIOR ELEVATION AT SAFETY CURB (MASSDOT 9.2.8)

SCALE: $\frac{3}{4}$" = 1'-0"



CT-TL2 BARRIER EXTERIOR ELEVATION AT SIDEWALK (MASSDOT 9.2.8)

SCALE: $\frac{3}{4}$" = 1'-0"

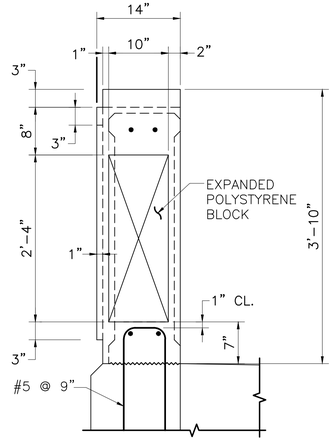


SECTION 1 –

SCALE: 1" = 1'-0"

CT-TL2 BARRIER PILASTER VERTICAL SECTION AT SAFETY CURB (MASSDOT 9.2.9)

SCALE: 1" = 1'-0"

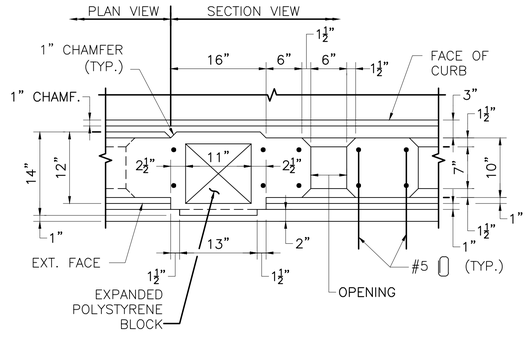


SECTION 2 –

SCALE: 1" = 1'-0"

CT-TL2 BARRIER PILASTER VERTICAL SECTION AT SIDEWALK (MASSDOT 9.2.9)

SCALE: 1" = 1'-0"

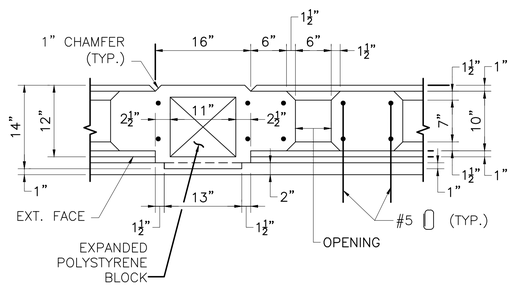


SECTION 3 –

SCALE: 1" = 1'-0"

CT-TL2 BARRIER PILASTER HORIZONTAL SECTION (MASSDOT 9.2.11)

SCALE: 1" = 1'-0"



SECTION 4 –

SCALE: 1" = 1'-0"

CT-TL2 BARRIER PILASTER HORIZONTAL SECTION (MASSDOT 9.2.11)

SCALE: 1" = 1'-0"

MASSDOT STANDARD DETAILS:
MASSDOT 2013 LRFD BRIDGE MANUAL,
PART II CONVENTIONAL CONSTRUCTION,
PRECAST HIGHWAY GUARDRAIL TRANSITION DETAILS
CT-TL2 BARRIER DETAILS

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

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APPROVED:	DLM

CT-TL2 BARRIER HIGHWAY GUARDRAIL DETAILS (SHEET 2 OF 2)

SCALE: AS SHOWN

R-102
SHEET 17 OF 23

Last Saved: 9/20/2022
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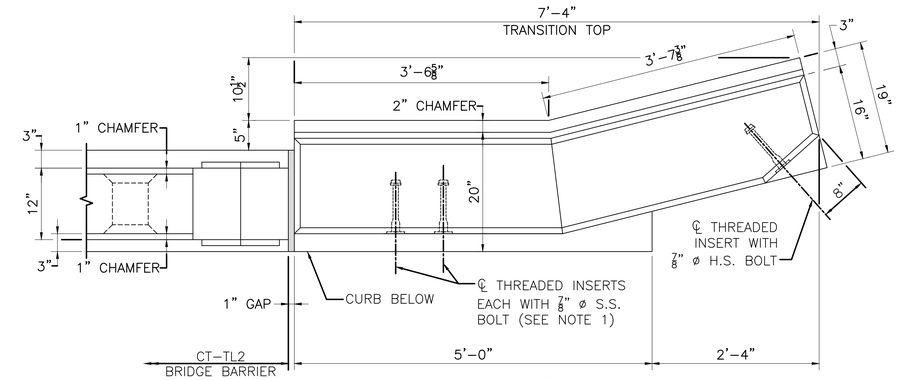
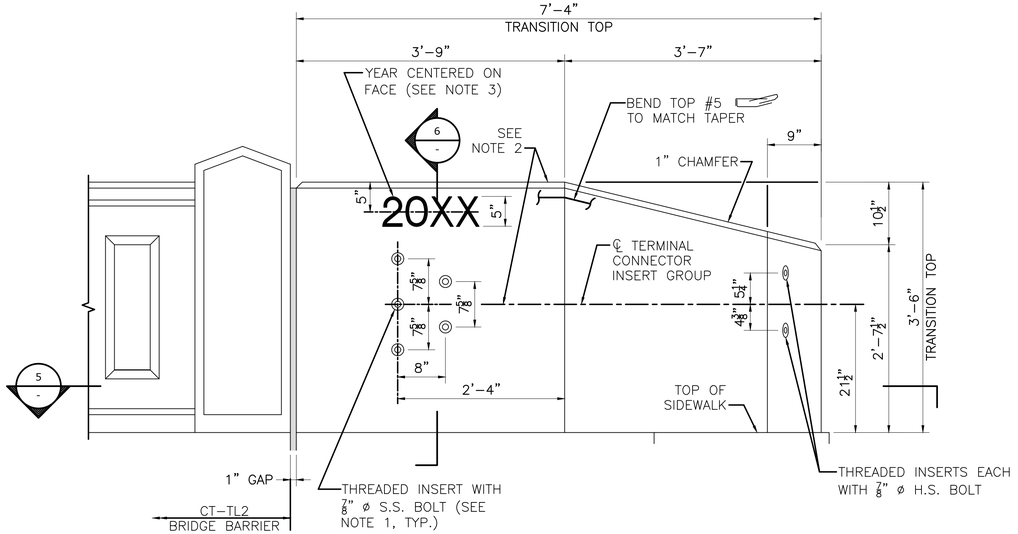
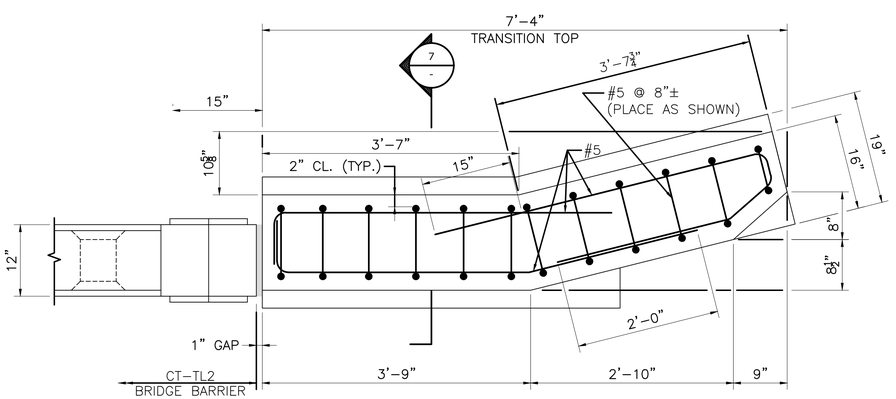


PLAN AT SAFETY CURB
SCALE: 1" = 1'–0"

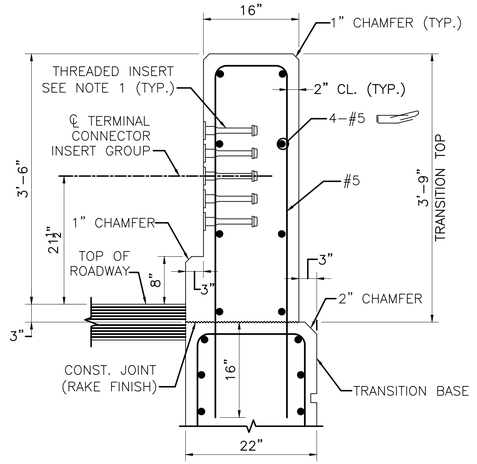


ELEVATION AT SIDEWALK
SCALE: 1" = 1'–0"



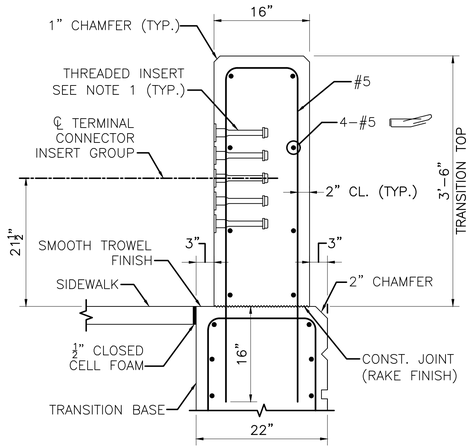
SECTION
SCALE: 1" = 1'–0"
5
–

TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION FOR CT–TL2 BARRIER



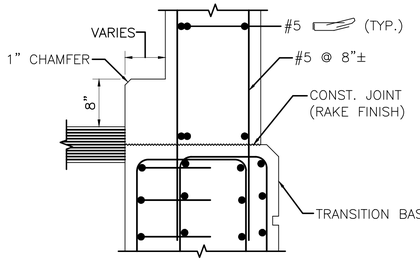
SECTION 6 AT SAFETY CURB

SECTION
SCALE: 1" = 1'–0"
6
–



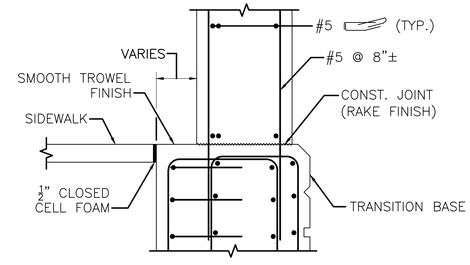
SECTION 6 AT SIDEWALK

SECTION
SCALE: 1" = 1'–0"
6
–



SECTION 7 AT SAFETY CURB

SECTION
SCALE: 1" = 1'–0"
7
–



SECTION 7 AT SIDEWALK

SECTION
SCALE: 1" = 1'–0"
7
–

NOTES:

1. THREADED INSERTS SHALL BE PREQUALIFIED BY THE MANUFACTURER AS BEING CAPABLE OF DEVELOPING A NOMINAL SHEAR RESISTANCE OF 20 KIPS PER ⅞" ø S.S. BOLT. S.S. BOLTS SHALL BE ⅞" ø x 1½" LONG FULLY THREADED AISI TYPE 304N STAINLESS STEEL. INSERTS FOR ⅞" S.S. BOLTS SHALL BE GALVANIZED AND CAST INTO THE TRANSITION.
2. FOR AN APPROACH GRADE UP TO 3%, THE TRANSITION MAY BE CAST SQUARE AND SET PLUMB WITH THE MINIMUM EMBEDMENT DEPTH SHOWN. THE TERMINAL CONNECTOR INSERT GROUP SHALL BE SQUARE TO THE POST.

   FOR AN APPROACH GRADE IN EXCESS OF 3%, THE TRANSITION TOP AND THE TOP OF THE BRIDGE BARRIERS SHALL FOLLOW THE APPROACH GRADE. THE HEIGHT OF THE TRANSITION TOP SHALL VARY PROVIDED THAT THE MINIMUM DIMENSIONS SHOWN ON THE CONSTRUCTION DRAWINGS ARE MET. THE BOTTOM OF THE TRANSITION BASE SHALL BE SET LEVEL WITH THE MINIMUM EMBEDMENT DEPTH SHOWN. THE TERMINAL CONNECTOR INSERT GROUP SHALL BE SLOPED TO FOLLOW THE APPROACH GRADE.
3. USE LATEST CONTRACT COMPLETION YEAR IN EFFECT WHEN THE FIRST GUARDRAIL TRANSITION IS CAST. USE THIS YEAR FOR ALL GUARDRAIL TRANSITIONS.
4. ALL CONCRETE FOR THE PRECAST HIGHWAY GUARDRAIL TRANSITION SHALL BE 5000 PSI, ¾", 685 HP CEMENT CONCRETE.
5. LIFTING DEVICES (NOT SHOWN), INCLUDING THEIR NUMBER AND LOCATION, SHALL BE DESIGNED AND DETAILED BY THE PRECASTER. THEY SHALL BE GALVANIZED AND SHALL BE PLACED AND RECESSED IN POCKETS TO PROVIDE 1½" CLEAR COVER TO THE FACE OF THE TRANSITION CONCRETE. THESE DEVICES SHALL BE CLEARLY SHOWN ON THE SHOP DRAWINGS ALONG WITH ALL SUPPORTING CALCULATIONS AND/OR CATALOG CUTS. ONCE THE PRECAST TRANSITION IS SET IN PLACE, THE LIFTING DEVICE POCKETS SHALL BE FILLED WITH A NON–SHRINK GROUT THAT MATCHES THE COLOR OF THE TRANSITION CONCRETE WHEN CURED AND THE FILLED POCKETS SHALL BE RUBBED WITH A CORUNDUM STONE TO BLEND OUT THE JOINTS.

MASSDOT STANDARD DETAILS:
MASSDOT 2013 LRFD BRIDGE MANUAL,
PART II CONVENTIONAL CONSTRUCTION,
TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION FOR CT-TL2 BARRIER

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER _____ DATE _____

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

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DRAWN BY:	DRF/SDS
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APPROVED:	DLM

TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION FOR CT-TL2 BARRIER

SCALE: AS SHOWN

R-103
SHEET 18 OF 23

Last Saved: 9/20/2022
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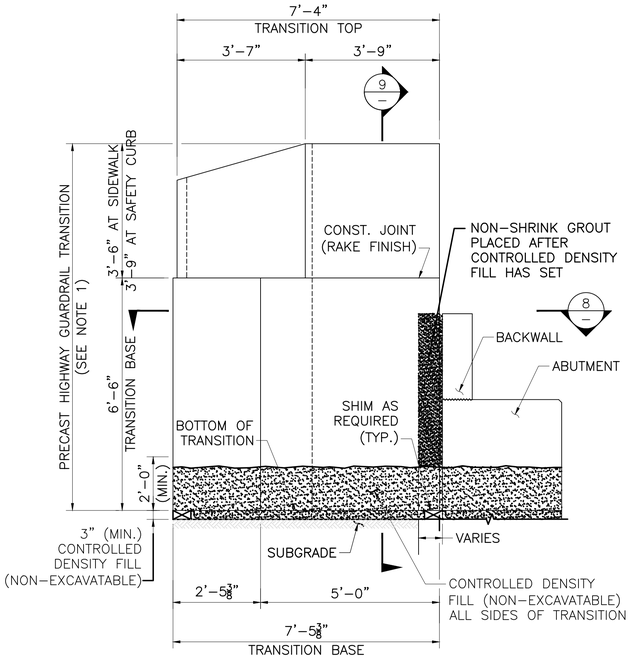
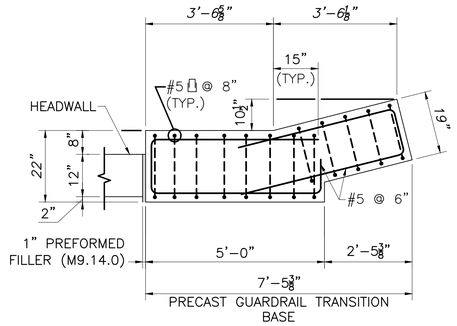


PRECAST HIGHWAY GUARDRAIL TRANSITION
ELEVATION AT SPLAYED WINGWALL (MASSDOT 3.8.9)

SCALE: ½" = 1'–0"

PRECAST HIGHWAY GUARDRAIL TRANSITION NOTES (MASSDOT 3.8.3):

1. PRECAST GUARDRAIL TRANSITION SHALL BE 5000 PSI, ¾ IN, 685 HP CEMENT CONCRETE.
2. GRAVEL BORROW SHALL BE PLACED AND THOROUGHLY COMPACTED TO THE GRADE OF 3" (MIN.) BELOW THE INTENDED BOTTOM OF THE PRECAST GUARDRAIL TRANSITION BASE AND TO A HEIGHT OF 2'–0" (MIN.) ON ALL SIDES OF THE TRANSITION BASE TO FORM A TRENCH IN WHICH TO SET THE TRANSITION. WHERE NO GRAVEL BORROW IS REQUIRED BELOW THE BASE, IT SHALL BE PLACED ON UNDISTURBED SOIL.
3. CONTRACTOR SHALL SET THE PRECAST GUARDRAIL TRANSITION TO THE REQUIRED ELEVATION AND ALIGNMENT, AND BACKILL PRECAST GUARDRAIL TRANSITION WITH CONTROLLED DENSITY FILL (NON–EXCAVATABLE) TO THE ELEVATION SHOWN.



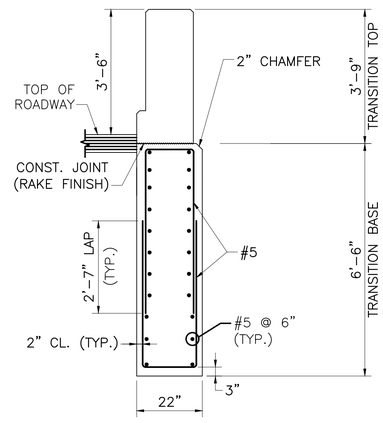
NOTE:

WINGWALL REINFORCEMENT NOT SHOWN FOR CLARITY.

SECTION 8 – SCALE: ½" = 1'–0"

PRECAST HIGHWAY GUARDRAIL TRANSITION
HORIZONTAL SECTION (MASSDOT 3.8.5)

SCALE: ½" = 1'–0"



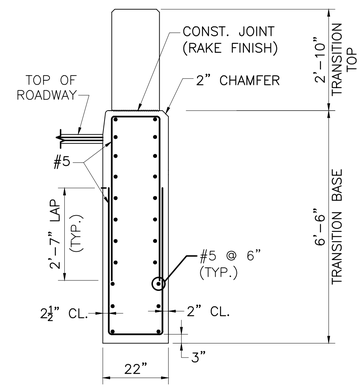
NOTE:

1. REINFORCEMENT OF THE TRANSITION TOP IS NOT SHOWN FOR CLARITY.

SECTION 9 – SCALE: ½" = 1'–0"

PRECAST HIGHWAY GUARDRAIL TRANSITION VERTICAL
SECTION FOR CT–TL2 AT SAFETY CURB (MASSDOT 3.8.6)

SCALE: ½" = 1'–0"



NOTE:

1. REINFORCEMENT OF THE TRANSITION TOP IS NOT SHOWN FOR CLARITY.

SECTION 9 – SCALE: ½" = 1'–0"

PRECAST HIGHWAY GUARDRAIL TRANSITION VERTICAL
SECTION FOR CT–TL2 AT SIDEWALK (MASSDOT 3.8.4)

SCALE: ½" = 1'–0"

MASSDOT STANDARD DETAILS:
MASSDOT 2013 LRFD BRIDGE MANUAL,
PART II CONVENTIONAL CONSTRUCTION,
PRECAST HIGHWAY GUARDRAIL TRANSITION DETAILS
CT-TL2 BARRIER DETAILS

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
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APPROVED:	DLM

PRECAST HIGHWAY GUARDRAIL TRANSITION DETAILS

SCALE: AS SHOWN

R-104
SHEET 19 OF 23

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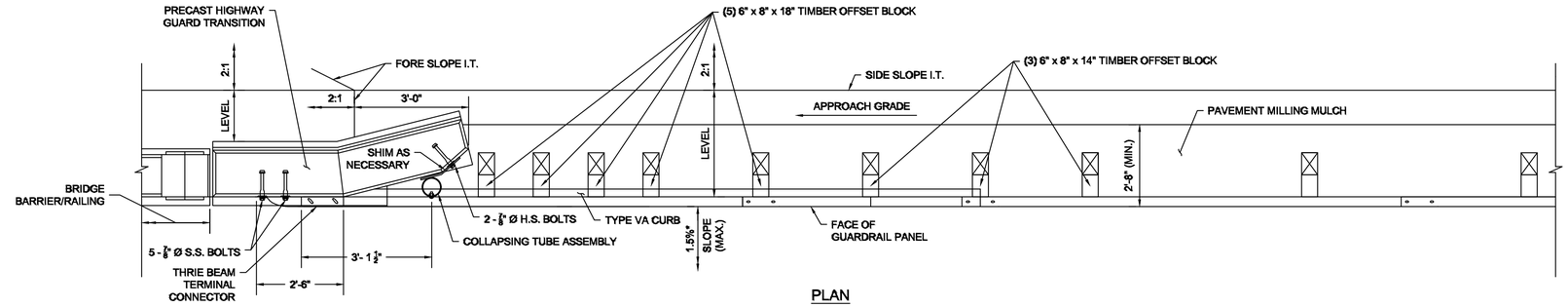
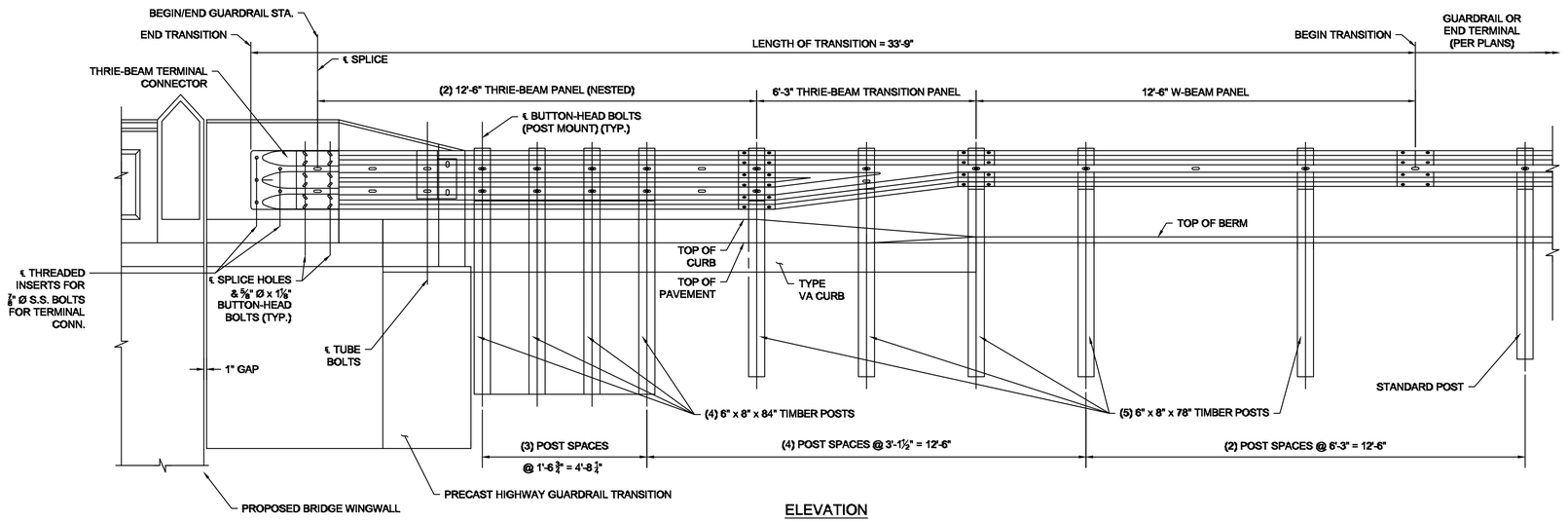
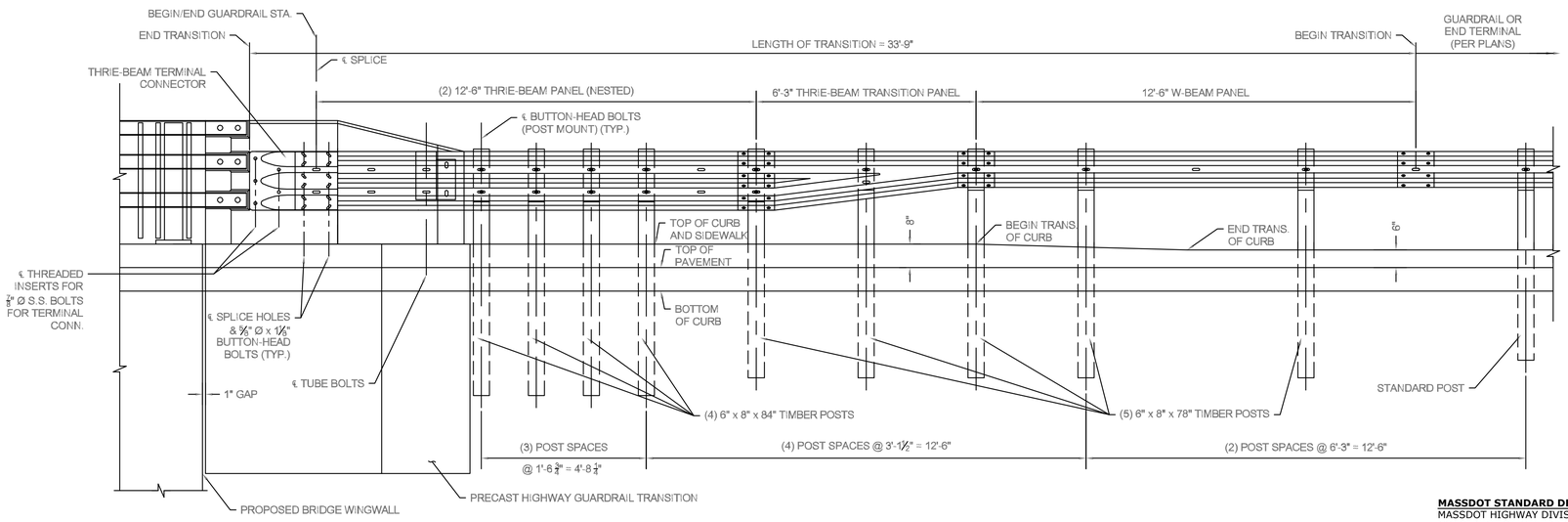


PLAN



ELEVATION

TRANSITION TO BRIDGE RAIL (FACE OF CURB) (MASSDOT 400.3.6)



TRANSITION TO BRIDGE RAIL (FACE OF SIDEWALK) (MASSDOT 400.3.6)

MASSDOT STANDARD DETAILS:
MASSDOT HIGHWAY DIVISION, CONSTRUCTION STANDARD DETAILS, GUARDRAIL TRANSITION TO BRIDGE RAIL (FACE OF CURB)

COMMONWEALTH OF MASSACHUSETTS
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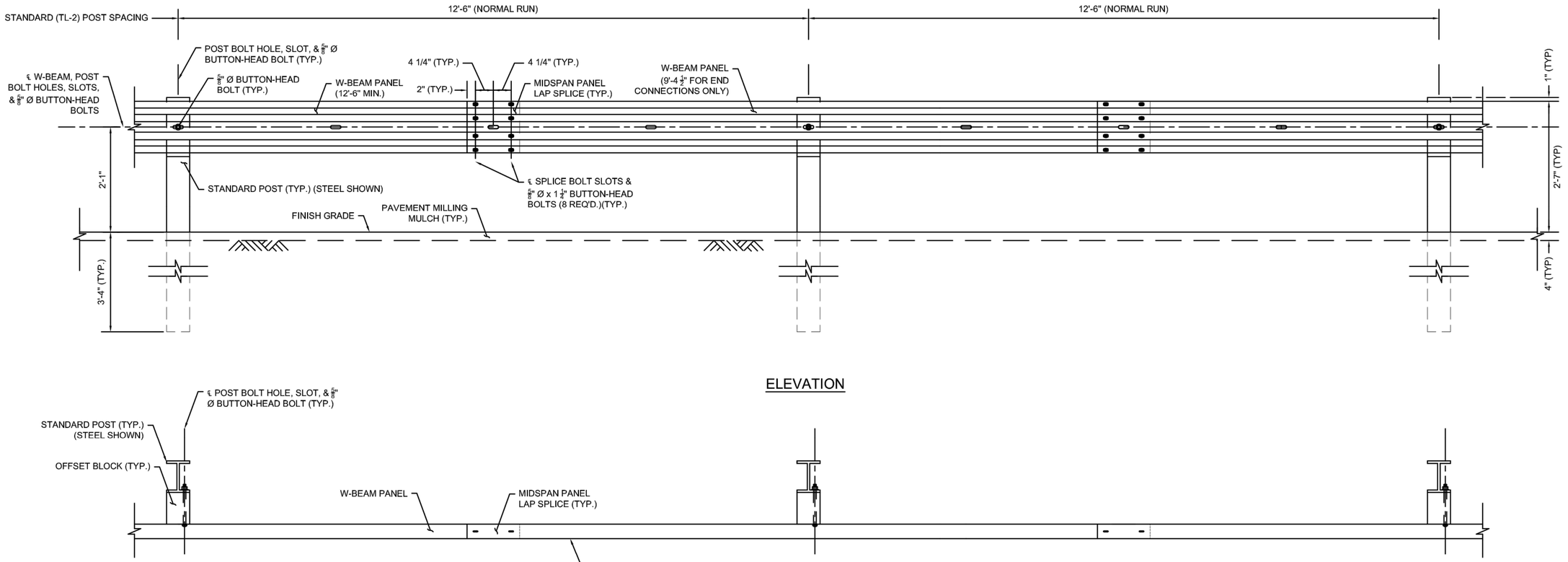
APPROVED:	DLM

GUARDRAIL TRANSITION TO BRIDGE RAIL (FACE OF CURB)

SCALE: AS SHOWN

R-105
SHEET 20 OF 23

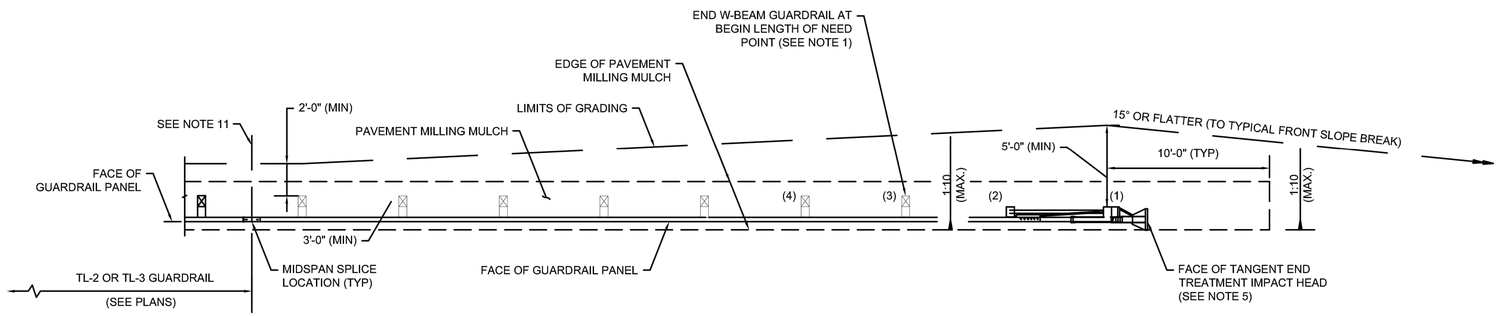
Last Saved: 9/20/2022
Plotted On: Sep 25, 2022 - 2:14pm By: DFeity
Tighe & Bond: J:\WA\1113 Ashland, MA\009 Main Street Over Cold Brook\Drawings_Figures\AutoCAD\Sheet\A-1113-009_R.dwg



ELEVATION

PLAN

GUARDRAIL TL–2 DETAILS
(MASSDOT 400.1.2)



TANGENT END TREATMENT SEGMENT – PLAN

MASSDOT STANDARD DETAILS:
MASSDOT HIGHWAY DIVISION,
CONSTRUCTION STANDARD DETAILS,
GUARDRAIL, TL2 & W-BEAM PANEL DETAILS

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER _____ DATE _____

Tighe&Bond

PERMIT SET NOT FOR CONSTRUCTION

Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_R.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

HIGHWAY GUARDRAIL DETAILS (SHEET 1 OF 2)

SCALE: AS SHOWN

R-106
SHEET 21 OF 23

Last Saved: 9/20/2022
Plotted On: Sep 25, 2022 - 2:15pm By: DFelly
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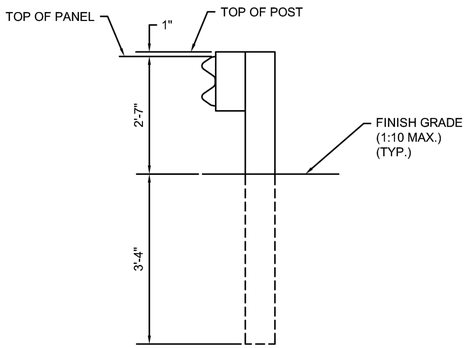
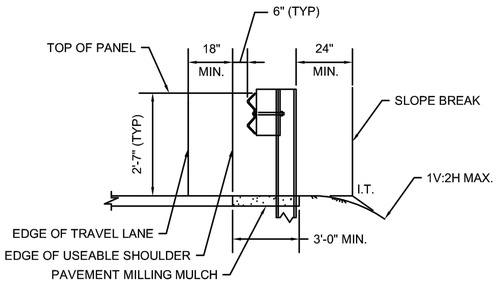
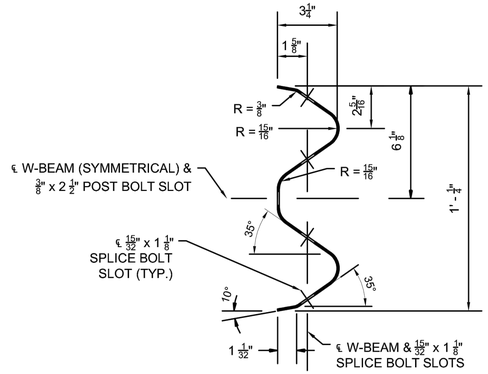


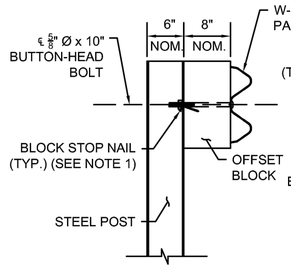


FLUSH WITH ROADWAY

GUARDRAIL MOUNTING HEIGHTS & POST DEPTHS (MASSDOT 400.1.4)



W-BEAM PANEL SECTION



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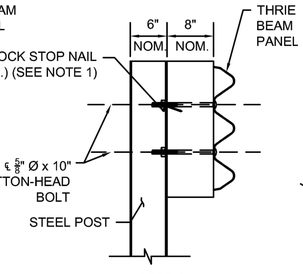

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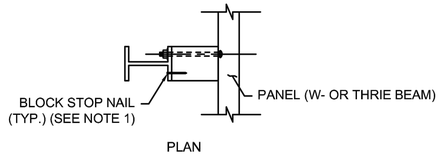
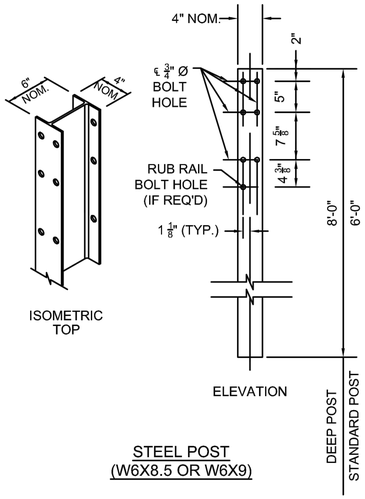


PLAN

W-BEAM & THRIE BEAM
STEEL POST



ELEVATION

STEEL POST
(W6X8.5 OR W6X9)

NOTES:

1. DRIVE ONE NAIL PER W BEAM TIMBER OFFSET BLOCK TO PREVENT BLOCK ROTATION. USE ASTM A153 HOT DIP GALVANIZED STEEL 3 ½" TYPE 16D NAILS. FOR STEEL POSTS, DRIVE THE NAIL THROUGH THE UNUSED FLANGE BOLT HOLE AND BEND THE NAIL SO ITS HEAD CONTACTS THE FLANGE.

2. DEEP STEEL POSTS SHALL ONLY BE USED WHERE INDICATED IN THESE STANDARDS OR THE PLANS.

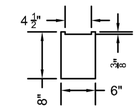
3. WHERE BACK OF POSTS ARE EXPOSED AND PLACED WITHIN 2'-0" OF A SIDEWALK, SEPARATED BIKE FACILITY OR SHARED-USE PATH, TIMBER POSTS SHALL BE USED. ALTERNATIVELY, STEEL POSTS WITH A TIMBER BACKING, PER 400.5.1, MAY BE SUBSTITUTED AT NO ADDITIONAL COST. WHEN TIMBER POSTS ARE USED, ONE OF THE FOLLOWING SAFETY TREATMENTS IS REQUIRED FOR ALL BOLTS PROTRUDING FROM THE BACK FACE OF THE POST:

   A. AFTER TIGHTENING THE NUT, TRIM THE PROTRUDING POST BOLT FLUSH WITH THE NUT AND GALVANIZE PER M7.04.11;

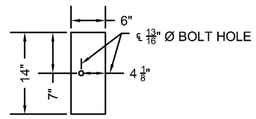
   B. USE 15" POST BOLTS AND COUNTERSINK THE WASHER AND NUT BETWEEN 1" AND 1 ½" DEEP INTO THE BACK FACE OF THE POST; OR

   C. USE 15" POST BOLT SLEEVE NUTS AND WASHERS.

END TREATMENTS AND TRANSITIONS, WHERE SPECIFIC MATERIAL TYPES ARE SPECIFIED, ARE EXEMPT FROM THESE REQUIREMENTS.



PLAN



ELEVATION

W-BEAM TIMBER OFFSET BLOCK
FOR USE WITH STEEL POSTS
(6"X8" NOMINAL)

POST & OFFSET BLOCK DETAILS

MASSDOT STANDARD DETAILS:
MASSDOT HIGHWAY DIVISION,
CONSTRUCTION STANDARD DETAILS,
GUARDRAIL, TL2 & W-BEAM PANEL DETAILS

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER _____ DATE _____

Tighe&Bond

PERMIT SET
NOT FOR CONSTRUCTION

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

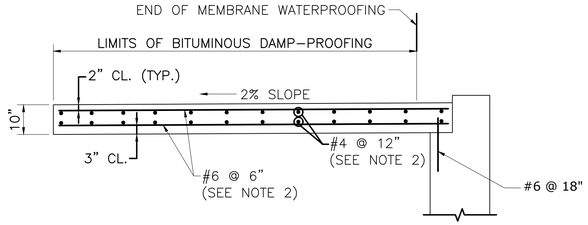
PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_R.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

HIGHWAY GUARDRAIL DETAILS (SHEET 2 OF 2)

SCALE: AS SHOWN

R-107
SHEET 22 OF 23

Last Saved: 9/20/2022
Plotted On: Sep 25, 2022 2:15pm By: DFelly
Tighe & Bond J:\WA\A1133 Ashland, MA\009 Main Street Over Cold Brook\Drawings_Figures\AutoCAD\Sheet\A-1113-009_R.dwg



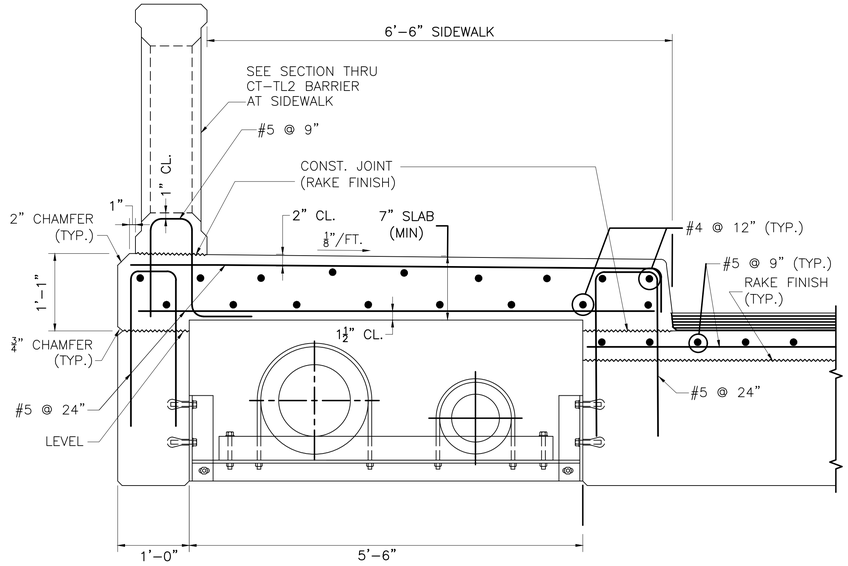
NOTES:

1. APPROACH SLAB TO BE 4000 PSI, 1½ IN, 565 CEMENT CONCRETE.
2. PLACE LONGITUDINAL REINFORCEMENT PERPENDICULAR TO ABUTMENT. PLACE TRANSVERSE REINFORCEMENT PARALLEL TO ABUTMENT.

SECTION 10 / S-101
SCALE: ½" = 1'-0"

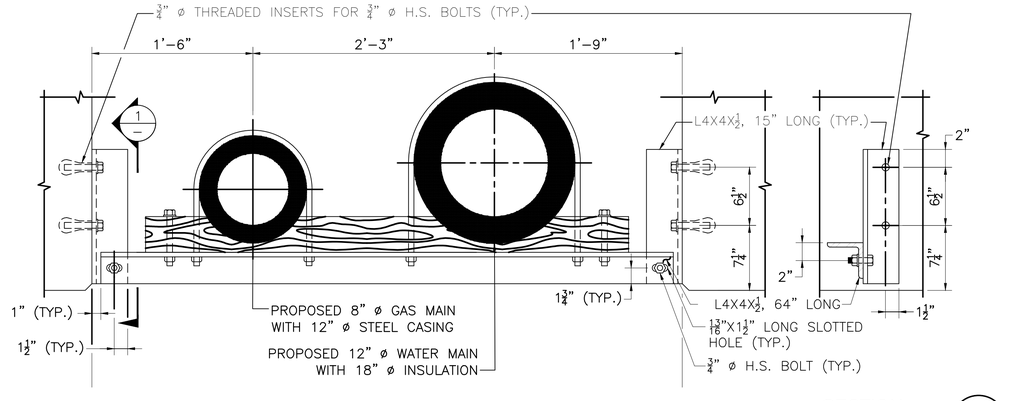
TYPE I APPROACH SLAB DETAILS (MASSDOT 3.1.13)

SCALE: ½" = 1'-0"



SIDEWALK DETAIL WITH UTILITY BAY FOR DECK BEAMS (MASSDOT 4.3.3)

SCALE: 1" = 1'-0"



UTILITY SUPPORT DETAILS

SCALE: 1½" = 1'-0"

SECTION 11 / –
SCALE: 1½" = 1'-0"

NOTES:

1. ALL STRUCTURAL STEEL SHALL CONFORM TO AASHTO M 27– GRADE 36.
2. ALL STRUCTURAL STELL AND FASTNERS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M 111 AND M 232.
3. THE ¾" ø THREADED INSERTS FOR ¾" ø BOLTS SHALL BE CAST INTO THE PRECAST BEAMS BY THE FABRICATOR AND SHALL PROVIDE A MINIMUM NOMINAL TENSILE RESISTANCE OG 6.0 KIPS AND A MINIMUM NOMINAL SHEAR RESISTANCE OF 6.0 KIPS IN 3000 PSI CONCRETE.

MASSDOT STANDARD DETAILS:
MASSDOT 2013 LRFD BRIDGE MANUAL,
PART II CONVENTIONAL CONSTRUCTION,
APPROACH SLAB DETAILS
PART III PREFABRICATED BRIDGE ELEMENTS,
SHEAR KEY DETAILS

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER _____ DATE _____

Tighe&Bond

PERMIT SET NOT FOR CONSTRUCTION

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Main Street over Cold Spring Brook Bridge Replacement

Town of Ashland

Ashland, Massachusetts

MassDOT Bridge No. A-14-010, BIN 7NV

MARK	DATE	DESCRIPTION

PROJECT NO:	A1113-009
DATE:	SEPTEMBER 2022
FILE:	A-1113-009_R.dwg
DRAWN BY:	DRF/SDS
CHECKED:	BRB
APPROVED:	DLM

MISCELLANEOUS DETAILS

SCALE: AS SHOWN

R-108
SHEET 23 OF 23

Tighe&Bond

APPENDIX B

Attachment C - Photographic Log

Client: Town of Ashland Department of Public Works **Job Number:** A-1133-009

Site: Main Street Bridge over Cold Spring Brook (Ashland, Massachusetts)

Photograph No.: 1	**Date:** 3/16/2021	**Direction Taken:** Northwest
Description: View of existing conditions at the Main Street Bridge, sidewalk, and grassy easement.		

Photograph No.: 2	**Date:** 3/16/2021	**Direction Taken:** Northwest
Description: View of the Main Street Bridge inlet, associated utilities, and stone armoring on the bank of Cold Spring Brook.		

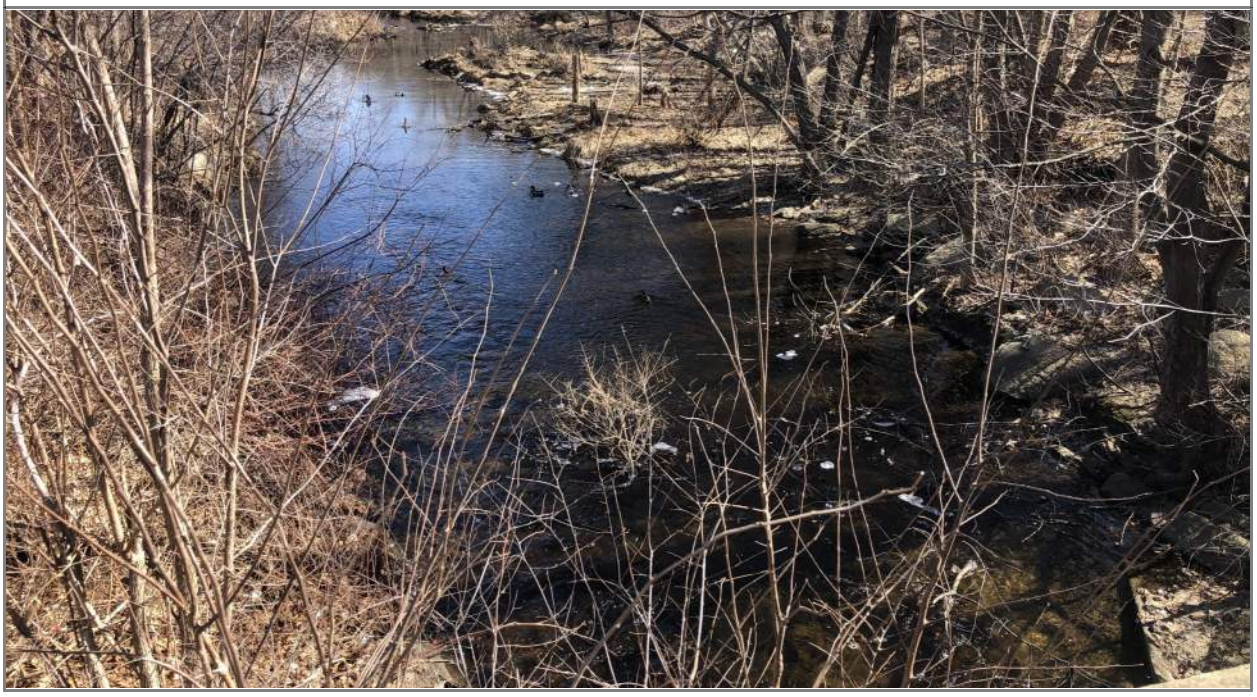
Attachment C - Photographic Log

Client: Town of Ashland Department of Public Works **Job Number:** A-1133-009

Site: Main Street Bridge over Cold Spring Brook (Ashland, Massachusetts)

Photograph No.: 3	**Date:** 3/13/2021	**Direction Taken:** Southwest
Description: Cold Spring Brook upstream of the Main Street Bridge. Photo taken from bridge.		

Photograph No.: 4	**Date:** 3/16/2021	**Direction Taken:** Northeast
Description: View of Cold Spring Brook downstream of the Main Street Bridge. Photo taken from bridge.		

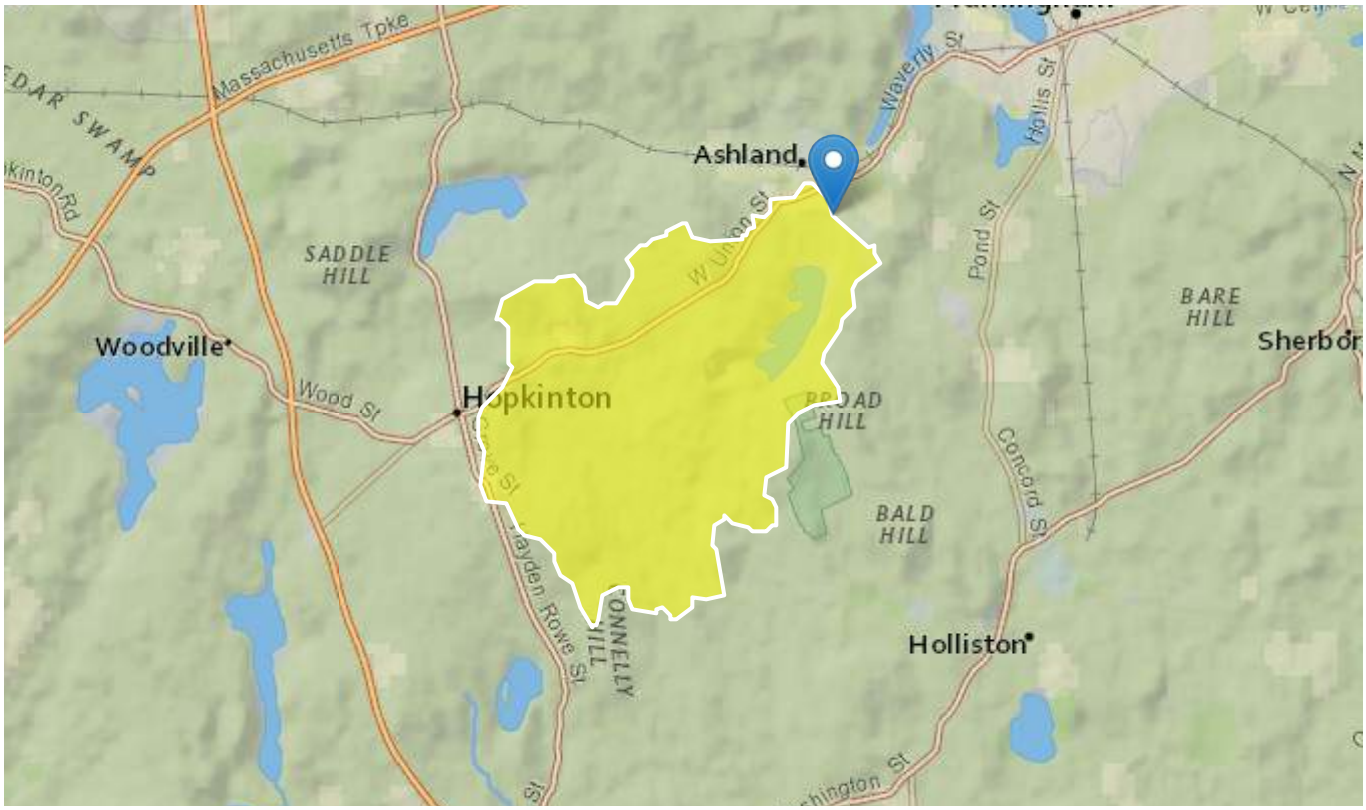


Tighe&Bond

APPENDIX C

Cold Spring Brook Basin

Region ID: MA
Workspace ID: MA20220705163620053000
Clicked Point (Latitude, Longitude): 42.25368, -71.45804
Time: 2022-07-05 12:36:39 -0400



Collapse All

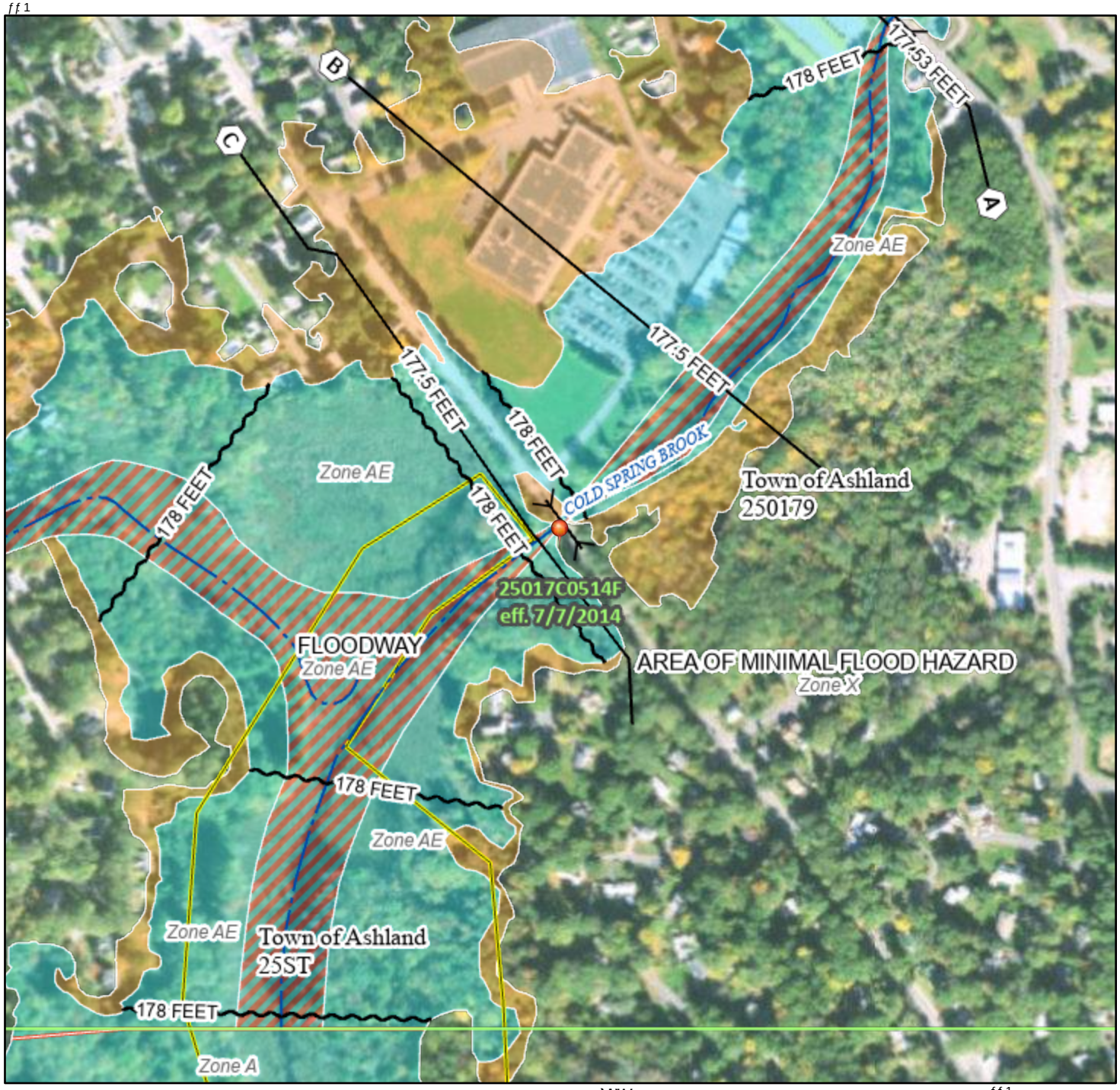
Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	7.94	square miles
FOREST	Percentage of area covered by forest	63.31	percent
LAKEAREA	Percentage of Lakes and Ponds	3.85	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	26	percent
WETLAND	Percentage of Wetlands	11.13	percent

Application Version: 4.10.0
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

1DWLRQDO)ORRG+D]DUG'DWD)OWWH

FEMA



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ff 1

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6()6$)&(5(*,21(6$1'6<0%2/6

L:KRRW %DVH)ORRG(OHYDWLRQ %()(
=RQH$ 9 $
L:KR%RUHSWK =RQH$ $ 9 9($
5LYHUDWRU\)ORRGZD

$QQXDO &KDQFH)ORRG+D]DUG $UHDV
R DQQXDO FKDQFHIORRGZKDYHUDH
G+SWKOHV WKDQRQHIRRW RU ZKGUDLQ
DUHDV R OHVV WKDQRQHVTXDUHPLOH=RQH;

)WXUH&RQGLWLRQV$QQXDO
&KDQFH)ORRG+D]DUG =RQH;
$UHDZK5HGH)ORRG5LVNGHWR
/HYH 6HH1RWHV =RQH;
$UHDZK)ORRG5LVNGHWR/HYH =RQH'

$UHDR DQQLBO)ORRG+D]DUG =RQH;
(IHFWLYHBV
$UHDR 8QGHWHUPQHG)ORRG+D]DUG =RQH'

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/HYH L'NH RU)ORRGZDO

&URVV6HFWLRQ ZKSDQDO &KQQH
DWHU 6UIDFHOHYDWLRQ
&RDWDO 7UDQVHFW
%DVH)ORRG(OHYDWLRQ/LQH %()
/LPLW R 6WUX
-XULVGLFWLRQ%RXQGDU\
&RDWDO 7UDQVHFW %DVHOLQH
3URWHFWH%DVHOLQH
+GURJUDSKLF)HDWXUH

L'LWDO DWDSWDOODEOH
1R'LWDO DWDSWDOODEOH
8QPDSSHG

7KHSLQGLVSODHGRQWKHPDSLV DQDSSURSULDWH
SRQW VHOHFWHGE\WKHXVHU DQGGRHV QRW UHSUH
DQDWKRULWDWLYHSURSHUW\ORFDWLRQ

7KLVPSFRROLHVZKHQ$VVWDQGDUG/IRU WKHXVHR
GL.LWDO IORRGPS/LI LW LVQRW YRLGV/GHVFULEHGEHORZ
7KHEDVHPS\VKRZQFRROLHVZKHQ$VEDVHPS
DFFXUDWHWDQGDUG/

7KHIORRGKDUGLQRUPDWLQQLVGHULYHGIURPWKH
DWKRULWDWLYHJHEHVHUYLFHV/SURYLGHGE\ 7KLVPS
ZVHSRUWHGRQ DW $ DQGGRHV QW
UHOHFW FKQJHV RU DQGHQWV VXEVHXHQW WR WKLV GDWHDQG
WLFH 7KHJHDGHHIFWLYHLQRUPDWLQQLVDFKQJHRU
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UHDODWRU\SUSRVHV

FLOOD INSURANCE STUDY

VOLUME 4 OF 8

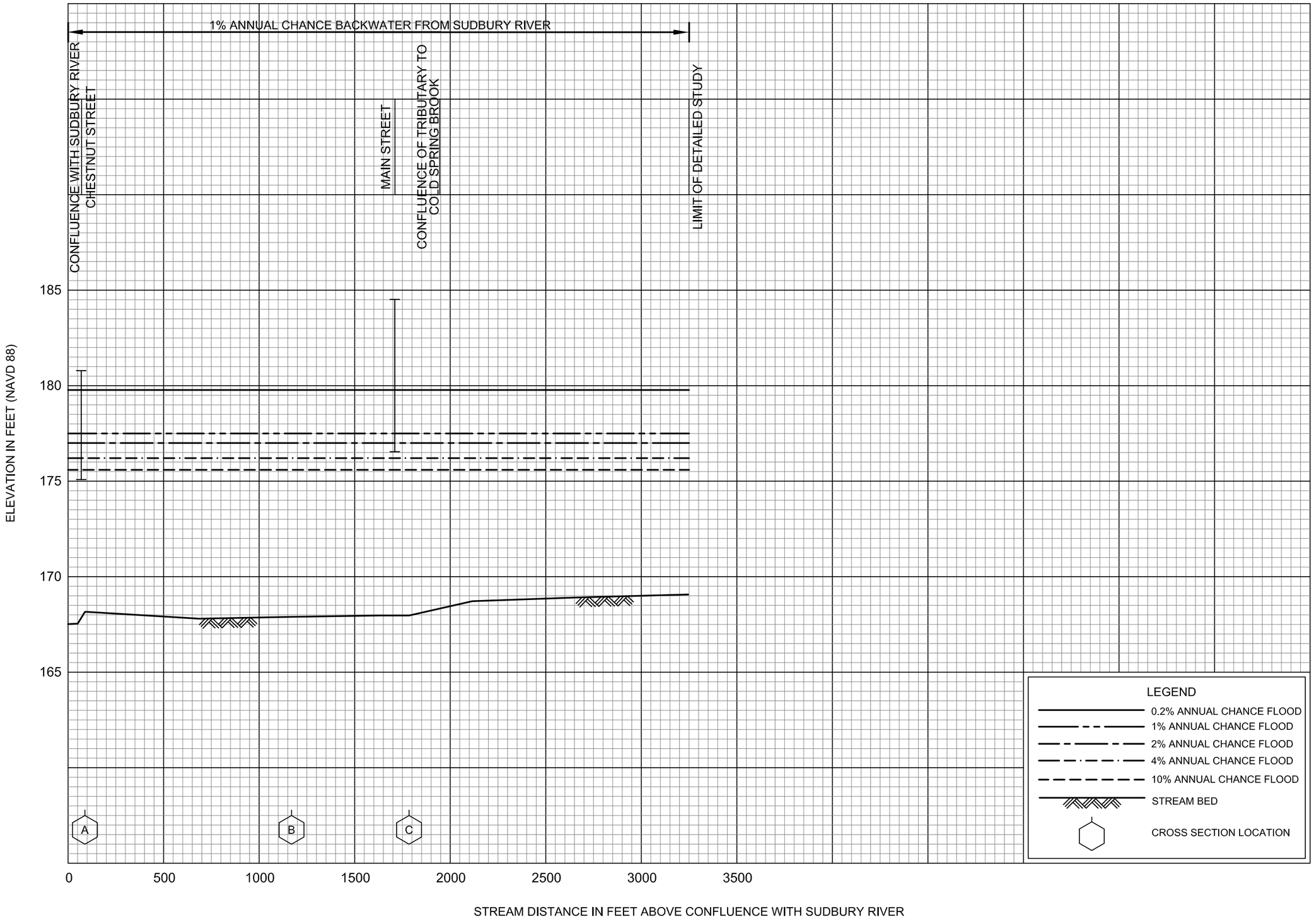
MIDDLESEX COUNTY, MASSACHUSETTS
(ALL JURISDICTIONS)

COMMUNITY NAME	COMMUNITY NUMBER
ACTON, TOWN OF	250176
ARLINGTON, TOWN OF	250177
ASHBY, TOWN OF	250178
ASHLAND, TOWN OF	250179
AYER, TOWN OF	250180
BEDFORD, TOWN OF	255209
BELMONT, TOWN OF	250182
BILLERICA, TOWN OF	250183
BOXBOROUGH, TOWN OF	250184
BURLINGTON, TOWN OF	250185
CAMBRIDGE, CITY OF	250186
CARLISLE, TOWN OF	250187
CHELMSFORD, TOWN OF	250188
CONCORD, TOWN OF	250189
DRACUT, TOWN OF	250190
DUNSTABLE, TOWN OF	250191
EVERETT, CITY OF	250192
FRAMINGHAM, TOWN OF	250193
GROTON, TOWN OF	250194
HOLLISTON, TOWN OF	250195
HOPKINTON, TOWN OF	250196
HUDSON, TOWN OF	250197
LEXINGTON, TOWN OF	250198
LINCOLN, TOWN OF	250199
LITTLETON, TOWN OF	250200
LOWELL, CITY OF	250201
MALDEN, CITY OF	250202
MARLBOROUGH, CITY OF	250203
MAYNARD, TOWN OF	250204
MEDFORD, CITY OF	250205
MELROSE, CITY OF	250206
NATICK, TOWN OF	250207
NEWTON, CITY OF	250208
NORTH READING, TOWN OF	250209
PEPPERELL, TOWN OF	250210
READING, TOWN OF	250211
SHERBORN, TOWN OF	250212
SHIRLEY, TOWN OF	250213
SOMERVILLE, CITY OF	250214
STONEHAM, TOWN OF	250215
STOW, TOWN OF	250216
SUDBURY, TOWN OF	250217
TEWKSBURY, TOWN OF	250218
TOWNSEND, TOWN OF	250219
TYNGSBOROUGH, TOWN OF	250220
WAKEFIELD, TOWN OF	250221
WALTHAM, CITY OF	250222
WATERTOWN, TOWN OF	250223
WAYLAND, TOWN OF	250224
WESTFORD, TOWN OF	250225
WESTON, TOWN OF	250226
WILMINGTON, TOWN OF	250227
WINCHESTER, TOWN OF	250228
WOBURN, CITY OF	250229

Map Revised: July 7, 2014

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
25017CV004B



FLOOD PROFILES

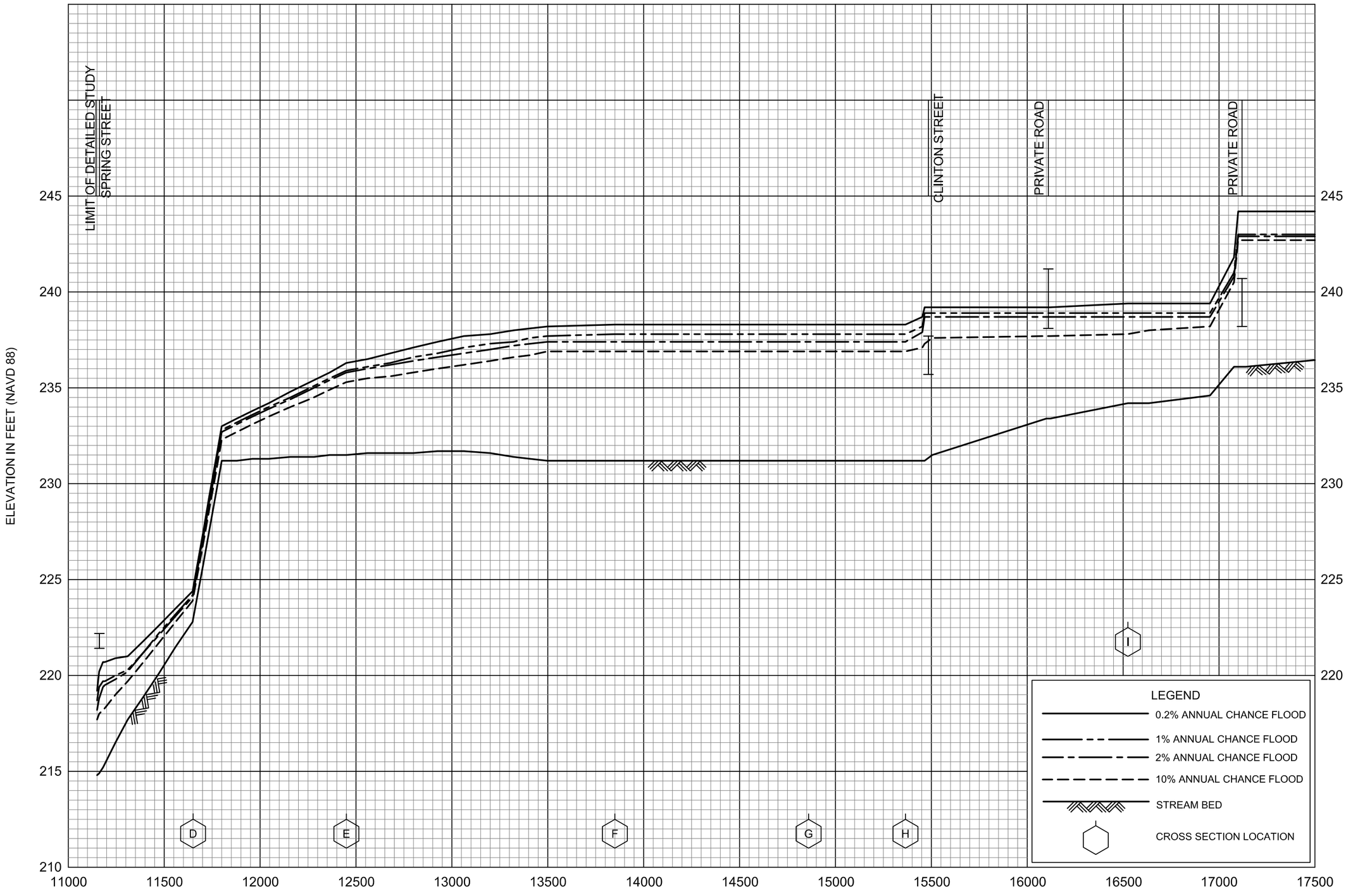
COLD SPRING BROOK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIDDLESEX COUNTY, MA

(ALL JURISDICTIONS)

148P



FLOOD PROFILES

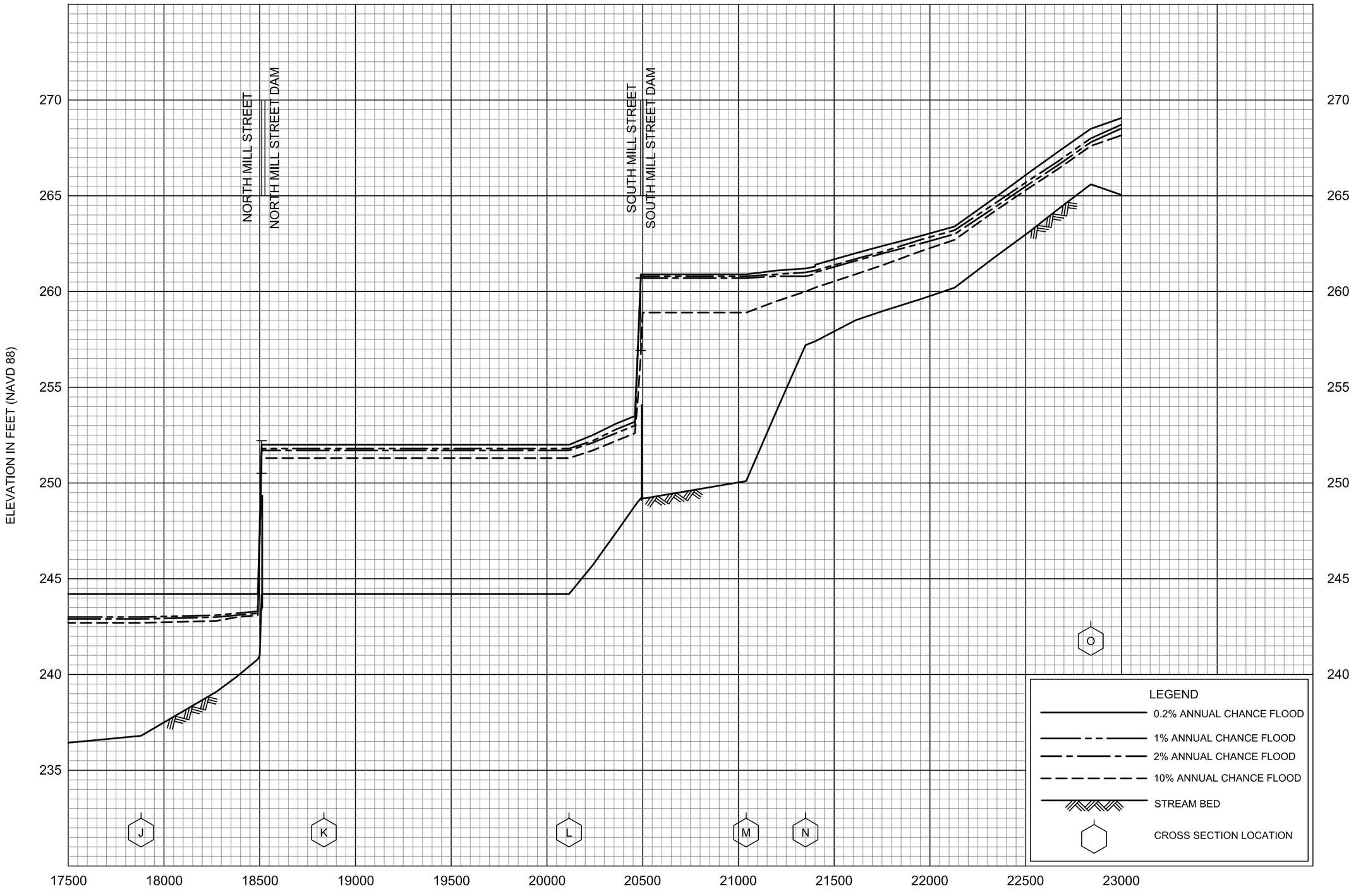
COLD SPRING BROOK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIDDLESEX COUNTY, MA

(ALL JURISDICTIONS)

149P



FLOOD PROFILES

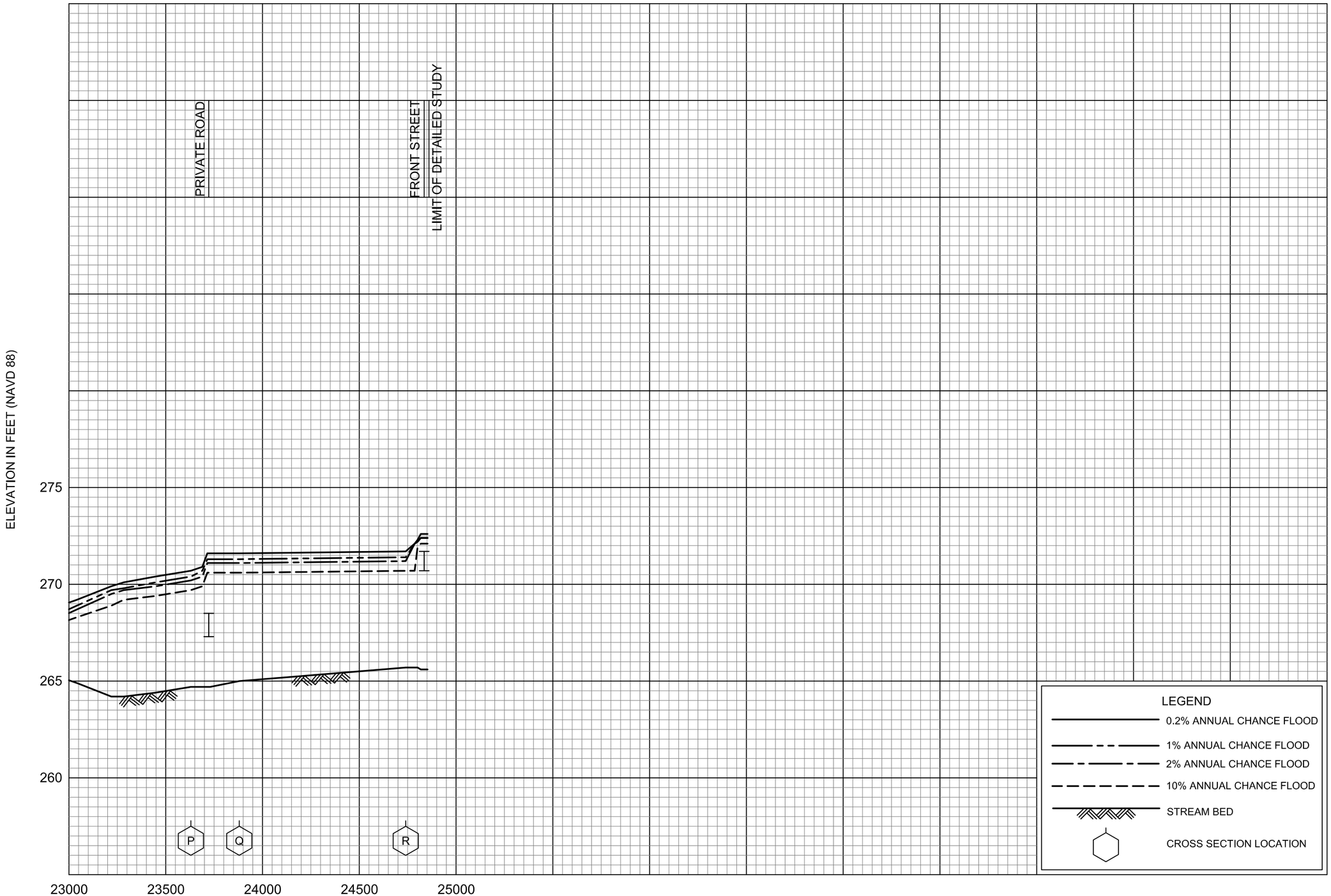
COLD SPRING BROOK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIDDLESEX COUNTY, MA

(ALL JURISDICTIONS)

150P



FLOOD PROFILES

COLD SPRING BROOK

FEDERAL EMERGENCY MANAGEMENT AGENCY

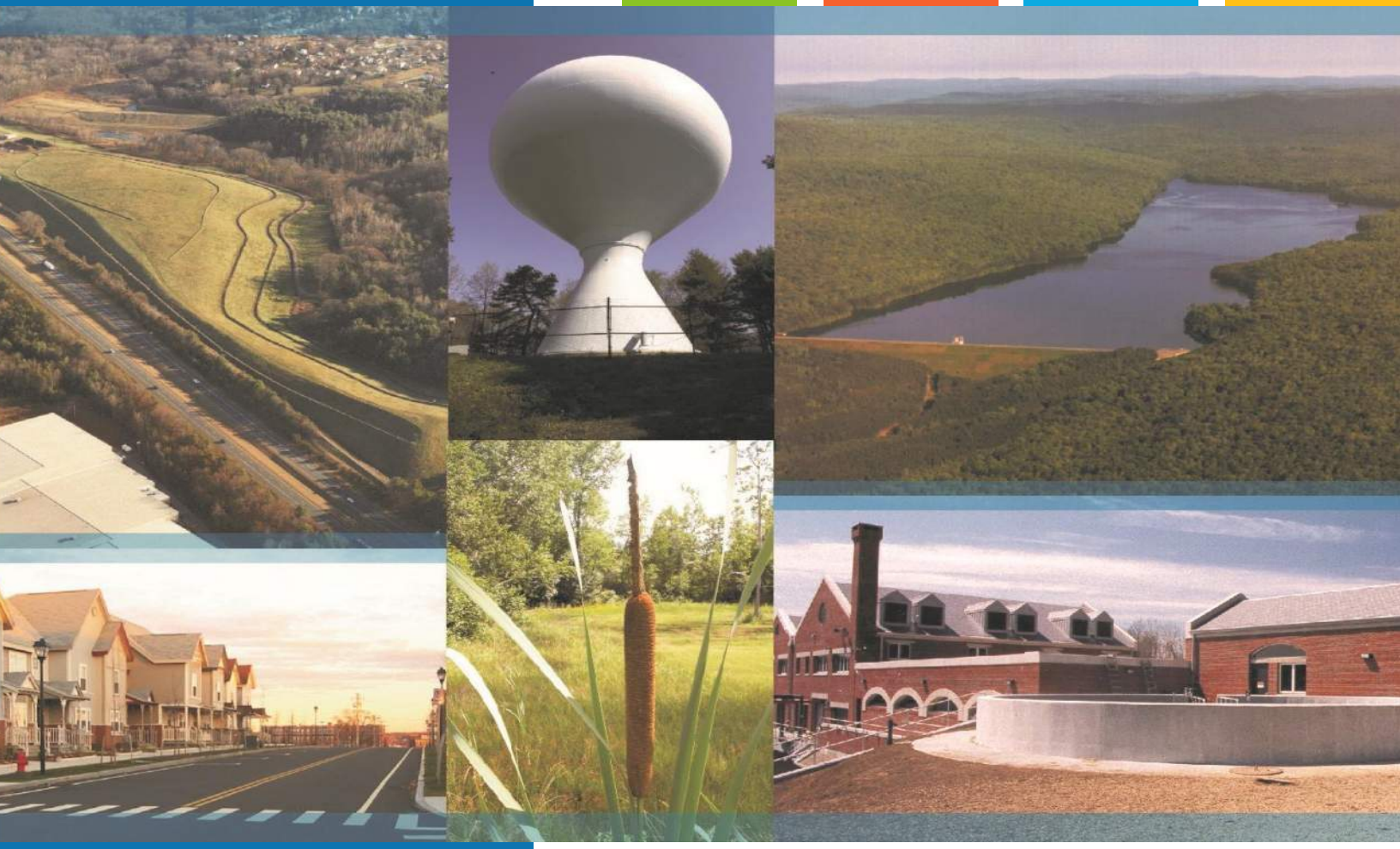
MIDDLESEX COUNTY, MA

(ALL JURISDICTIONS)

151P

Tighe&Bond

APPENDIX D



Main Street Over Cold Spring Brook
Ashland, MA

MAIN STREET BRIDGE REPLACEMENT

[MADOT Bridge # A-14-010, Bin # 7NV]

HYDRAULIC DESIGN REPORT

Town of Ashland, Massachusetts

October 25, 2022

Tighe&Bond

100% Recyclable

Table of Contents

\\Tighebond.com\data\Data\Projects\A\A1133 Ashland, MA\009 Main Street Over Cold Brook\Report_Evaluation\H&H Report\Cold Spring Brook H&H_Report.docx

List of Attachments

List of Tables

List of Figures

Section 1
Executive Summary

Tighe & Bond prepared a hydrologic and hydraulic analysis as part of engineering design and permitting for the Main Street Over Cold Spring Brook Rehabilitation Project. The existing bridge, a 15'-6" single-span concrete deck slab supported by stone block abutments and wingwalls, is located over Cold Spring Brook approximately 1,500 feet southeast of the intersection of Main Street and Union Street (MA-135). The primary reasons for performing the hydrologic and hydraulic analysis were to:

- Evaluate the hydraulics of the existing bridge
- Evaluate the results for the proposed bridge replacement including a no-rise evaluation
- Evaluate the potential scour conditions

The 15'-6" span meets the Massachusetts Department of Transportation (MassDOT) Municipal Bridge Projects MGL Chapter 85 Section 35 Review requirements for passing the hydraulic design of the 10% Annual Exceedance Probability (AEP) storm event (also known as the 10-year flood), following the guidance provided in the MassDOT LFRD Bridge Manual (2013) for an Urban Minor Arterial Street. The rehabilitated culvert has capacity to pass the 25% AEP frequency storm event with approximately 2.3 feet of freeboard (compared to the proposed low chord elevation).

A no-rise evaluation was performed, and the proposed opening is expected to maintain or reduce water surface elevations of Cold Spring Brook. In addition, anticipated scour depths were analyzed for the 2% AEP storm scour design flood.

Attachment A contains figures depicting an aerial overview of Main Street Bridge over Cold Spring Brook. (Figure 1), a topographic map of the drainage-area (Figure 2), and the geometry used to define the cross-sections in the HEC-RAS model (Figure 3). Attachment B contains the HEC-RAS model output for the existing and proposed condition. Attachment C contains scour/stone sizing calculations. Attachment D contains the FEMA data and Attachment E contains the FEMA correspondence.

A summary of the proposed geometry is provided below, with elevations referencing the North American Vertical Datum of 1988 (NAVD88):

Item	Description
Culvert Size and Type	15'-6" span concrete bridge
Low Chord Elevation	179.11 to179.55 feet NAVD88
Top of Road Elevation	181.8 feet NAVD88 (+/-)
Upstream/Downstream Stream Bed Elevation	169.9/169.8 feet NAVD88
Skew	3.4-degrees

Design Scour Depth	*10.2 feet
Sediment D_{50} within Culvert	Greater than or equal to critical grain size (8.6± mm)
Scour Countermeasure D_{50}	≥19.0-inch

*Scour depth was calculated using a 100-mm sediment D50 grain size during 2% AEP frequency storm event

Section 2
Project Site Description

2.1 Existing Structure

The existing Main Street Bridge Over Cold Spring Brook consists of a single span concrete deck-slab spanning approximately 15'-6", supported by gravity masonry block retaining wall abutments and wingwalls. There is no information regarding the existing foundations, but it is assumed that the walls are founded on shallow spread footings, which would be typical of this era of construction in New England for this type of small bridge. MassDOT completed an inspection of the Main Street Bridge in 2018. Several deficiencies were identified, most notably deck and superstructure deterioration including concrete cracking, efflorescence and spalling, rebar exposure in several locations, with visible rusting and the utilities being in poor condition. A replacement superstructure with rehabilitated abutments and wingwalls is proposed at this location as part of the state's Small Bridge Program.

2.1.1 Waterway at Bridge Location

Cold Spring Brook is a tributary of the Sudbury River. The Main Street Bridge crosses Cold Spring Brook approximately 0.5 miles downstream and to the northeast of the Ashland Reservoir. Stream flow is from southwest to northeast under the bridge. The brook is generally straight upstream and downstream of the bridge. Bordering the Cold Spring Brook immediately upstream (southwest) and downstream (northeast) of the bridge are steep earthen banks with mostly forested areas.

2.1.2 Highway Conveyed

Main Street is not part of the National Highway System. Rather, it is a locally owned and operated roadway serving an industrial and residential area in town. There is no available Annual Average Daily Traffic (AADT) from the MassDOT Transportation Data Management System. The design speed is 25 mph northwest bound and 35 mph southeast bound. MassDOT classifies Main Street as an Urban Minor Arterial Street.

2.1.3 Adjacent Land Uses

The areas adjacent to the Main Street Bridge area primarily composed of forested/non-forested wetlands, developed open space, deciduous forest and industrial areas, as shown on the MassGIS Land Use (2016) and MassGIS 2019 Ortho-imagery.

2.1.4 Special Site Considerations

The Main Street Bridge is within a Federal Emergency Management Agency (FEMA) 100-year Special Flood Hazard Area (SFHA) as well as a regulatory floodway. The bridge is located between FEMA Cross Section C and FEMA Cross Section B on the Flood Insurance Rate Map (FIRM), map number 25017C0514F. See Attachment D.

2.2 Proposed Action

The proposed action is to replace the superstructure and to rehabilitate the existing abutments and wingwalls. It was determined that the existing abutments do not have suitable capacity to support the new superstructure, therefore the existing abutments

will be reinforced with micro-piles. The replaced superstructure will include standard MassDOT approved crash tested bridge barrier including the Manual for Assessing Safety Hardware (MASH) compliant highway guardrail. This approach is most cost-effective for overall project design and construction based on grant funds available, while providing the Town a repaired facility addressing major concerns identified in inspection reports.

Section 3
Data Collection

The data collected for the hydraulic analysis are listed in Table 3-1.

TABLE 3-1
Data Sources

Item	Source/Reference
FEMA Effective Base Flood Elevations, Manning's 'n' values and Profile for Cold Spring Brook	Flood Insurance Study (FIS) for Middlesex County effective July 6, 2014, prepared by FEMA, available online at: https://msc.fema.gov/portal/home
FEMA Effective (Historic) Flows	Flood Insurance Study (FIS) for Middlesex County effective June 4, 2010, prepared by FEMA, available online at: https://msc.fema.gov/portal/home
FEMA Flood Insurance Rate Map (FIRM)	Flood Insurance Rate Map (FIRM) Map Number 25017C0514F effective July 7, 2014, prepared by FEMA, available online at: https://msc.fema.gov/portal/home
USGS Streamstats Program (v. 4.10.1)	https://streamstats.usgs.gov/ss/
Elevation terrain	The Commonwealth of Massachusetts, Executive Office of Technology Services and Security, Bureau of Geographic Information (MassGIS) 2010-2015 LiDAR Dataset, available online at: https://maps.massgis.digital.mass.gov/MassMapper/MassMapper.html
Existing Conditions Survey – Main Street Bridge Over Cold Spring Brook Ashland, Massachusetts	Prepared by WSP Inc., dated March 10, 2021

Section 4
Engineering Methods

4.1 Hydrologic Analysis

4.1.1 Flows from FEMA for Cold Spring Brook

Tighe & Bond requested the effective FEMA model for Cold Spring Brook from the FEMA library on June 8, 2022, but no data was available for this location. See Attachment E for correspondence from FEMA dated July 19, 2022 indicating that FEMA was unable to locate the hydraulic modeling. The effective Flood Insurance Study (FIS) for Middlesex County, effective July 6, 2016, did not include the flow rate table for Cold Spring Brook upstream of the Sudbury River, so values from the historic FIS for Middlesex County dated June 4, 2010 were used for modeling and are shown in Table 4-1.

TABLE 4-1
Flow rates from historic FEMA model for Cold Spring Brook

River Name	Drainage Area (mi^2)	10% AEP† [10-year] (cfs*)	2% AEP† [50-year] (cfs*)	1% AEP† [100-year] (cfs*)	0.2% AEP† [500-year] (cfs*)
Main Street Bridge	8.54	550	1,030	1,250	1,610

*cfs = cubic feet per second

†AEP = annual exceedance probability

4.1.2 Flows not Included in FEMA Study

Tighe & Bond estimated the flow rate for the 4-percent AEP flood (25-year storm event), that was not included in the FEMA FIS, by plotting the 10-, 2-, 1- and 0.2-percent AEP flows from FEMA on a logarithmic graph to develop a best-fit trendline. The trendline was used to determine an estimated flow for the 4% AEP storm event of approximately 830 cubic feet per second (cfs). Figure 4-1 below shows the FEMA flow data and the estimated 4% AEP flow rate. The 50-percent AEP flood (2-year storm event) was estimated using the online Streamstats program, with a flow of approximately 180 cfs.

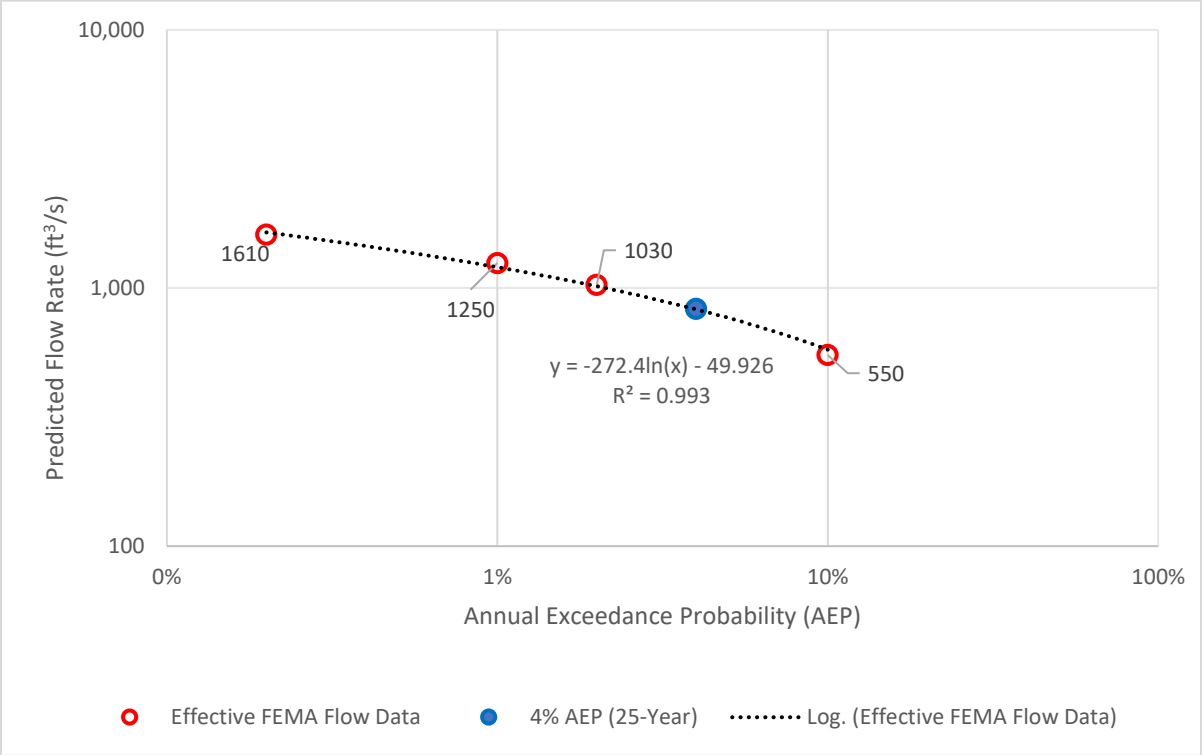


FIGURE 4-1
Effective FEMA flow rates and estimated 4% Annual Exceedance Probability (AEP) flood flow rate at Church Street Bridge using data best-fit trendline

4.2 Hydraulic Analysis

4.2.1 Data Acquisition

Due to FEMA being unable to locate the effective FEMA model existing at this location, Tighe & Bond had to create a new model. To create the hydraulic model Tighe & Bond utilized a combination of data from the effective FEMA FIS, an on the ground survey and observations/data collected in the field.

4.2.2 Duplicative Effective Model

Since no data was provided by FEMA for this location Tighe & Bond created a single model that functions as the duplicative effective model and the existing conditions model. See Section 4.2.3 for the existing conditions model that will serve as a basis for this no-rise evaluation.

4.2.3 Existing Conditions Model

Tighe & Bond created the existing conditions model by recreating the river centerline and cross sections provided in the FEMA FIRM and FIS and adding additional cross sections in the vicinity of the existing bridges. The channel bed elevation from the survey and the FEMA cross sections were used to adjust the cross-section data produced from the LiDAR.

The slope and manning's 'n' values from the FIS were also used to facilitate in the creation of the existing conditions model.

A hydraulic analysis for Cold Spring Brook was developed using HEC-RAS (v. 6.1.0), a hydraulic modeling program available from the U.S. Army Corps of Engineers. A steady state model was developed for Cold Spring Brook from approximately 500 feet upstream of the Main Street Bridge to approximately 1,600 feet downstream of the bridge.

To create the model, Tighe & Bond first created a Triangular Irregular Network (TIN) elevation surface using the March 2021 survey performed by WSP USA Inc. and MassGIS LiDAR topographic data for overbank areas beyond the extent of the surveyed cross sections. A geometric representation of the channel, banks, and cross-sections was created using HEC-RAS to extract cross sections from the TIN. The hydraulic model of Cold Spring Brook was modeled using 7 cross sections. The channel Manning's roughness coefficients (Manning's n) were estimated to be 0.035 based on the survey and orthographic imagery. The overbank area Manning's n varied from 0.013 (impervious cover) to 0.1 (forest cover). The overbank Manning's n coefficients were set constant horizontally along the cross sections and were estimated using orthographic imagery.

Normal depth upstream and downstream boundary conditions were used for the hydraulic model. The Main Street Bridge was modeled using "Multiple Opening Analysis" to account for the flow that overtops a low area in the road west of the Bridge that is lower than the overtopping elevation in the vicinity of the Bridge itself.

Table 4-2 below shows the difference between the regulatory FEMA base flood elevations (BFE) and the existing conditions model at the three FEMA cross-sections within the project area and additional cross-section just upstream of bridge. Please note that at two of the three FIS cross-section elevations are not within 0.50 feet of the regulatory FEMA BFE's, however inconsistencies were found with the low chord/roadway elevation between the FIS report and the survey. Regardless of the elevation of the BFE we are confident that the proposed work will result in a no-rise.

TABLE 4-2
Comparison of Existing Conditions Model (also Duplicate Effective Model) with Published FEMA Base Flood Elevations Regulatory and Without Floodway

River Station	FIS Cross-Section	[1] Published Base Flood Elevation "Without Floodway" (feet, NAVD88*)	[2] Published Base Flood Elevation "‡Regulatory" (feet, NAVD88*)	[3] Duplicate Effective Model Base Flood Elevation (feet, NAVD88*)	[3]-[1]	[3]-[2]
97	A	173.5	177.5	173.7	-3.8	0.2
1,164	B	173.7	177.5	175.8	-1.7	2.1
1,728	[Main Street Bridge]					
1,755	-	174.0§	177.5	177.9	0.4	3.9
1,785	C	174.4	177.5	178.0	0.5	3.6

*NAVD88 = North America Vertical Datum of 1988
†The existing conditions model base flood elevation in the columns above are rounded to the nearest tenth for consistency with the published values in the FIS Report
‡The Regulatory Base Flood Elevation is caused by backwater effects from the Sudbury River.
§The BFE Without Floodway at Station 1,755 was approximated using linear interpolation.

Figure 3 in Attachment A shows the FEMA effective lettered cross sections and additional HEC-RAS added adjacent to the Main Street Bridge. Table 4-3 shows existing condition model results provided to the nearest hundredth of a foot as provided in HEC-RAS model output.

4.2.4 Proposed Conditions Model and No-Rise Evaluation

The proposed conditions model was developed by updating the low-chord elevations of the existing conditions bridge. No changes to the span, channel bed or embankments are proposed.

Table 4-3 compares the hydraulic performance for the BFE for existing conditions and proposed conditions. The results show a "no-rise" condition.

TABLE 4-3
Comparison of Hydraulic Performance for the Base Flood Elevation (BFE)

River Station	FIS Cross-Section	[1] Existing Condition Model (feet, NAVD88*)	[2] Proposed Condition Model (feet, NAVD88*)	[2]-[1] No – Rise Evaluation
97	A	173.73	173.73	0.00
1,164	B	175.81	175.81	0.00
1,728	[Main Street Bridge]			
1,755	-	177.94	177.94	0.00
1,785	C	177.98	177.98	0.00

*NAVD88 = North America Vertical Datum of 1988; N/A = Not applicable

4.2.5 Model Results for All Computed Flow Rates

Tighe & Bond evaluated Cold Spring Brook using HEC-RAS for the flow rates discussed in Section 4.1. Table 4-4 provides the HEC-RAS model output for existing conditions and Table 4-5 provides the HEC-RAS model output for proposed conditions. HEC-RAS model output for the existing and proposed conditions are provided in Attachment B. The hydraulic design table, a hydraulic summary table and temporary water control data table are provided in Section 5.

TABLE 4-4
HEC-RAS Results for Existing Conditions at Main Street Bridge (bridge low chord at 178.90, water levels at River Station 1,755)

AEP*	Peak Water Surface Elevation Upstream of Bridge (NAVD88*)	Freeboard (feet)	Distance to Top of Road at Low Point† (feet)	Distance to Top of Road at Bridge‡ (feet)	Max Velocity§ (ft/s*)
50% (2-year)	172.4	6.5	4.6	9.4	4.3
10% (10-year)	175.1	3.8	1.9	6.7	8.6
4% (25-year)	176.8	2.1	0.2	5.0	11.5
2% (50-year)	177.6	1.3	-0.6	4.2	11.7
1% (100-year)	177.94	1.0	-0.9	3.9	10.8

0.2% (500-year)	178.3	0.6	3.5	-1.3	10.5

*AEP = annual exceedance probability, ft/s = feet per second
†A low area of Main Street is located north of the bridge with a minimum elevation of approximately 177 feet NAVD88 and is anticipated to overtop in the model and are shown overtopping in the FIRM.
‡A low area of Main Street is in the vicinity of the bridge has a minimum elevation of approximately 181.8 feet NAVD88.
§Velocity above is reported as the max velocity from within the bridge at River Station 1,728 (for open bottom structures)

TABLE 4-5
HEC-RAS Proposed Conditions at Main Street Bridge (replace bridge superstructure, match existing 15'-6" span and new low chord from 179.11 to 179.55, water levels at River Station 1,755)

AEP*	Peak Water Surface Elevation Upstream of Bridge (NAVD88*)	Freeboard (feet)	Distance to Top of Road at Low Point† (feet)	Distance to Top of Road at Bridge‡ (feet)	Max Velocity§ (ft/s*)
50% (2-year)	172.4	6.7	4.6	9.4	4.3
10% (10-year)	175.1	4.1	1.9	6.7	8.6
4% (25-year)	176.8	2.3	0.2	5.0	11.5
2% (50-year)	177.6	1.5	-0.6	4.2	11.7
1% (100-year)	177.94	1.2	-0.9	3.9	10.8
0.2% (500-year)	178.3	0.9	-1.3	3.5	10.5

*AEP = annual exceedance probability, ft/s = feet per second
†A low area of Main Street is located north of the bridge with a minimum elevation of approximately 177 feet NAVD88 and is anticipated to overtop in the model and are shown overtopping in the FIRM.
‡A low area of Main Street is in the vicinity of the bridge has a minimum elevation of approximately 181.8 feet NAVD88.
§Velocity above is reported as the max velocity from within the bridge at River Station 1,728 (for open bottom structures)

4.3 Scour Safety/Stability Analysis

Scour at the Main Street Bridge was evaluated in a manner consistent with the general guidelines set forth in the FHWA Hydraulic Engineering Circular No. 18 (HEC-18), HEC-20, and the MassDOT LRFD Bridge Manual Section 1.3.3.4 Scour/Stability Analysis. The HEC-RAS model was used to estimate the hydraulic parameters required to compute the total scour potential. The scour design and scour check flood return frequencies were the 50-year and the 100-year frequency storm event, based on Table 1.3.4-1 in the LRFD Bridge Manual for an Urban Minor Arterial Street.

Total scour consists of the summation of contraction scour, abutment scour and long-term aggregation and degradation. Contraction scour and abutment scour were calculated using the Clear-Water Scour Equation for Open-Bottom Culverts outlined in HEC-18. There are no piers proposed, so pier scour was not evaluated. Long-term aggregation and degradation were evaluated based on qualitative approaches outlined in HEC-20. Scour

calculations did not account for any potential scour countermeasures; however, optional countermeasures were designed for consideration to reduce future scour potential.

Abutment, contraction, and long-term aggregation and degradation scour processes were evaluated in detail for the proposed conditions. Attachment C contains the calculations for this analysis.

Two scenarios were analyzed as field observations and conditions at the culvert inlet and outlet differed from the particle size distribution measured upstream of the bridge inlet. The first scenario is based off the particle size distribution data and uses a median particle diameter, D50 equal to 3-millimeters (0.12-inches), similar to sand leading to a larger scour depth. The second scenario is based off field observations and uses a large gravel as the median particle diameter, D50 equal to approximately 100-millimeters (4-inches), and results in a lesser and more expected scour depth. Results for a 4-inch D50 were used for design since it better matches observed conditions at the bridge.

Based on modeled hydraulic characteristics and sediment size, clear-water (water free of sediment) conditions were predicted in the channel and banks during both the 50-year scour design storm and the 100-year scour check storm consistent with the open-bottom culvert equations used from HEC-18. The computed combined contraction and abutment scour depth for the 50-year scour design storm and 100-year scour check storm for the 3-millimeter D50 scenario were 16.0 feet and 16.1 feet, respectively. The computed combined contraction and abutment scour depth for the 50-year scour design storm and 100-year scour check storm for the 100-millimeter D50 scenario were both 10.2 feet.

The potential for long term aggradation and degradation was analyzed. Sediment aggradation and degradation was not observed onsite. The natural bed material of this stream upstream of the bridge is mostly comprised well-graded gravel and coarse sand. The D_{50} for the channel and floodplain is 0.12-inch and 0.023-inch, respectively. The D_{85} for the channel and floodplain is 0.59-inch and 0.12-inch, respectively. An incipient diameter analysis was performed, and results indicate that the hydraulic forces are adequate to transport bed material up to 0.34-inch for a 2-year frequency storm event (an approximation for the channel forming flow rate), which is less than the average D_{85}. An armoring analysis was performed, and it is anticipated that an armor layer would form after degradation of less than 1.2 feet. Long term degradation at the proposed bridge is therefore not considered likely due to armoring. Stream sediment is recommended to have a D_{50} greater than or equal to the critical grain size of 0.34 inch (8.6 mm) to further reduce potential for degradation.

4.4 Scour Countermeasure Design

The appropriate cobble/stone size to protect the upstream embankment slope was evaluated using Federal Highway Administration (FHWA) Hydraulic Engineering Circular No. 23 (HEC-23) Volume 2. Equation 18.3 was used to calculate the stable median stone diameter (D_{50}) and the D_{30}. Attachment C provides the results of the stone sizing analysis. The appropriate gradation was determined based on USACE Class VI riprap as provided in HEC-23 or MassDOT Riprap/Rock Fill with the following characteristics:

- $D_{30} \geq$ 16.0-inch
- $D_{50} \geq$ 19.0-inch

The proposed structural design includes micro-piles extending to a depth of approximately 25 feet below the channel so scour countermeasures are not being proposed at this time.

4.5 Discussion of FEMA Regulatory Requirements

The Main Street Bridge over Cold Spring Brook is located within a Federal Emergency Management Agency (FEMA) 1% AEP (100-year) Special Flood Hazard Area (SFHA) with a regulatory floodway as shown on the Flood Insurance Rate Map (FIRM) for the Town of Ashland, Map ID 25018C0514F. The Code of Federal Regulations Chapter 44 (44 CFR) Section 60.3 (d) (3) specifies that for development (or changes) within a regulated floodway a Conditional Letter of Map Revision (CLOMR) is required if an increase in base flood elevation of 0.01 feet or greater is anticipated. As described in Section 4.2.4 the proposed change will result in no-rise in the BFE.

Section 5
Conclusions and Recommendations

5.1 Conclusions

The hydrologic and hydraulic analysis methodology and results described above will be used as the basis of design of the Main Street Bridge Rehabilitation Project along Cold Spring Brook in the Town of Ashland. The analysis confirms that the proposed design will provide adequate hydraulic capacity for the hydraulic design storm (25-year storm). Furthermore, the scour depth for the scour design storm (50-year storm) is anticipated to be 10.2 feet. The proposed design will result in no-rise and will maintain or reduce water surface elevations along Cold Spring Brook.

The final design will need to consider construction and permitting requirements and restrictions pertinent to the proposed design. Potential environmental impacts, hydraulic impacts, and potential for wildlife stream crossing will be considered.

5.2 Hydraulic Design Table and Summary Tables

Table 5-1 provides the hydraulic design data table for the Main Street Bridge. Table 5-2 provides a summary of the hydraulic performance and Table 5-3 provides a summary of proposed flows for temporary water controls.

TABLE 5-1
Hydraulic Design Data Table Included in Design Drawings for the Main Street Bridge (low chord ranging from 179.11 to 179.55 feet NAVD88, water levels at River Station 1,755)

HYDRAULIC DATA (PROPOSED CONDITIONS)	
DRAINAGE AREA	8.54 SQ. MILES
DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	25% (25-YEARS)
DESIGN FLOOD DISCHARGE (25 YR)	830 CFS
DESIGN FLOOD VELOCITY (25 YR) §	11.49 FPS
DESIGN FLOOD ELEVATION (25 YR)	176.84 FEET
BASE 100-YR FLOOD DATA (EXISTING CONDITIONS)	
BASE FLOOD DISCHARGE (100 YR)	1,250 CFS
EXISTING BASE FLOOD ELEVATION (100 YR)	177.98 FEET (@ FEMA XS 'C')
REGULATORY FEMA BASE FLOOD ELEVATION (100 YR)	177.5 FEET (@ FEMA XS 'C')
DESIGN AND CHECK SCOUR DATA	
SCOUR DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	2% (50-YEARS)
DESIGN FLOOD ABUTMENT SCOUR DEPTH (D50=100mm)	10.2 FEET
SCOUR CHECK FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	1% (100-YEARS)
CHECK FLOOD ABUTMENT SCOUR DEPTH (D50=100mm)	10.2 FEET
FLOOD OF RECORD	

DISCHARGE	UNKNOWN
FREQUENCY (IF KNOWN)	N/A
MAXIMUM ELEVATION	N/A
DATE	N/A
HISTORY OF ICE FLOWS	UNKNOWN
EVIDENCE OF SCOUR AND EROSION	N/A

§VELOCITY ABOVE IS REPORTED AS THE MAX VELOCITY FROM WITHIN THE BRIDGE AT RIVER STATION 1,728 (FOR OPEN BOTTOM STRUCTURES)
NOTE: THE HYDRAULIC ANALYSIS ASSUMES NO MAJOR CHANGES IN THE LOCAL HYDRAULIC REGIME WILL OCCUR WITHIN THE DESIGN LIFE OF THE REPLACEMENT BRIDGE. THE FEMA EFFECTIVE MODEL WAS NOT AVAILBLE FROM FEMA.

TABLE 5-2
Summary of Hydraulic Performance, water levels at River Station 1,755

AEP*	Peak Flow (cfs*)	Existing		Proposed	
		WSEL* (feet NAVD88*)	Max Velocity† (ft/s*)	WSEL* (feet NAVD88*)	Max Velocity† (ft/s*)
50% (2-year)	180	172.4	4.3	172.44	4.3
10% (10-year)	550	175.1	8.6	175.06	8.6
4% (25-year)	830	176.8	11.5	176.84	11.5
2% (50-year)	1,030	177.6	11.7	177.50	11.7
1% (100-year)	1,250	177.94	10.8	177.8	10.8
0.2% (500-year)	1,610	172.4	10.5	178.10	10.5

*cfs = cubic feet per second, NAVD88 = North American Vertical Datum of 1988, ft/s = feet per second
† Velocity above is reported as the max velocity from within the bridge (for open bottom structures)

TABLE 5-3
Temporary Water Control Design Data

AEP*	Peak Flow (cfs*)	Water Surface Elevation† (feet NAVD88*)	Velocity† (ft/s*)	Freeboard† (feet)	MassDOT Recommended Elevation for Coffer Dam‡ (feet NAVD88*)
50% (2-year)	180**	174.00	10.1	2.0	175.0

*AEP = annual exceedance probability, cfs = cubic feet per second, NAVD88 = North American Vertical Datum of 1988, ft/s = feet per second
† The temporary water control bypass system modeled for this analysis consisted of two 6-foot diameter concrete culverts.
‡ The LFRD Bridge Manual recommends the top elevation of the temporary water control measure be the design flood elevation plus 1-foot of freeboard.
**Peak flow from Streamstats

ATTACHMENT A
Figures

FIGURE 1
SITE AERIAL OVERVIEW

Main Street Bridge
Over Cold Spring Brook H&H Analysis
Ashland, Massachusetts

September 2022

Tighe&Bond

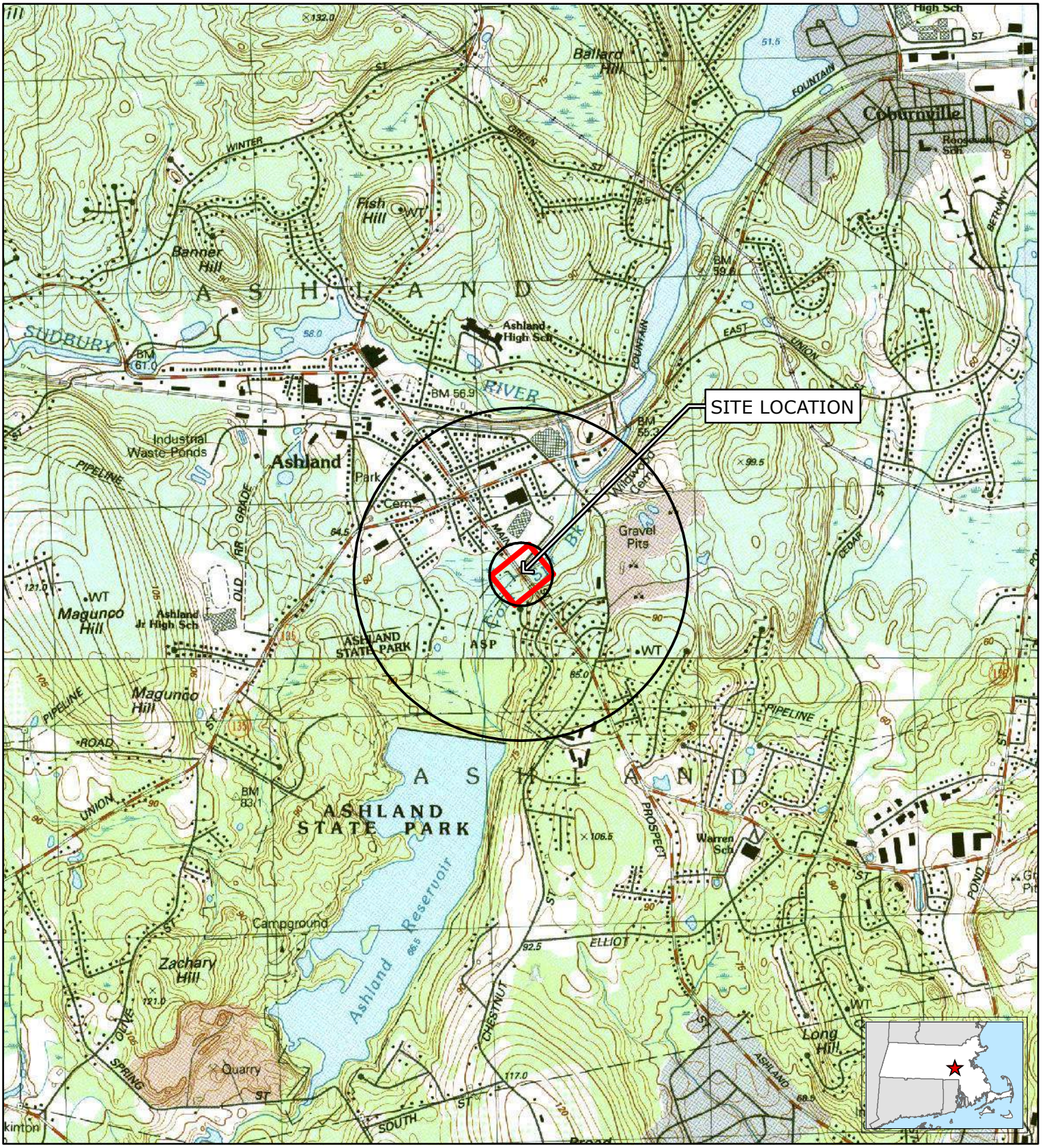
Based on MassGIS Color Orthophotography (2021)

1:2,400
0 100 200
Feet

N

G:\GIS\MA\SiteLocus\Ashland\aerial_ColdSpringBrook.mxd [Exported By: EManley, 9/22/2022, 1:36:58 PM]

A-1133



Legend

Project Area

Tighe&Bond

Based on USGS Topographic Map for Ashland, MA Revised 1992.
Contour Interval Equals Meters.
Circles indicate 500-foot and half-mile radii

1:24,000

0 1,000 2,000

Feet

N

FIGURE 2
SITE TOPOGRAPHIC MAP

Main Street Bridge
Over Cold Spring Brook H&H Analysis
Ashland, Massachusetts

September 2022

Legend

- Cross Sections
- Cold Spring Brook Centerline

Tighe&Bond

Based on MassGIS Color Orthophotography (2021)

1:3,600

0 150 300

Feet

N

FIGURE 3
HYDRAULIC MODEL GEOMETRY

Main Street Bridge
Over Cold Spring Brook H&H Analysis
Ashland, Massachusetts

September 2022

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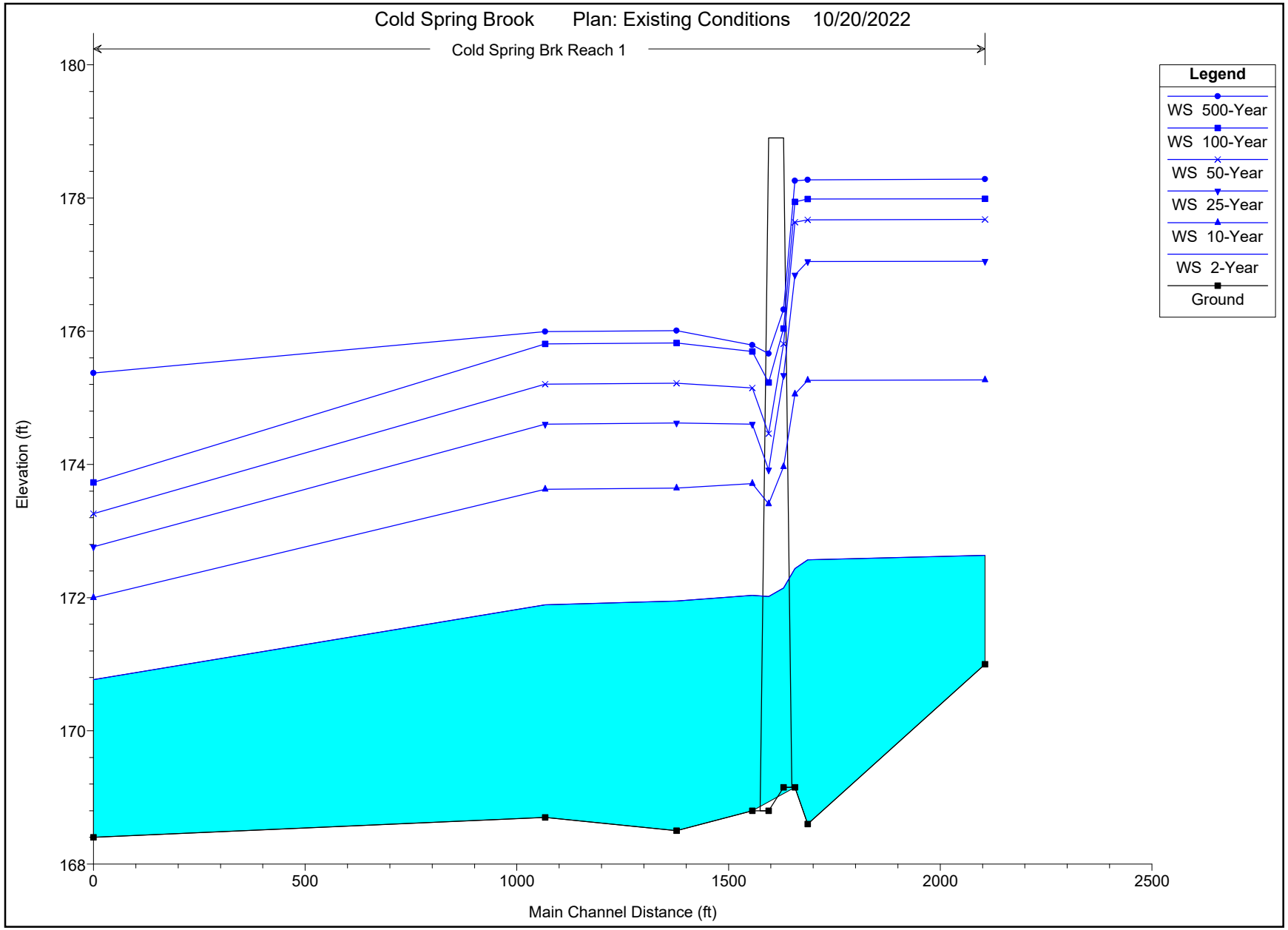
ATTACHMENT B
HEC-RAS Hydraulic Model Results

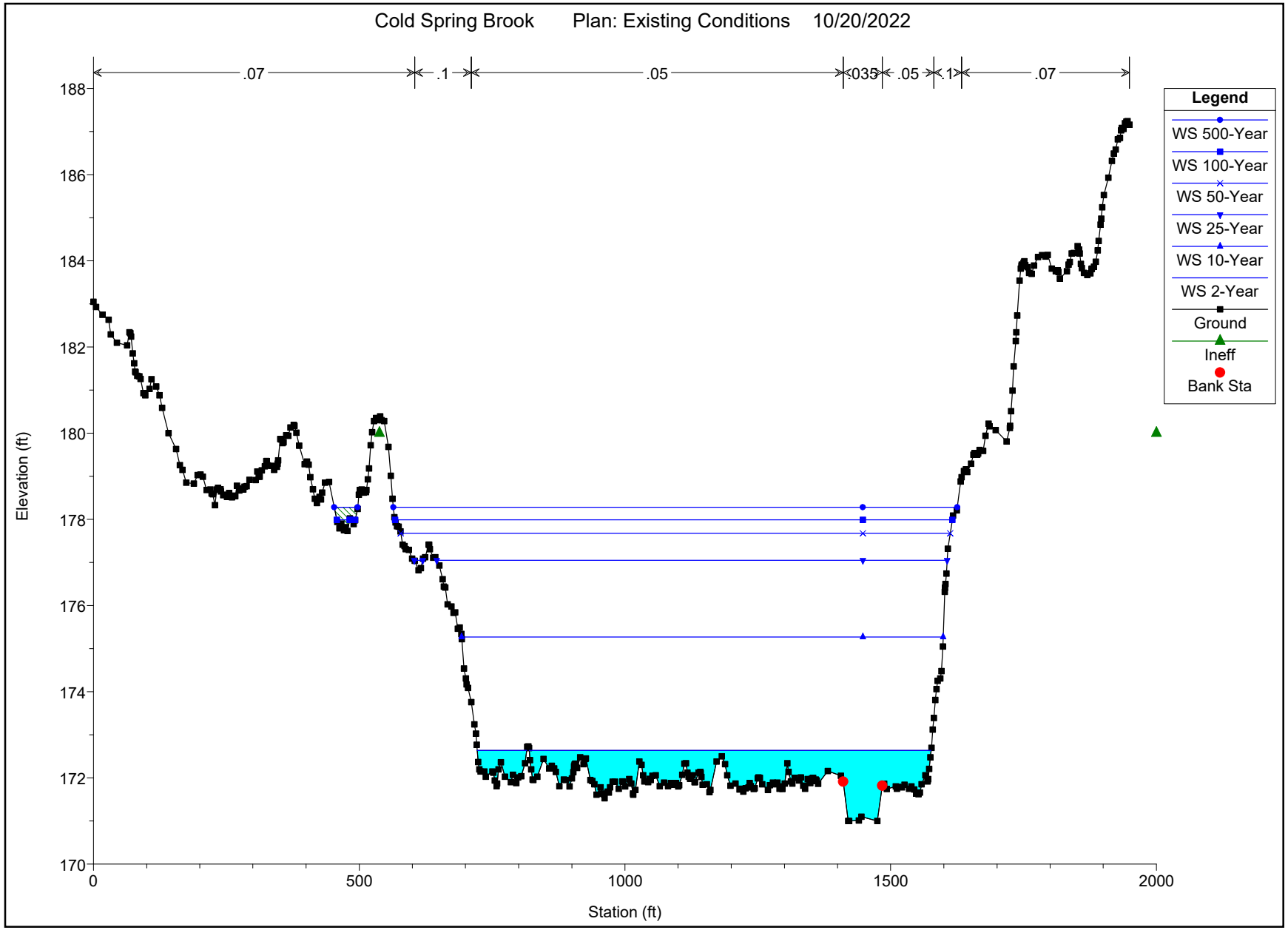
HEC-RAS Plan: EC River: Cold Spring Brk Reach: Reach 1

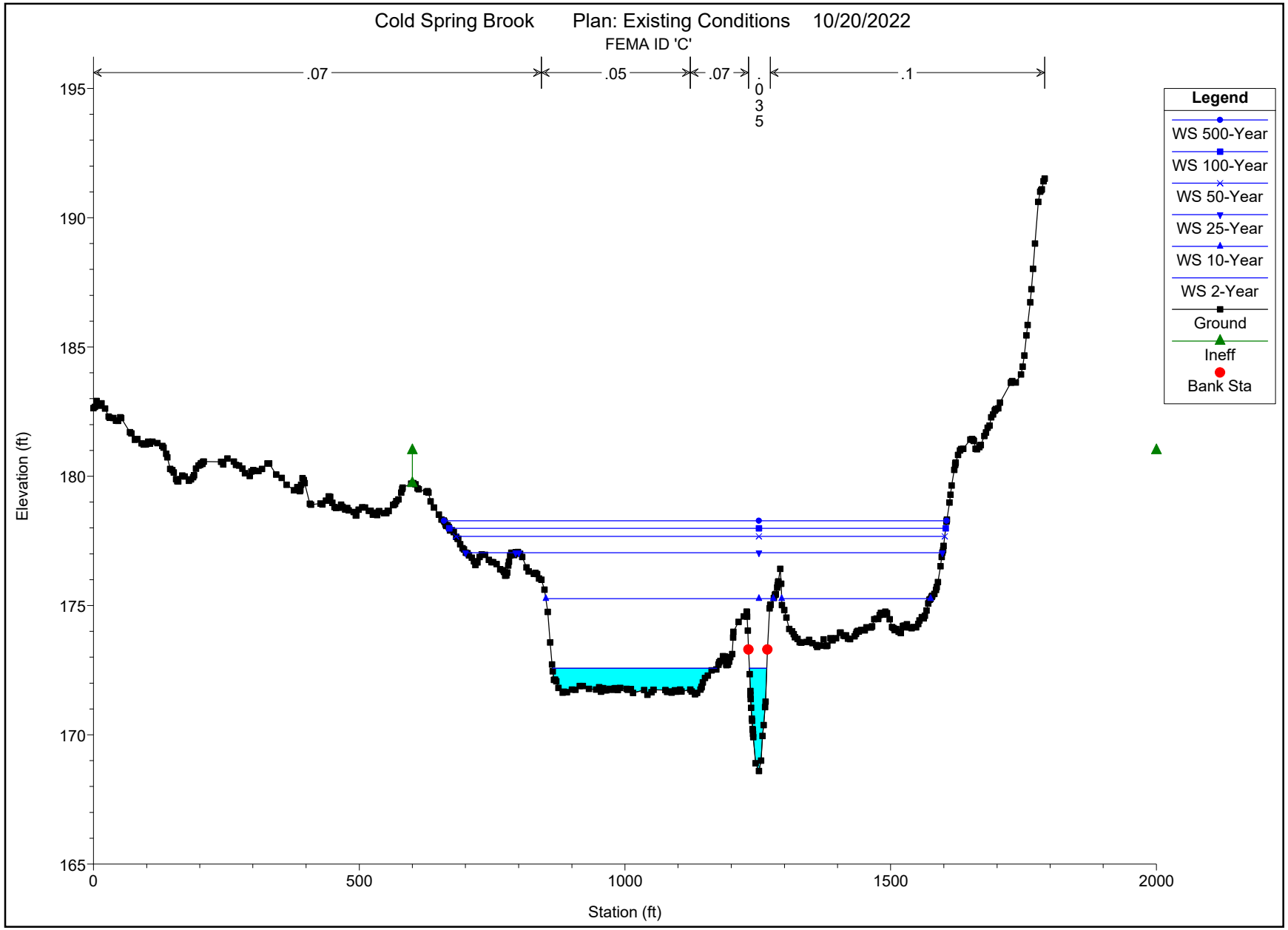
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	2204	2-Year	180.00	171.00	172.64	171.73	172.64	0.000096	0.55	625.74	848.99	0.08
Reach 1	2204	10-Year	550.00	171.00	175.27	172.17	175.27	0.000007	0.29	2943.62	906.07	0.03
Reach 1	2204	25-Year	830.00	171.00	177.05	172.29	177.05	0.000004	0.28	4608.05	976.38	0.02
Reach 1	2204	50-Year	1030.00	171.00	177.68	172.36	177.68	0.000004	0.30	5244.15	1033.82	0.02
Reach 1	2204	100-Year	1250.00	171.00	177.99	172.43	177.99	0.000005	0.35	5569.60	1080.94	0.02
Reach 1	2204	500-Year	1610.00	171.00	178.28	172.51	178.28	0.000007	0.42	5877.60	1105.06	0.03
Reach 1	1785	2-Year	180.00	168.60	172.57	170.57	172.58	0.000201	1.11	324.05	341.77	0.12
Reach 1	1785	10-Year	550.00	168.60	175.26	172.21	175.26	0.000029	0.65	1709.07	708.36	0.05
Reach 1	1785	25-Year	830.00	168.60	177.05	172.43	177.05	0.000014	0.57	3087.58	891.00	0.04
Reach 1	1785	50-Year	1030.00	168.60	177.67	172.56	177.67	0.000015	0.60	3657.07	919.90	0.04
Reach 1	1785	100-Year	1250.00	168.60	177.98	172.68	177.99	0.000018	0.68	3945.57	934.17	0.04
Reach 1	1785	500-Year	1610.00	168.60	178.27	172.84	178.28	0.000024	0.82	4218.12	945.84	0.05
Reach 1	1755	2-Year	180.00	169.15	172.44	170.92	172.54	0.001342	2.59	69.44	199.94	0.31
Reach 1	1755	10-Year	550.00	169.15	175.06	172.32	175.22	0.000959	3.20	177.58	363.98	0.28
Reach 1	1755	25-Year	830.00	169.15	176.84	173.08	177.00	0.000595	3.23	282.34	536.34	0.24
Reach 1	1755	50-Year	1030.00	169.15	177.64	173.54	177.67	0.000151	1.78	928.29	757.13	0.12
Reach 1	1755	100-Year	1250.00	169.15	177.94	174.02	177.98	0.000178	1.99	1047.81	836.04	0.13
Reach 1	1755	500-Year	1610.00	169.15	178.26	174.63	178.27	0.000089	1.45	1836.10	965.42	0.10
Reach 1	1728		Mult Open									
Reach 1	1654	2-Year	180.00	168.80	172.03	170.59	172.12	0.001170	2.38	75.49	34.55	0.28
Reach 1	1654	10-Year	550.00	168.80	173.71	171.82	173.95	0.001824	3.94	139.63	41.57	0.38
Reach 1	1654	25-Year	830.00	168.80	174.60	172.50	174.95	0.001895	4.70	178.10	44.64	0.40
Reach 1	1654	50-Year	1030.00	168.80	175.15	172.94	175.56	0.001952	5.16	202.90	46.74	0.42
Reach 1	1654	100-Year	1250.00	168.80	175.70	173.36	176.18	0.001995	5.61	230.32	186.67	0.43
Reach 1	1654	500-Year	1610.00	168.80	175.79	173.95	176.57	0.003121	7.10	235.30	194.30	0.54
Reach 1	1475	2-Year	180.00	168.50	171.95		171.98	0.000397	1.47	132.53	80.59	0.17
Reach 1	1475	10-Year	550.00	168.50	173.64		173.72	0.000483	2.33	360.68	233.45	0.20
Reach 1	1475	25-Year	830.00	168.50	174.62		174.68	0.000354	2.30	658.50	338.39	0.18
Reach 1	1475	50-Year	1030.00	168.50	175.22		175.27	0.000289	2.24	867.60	355.60	0.17
Reach 1	1475	100-Year	1250.00	168.50	175.82		175.87	0.000242	2.19	1084.34	365.31	0.16
Reach 1	1475	500-Year	1610.00	168.50	176.01		176.07	0.000342	2.66	1152.64	368.01	0.19
Reach 1	1164	2-Year	180.00	168.70	171.89		171.90	0.000157	0.72	258.52	187.88	0.10
Reach 1	1164	10-Year	550.00	168.70	173.63		173.64	0.000106	0.97	620.12	240.36	0.09

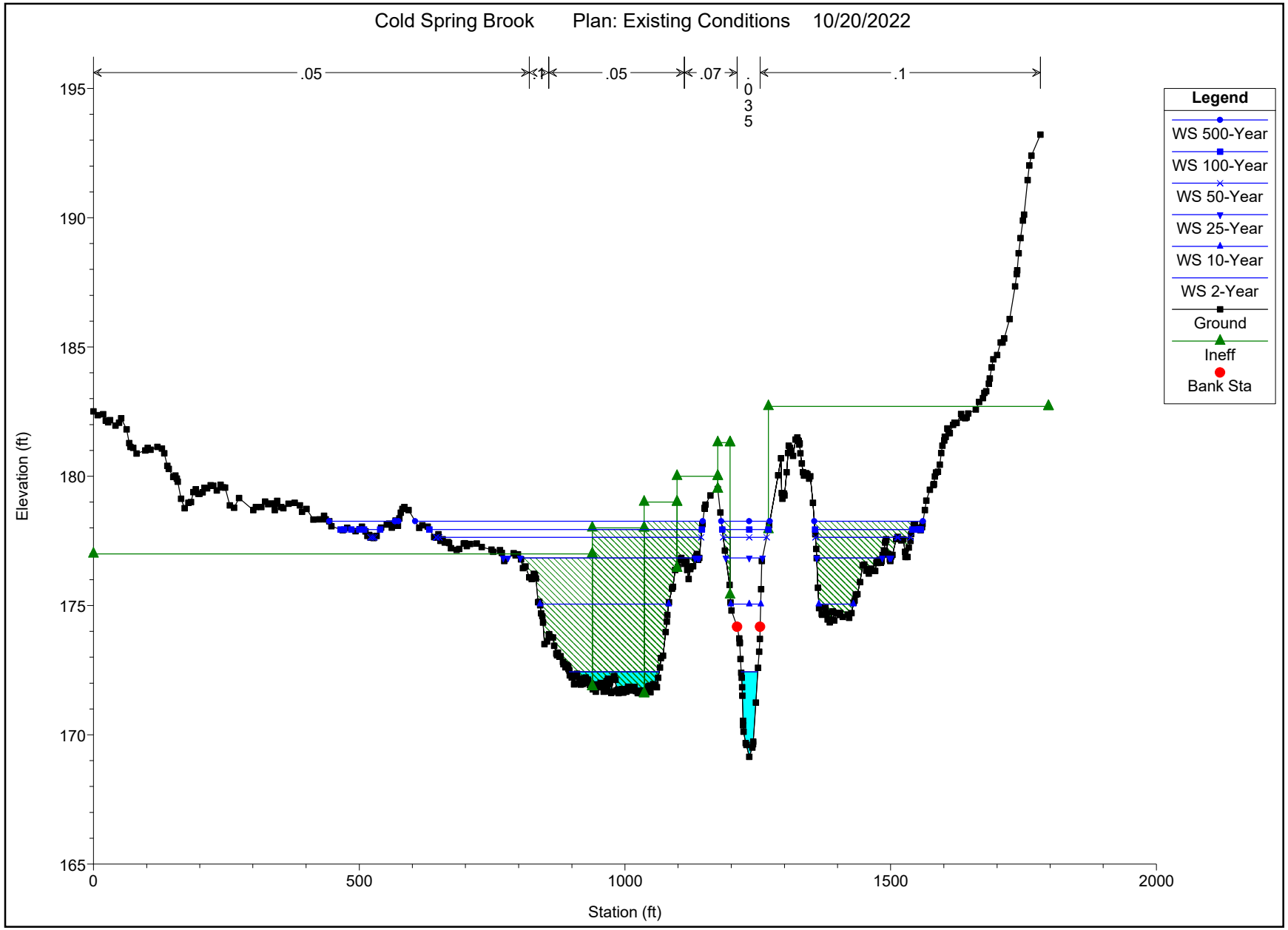
HEC-RAS Plan: EC River: Cold Spring Brk Reach: Reach 1 (Continued)

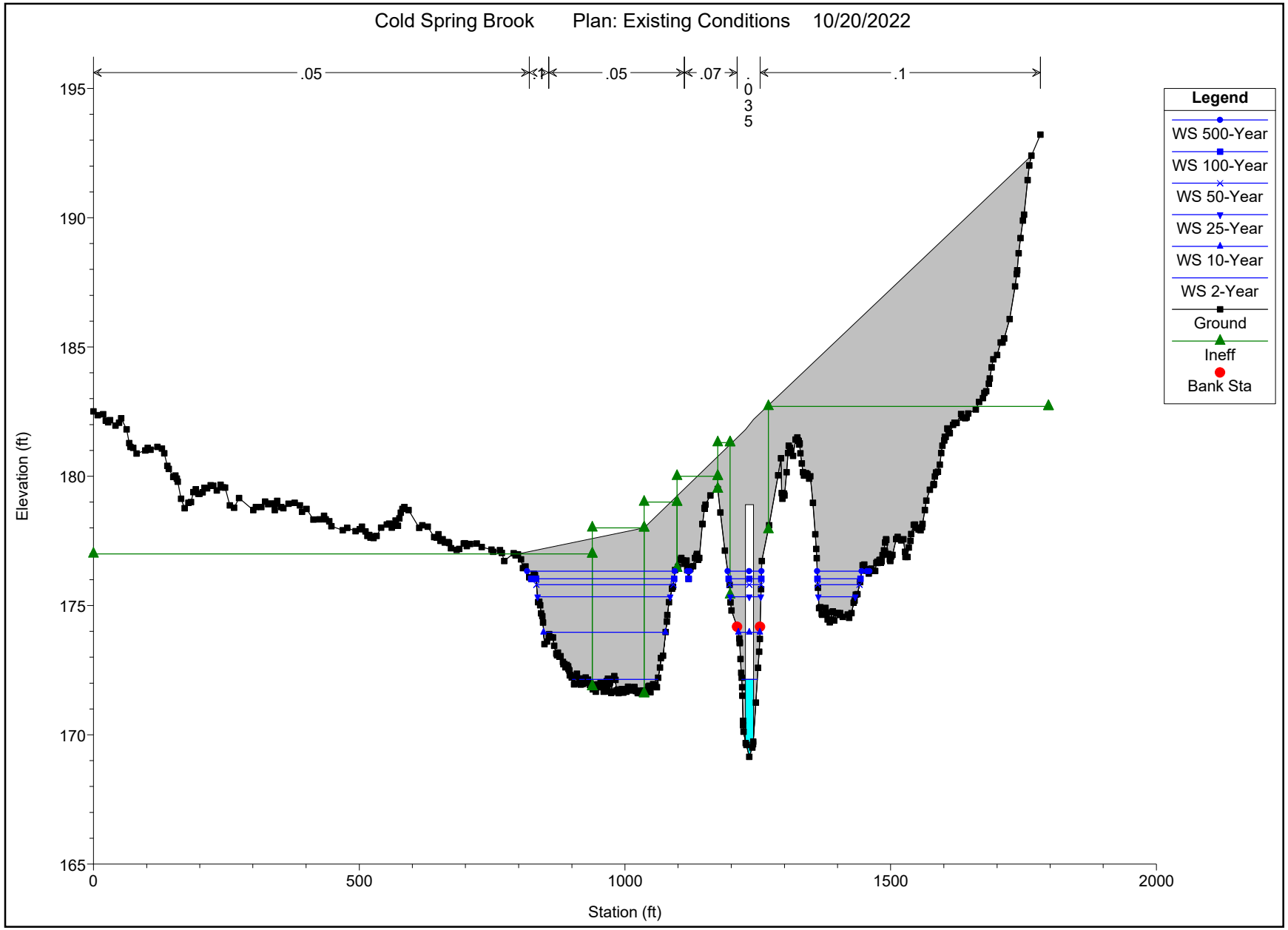
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1164	25-Year	830.00	168.70	174.61		174.62	0.000082	1.02	884.71	309.59	0.09
Reach 1	1164	50-Year	1030.00	168.70	175.21		175.22	0.000067	1.00	1086.47	354.00	0.08
Reach 1	1164	100-Year	1250.00	168.70	175.81		175.83	0.000054	0.98	1310.38	390.08	0.07
Reach 1	1164	500-Year	1610.00	168.70	175.99		176.02	0.000076	1.18	1383.13	409.57	0.09
Reach 1	97	2-Year	180.00	168.40	170.77	170.67	171.30	0.014022	5.83	30.88	24.25	0.91
Reach 1	97	10-Year	550.00	168.40	172.00	172.00	173.14	0.013684	8.59	65.23	31.85	0.99
Reach 1	97	25-Year	830.00	168.40	172.76	172.76	174.18	0.011755	9.62	92.42	39.03	0.97
Reach 1	97	50-Year	1030.00	168.40	173.26	173.26	174.82	0.010743	10.16	112.67	42.59	0.95
Reach 1	97	100-Year	1250.00	168.40	173.73	173.73	175.45	0.010209	10.75	133.68	47.45	0.94
Reach 1	97	500-Year	1610.00	168.40	175.37	175.37	175.75	0.002098	6.11	445.21	468.22	0.45

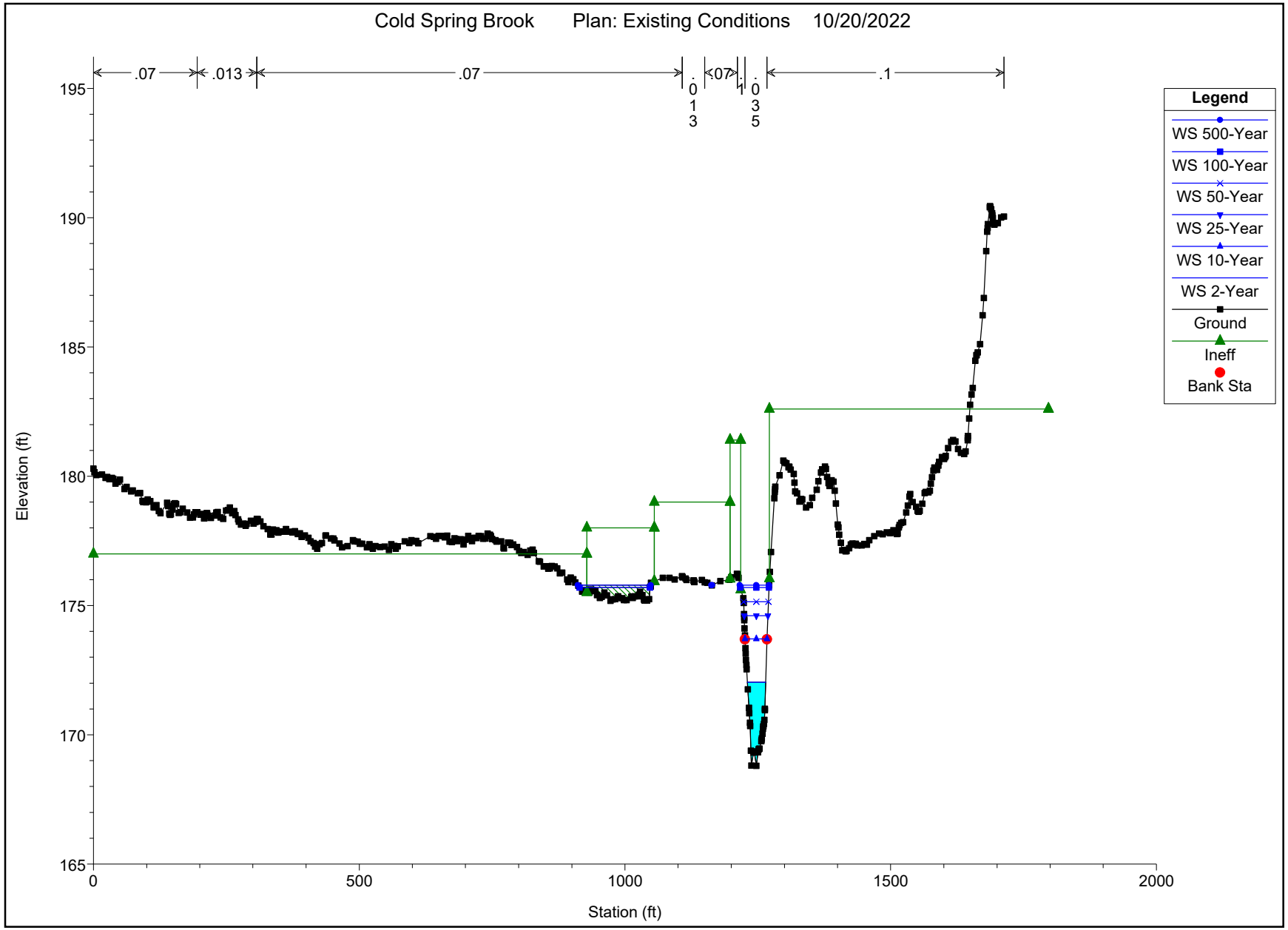

Cold Spring Brook Plan: Existing Conditions 10/20/2022
Cold Spring Brk Reach 1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Elevation (ft)
180
178
176
174
172
170
168
0
500
1000
1500
2000
2500
Main Channel Distance (ft)

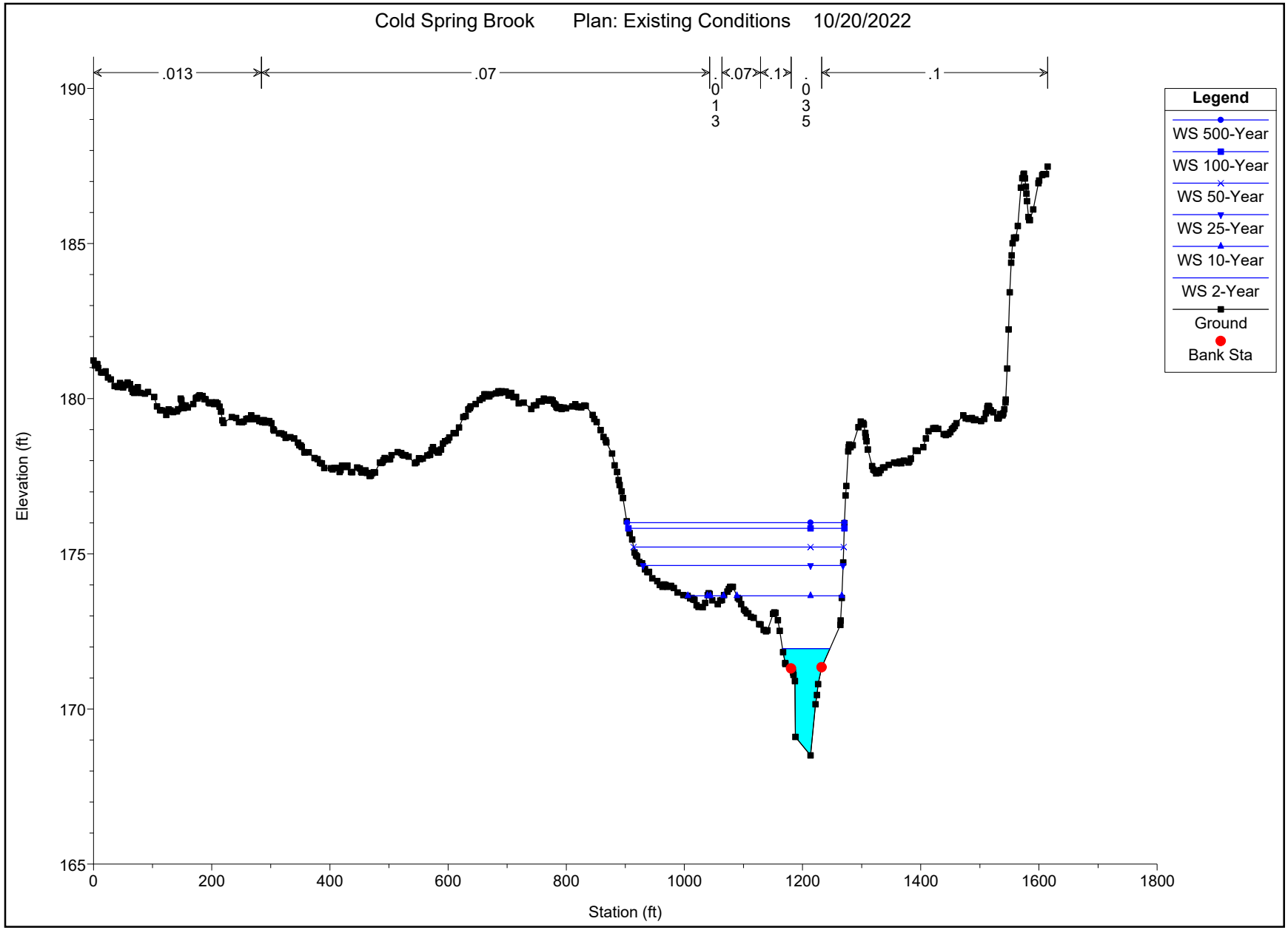

Cold Spring Brook Plan: Existing Conditions 10/20/2022
.07
.1
.05
.035
.05
.1
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Ineff
Bank Sta
Elevation (ft)
188
186
184
182
180
178
176
174
172
170
0
500
1000
1500
2000
Station (ft)
1

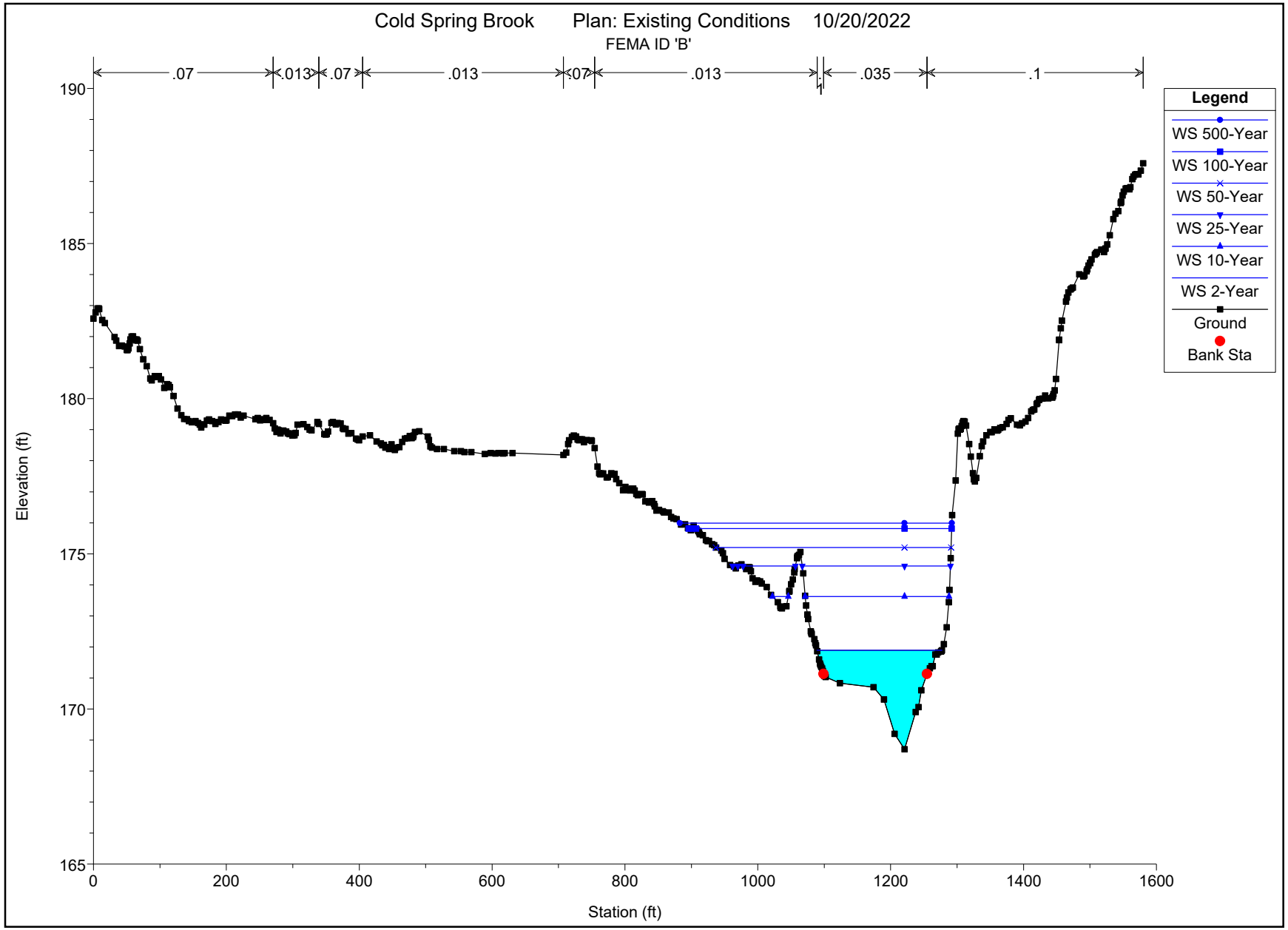

Cold Spring Brook Plan: Existing Conditions 10/20/2022
FEMA ID 'C'
.07
.05
.07
.035
.1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Ineff
Bank Sta
Elevation (ft)
195
190
185
180
175
170
165
0
500
1000
1500
2000
Station (ft)

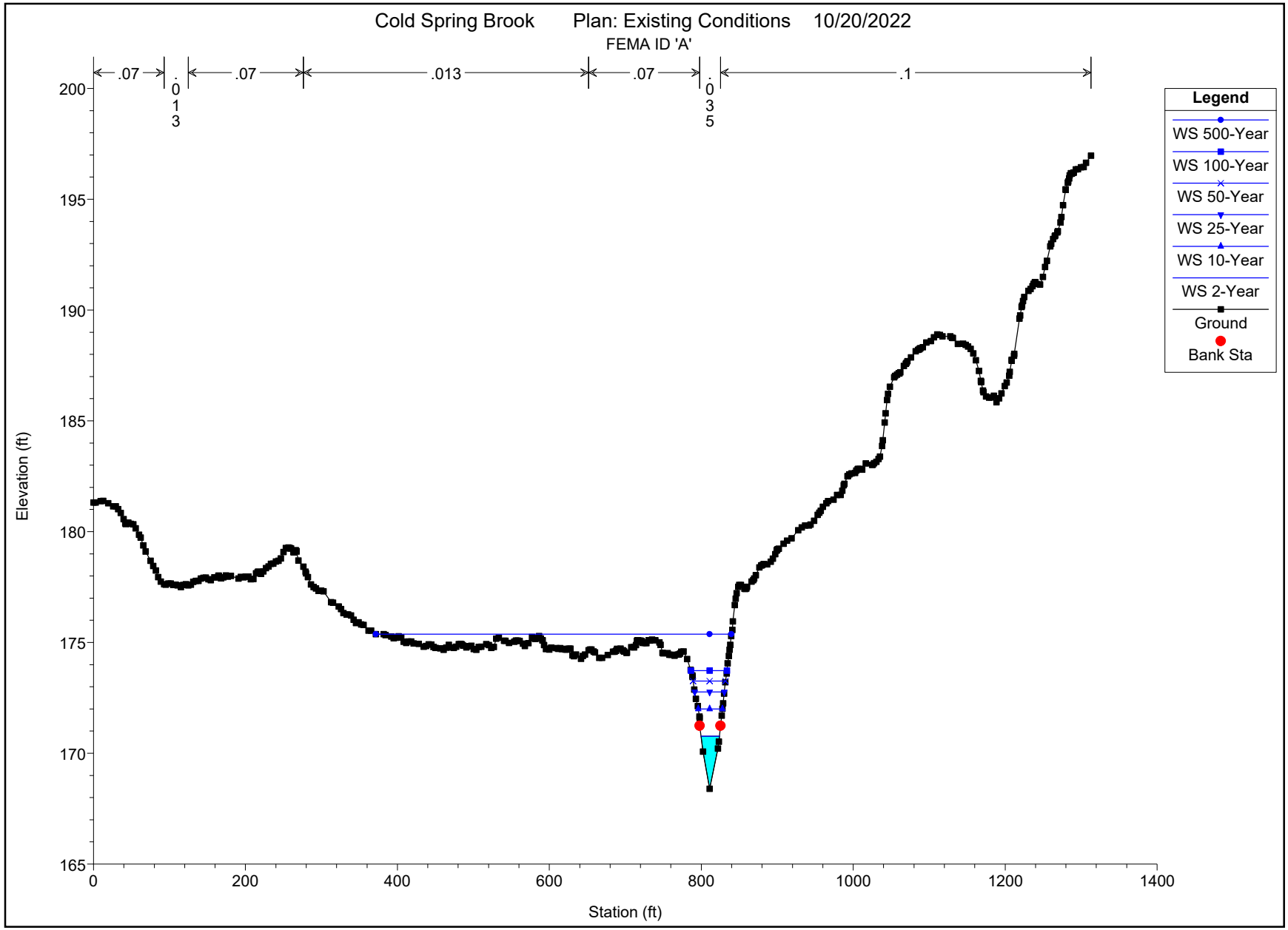

Cold Spring Brook Plan: Existing Conditions 10/20/2022
.05
.05
.07
.1
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Ineff
Bank Sta
Elevation (ft)
195
190
185
180
175
170
165
0
500
1000
1500
2000
Station (ft)


Cold Spring Brook Plan: Existing Conditions 10/20/2022
.05
.05
.07
.035
.1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Ineff
Bank Sta
Elevation (ft)
195
190
185
180
175
170
165
0
500
1000
1500
2000
Station (ft)


Cold Spring Brook Plan: Existing Conditions 10/20/2022
.07
.013
.07
.013
.07
.035
.1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Ineff
Bank Sta
Elevation (ft)
195
190
185
180
175
170
165
0
500
1000
1500
2000
Station (ft)


Cold Spring Brook Plan: Existing Conditions 10/20/2022
.013
.07
.013
.07
.1
.035
.1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Bank Sta
Elevation (ft)
190
185
180
175
170
165
0
200
400
600
800
1000
1200
1400
1600
1800
Station (ft)


Cold Spring Brook Plan: Existing Conditions 10/20/2022
FEMA ID 'B'
.07
.013
.07
.013
.07
.013
.035
.1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Bank Sta
Elevation (ft)
190
185
180
175
170
165
0
200
400
600
800
1000
1200
1400
1600
Station (ft)

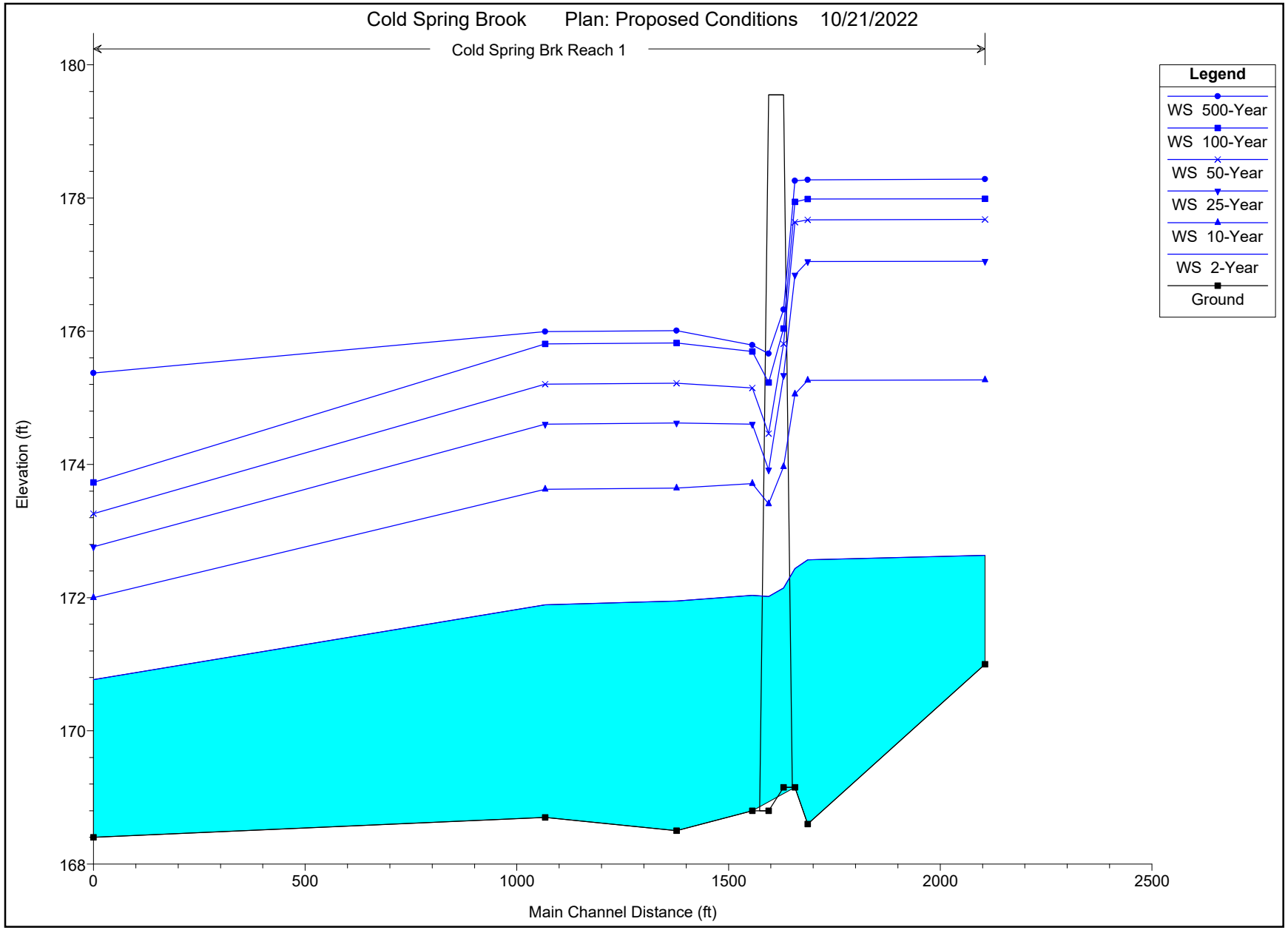

Cold Spring Brook Plan: Existing Conditions 10/20/2022
FEMA ID 'A'
.07
.013
.07
.1
.07
.013
.035
Elevation (ft)
Station (ft)
200
195
190
185
180
175
170
165
0
200
400
600
800
1000
1200
1400
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Bank Sta

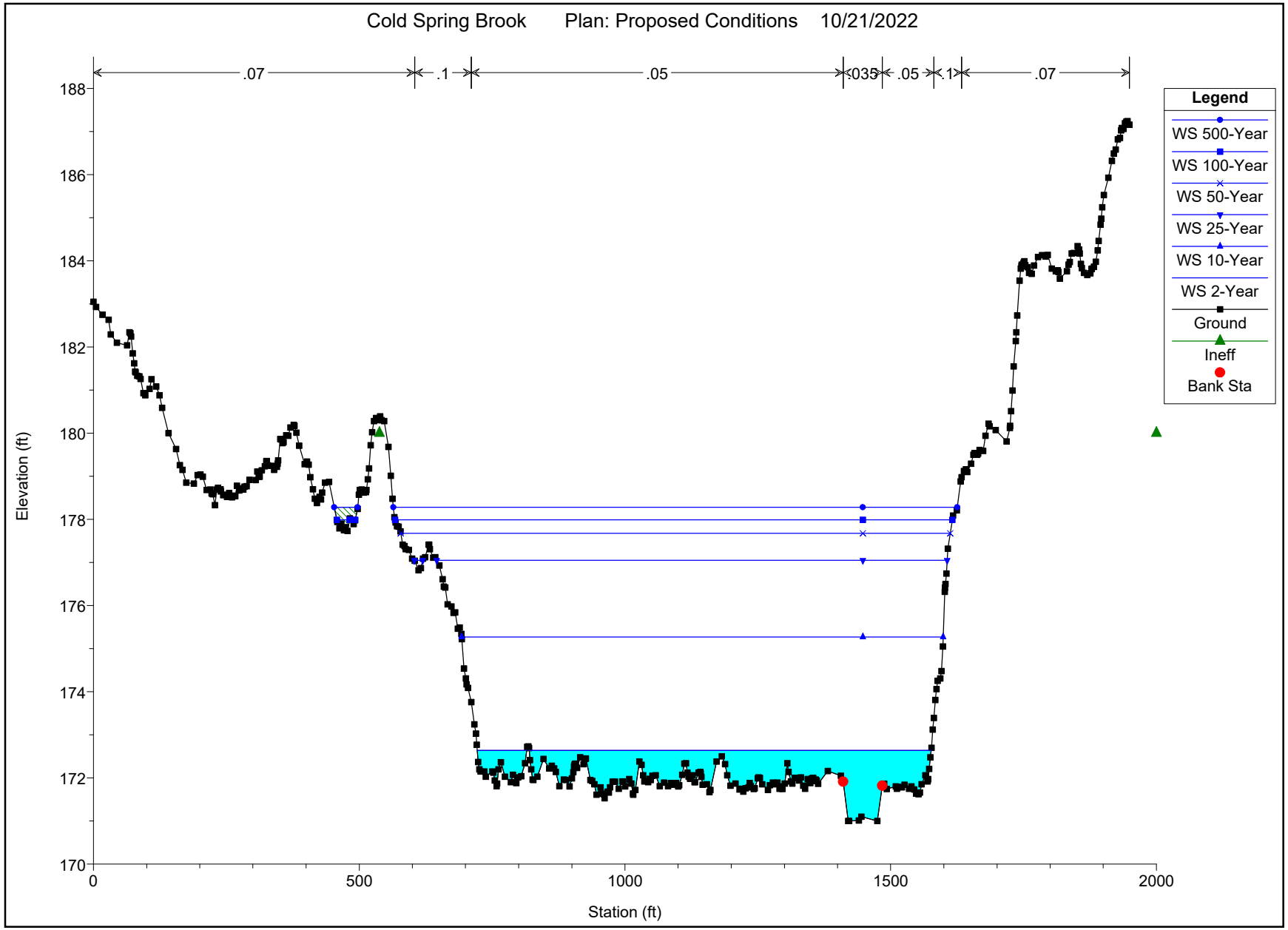
HEC-RAS Plan: PC River: Cold Spring Brk Reach: Reach 1

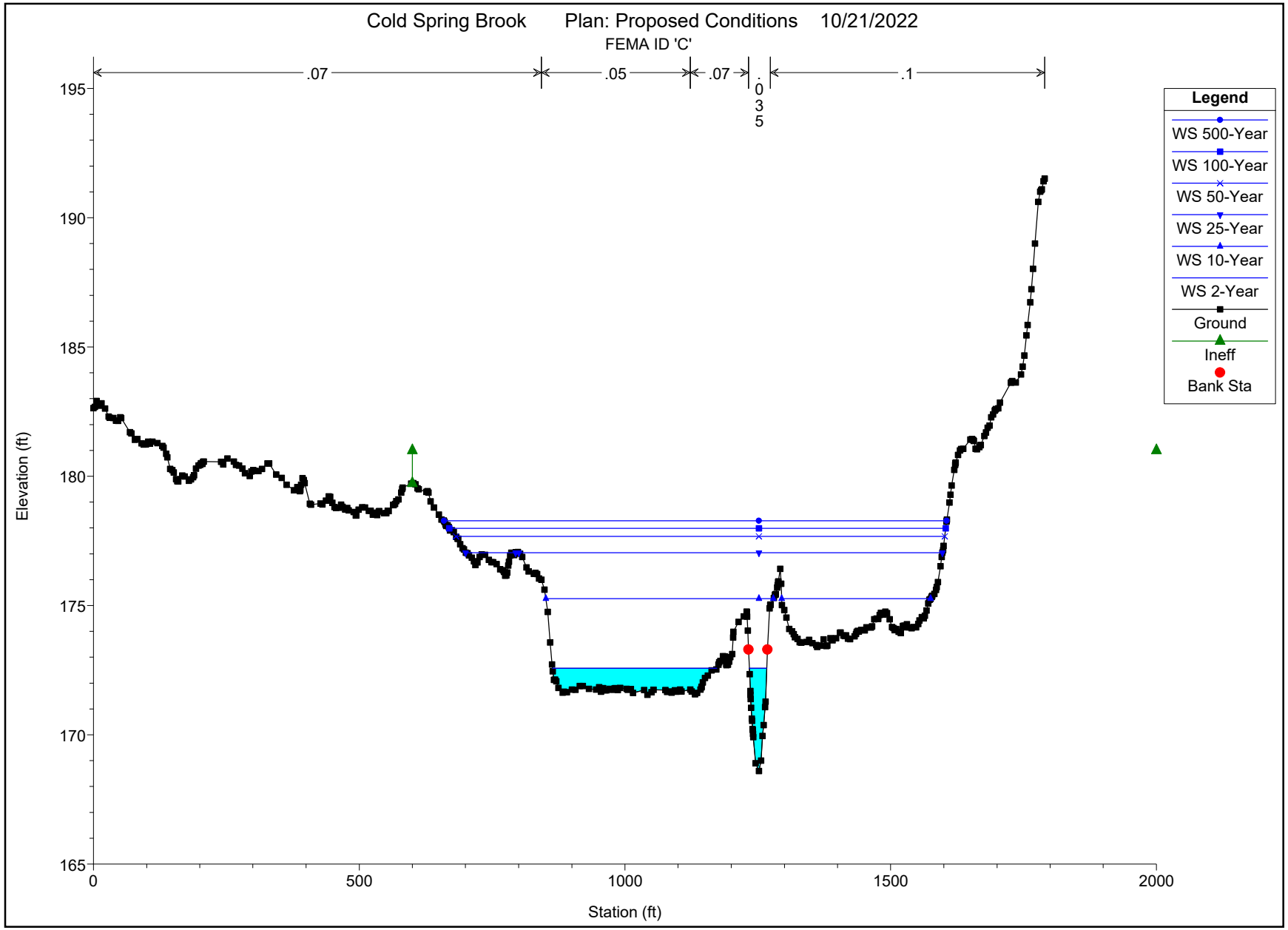
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	2204	2-Year	180.00	171.00	172.64	171.73	172.64	0.000096	0.55	625.74	848.99	0.08
Reach 1	2204	10-Year	550.00	171.00	175.27	172.17	175.27	0.000007	0.29	2943.62	906.07	0.03
Reach 1	2204	25-Year	830.00	171.00	177.05	172.29	177.05	0.000004	0.28	4608.05	976.38	0.02
Reach 1	2204	50-Year	1030.00	171.00	177.68	172.36	177.68	0.000004	0.30	5244.50	1033.82	0.02
Reach 1	2204	100-Year	1250.00	171.00	177.99	172.43	177.99	0.000005	0.35	5569.60	1080.94	0.02
Reach 1	2204	500-Year	1610.00	171.00	178.28	172.51	178.28	0.000007	0.42	5877.60	1105.06	0.03
Reach 1	1785	2-Year	180.00	168.60	172.57	170.57	172.58	0.000201	1.11	324.05	341.77	0.12
Reach 1	1785	10-Year	550.00	168.60	175.26	172.21	175.26	0.000029	0.65	1709.07	708.36	0.05
Reach 1	1785	25-Year	830.00	168.60	177.05	172.43	177.05	0.000014	0.57	3087.58	891.00	0.04
Reach 1	1785	50-Year	1030.00	168.60	177.67	172.56	177.68	0.000015	0.60	3657.38	919.91	0.04
Reach 1	1785	100-Year	1250.00	168.60	177.98	172.68	177.99	0.000018	0.68	3945.57	934.17	0.04
Reach 1	1785	500-Year	1610.00	168.60	178.27	172.84	178.28	0.000024	0.82	4218.12	945.84	0.05
Reach 1	1755	2-Year	180.00	169.15	172.44	170.92	172.54	0.001342	2.59	69.44	199.94	0.31
Reach 1	1755	10-Year	550.00	169.15	175.06	172.32	175.22	0.000959	3.20	177.58	363.98	0.28
Reach 1	1755	25-Year	830.00	169.15	176.84	173.08	177.00	0.000595	3.23	282.34	536.34	0.24
Reach 1	1755	50-Year	1030.00	169.15	177.64	173.54	177.67	0.000151	1.78	928.41	757.33	0.12
Reach 1	1755	100-Year	1250.00	169.15	177.94	174.02	177.98	0.000178	1.99	1047.81	836.04	0.13
Reach 1	1755	500-Year	1610.00	169.15	178.26	174.63	178.27	0.000089	1.45	1836.10	965.42	0.10
Reach 1	1728		Mult Open									
Reach 1	1654	2-Year	180.00	168.80	172.03	170.59	172.12	0.001170	2.38	75.49	34.55	0.28
Reach 1	1654	10-Year	550.00	168.80	173.71	171.82	173.95	0.001824	3.94	139.63	41.57	0.38
Reach 1	1654	25-Year	830.00	168.80	174.60	172.50	174.95	0.001895	4.70	178.10	44.64	0.40
Reach 1	1654	50-Year	1030.00	168.80	175.15	172.94	175.56	0.001952	5.16	202.90	46.74	0.42
Reach 1	1654	100-Year	1250.00	168.80	175.70	173.36	176.18	0.001995	5.61	230.32	186.67	0.43
Reach 1	1654	500-Year	1610.00	168.80	175.79	173.95	176.57	0.003121	7.10	235.30	194.30	0.54
Reach 1	1475	2-Year	180.00	168.50	171.95		171.98	0.000397	1.47	132.53	80.59	0.17
Reach 1	1475	10-Year	550.00	168.50	173.64		173.72	0.000483	2.33	360.68	233.45	0.20
Reach 1	1475	25-Year	830.00	168.50	174.62		174.68	0.000354	2.30	658.50	338.39	0.18
Reach 1	1475	50-Year	1030.00	168.50	175.22		175.27	0.000289	2.24	867.60	355.60	0.17
Reach 1	1475	100-Year	1250.00	168.50	175.82		175.87	0.000242	2.19	1084.34	365.31	0.16
Reach 1	1475	500-Year	1610.00	168.50	176.01		176.07	0.000342	2.66	1152.64	368.01	0.19
Reach 1	1164	2-Year	180.00	168.70	171.89		171.90	0.000157	0.72	258.52	187.88	0.10
Reach 1	1164	10-Year	550.00	168.70	173.63		173.64	0.000106	0.97	620.12	240.36	0.09

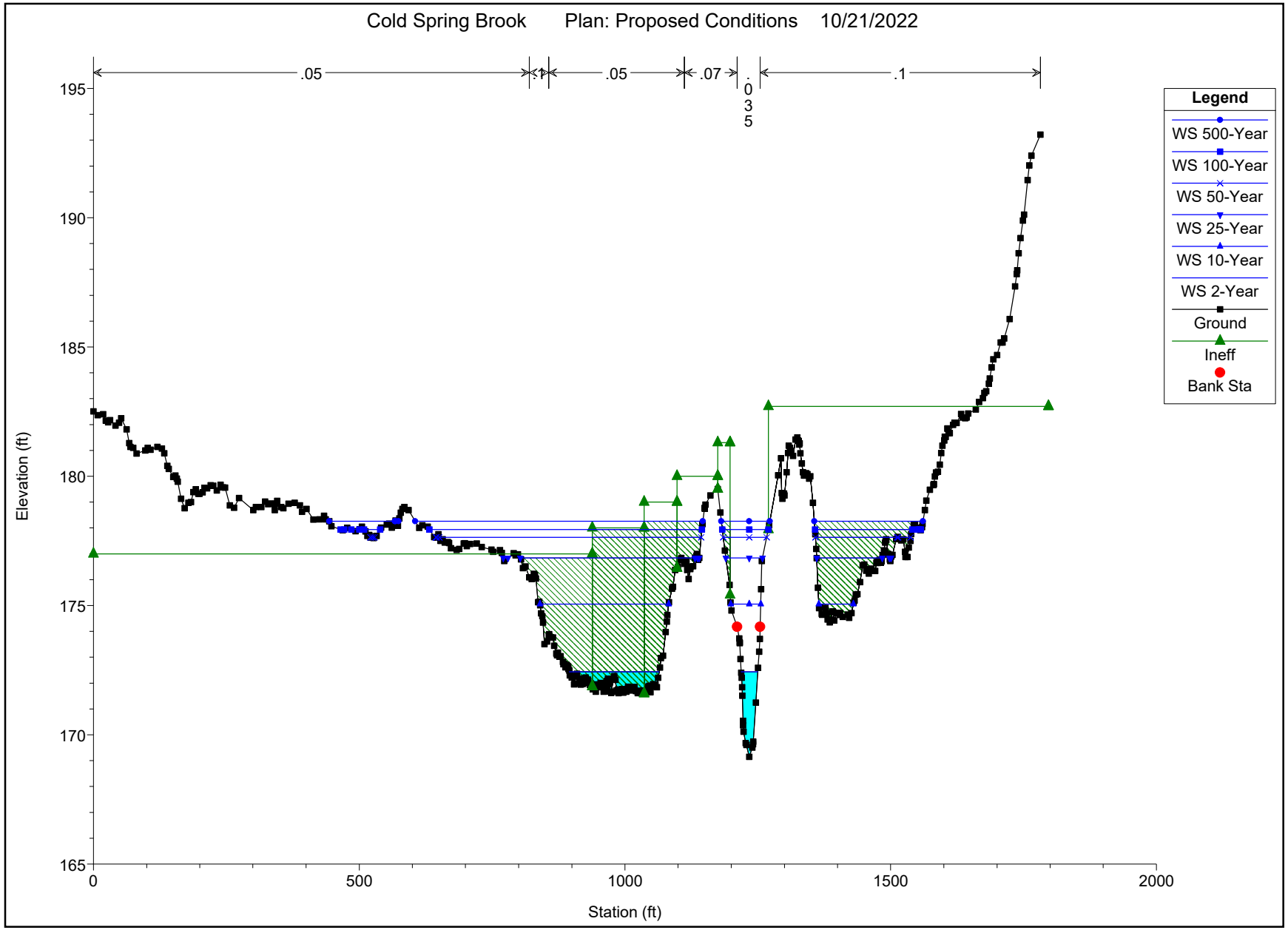
HEC-RAS Plan: PC River: Cold Spring Brk Reach: Reach 1 (Continued)

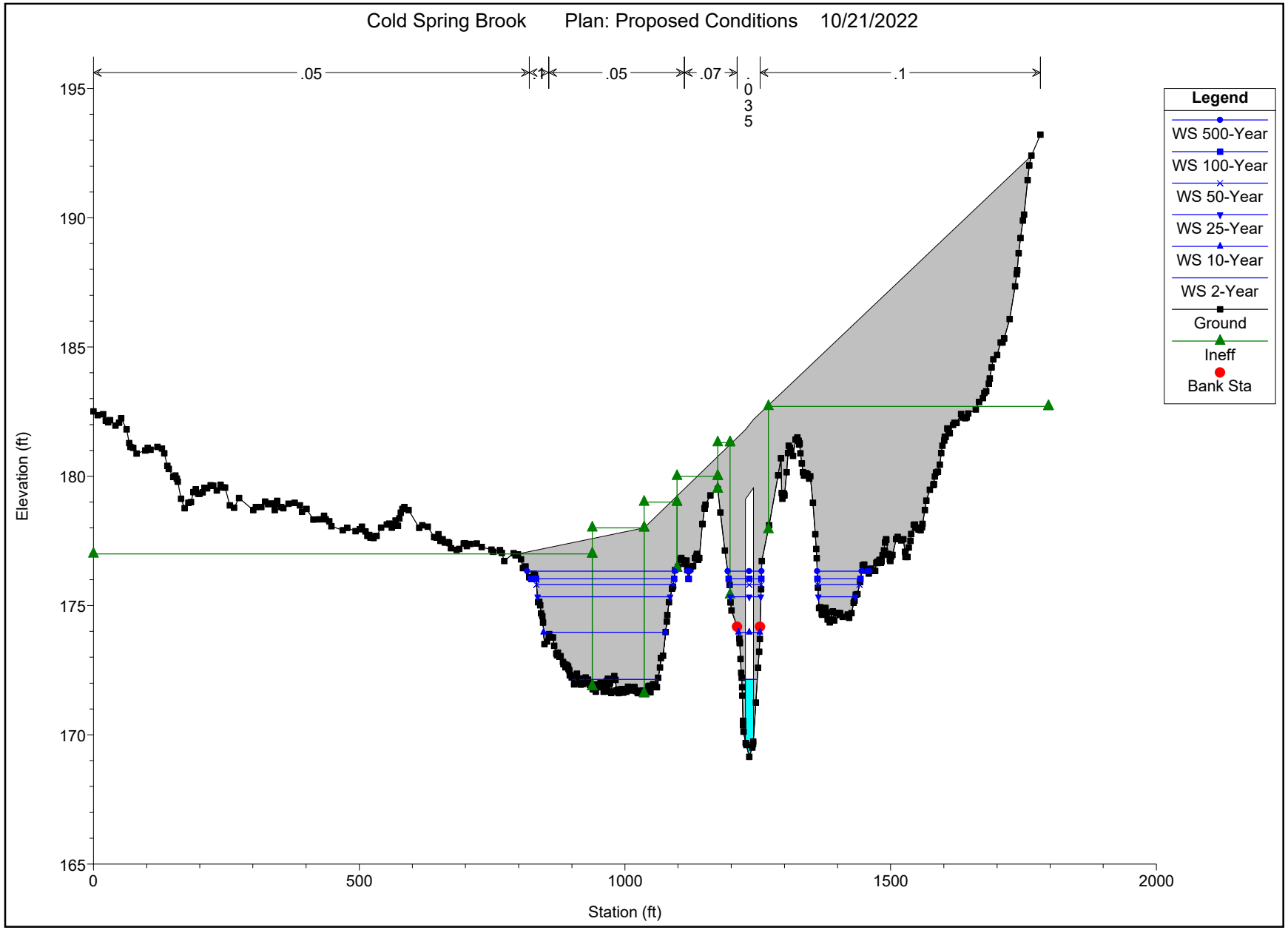
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1164	25-Year	830.00	168.70	174.61		174.62	0.000082	1.02	884.71	309.59	0.09
Reach 1	1164	50-Year	1030.00	168.70	175.21		175.22	0.000067	1.00	1086.47	354.00	0.08
Reach 1	1164	100-Year	1250.00	168.70	175.81		175.83	0.000054	0.98	1310.38	390.08	0.07
Reach 1	1164	500-Year	1610.00	168.70	175.99		176.02	0.000076	1.18	1383.13	409.57	0.09
Reach 1	97	2-Year	180.00	168.40	170.77	170.67	171.30	0.014022	5.83	30.88	24.25	0.91
Reach 1	97	10-Year	550.00	168.40	172.00	172.00	173.14	0.013684	8.59	65.23	31.85	0.99
Reach 1	97	25-Year	830.00	168.40	172.76	172.76	174.18	0.011755	9.62	92.42	39.03	0.97
Reach 1	97	50-Year	1030.00	168.40	173.26	173.26	174.82	0.010743	10.16	112.67	42.59	0.95
Reach 1	97	100-Year	1250.00	168.40	173.73	173.73	175.45	0.010209	10.75	133.68	47.45	0.94
Reach 1	97	500-Year	1610.00	168.40	175.37	175.37	175.75	0.002098	6.11	445.21	468.22	0.45

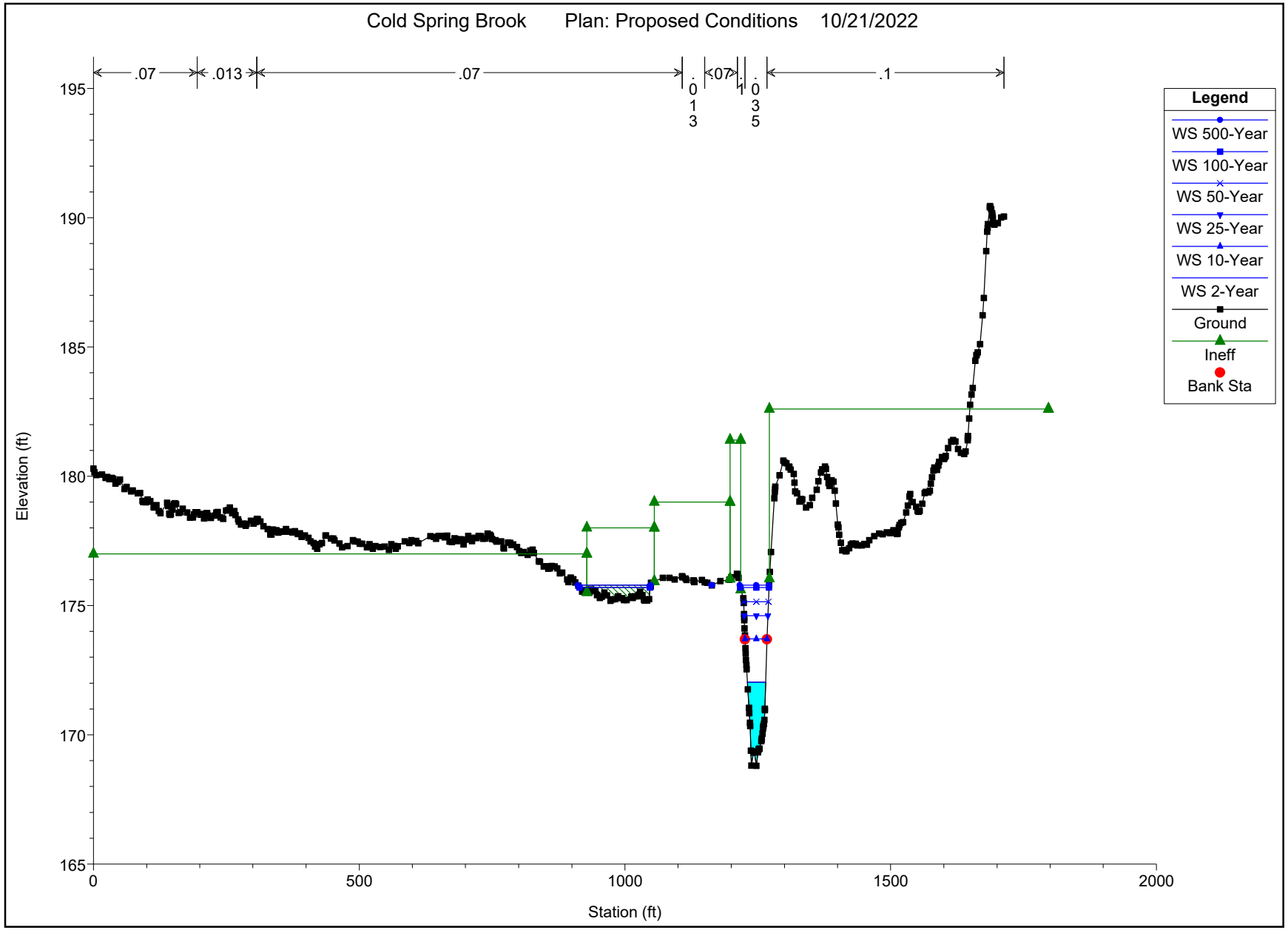

Cold Spring Brook Plan: Proposed Conditions 10/21/2022
Cold Spring Brk Reach 1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Elevation (ft)
180
178
176
174
172
170
168
0
500
1000
1500
2000
2500
Main Channel Distance (ft)


Cold Spring Brook Plan: Proposed Conditions 10/21/2022
.07
.1
.05
.035
.05
.1
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Ineff
Bank Sta
Elevation (ft)
188
186
184
182
180
178
176
174
172
170
0
500
1000
1500
2000
Station (ft)
1


Cold Spring Brook Plan: Proposed Conditions 10/21/2022
FEMA ID 'C'
.07
.05
.07
.035
.1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Ineff
Bank Sta
Elevation (ft)
195
190
185
180
175
170
165
0
500
1000
1500
2000
Station (ft)


Cold Spring Brook Plan: Proposed Conditions 10/21/2022
.05
.05
.07
.035
.1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Ineff
Bank Sta
Elevation (ft)
195
190
185
180
175
170
165
0
500
1000
1500
2000
Station (ft)


Cold Spring Brook Plan: Proposed Conditions 10/21/2022
.05
.05
.07
.035
.1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Ineff
Bank Sta
Elevation (ft)
195
190
185
180
175
170
165
0
500
1000
1500
2000
Station (ft)


Cold Spring Brook Plan: Proposed Conditions 10/21/2022
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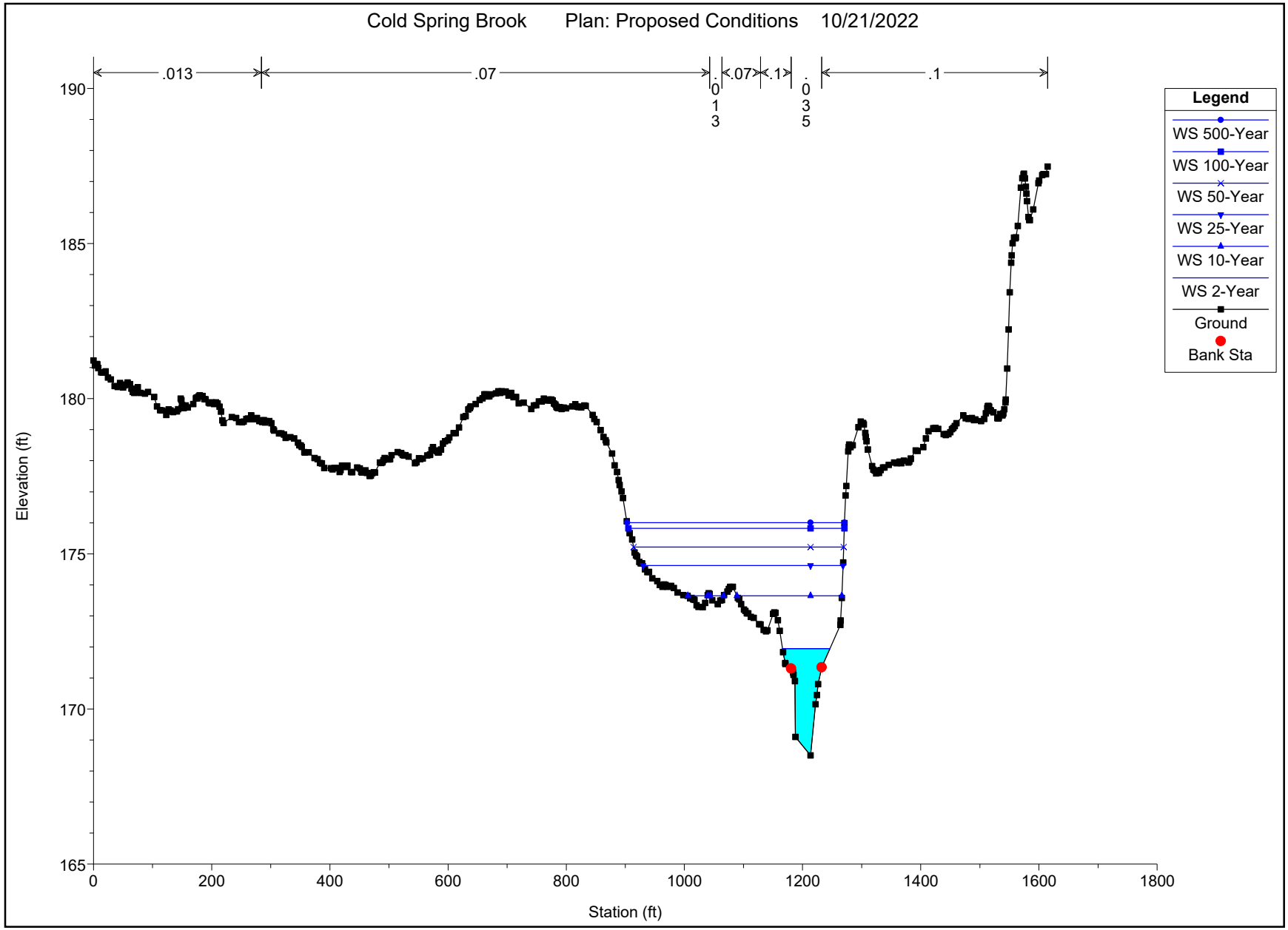
.07
.035
.1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Ineff
Bank Sta
Elevation (ft)
195
190
185
180
175
170
165
0
500
1000
1500
2000
Station (ft)


Cold Spring Brook Plan: Proposed Conditions 10/21/2022
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.013
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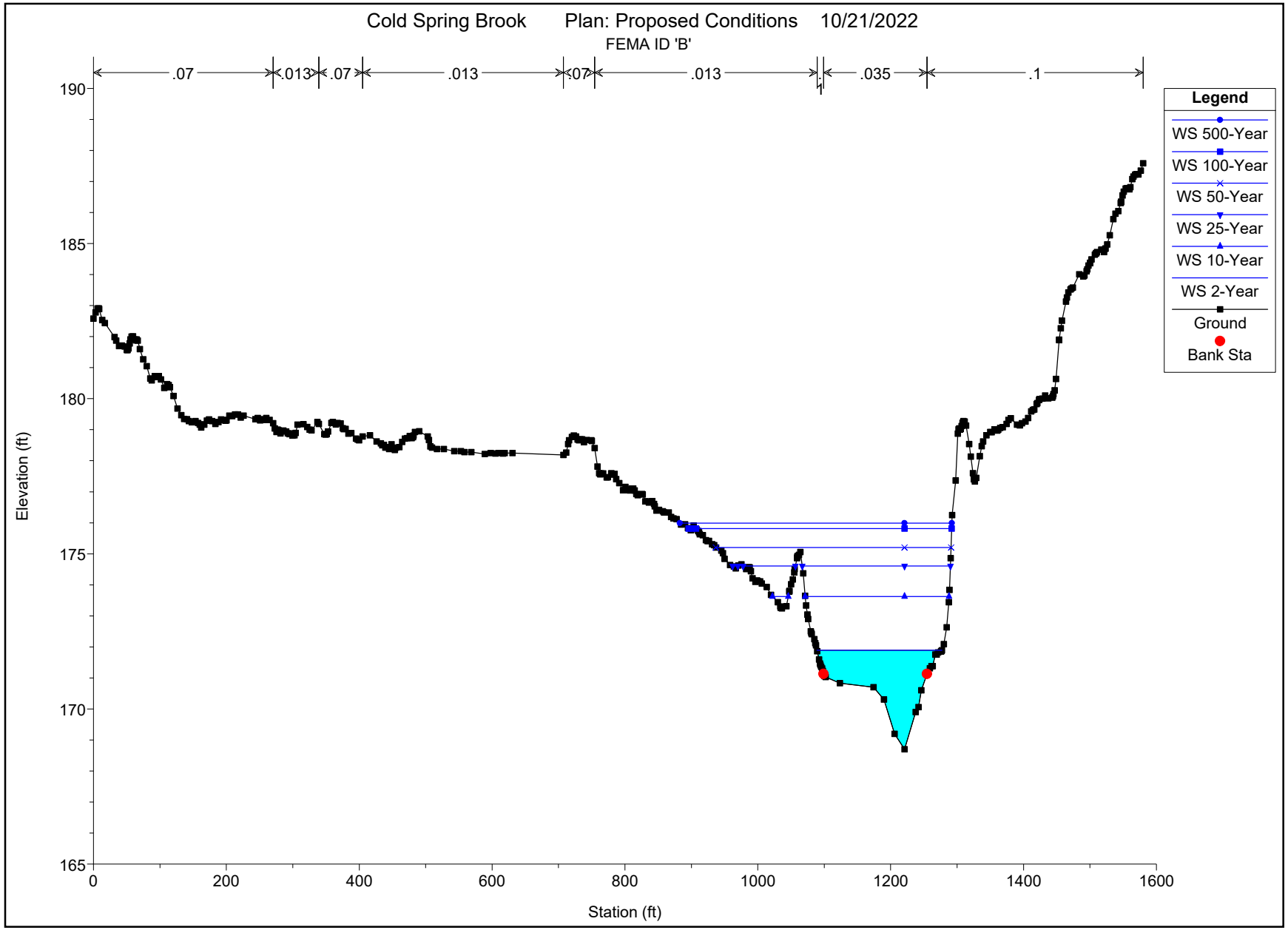
.1
.035
.1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Bank Sta
Elevation (ft)
190
185
180
175
170
165
0
200
400
600
800
1000
1200
1400
1600
1800
Station (ft)


Cold Spring Brook Plan: Proposed Conditions 10/21/2022
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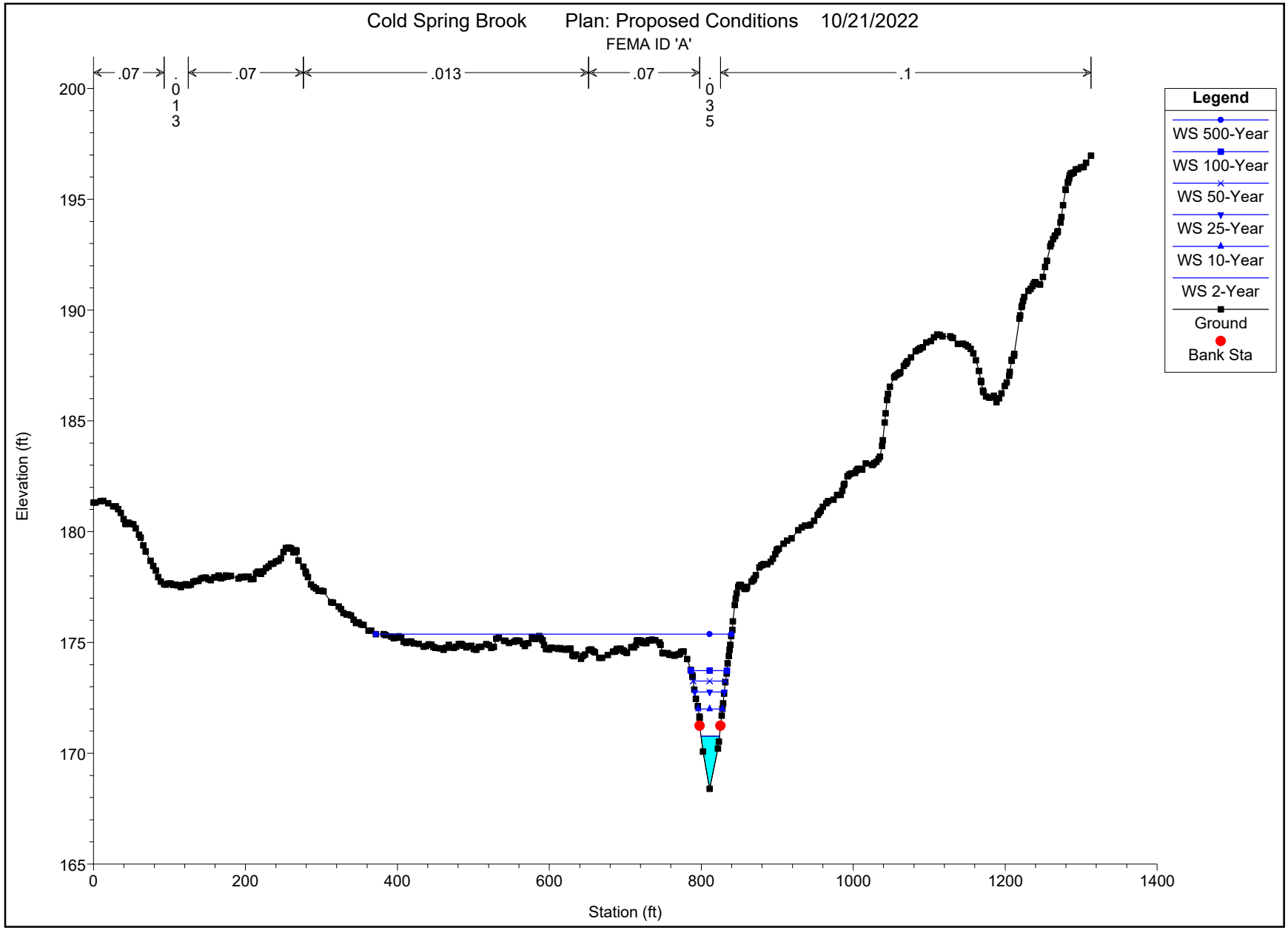
.013
.07
.013
.07
.013
.035
.1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Bank Sta
Elevation (ft)
190
185
180
175
170
165
0
200
400
600
800
1000
1200
1400
1600
Station (ft)


Cold Spring Brook Plan: Proposed Conditions 10/21/2022
FEMA ID 'A'
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.013
.07
.07
.1
.013
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 25-Year
WS 10-Year
WS 2-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
200
195
190
185
180
175
170
165
0
200
400
600
800
1000
1200
1400

ATTACHMENT C
Scour Results

SCOUR ANALYSIS (D50=3mm) - CONTRACTION SCOUR & ABUTMENT SCOUR

Tighe&Bond

Proposed 15.5' span bridge - 2% AEP (50-Year) - NOT USED FOR DESIGN

Bridge/Culvert Name:	Main Street Culvert
Town	Ashland, MA
Lat:	42.253587
Long:	-71.458111
Storm Size:	50-Year
HEC-RAS Proj:	ColdSpringBrook.prj
HEC-RAS Geom:	ColdSpringBrook.g02.hdf
HEC-RAS XS1	1785
HEC-RAS XS2	1755

Notes
(1) Governing storms are 50-year for Scour Design and 100-Year for Scour Check (based on Table 1.3.4-1 in the MassDOT LRFD Bridge Manual.
(2) for scour at open-bottom culverts, refer to HEC-18 for equations
(3) left bank and right bank defined from looking downstream

Data Input (Constants from HEC-18 manual)

Description	Item	LOB	CHANNEL	ROB	
Constant for Critical Velocity Calculation (English Units)	Ku (crit)	11.17	11.17	11.17	
Constant for Clear-Water Scour Calculations (English Units)	Ku (CW-cont.)	0.0077	0.0077	0.0077	
Constant for Open Bottom Culvert Contraction Scour Calc	Ku (Open-Bottom)	0.84	0.84	0.84	
Hydraulic Depth at XS 1	y_1 (ft)	4.13	7.46	3.35	
Hydraulic Depth at XS 1 (for Critical Velocity Calculation)	y (ft)	**4.13**	**7.46**	**3.35**	
Hydraulic Depth at XS 2 Prior to Scour	y_0 (ft)	2.07	6.54	0.9	
Flow at XS 1	Q_1 (ft^3/s)	720.35	159.19	150.46	
Flow at XS 2	Q_2 (ft^3/s)	444.6	500.72	2.34	<- varies per multiple opening analysis
Top Width at XS1	W_1 (ft)	550.51	35.6	333.81	
Top Width at XS2	W_2 (ft)	524.44	43.12	189.76	
Unit Discharge at XS1	q_1 (ft^2/s)	**1.31**	**4.47**	**0.45**	
Unit Discharge at XS2	q_2 (ft^2/s)	**0.85**	**11.61**	**0.01**	
Velocity at XS1	V_1 (ft/s)	0.32	0.6	0.13	
Velocity at XS1 (For Critical Scour Equation V is V1)	V (ft/s)	**0.32**	**0.6**	**0.13**	
Energy Grade Line at XS1	S_1 (ft/ft)	0.000015	0.000015	0.000015	
D50 from Sieve Analysis	D50 (mm)	0.6	3.0	0.6	<-- 100mm D50 used for design
D50 from Sieve Analysis with Conversion from mm to ft	D50 (ft)	0.002	0.010	0.002	

Critical Velocity

$$V_c = K_u y^{1/6} D_{50}^{1/3}$$

Input:

	LOB	CHANNEL	ROB	
Ku (crit)	**11.17**	**11.17**	**11.17**	<- constant English units
y (ft)	**4.13**	**7.46**	**3.35**	<- hydraulic depth from HEC-RAS upstream cross section
D50 (ft)	**0.002**	**0.010**	**0.002**	<- based on sieve analysis
V (ft/s)	**0.32**	**0.6**	**0.13**	<- mean channel velocity in HEC-RAS

Output:

Vc (ft/s)	**1.77**	**3.35**	**1.71**	
Clear-Water ??	YES	YES	YES	
Live-Bed ??	NO	NO	NO	
Contraction Scour Equations	**Clear-Water**	**Clear-Water**	**Clear-Water**	<- Calculate for "live-bed" and for "clear-water Open-Bottom Culvert"

SCOUR ANALYSIS (D50=3mm) - CONTRACTION SCOUR & ABUTMENT SCOUR

Tighe&Bond

Proposed 15.5' span bridge - 2% AEP (50-Year) - NOT USED FOR DESIGN

Bridge/Culvert Name:	Main Street Culvert
Town	Ashland, MA
Lat:	42.253587
Long:	-71.458111

Storm Size:	50-Year
HEC-RAS Proj:	ColdSpringBrook.prj
HEC-RAS Geom:	ColdSpringBrook.g02.hdf

Clear-Water Scour Equation for Open-Bottom Culverts (with WingWall)

$$y_{max}=K_u Q_{BI}^{0.28}\left(\frac{Q}{W_C D_{50}^{1/3}}\right)^{0.26} \qquad y_s=y_2-y_0$$

		Left	Right	
Input:	Ku (Open-Bottom)	0.84	0.84	<- 0.84 english units; 1.16 SI units
	QBI (cfs)	621	58	<- Discharge blocked by road embankment on one side of culvert (estimated using HEC-RAS Flow Tubes) and adjusted per multiple flow analysis
	Q_{CULV} (ft^3/s)	947.66	947.66	<Full Culvert Flow
	Wc (ft)	15.5	15.5	<- Culvert Width
	D50 (ft)	0.00984	0.00984	
	y0 (ft)	6.08	5.9	<- Cross Section 2 Hydraulic Depth at Culvert Corner
	ymax (ft)	22.12	11.39	
	ys (ft)	16.04	5.49	
CONTRACTION SCOUR + ABUTMENT SCOUR ESTIMATE FOR OPEN BOTTOM CULVERT (feet)		Open Bottom Culvert Scour: 16.0	Open Bottom Culvert Scour: 5.5	<-- 100mm D50 scour depths used for design

SCOUR ANALYSIS (D50=100mm) - CONTRACTION SCOUR & ABUTMENT SCOUR

Tighe&Bond

Proposed 15.5' span bridge - 2% AEP (50-Year)

Bridge/Culvert Name:	Main Street Culvert
Town	Ashland, MA
Lat:	42.253587
Long:	-71.458111
Storm Size:	50-Year
HEC-RAS Proj:	ColdSpringBrook.prj
HEC-RAS Geom:	ColdSpringBrook.g02.hdf
HEC-RAS XS1	1785
HEC-RAS XS2	1755

Notes
(1) Governing storms are 50-year for Scour Design and 100-Year for Scour Check (based on Table 1.3.4-1 in the MassDOT LRFD Bridge Manual.
(2) for scour at open-bottom culverts, refer to HEC-18 for equations
(3) left bank and right bank defined from looking downstream

Data Input (Constants from HEC-18 manual)

Description	Item	LOB	CHANNEL	ROB	
Constant for Critical Velocity Calculation (English Units)	Ku (crit)	11.17	11.17	11.17	
Constant for Clear-Water Scour Calculations (English Units)	Ku (CW-cont.)	0.0077	0.0077	0.0077	
Constant for Open Bottom Culvert Contraction Scour Calc	Ku (Open-Bottom)	0.84	0.84	0.84	
Hydraulic Depth at XS 1	y_1 (ft)	4.13	7.46	3.35	
Hydraulic Depth at XS 1 (for Critical Velocity Calculation)	y (ft)	**4.13**	**7.46**	**3.35**	
Hydraulic Depth at XS 2 Prior to Scour	y_0 (ft)	2.07	6.54	0.9	
Flow at XS 1	Q_1 (ft^3/s)	720.35	159.19	150.46	
Flow at XS 2	Q_2 (ft^3/s)	444.6	500.72	2.34	<- varies per multiple opening analysis
Top Width at XS1	W_1 (ft)	550.51	35.6	333.81	
Top Width at XS2	W_2 (ft)	524.44	43.12	189.76	
Unit Discharge at XS1	q_1 (ft^2/s)	**1.31**	**4.47**	**0.45**	
Unit Discharge at XS2	q_2 (ft^2/s)	**0.85**	**11.61**	**0.01**	
Velocity at XS1	V_1 (ft/s)	0.32	0.6	0.13	
Velocity at XS1 (For Critical Scour Equation V is V1)	V (ft/s)	**0.32**	**0.6**	**0.13**	
Energy Grade Line at XS1	S_1 (ft/ft)	0.000015	0.000015	0.000015	
D50 from Sieve Analysis	D50 (mm)	0.6	100.0	0.6	
D50 from Sieve Analysis with Conversion from mm to ft	D50 (ft)	0.002	0.328	0.002	

Critical Velocity

$$V_c = K_u y^{1/6} D_{50}^{1/3}$$

Input:

	LOB	CHANNEL	ROB	
Ku (crit)	**11.17**	**11.17**	**11.17**	<- constant English units
y (ft)	**4.13**	**7.46**	**3.35**	<- hydraulic depth from HEC-RAS upstream cross section
D50 (ft)	**0.002**	**0.328**	**0.002**	<- based on sieve analysis
V (ft/s)	**0.32**	**0.6**	**0.13**	<- mean channel velocity in HEC-RAS

Output:

Vc (ft/s)	**1.77**	**10.77**	**1.71**	
Clear-Water ??	YES	YES	YES	
Live-Bed ??	NO	NO	NO	
Contraction Scour Equations	**Clear-Water**	**Clear-Water**	**Clear-Water**	<- Calculate for "live-bed" and for "clear-water Open-Bottom Culvert"

SCOUR ANALYSIS (D50=100mm) - CONTRACTION SCOUR & ABUTMENT SCOUR

Tighe&Bond

Proposed 15.5' span bridge - 2% AEP (50-Year)

Bridge/Culvert Name:	Main Street Culvert
Town	Ashland, MA
Lat:	42.253587
Long:	-71.458111
Storm Size:	50-Year
HEC-RAS Proj:	ColdSpringBrook.prj
HEC-RAS Geom:	ColdSpringBrook.g02.hdf

Clear-Water Scour Equation for Open-Bottom Culverts (with WingWall)

$$y_{max}=K_u Q_{BI}^{0.28}\left(\frac{Q}{W_C D_{50}^{1/3}}\right)^{0.26} \qquad y_s=y_2-y_0$$

		Left	Right	
Input:	Ku (Open-Bottom)	0.84	0.84	<- 0.84 english units; 1.16 SI units
	QBI (cfs)	621	58	<- Discharge blocked by road embankment on one side of culvert (estimated using HEC-RAS Flow Tubes) and adjusted per multiple flow analysis
	Q_{CULV} (ft^3/s)	947.66	947.66	<Full Culvert Flow
	Wc (ft)	15.5	15.5	<- Culvert Width
	D50 (ft)	0.328	0.328	
	y0 (ft)	6.08	5.9	<- Cross Section 2 Hydraulic Depth at Culvert Corner
	ymax (ft)	16.32	8.40	
	ys (ft)	10.24	2.50	
CONTRACTION SCOUR + ABUTMENT SCOUR ESTIMATE FOR OPEN BOTTOM CULVERT (feet)		**Open Bottom Culvert Scour** 10.2	**Open Bottom Culvert Scour** 2.5	<-- Upstream corner for clearwater open bottom box culvert (Use this value)

SCOUR ANALYSIS (D50=3mm) - CONTRACTION SCOUR & ABUTMENT SCOUR

Tighe&Bond

Proposed 15.5' span bridge - 1% AEP (100-Year) - NOT USED FOR DESIGN

Bridge/Culvert Name:	Main Street Culvert
Town	Ashland, MA
Lat:	42.253587
Long:	-71.458111
Storm Size:	100-Year
HEC-RAS Proj:	ColdSpringBrook.prj
HEC-RAS Geom:	ColdSpringBrook.g02.hdf
HEC-RAS XS1	1785
HEC-RAS XS2	1755

Notes
(1) Governing storms are 50-year for Scour Design and 1000-Year for Scour Check (based on Table 1.3.4-1 in the MassDOT LRFD Bridge Manual.
(2) for scour at open-bottom culverts, refer to HEC-18 for equations
(3) left bank and right bank defined from looking downstream

Data Input (Constants from HEC-18 manual)

Description	Item	LOB	CHANNEL	ROB	
Constant for Critical Velocity Calculation (English Units)	Ku (crit)	11.17	11.17	11.17	
Constant for Clear-Water Scour Calculations (English Units)	Ku (CW-cont.)	0.0077	0.0077	0.0077	
Constant for Open Bottom Culvert Contraction Scour Calc	Ku (Open-Bottom)	0.84	0.84	0.84	
Hydraulic Depth at XS 1	y_1 (ft)	4.35	7.77	3.64	
Hydraulic Depth at XS 1 (for Critical Velocity Calculation)	y (ft)	**4.35**	**7.77**	**3.64**	
Hydraulic Depth at XS 2 Prior to Scour	y_0 (ft)	1.99	6.84	1	
Flow at XS 1	Q_1 (ft^3/s)	872.15	187.2	190.65	
Flow at XS 2	Q_2 (ft^3/s)	413.01	586.75	3.59	<- varies per multiple opening analysis
Top Width at XS1	W_1 (ft)	562.96	35.6	335.62	
Top Width at XS2	W_2 (ft)	592.4	43.12	200.52	
Unit Discharge at XS1	q_1 (ft^2/s)	**1.55**	**5.26**	**0.57**	
Unit Discharge at XS2	q_2 (ft^2/s)	**0.70**	**13.61**	**0.02**	
Velocity at XS1	V_1 (ft/s)	0.36	0.68	0.16	
Velocity at XS1 (For Critical Scour Equation V is V1)	V (ft/s)	**0.36**	**0.68**	**0.16**	
Energy Grade Line at XS1	S_1 (ft/ft)	0.000018	0.000018	0.000018	
D50 from Sieve Analysis	D50 (mm)	0.6	3.0	0.6	<-- 100mm D50 used for design
D50 from Sieve Analysis with Conversion from mm to ft	D50 (ft)	0.0020	0.0098	0.0020	

Critical Velocity

$$V_c = K_u y^{1/6} D_{50}^{1/3}$$

Input:

	LOB	CHANNEL	ROB	
Ku (crit)	**11.17**	**11.17**	**11.17**	<- constant English units
y (ft)	**4.35**	**7.77**	**3.64**	<- hydraulic depth from HEC-RAS upstream cross section
D50 (ft)	**0.002**	**0.010**	**0.002**	<- based on sieve analysis
V (ft/s)	**0.36**	**0.68**	**0.16**	<- mean channel velocity in HEC-RAS

Output:

Vc (ft/s)	**1.79**	**3.37**	**1.74**	
Clear-Water ??	YES	YES	YES	
Live-Bed ??	NO	NO	NO	
Contraction Scour Equations	**Clear-Water**	**Clear-Water**	**Clear-Water**	<- Calculate for "live-bed" and for "clear-water Open-Bottom Culvert"

SCOUR ANALYSIS (D50=3mm) - CONTRACTION SCOUR & ABUTMENT SCOUR

Tighe&Bond

Proposed 15.5' span bridge - 1% AEP (100-Year) - NOT USED FOR DESIGN

Bridge/Culvert Name:	Main Street Culvert
Town	Ashland, MA
Lat:	42.253587
Long:	-71.458111
Storm Size:	100-Year
HEC-RAS Proj:	ColdSpringBrook.prj
HEC-RAS Geom:	ColdSpringBrook.g02.hdf

Clear-Water Scour Equation for Open-Bottom Culverts (with WingWall)

$$y_{max}=K_u Q_{BI}^{0.28}\left(\frac{Q}{W_C D_{50}^{1/3}}\right)^{0.26} \qquad y_s=y_2-y_0$$

		Left	Right	
Input:	Ku (Open-Bottom)	0.84	0.84	<- 0.84 english units; 1.16 SI units
	QBI (cfs)	620	68	<- Discharge blocked by road embankment on one side of culvert (estimated using HEC-RAS Flow Tubes) and adjusted per multiple flow analysis
	Q_{CULV} (ft^3/s)	1003.35	1003.35	<Full Culvert Flow
	Wc (ft)	15.5	15.5	<- Culvert Width
	D50 (ft)	0.010	0.010	
	y0 (ft)	6.35	6.18	<- Cross Section 2 Hydraulic Depth at Culvert Corner
	ymax (ft)	22.44	12.08	
	ys (ft)	16.09	5.90	
CONTRACTION SCOUR + ABUTMENT SCOUR ESTIMATE FOR OPEN BOTTOM CULVERT (feet)		**Open Bottom Culvert Scour**	**Open Bottom Culvert Scour**	
		16.1	5.9	<-- 100mm D50 scour depths used for design

SCOUR ANALYSIS (D50=100mm) - CONTRACTION SCOUR & ABUTMENT SCOUR

Tighe&Bond

Proposed 15.5' span bridge - 1% AEP (100-Year)

Bridge/Culvert Name:	Main Street Culvert
Town	Ashland, MA
Lat:	42.253587
Long:	-71.458111
Storm Size:	100-Year
HEC-RAS Proj:	ColdSpringBrook.prj
HEC-RAS Geom:	ColdSpringBrook.g02.hdf
HEC-RAS XS1	1785
HEC-RAS XS2	1755

Notes
(1) Governing storms are 50-year for Scour Design and 1000-Year for Scour Check (based on Table 1.3.4-1 in the MassDOT LRFD Bridge Manual.
(2) for scour at open-bottom culverts, refer to HEC-18 for equations
(3) left bank and right bank defined from looking downstream

Data Input (Constants from HEC-18 manual)

Description	Item	LOB	CHANNEL	ROB	
Constant for Critical Velocity Calculation (English Units)	Ku (crit)	11.17	11.17	11.17	
Constant for Clear-Water Scour Calculations (English Units)	Ku (CW-cont.)	0.0077	0.0077	0.0077	
Constant for Open Bottom Culvert Contraction Scour Calc	Ku (Open-Bottom)	0.84	0.84	0.84	
Hydraulic Depth at XS 1	y_1 (ft)	4.35	7.77	3.64	
Hydraulic Depth at XS 1 (for Critical Velocity Calculation)	y (ft)	**4.35**	**7.77**	**3.64**	
Hydraulic Depth at XS 2 Prior to Scour	y_0 (ft)	1.99	6.84	1	
Flow at XS 1	Q_1 (ft^3/s)	872.15	187.2	190.65	
Flow at XS 2	Q_2 (ft^3/s)	413.01	586.75	3.59	<- varies per multiple opening analysis
Top Width at XS1	W_1 (ft)	562.96	35.6	335.62	
Top Width at XS2	W_2 (ft)	592.4	43.12	200.52	
Unit Discharge at XS1	q_1 (ft^2/s)	**1.55**	**5.26**	**0.57**	
Unit Discharge at XS2	q_2 (ft^2/s)	**0.70**	**13.61**	**0.02**	
Velocity at XS1	V_1 (ft/s)	0.36	0.68	0.16	
Velocity at XS1 (For Critical Scour Equation V is V1)	V (ft/s)	**0.36**	**0.68**	**0.16**	
Energy Grade Line at XS1	S_1 (ft/ft)	0.000018	0.000018	0.000018	
D50 from Sieve Analysis	D50 (mm)	0.6	100.0	0.6	
D50 from Sieve Analysis with Conversion from mm to ft	D50 (ft)	0.0020	0.3280	0.0020	

Critical Velocity

$$V_c = K_u y^{1/6} D_{50}^{1/3}$$

Input:

	LOB	CHANNEL	ROB	
Ku (crit)	**11.17**	**11.17**	**11.17**	<- constant English units
y (ft)	**4.35**	**7.77**	**3.64**	<- hydraulic depth from HEC-RAS upstream cross section
D50 (ft)	**0.002**	**0.328**	**0.002**	<- based on sieve analysis
V (ft/s)	**0.36**	**0.68**	**0.16**	<- mean channel velocity in HEC-RAS

Output:

Vc (ft/s)	**1.79**	**10.84**	**1.74**	
Clear-Water ??	YES	YES	YES	
Live-Bed ??	NO	NO	NO	
Contraction Scour Equations	**Clear-Water**	**Clear-Water**	**Clear-Water**	<- Calculate for "live-bed" and for "clear-water Open-Bottom Culvert"

SCOUR ANALYSIS (D50=100mm) - CONTRACTION SCOUR & ABUTMENT SCOUR

Tighe&Bond

Proposed 15.5' span bridge - 1% AEP (100-Year)

Bridge/Culvert Name:	Main Street Culvert
Town	Ashland, MA
Lat:	42.253587
Long:	-71.458111
Storm Size:	100-Year
HEC-RAS Proj:	ColdSpringBrook.prj
HEC-RAS Geom:	ColdSpringBrook.g02.hdf

Clear-Water Scour Equation for Open-Bottom Culverts (with WingWall)

$$y_{max}=K_u Q_{BI}^{0.28}\left(\frac{Q}{W_C D_{50}^{1/3}}\right)^{0.26} \qquad y_s=y_2-y_0$$

		Left	Right	
Input:	Ku (Open-Bottom)	0.84	0.84	<- 0.84 english units; 1.16 SI units
	QBI (cfs)	620	68	<- Discharge blocked by road embankment on one side of culvert (estimated using HEC-RAS Flow Tubes) and adjusted per multiple flow analysis
	Q_{CULV} (ft^3/s)	1003.35	1003.35	<Full Culvert Flow
	Wc (ft)	15.5	15.5	<- Culvert Width
	D50 (ft)	0.328	0.328	
	y0 (ft)	6.35	6.18	<- Cross Section 2 Hydraulic Depth at Culvert Corner
	ymax (ft)	16.56	8.92	
	ys (ft)	10.21	2.74	
CONTRACTION SCOUR + ABUTMENT SCOUR ESTIMATE FOR OPEN BOTTOM CULVERT (feet)		Open Bottom Culvert Scour: 10.2	Open Bottom Culvert Scour: 2.7	<-- Upstream corner for clearwater open bottom box culvert (Use this value)

SCOUR ANALYSIS - LONG-TERM AGGREGATION/DEGRADATION

Tighe&Bond

QUALITATIVE AND QUANTITATIVE APPROACHES

Bridge/Culvert Nam	Main Street Culvert
Town	Ashland, MA
Lat:	42.253587
Long:	-71.458111

Notes
(1) Assume long term degradation / aggradation only occurring in main channel.
(2) Qualitative and Quantitative analyses below reference HEC-20 FHWA approach

HEC-20 (6.26) Level 1 (Qualitative Geomorphic Analyses)

Direct Evidence	
Land-Use Change?	No - drainage area continues to be primary forested
Exposed Utility Crossings	Yes - approx 4" above low chord to invert
Exposed Bridge Foundations	N/A
Channel Banks Failing Due to Excessive Height	(No Data)
Comparison of Reference Reach Cross sections	(No Data)
Dams/Reservoirs Upstream/Downstream ?	Ashland Dam roughly 0.5 miles upstream
Changes in Watershed Land-Use ?	
Urbanization	Not Significant
Deforestation	Not Significant
Increased Impervious	Not Significant
Channelization	(No Data)
Cutoffs of Meander Bends (natural or manmade)	(No Data)
Changes in Downstream Hydraulic Control	
Rocks	(Assumed None)
Dams	N/A
Culvert	N/A
Diversions of Water In/Out of Stream	(Assumed None)

HEC-20 (6.26) Level 2 (Basic Engineering Analyses)

Watershed Sediment Yield	No data Available
Incipient Motion	Yes (See Below)
Armoring	Yes (See Below)
Rating Curve Shifts	No Data Available

HEC-20 (6.26) Level 3 (Mathematical or Physical Modeling Studies)

Sediment Transport/Routing Modeling	Based on project size, Level 1 and 2 analyses, this was not performed.

SCOUR ANALYSIS - LONG-TERM AGGREGATION/DEGRADATION

Tighe&Bond

QUALITATIVE AND QUANTITATIVE APPROACHES

Incipient Diameter Analysis (Performed at XS 1755 for 2-year storm event)

Input:

	LOB	CHANNEL	ROB	
Q (cfs)		180		
V (f/s)		4.3		
y (ft)		2.71		<- hydraulic depth from HEC-RAS
A (ft^2)		41.9		< - Wetted Area (HEC-RAS)
W (ft)		20.22		< - wetted perimeter (HEC-RAS)
R (ft)		**2.07**		<- area / wetted perimeter (HEC-RAS)
D50 (mm)		3.0		<- for stream bottom
D85 (mm)		15.0		<- for stream bottom
D50 (ft)		**0.010**		
D85 (ft)		**0.049**		
D50 (in)		**0.118**		
D85 (in)		**0.590**		
Ku		1.486		<- constant
n		0.035		<- manually enter here, or use the calc below
ρ		1.94		< Density of water 1.94 slugs/ft^3

Intermediate Calcs:

ks	**0.172**	< - Based on notes of equation 6.15 3.5 x D84
n	**0.019**	<- est of Manning's n based on D50 , Sturm 2001
n	**0.024**	<- est of Manning's n based on 3.5D85, Sturm 2001
τ_0	**0.502**	< - For Sand Size Particles Using Equation 6.14
τ_0	**0.231**	< - For Gravel Size Particles or Larger using Equation 6.15

Output:

Dc (ft) Sand Size	**0.028**	Sand Size Particles (Equation 6.14)
Dc (inch)	**0.340**	λ=62.4
Dc (mm)	**8.637**	λs=(2.65*62.4)
Dc (ft) Gravel and Larger	0.013	Gravel Size Particles (Equation 6.15)
Dc (inch)	0.156	
Dc (mm)	3.965	

>During design flood, hydraulic forces are adequate to transport bed material up to Dc in diameter. The gradation curve indicates the percentage of bed material that is less than or equal to this particle diameter, therefor, 100 - (this percentage) is coarser than the Dc

>If more than 5% of the bed material is coarser than Dc, then armoring is possible. See section below

Armoring Analysis

(Armoring is anticipated to occur)

Input:

	LOB	CHANNEL	ROB	
Dc		**0.028**		
ya		**0.0850**		<- assume armor layer thickness is 3 * Dc
Pc		0.07		<- % of bed material coarser than Dc

Output:

Ys (feet)	**1.129**	<- Depth to Armor Layer in Feet

> It is expected that the bed would armor after a distance of Ys of degradation

Conclusions:	Based on the qualitative and quantitative analysis above, it is anticipated that an armor layer would form prior to degredation occuring for the channel forming flow (~2-year storm event). The channel sediment in the area of the culvert will be specified so that the D50 is greater than the critical diameter.

ATTACHMENT D
Stone Sizing Results

Stone Sizing Calculations - Using HEC-23 Design Guide 18

Tighe&Bond

Name:	Main Street Culvert
Town	Ashland, MA
Lat:	42.253587
Long:	-71.458111
Storm Size:	25-Year
HEC-RAS Proj:	ColdSpringBrook.prj
HEC-RAS Geom:	ColdSpringBrook.g02.hdf
HEC-RAS XS	Varies, see below

Notes
(1) Stone sized using methodology outlined in HEC-23 Volume 2
(2) Assume that riprap will be buried 2 feet below the channel bottom upstream of the culvert to reduce scour potential while still allowing for stream habitat.

Data Input

Description	Item	All Cross Sections	Station 1785	Station 1755	1728 Bridge US	1728 Bridge DS	Station 1654	Notes
Kr		0.53						Assume average between 0.38 and 0.68
Local Depth of flow, ft	y (ft)	N/A	6.83	5.75	5.9	4.67	4.26	Hydraulic depth within channel
Channel cross-sectional average velocity ft/s	V_{avg} (ft/s)	N/A	0.57	3.23	9.09	11.49	4.70	
Channel design velocity ft/s	V_{des} (ft/s)	N/A	0.57	3.23	9.09	11.49	4.70	
Specific Gravity of Riprap	Sg	2.65						Typical Value.
Gravity (ft/s2)	g	32.2						Constant

Sizing Rock Riprap Based on HEC-23 Equations 18.1

$$d_{50} = y\left(\frac{K}{S_s - 1}\right)\left[\frac{(V_{des})^2}{gy}\right]^{0.33}$$

$$d_{50} = 1.2 d_{30} \qquad 1.5 < \frac{d_{85}}{d_{15}} < 2.5\ (Target\ 2)$$

Input:

	Station 1785	Station 1755	1728 Bridge US	1728 Bridge DS	Station 1654
y (ft)	6.83	5.75	5.9	4.67	4.26
V_{des} (ft/s)	0.57	3.23	9.09	11.49	4.7
Kr	0.53	0.53	0.53	0.53	0.53
d_{50}	0.255	0.715	1.440	1.437	0.749
d_{50} (feet)	0.26	0.71	1.44	1.44	0.75
d_{30} (feet)	0.21	0.60	1.20	1.20	0.62
d_{50} (inch)	3.1	8.6	17.3	17.2	9.0
d_{30} (inch)	2.6	7.1	14.4	14.4	7.5

D50 greater than 18-inches adequate
Conclusion: - MassDOT "Class VI Riprap" adequate

Stone Sizing Calculations - Using HEC-23 Design Guide 18

Tighe&Bond

Name: Main Street Culvert
Town Ashland, MA
Lat: 42.253587
Long: -71.458111

Storm Size: 50-Year
HEC-RAS Proj: ColdSpringBrook.prj
HEC-RAS Geom: ColdSpringBrook.g02.hdf
HEC-RAS XS Varies, see below

Notes
(1) Stone sized using methodology outlined in HEC-23 Volume 2
(2) Assume that riprap will be buried 2 feet below the channel bottom upstream of the culvert to reduce scour potential while still allowing for stream habitat.

Data Input

Description	Item	All Cross Sections	Station 1785	Station 1755	1728 Bridge US	1728 Bridge DS	Station 1654	Notes
Kr		0.53						Assume average between 0.38 and 0.68
Local Depth of flow, ft	y (ft)	N/A	7.46	6.54	6.37	5.22	4.81	Hydraulic depth within channel
Channel cross-sectional average velocity ft/s	V_{avg} (ft/s)	N/A	0.6	1.78	9.61	11.74	5.16	
Channel design velocity ft/s	V_{des} (ft/s)	N/A	0.6	1.78	9.61	11.74	5.16	
Specific Gravity of Riprap	Sg	2.65						Typical Value.
Gravity (ft/s2)	g	32.2						Constant

Sizing Rock Riprap Based on HEC-23 Equations 18.1

$$d_{50} = y\left(\frac{K}{S_s - 1}\right)\left[\frac{(V_{des})^2}{gy}\right]^{0.33}$$

$$d_{50} = 1.2 d_{30} \qquad 1.5 < \frac{d_{85}}{d_{15}} < 2.5\ (Target\ 2)$$

Input:

	Station 1785	Station 1755	1728 Bridge US	1728 Bridge DS	Station 1654
y (ft)	7.46	6.54	6.37	5.22	4.81
V_{des} (ft/s)	0.6	1.78	9.61	11.74	5.16
Kr	0.53	0.53	0.53	0.53	0.53
d_{50}	0.280	0.526	1.572	1.570	0.864
d_{50} (feet)	0.28	0.53	1.57	1.57	0.86
d_{30} (feet)	0.23	0.44	1.31	1.31	0.72
d_{50} (inch)	3.4	6.3	18.9	18.8	10.4
d_{30} (inch)	2.8	5.3	15.7	15.7	8.6

D50 greater than 19-inches adequate
Conclusion: - MassDOT "Class VI Riprap" adequate

ATTACHMENT E

Federal Emergency Management Agency (FEMA) Data

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cochituate Brook								
A	1,900	30	218	3.7	125.0	125.7[2]	126.3	0.6
B	3,190	20	116	6.9	125.0	126.2[2]	126.9	0.7
Cold Brook								
A	9,215	58	196	0.4	121.2	119.9[2]	120.9	1.0
B	9,775	28	73	0.9	121.2	120.0[2]	121.0	1.0
C	10,785	33	61	1.3	121.4	121.4	122.2	0.8
D	11,380	23	56	1.4	122.7	122.7	123.6	0.9
E	12,500	45	68	1.2	125.7	125.7	126.6	0.9
F	13,010	12	17	4.8	129.8	129.8	130.6	0.8
Cold Spring Brook								
A	98	37	164	2.2	177.5	173.5[2]	173.9	0.4
B	1,164	127	487	1.2	177.5	173.7[2]	174.2	0.5
C	1,784	39	168	2.2	177.5	174.4[2]	174.8	0.4
D	11,650	30	71	6.0	224.2	224.2	225.0	0.8
E	12,450	35	116	3.7	235.9	235.9	236.6	0.7
F	13,850	260	1,395	0.3	237.8	237.8	238.6	0.8
G	14,860	380	1,722	0.2	237.8	237.8	238.6	0.8
H	15,365	225	1,282	0.3	237.8	237.8	238.6	0.8
I	16,525	40	187	2.3	238.9	238.9	239.6	0.7
J	17,880	215	1,089	0.4	243.0	243.0	243.0	0.0
K	18,835	55	351	1.2	251.8	251.8	251.8	0.0
L	20,115	45	277	1.5	251.8	251.8	251.8	0.0
M	21,040	440	3,801	0.1	260.8	260.8	260.8	0.0
N	21,350	55	152	2.8	261.0	261.0	261.1	0.1

[1] Feet above confluence with Sudbury River
[2] Elevation computed without consideration of backwater effects from Sudbury River

TABLE 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIDDLESEX COUNTY, MA
(ALL JURISDICTIONS)

FLOODWAY DATA

COCHITUATE BROOK – COLD BROOK – COLD SPRING BROOK

TABLE 5 - SUMMARY OF DISCHARGES – continued

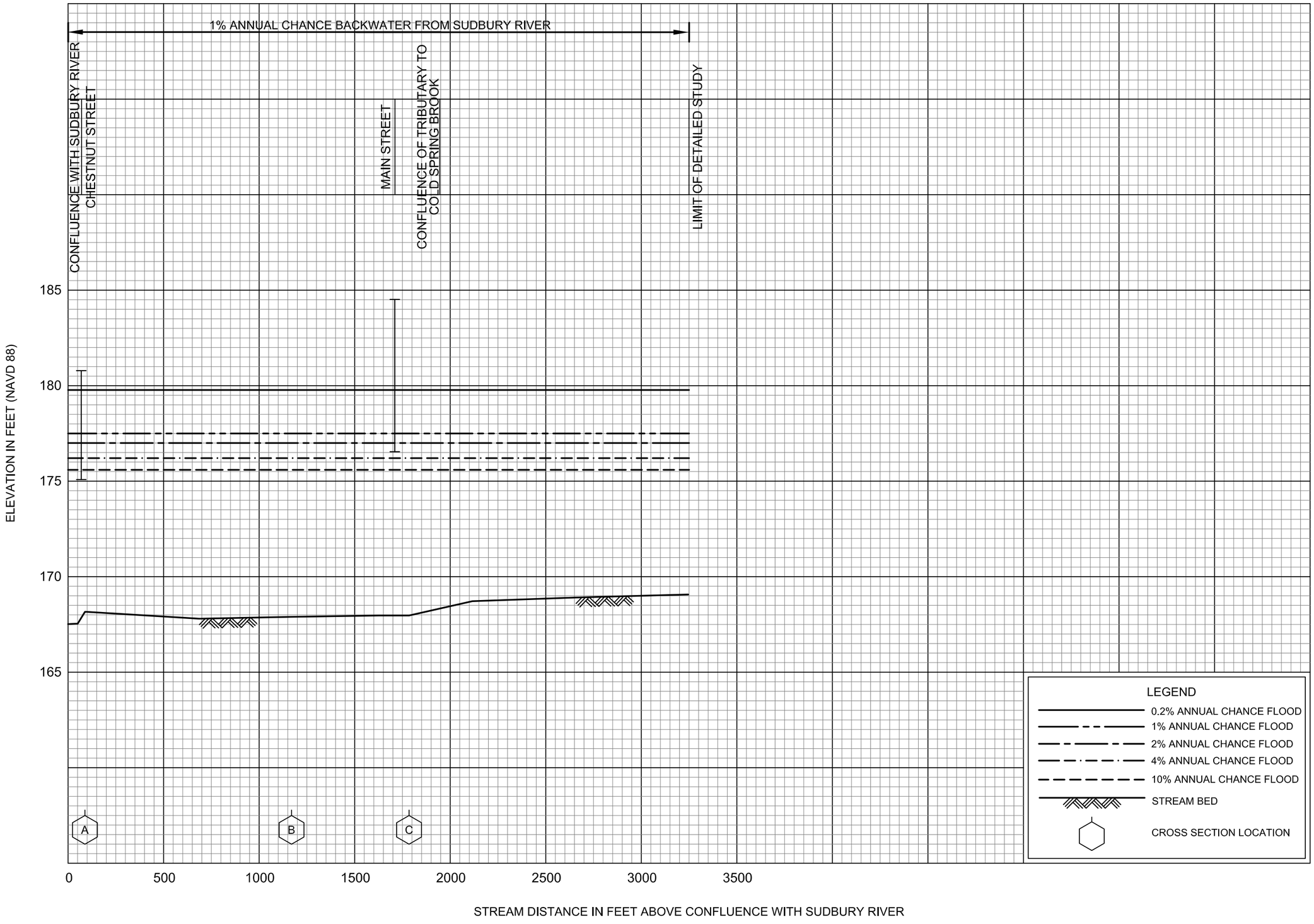
FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
CHICKEN BROOK					
At county boundary	2.98	150	250	300	450
Upstream of Waseeka Wildlife Dam	0.22	40	50	60	80
COCHITUATE BROOK					
At confluence with Sudbury River	18.21	420	690	800	1,100
COLD BROOK					
At confluence of Pantry Brook	2.1	120	190	230	345
Above confluence of Tributary A to Cold Brook	0.41	40	65	80	125
COLD SPRING BROOK					
Downstream of Ashland Reservoir at Chestnut Street	8.54	550	1,030	1,250	1,610
Upstream of Ashland Reservoir	5.68	250	370	430	570
At the Ashland/Hopkinton corporate limits	5.48	250	370	430	570
COLE'S BROOK					
At School Street	1.83	275	455	530	655
At Brucewood Road	1.46	275	455	530	655
At confluence of Tributary 1 to Cole's Brook	1.13	225	370	430	530
COLLINS BROOK					
At confluence with Sutton Brook	0.5	55	100	130	220
At Pringle Street	0.2	40	65	85	145
CONANT BROOK					
At confluence with Nashoba Brook	2.22	290	490	550	630
At Nagog Hill Road	1.16	200	330	370	430
CONCORD RIVER					
At Billerica/Chelmsford corporate limits	373.0	3,105	4,924	5,995	8,870
At the Billerica/Tewksbury corporate limits	373.0	3,100	4,900	6,000	8,900
At Talbot Mill Dam	370.0	2,940	4,660	5,675	8,395
At U.S. Route 3 Bridge, In Billerica	363.0	2,885	4,577	5,575	8,245

TABLE 10 - MANNING'S "n" VALUES – continued

Stream	Channel "n"	Overbank "n"
Beaver Brook 2 Split 3[1]	0.060	0.050-0.090
Beaver Brook 3	0.030-0.045	0.045-0.075
Beaver Brook 4	0.035-0.070	0.050-0.140
Beaver Brook 5	0.050-0.080	0.060-0.100
Beaver Dam Brook	0.015-0.050	0.050-0.110
Bennetts Brook	0.035	0.050
Birch Meadow Brook	0.025-0.045	0.045-0.085
Black Brook	0.030-0.035	0.055-0.085
Bogastow Brook – Jar Brook	0.055	0.160
Bogle Brook 1	0.015-0.050	0.070-0.110
Bogle Brook 2	0.015-0.040	0.030-0.240
Boons Pond and Branch	0.015-0.060	0.050-0.120
Boutwell Brook	0.030	0.050
Bow Brook	0.035	0.050-0.070
Branch of Assabet River	0.015-0.060	0.050-0.120
Branch of Elizabeth Brook 1	0.015-0.060	0.050-0.120
Broad Meadow Brook	0.015-0.035	0.045-0.080
Brook A of Shawsheen River	*	*
Brook from Waushakum Pond	0.030-0.035	0.050-0.060
Butter Brook	0.035-0.045	0.050-0.085
Catacoonamug Brook	0.035	0.050-0.070
Charles River	0.015-0.060	0.040-0.150
Cheese Cake Brook	0.030-0.035	0.010
Cherry Brook	0.015-0.040	0.030-0.240
Chester Brook	0.015-0.040	0.030-0.150
Chicken Brook	0.060	0.120
Cochituate Brook	0.030-0.035	0.050-0.060
Cold Brook	0.016-0.050	0.050-0.100
Cold Spring Brook[1]	0.035-0.050	0.050-0.100
Cole's Brook	0.045	0.035-0.090
Collins Brook	*	*
Conant Brook	0.030-0.040	0.040-0.080
Concord River[1]	0.032-0.050	0.032-0.100
Content Brook – Middlesex Canal	0.030-0.045	0.060-0.110
Course Brook[1]	0.040	0.032-0.080
Cow Pond Brook	0.035-0.040	0.050-0.070
Cranberry Brook	0.040	0.100
Cummings Brook	0.035-0.060	0.014-0.300
Dakins Brook	0.030-0.040	0.080
Danforth Brook	0.030-0.060	0.030-0.130
Darby Brook	0.015-0.045	0.060-0.070
Davis Brook	0.015-0.050	0.070-0.110

*Data not available

[1]Updated values for the July 7, 2014 countywide analyses



FLOOD PROFILES

COLD SPRING BROOK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIDDLESEX COUNTY, MA

(ALL JURISDICTIONS)

148P

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Massachusetts State Plane Mainland Zone (FIPS zone 2001). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from orthophotography provided by MassGIS at a scale of 1:500 from photography dated April 2008.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

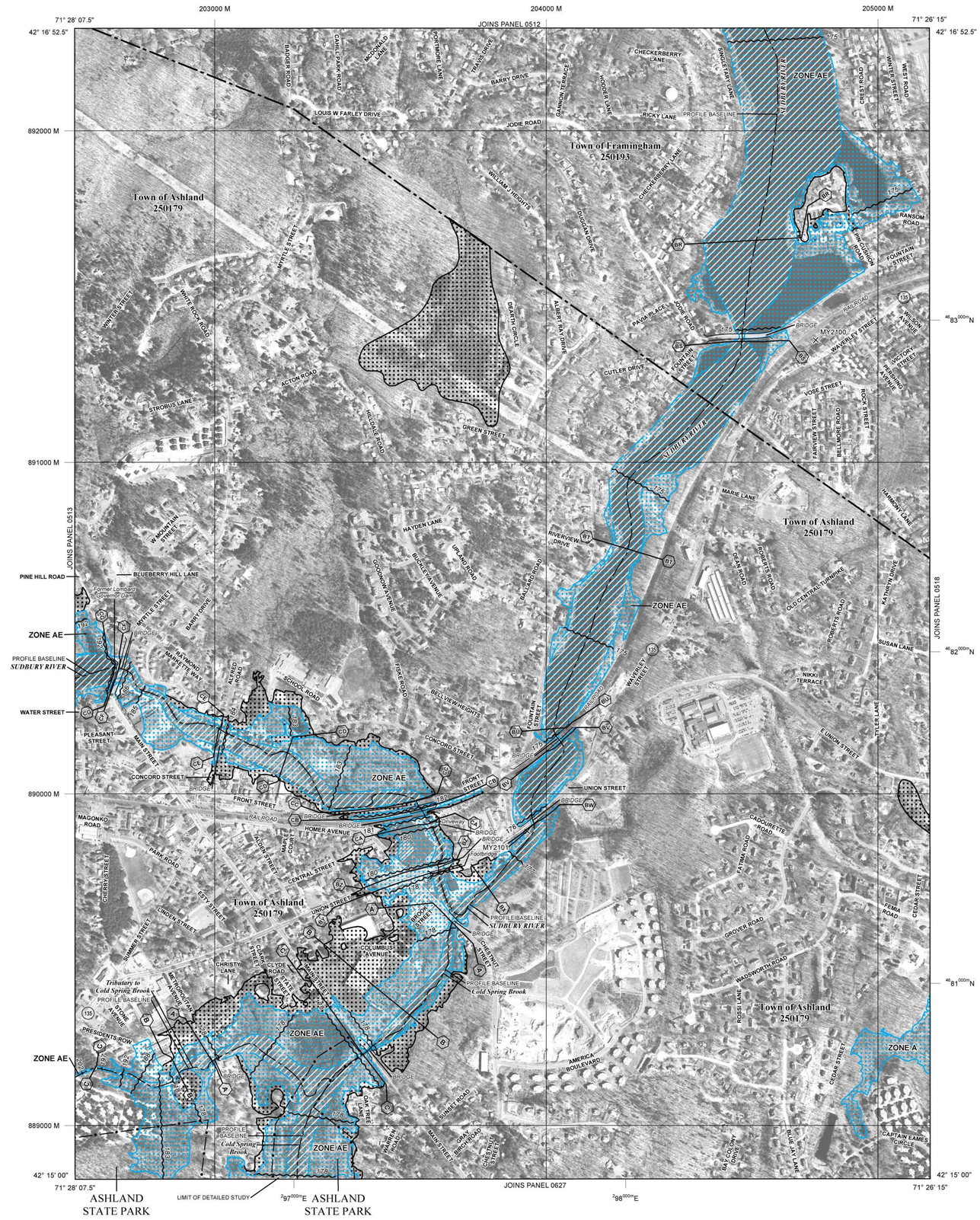
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A / A — Cross section line
- 23 / 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 4989000 M — 1000-meter ticks: Massachusetts State Plane Mainland Zone (FIPS Zone 2001), Lambert Conformal Conic projection
- 4683 000m N — 1000-meter Universal Transverse Mercator grid values, zone 19
- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 4, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

July 7, 2014 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0514F

FIRM

FLOOD INSURANCE RATE MAP

MIDDLESEX COUNTY, MASSACHUSETTS (ALL JURISDICTIONS)

PANEL 514 OF 656
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ASHLAND, TOWN OF	250179	0514	F
FRAMINGHAM, TOWN OF	250193	0514	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
25017C0514F
MAP REVISED
JULY 7, 2014

Federal Emergency Management Agency

ATTACHMENT F

Federal Emergency Management Agency (FEMA) Correspondence

Michael Baker International
FEMA Engineering Library
3601 Eisenhower Ave.
Alexandria, Virginia 22304

July 19, 2022

IN REPLY REFER TO:
Request No.: B2201057

Davis Azinheira
Tighe & Bond
53 Southampton Road
Westfield, MSA 01085

Dear Mr. Azinheira,

This is in response to your **6/8/22** letter requesting FEMA back up data for **Cold Spring Brook** in **Middlesex County, MA**. After an extensive search, we are unable to locate the requested data. According to the FIS for Middlesex County, MA (All Jurisdictions), the data was prepared by HTNB in 11/1979. We do not have this data.

We thank you for your request and look forward to serving you again in the future. If you have any questions regarding your request or we may be of further assistance, please contact us.

Sincerely,

John Adams
FEMA Engineering Library

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APPENDIX E

Notification to Abutters

By Hand Delivery, Certified Mail (return receipt requested), or Certificates of Mailing

This is a notification required by law. You are receiving this notification because you have been identified as the owner of land abutting another parcel of land for which certain activities are proposed. Those activities require a permit under the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40) and the Town of Ashland Wetlands Protection By-Law (Chapter 280).

In accordance with the second paragraph of the Massachusetts Wetlands Protection Act, and 310 CMR 10.05(4)(a) of the Wetlands Regulations, you are hereby notified that:

A. A Notice of Intent was filed with the Ashland Conservation Commission on November 3, 2022 seeking permission to remove, fill, dredge, or alter an area subject to protection under M.G.L. c. 131 §40. The following is a description of the proposed activity/activities:

The Town of Ashland (Town) Proposes the replacement of the superstructure of the Main Street Bridge crossing over Cold Spring Brook. The bridge and associated utilities were found to be in Poor condition by the Massachusetts Department of Transportation in 2018 and have awarded the Town a Small Bridge Grant to support construction.

B. The name of the applicant is: Town of Ashland Department of Public Works.

C. The address of the land where the activity is proposed is: Main Street roadway right-of-way crossing Cold Spring Brook at approximately 500 Main Street.

D. Copies of the Notice of Intent may be examined or obtained at the office of the Ashland Conservation Commission, located at 101 Main Street Ashland, MA 01721. The Commission may be reached at bsolomon@ashlandmass.com or by phone at 508-881-0100 x 7924.

E. Copies of the Notice of Intent may be obtained from the applicant or their representative by calling Melissa Coady, at 413-572-3224. An administrative fee may be applied for providing copies of the NOI and plans.

F. Information regarding the date, time, and location of the public hearing regarding the Notice of Intent may be obtained from the Ashland Conservation Commission. Notice of the public hearing will be published at least five business days in advance, in the MetroWest Daily News.

Notification provided pursuant to the above requirement does not automatically confer standing to the recipient to request Departmental Action for the underlying matter. See 310 CMR 10.05(7)(a)4.

April 7, 2021

To The Conservation Commission
0 Main Street
Thomas Miller
Abutters To Map 20 Parcel 255

PARCEL ID	PARCEL ADDRESS	OWNER NAME 1	OWNER NAME 2	MAILING ADDRESS	CITY/TOWN	STATE	ZIP
20-030-00-000	400 MAIN ST	POUT ROCK LLC		3100 SPRINGHEAD COURT	SAINT CLOUD	FL	34771
20-033-00-000	0 CHESTNUT ST	COLD SPRING BROOK LLC		3100 SPRINGHEAD COURT	SAINT CLOUD	FL	34771
20-254-00-000	25 OAK TREE LN	MILLER THOMAS		25 OAK TREE LN	ASHLAND	MA	01721
20-255-00-000	0 OAK TREE LN REAR	MILLER THOMAS		25 OAK TREE LN	ASHLAND	MA	01721
24-001-00-000	0 MAIN ST	DEPT OF ENVIRONMENTAL MANAGEMENT	(MASS COMMONWEALTH DNR)	251 CAUSEWAY ST / SUITE 600-700	BOSTON	MA	02114

The above reflects the latest information available on our records.

Richard E. Ball, M.A.A.
Director of Assessing

4/7/21
Date

5 parcels/abutters

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