

Sudbury, Massachusetts

Concord Road Culvert Repairs

Over Cold Brook

December 2019

NOTICE OF INTENT



BETA

89 Shrewsbury Street
Suite 300
Worcester, MA 01604
508.756.1600
www.BETA-Inc.com

Concord Road Culvert Repairs

Sudbury, Massachusetts

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NOTICE OF INTENT

Prepared by: BETA GROUP, INC.

Prepared for: Sudbury Department of Public Works

December 2019

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WPA FORM 3 – NOTICE OF INTENT



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

Sudbury

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):

Concord Road Culvert (no address)	Sudbury	01776
a. Street Address	b. City/Town	c. Zip Code
Latitude and Longitude:	42°24'34.84"N	71°22'42.73"W
N/A - Town ROW	d. Latitude	e. Longitude
f. Assessors Map/Plat Number	g. Parcel /Lot Number	

2. Applicant:

Daniel	Nason	
a. First Name	b. Last Name	
Sudbury Department of Public Works		
c. Organization		
275 Old Lancaster Road		
d. Street Address		
Sudbury	MA	01776
e. City/Town	f. State	g. Zip Code
978-440-5421	nasond@sudbury.ma.us	
h. Phone Number	i. Fax Number	j. Email Address

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

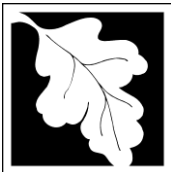
a. First Name		b. Last Name
c. Organization		
d. Street Address		
e. City/Town	f. State	g. Zip Code
h. Phone Number	i. Fax Number	j. Email address

4. Representative (if any):

Marta	Nover	
a. First Name	b. Last Name	
BETA Group, Inc.		
c. Company		
89 Shrewsbury Street, Suite 300		
d. Street Address		
Worcester	MA	01604
e. City/Town	f. State	g. Zip Code
508-756-1600	mnover@beta-inc.com	
h. Phone Number	i. Fax Number	j. Email address

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

Exempt - Town Project		
a. Total Fee Paid	b. State Fee Paid	c. City/Town Fee Paid



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A. General Information (continued)

6. General Project Description:

The Town of Sudbury proposes to repair the existing culvert carrying Concord Road over Cold Brook. The Project involves reconstruction of both headwalls and removal of sediment within the streambed.

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)

2. Limited Project Type

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

8. Property recorded at the Registry of Deeds for:

n/a - Town Road Layout

a. County

b. Certificate # (if registered land)

c. Book

d. Page Number

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

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

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



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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. <input checked="" type="checkbox"/> Bank	105 (temp) 2 (perm)	105 2. linear feet
b. <input type="checkbox"/> Bordering Vegetated Wetland	1. square feet	2. square feet
c. <input checked="" type="checkbox"/> Land Under Waterbodies and Waterways	449 (temp) 1. square feet 15 3. cubic yards dredged	2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. <input checked="" type="checkbox"/> Bordering Land Subject to Flooding	1. square feet 0 3. cubic feet of flood storage lost	2. square feet 0 4. cubic feet replaced
e. <input type="checkbox"/> Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced
f. <input checked="" type="checkbox"/> Riverfront Area	Cold 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: 6000 square feet

4. Proposed alteration of the Riverfront Area:

992 a. total square feet 992 b. square feet within 100 ft. 0 c. square feet between 100 ft. and 200 ft.

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.

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
a. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. <input type="checkbox"/> Land Under the Ocean	_____	
	1. square feet	

	2. cubic yards dredged	
c. <input type="checkbox"/> Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. <input type="checkbox"/> Coastal Beaches	_____	_____
	1. square feet	2. cubic yards beach nourishment
e. <input type="checkbox"/> Coastal Dunes	_____	_____
	1. square feet	2. cubic yards dune nourishment
	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
f. <input type="checkbox"/> Coastal Banks	_____	
	1. linear feet	
g. <input type="checkbox"/> Rocky Intertidal Shores	_____	
	1. square feet	
h. <input type="checkbox"/> Salt Marshes	_____	_____
	1. square feet	2. sq ft restoration, rehab., creation
i. <input type="checkbox"/> Land Under Salt Ponds	_____	
	1. square feet	

	2. cubic yards dredged	
j. <input type="checkbox"/> Land Containing Shellfish	_____	
	1. square feet	
k. <input type="checkbox"/> 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. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	_____	
	1. square feet	
4. <input type="checkbox"/> 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. <input type="checkbox"/> Project Involves Stream Crossings		
	_____	_____
	a. number of new stream crossings	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**

- 2017 _____
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 100%
percentage/acreage

(b) outside Resource Area _____
percentage/acreage

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

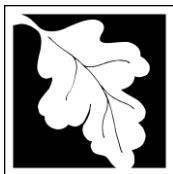
2. Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

(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 <http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/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 http://www.mass.gov/dfwele/dfw/nhosp/regulatory_review/mesa/mesa_fee_schedule.htm). 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, http://www.mass.gov/dfwele/dfw/nhosp/regulatory_review/mesa/mesa_exemptions.htm; 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@state.ma.us

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@state.ma.us

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.



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

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

- 4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?
 a. Yes No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.
 b. ACEC

- 5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?
 a. Yes No
- 6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?
 a. Yes No
- 7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?
 a. Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:
 - 1. Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)
 - 2. A portion of the site constitutes redevelopment
 - 3. Proprietary BMPs are included in the Stormwater Management System.
 b. No. Check why the project is exempt:
 - 1. Single-family house
 - 2. Emergency road repair
 - 3. Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

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

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

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

- 1. USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)
- 2. Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.



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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.

Concord Road Culvert Repairs

a. Plan Title

BETA Group, Inc.

b. Prepared By

12/12/2019

d. Final Revision Date

Christopher W. Jones, P.E.

c. Signed and Stamped by

1" = 10'

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:

2. Municipal Check Number

3. Check date

4. State Check Number

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name



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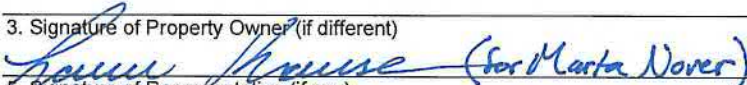
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Sudbury
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.

	12/10/2019
1. Signature of Applicant	2. Date
3. Signature of Property Owner (if different)	4. Date
	12/10/2019
5. Signature of Representative (if any)	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.

ABUTTERS INFORMATION

Nielsen David V& Linda Cregg
D12-0203
1021 Concord Road
Sudbury, MA 01776

Commonwealth Of Massachusetts
Fisheries And Game
D13-0008
251 Causeway Street, Suite 400
Boston, MA 02114

Sudbury Water District
D13-0500
Raymond Road
Sudbury, MA 01776

Commonwealth Of Massachusetts
Fisheries And Game
D13-0008
251 Causeway Street, Suite 400
Boston, MA 02114

**NOTIFICATION TO ABUTTERS
UNDER THE MASSACHUSETTS WETLAND PROTECTION ACT**

In accordance with the second paragraph of Massachusetts General Laws Chapter 131 section 40, you are hereby notified of the following:

- A. The name of the applicant is: Sudbury Department of Public Works
- B. The applicant has filed a Notice of Intent with the Conservation Commission for the municipality of Sudbury seeking permission to remove, fill, dredge or alter an area Subject to Protection under the Wetlands Protection Act (G.L. Chapter 131 section 40) and the Bylaw.
- C. The address of the lot where the activity is proposed is: Within the Concord Road right-of-way over Cold Brook
- D. The work proposed is: Concord Road Culvert Repairs and Sediment Removal
- E. Copies of the Notice of Intent may be examined at: Sudbury Conservation Commission Office, DPW Building (by appointment.) between the hours of 8:00 (am) and 3:30 (pm) on the following days of the week: Monday through Friday
For more information, call (978) 440 - 5471
Check One: This is the applicant , applicant's representative , or other (specify, Commission):
- F. Copies of the Notice of Intent may be obtained from either (check one) the applicant , or the applicant's representative , by calling BETA Group, Inc. between the hours of 8:00 and 5:00 on the following days of the week: Monday – Friday (508-756-1600 ext 156)
- G. The hearing to discuss the above project will be held on: Monday December 30, 2019
Location : Sudbury Department of Public Works Building Conference Room, 275 Old Lancaster Road, Sudbury, MA
The hearing will be held at : 6:45 pm

Note: Notice of the public hearing, including date, time, and place will also be published at least five business days in advance in Sudbury Town Crier. Contact Conservation Commission to confirm paper.
(name of newspaper)

Note: Notice of public hearing, including its date, time, and place, will be posted in the Town Hall not less than forty-eight (48) hours in advance.

Note: Contact your local Conservation Commission or the nearest Department of Environmental Protection Regional Office for more information about this application or the Wetlands Protect Act.

To contact DEP, call:

<input type="checkbox"/> Western Region:	413.784.1100	<input checked="" type="checkbox"/> Northeast Region:	978.661.7600
<input type="checkbox"/> Central Region:	508.792.7650	<input type="checkbox"/> Southeast Region:	508.946.2700

Affidavit of Service
Under the Massachusetts Wetlands Protection Act

(to be submitted to the Massachusetts Department of Environmental Protection and the
Conservation Commission when filing a Notice of Intent)

I, Noel Lioce, hereby certify under the pains and penalties of perjury that on December 16, 2019 I gave notification to abutters in compliance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40, and the DEP Guide to Abutter Notification dated April 8, 1994, in connection with the following matter:

A Notice of Intent filed under the Massachusetts Wetlands Protection Act by The Town of Sudbury –Department of Public Works with the Town of Sudbury Conservation Commission on December 16, 2019 for proposed repairs to the Concord Road Culvert over Cold Brook in Sudbury, Massachusetts.

The form of notification, and a list of the abutters to whom it was given and their addresses, are attached to this Affidavit of Service.

December 16, 2019

Name

Date

NARRATIVE

1.0 INTRODUCTION

This Project involves repairing the Concord Road Culvert over Cold Brook in Sudbury, Massachusetts. The culvert carries Concord Road over Cold Brook upstream of its confluence with Pantry Brook within the Pantry Brook Wildlife Management Area and is owned and maintained by the Town of Sudbury. Cold Brook is a low-gradient, slow moving stream that flows southerly through the single six-foot by six-foot culvert. The Project limits extend approximately 50 feet from east to west along Concord Road and approximately 50 feet from north to south (the Site).

Culvert repairs and maintenance are necessary in order to ensure continued safe vehicular passage on Concord Road, an east/west connector route through northeastern Sudbury, as well as to restore the function of the culvert. Work to repair the culvert and restore the area will include the following:

- Installation of temporary cofferdams upstream and downstream of the culvert to isolate and dewater the work area;
- Mechanical dredging of sediment deposits within the culvert and at the culvert openings;
- Installation of smaller temporary cofferdams around the northern wingwalls to allow access for repairs;
- Placement of concrete caps over the existing wingwalls;
- Construction of moment slab headwalls over the existing wingwalls and installation of guardrails along both the north and south sides of Concord Road;
- Construction of an asphalt stormwater spillway to prevent erosion; and,
- Removal of concrete debris on the streambank and restoration.

Work on the wingwalls and construction of the moment slab with new guard rails is required on the north side of Concord Street because the northern headwall is missing. This headwall was dislodged by an apparent vehicle impact and the Town placed stacked concrete median barriers at this location to serve as a temporary headwall while a permanent solution was designed and permitted. The southern headwall is also proposed to be replaced because the existing headwall is not crash tested, so a vehicle impact to that wall could result in a similar situation on this side of the road.

Dredging is proposed at this culvert location because there is heavy aggradation of gravel, sand, crushed stone, and organic debris throughout the length of the culvert, which is impeding its function. It is anticipated that dredging will be conducted using mechanical methods, which requires installation of cofferdams to allow the area to be sufficiently dewatered. The dredging work is anticipated to take less than a week.

The proposed work will take place within resources jurisdictional under the Massachusetts Wetlands Protection Act (the Act) and its regulations at 310 CMR 10.00 (WPA Regulations); and, the Town of Sudbury Wetlands Administration Bylaw (as Amended through September 15, 2010) (the Bylaw) and its regulations (as amended 9/25/2017). The Project is being filed under the Limited Project provision found in the WPA Regulations at 310 CMR 10.53(3)(i)¹.

¹ 310 CMR 10.53(3)(i) states, "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 CMR10.51 through 10.60 (April 1, 1983)."

2.0 SITE DESCRIPTION

2.1 PROJECT LOCUS

This Project involves repairing the Concord Road Culvert over the Cold Brook in northeastern Sudbury (Figure 1 - USGS Topographic Map). The Concord Road Culvert is generally located near the Sudbury / Concord Town Line, south of Route 117 and north of Route 27 in Sudbury, Massachusetts. At the Project location, Concord Road runs in an east/west direction through a low-density residential area with state-owned wildlife management areas located immediately to the north and south of the Site (Figure 2 – Environmental Resources Map).

2.2 WETLAND RESOURCE AREAS

A Site inspection was conducted by BETA's Wetland Scientists on August 8, 2019 to identify and delineate the boundary of existing wetland resource areas on the Site and in the immediate vicinity of the Site. Resource area boundaries were identified and delineated in accordance with the methods developed by the Massachusetts Department of Environmental Protection's *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act*, dated 1995, as well as definitions set forth in the Wetland Regulations (310 CMR 10.00), and the Town of Sudbury Wetlands Administration Bylaw (Article XXII).

State jurisdictional resources areas identified onsite include Bordering Vegetated Wetland (BVW), Bank (to perennial stream), Land Under Water (LUW), Bordering Land Subject to Flooding (BLSF), and Riverfront Area (RA). A complete description of areas Subject to Protection under the Act and the local Bylaw is included in Appendix A (*Wetland Delineation Report*).

2.3 BUFFER ZONES

Portions of the Project are located within the 100-foot buffer zone to Bank and BVW, however, the Buffer Zone within the Project Area is also entirely within the RA of Cold Brook and BLSF. The existing buffer zone within the Project Area is surfaced with impervious hot-mixed asphalt (HMA) associated with Concord Road.

2.4 NHESP-MAPPED HABITAT AND OTHER SENSITIVE AREAS

According to the latest MassGIS data, the Project is located within NHESP mapped Priority Habitat of Rare Species and Estimated Habitat of Rare Wildlife. Accordingly, a copy of this Notice of Intent will be submitted to the NHESP for a Streamlined Mass. Endangered Species Act Review.

The Project Area is not located within an Area of Critical Environmental Concern (ACEC), or within 200 feet of mapped Certified or Potential Vernal Pools. In addition, the Site is not located within groundwater or surface water protection zones associated with a public water supply.

3.0 WORK DESCRIPTION

3.1 WORK WITHIN JURISDICTIONAL RESOURCE AREAS

3.1.1 INLAND BANK (TO PERENNIAL STREAM, 310 CMR 10.54)

Proposed work includes temporary alteration to the Banks of Cold Brook. Due to the low flow and shallow gradient of this stream, the mean annual flood level and first observable break in slope are located above

the elevation of vegetation growth. Accordingly, impacts to the area between the mean annual flood level and mean annual low flow level are quantified as impacts to vegetated Bank.

Impacts to Bank result from installation of erosion controls, installation of temporary cofferdams, removal of sediment accumulated within the Bank, removal of concrete debris, construction of a stormwater spillway to the southeast of the culvert, and stabilization following construction. The proposed impacts include:

- 67 lf of temporary impacts along the top of the Bank
- 38 lf of temporary impacts along the lower Bank boundary
- 2 lf of permanent impacts along the top of the Bank associated with construction of the HMA spillway at the southeast corner of the bridge. This spillway is proposed to prevent additional erosion of roadway material into the River at this location.

The Project will impact 389 sf of vegetated Bank which will be restored in place following impacts as depicted on the accompanying plans.

3.1.2 LAND UNDER WATER (310 CMR 10.56)

Dredging is proposed at this culvert location because there is heavy aggradation of gravel, sand, crushed stone, and organic debris throughout the length of the culvert, which is impeding its function. The mudline is composed of sand with some silt and organic debris. The sediment build-up is deepest at the culvert ends with depths of approximately 30" at the south end and 42" at the north end. Towards the interior of the culvert the sediment depth becomes shallower, with a depth of approximately 6" near the center. The material at the north end is primarily crushed stone fill that may have fallen into the river at the time the temporary headwall was installed.

Impacts to LUW totals 449 sf of temporary alteration resulting from installation of temporary coffer dams placed to the north and south of the culvert and mechanical dredging of the sediment. The volume of sediment to be removed totals 15 cubic yards.

3.1.3 BORDERING LAND SUBJECT TO FLOODING (310 CMR 10.57(A))

According to the latest FEMA Flood Insurance Rate Maps (FIRM) for the area, dated July 7, 2014, the entire site is located within a FEMA Flood Zone AE with a Base Flood Elevation (BFE) of 121 feet NAVD.

Impacts to the Project Site below the BLSF include work within the Concord Road ROW and installation of the new headwalls (986 sf of temporary impacts) and impacts associated with the HMA spillway (6 sf of permanent alteration). No permanent filling of BLSF is proposed, but all work will be located below the BFE. The bridge replacement Project will not change any elevations within the BLSF boundary, nor will it change the flood storage capacity of the Site.

3.1.4 RIVERFRONT AREA (310 CMR 10.58)

The entire Project is located within the RA to Cold Brook. In total, approximately 992 sf of mostly degraded RA will be altered as a result of this Project. No changes or expansion to the existing roadway alignment are anticipated. Of these impacts, all impacts are within the inner riparian area, and include 986 sf of temporary impacts and 6 sf of permanent impacts. These impacts fully overlap with the BLSF impacts.

Work in RA includes:

- Construction of moment slab headwalls on both the north and south sides of Concord Road
- Construction of the HMA stormwater spillway
- Pavement repairs
- Guardrail installation.

All work, with the exception of the proposed HMA swale is proposed within in degraded RA. Construction staging will occur within degraded RA on the Concord Road paved surface and erosion control measures will be installed at the limit of work to protect Cold Brook from impacts resulting from staging. construction staging.

3.2 WORK IN BUFFER ZONES

The entire Project is proposed to occur within the 100 foot Buffer Zone to Bank and BVW as well as within and within the Adjacent Upland Resource Area (AURA – a bylaw resource area). Due to the nature of bridge work, all the Buffer Zone impacts are unavoidable. The bridge repair plans were designed to result in the least possible impacts to Buffer Zone practicable while still accomplishing the bridge repair goal of the Project. All adjacent wetland resources will be protected from work within Buffer Zones via the proper installation and maintenance of erosion controls as described below.

4.0 MITIGATION MEASURES

4.1 EROSION AND SEDIMENTATION CONTROLS

Best Management Practices for erosion and sedimentation control will be adhered to for all phases of construction to minimize erosion, sedimentation, and impacts on resource areas. The plan *Town of Sudbury, Massachusetts Department of Public Works, Concord Road Culvert Repairs - 8 Sheets - (Appendix B)* depict erosion control details and locations.

Erosion control measures will be implemented along the limit of work downgradient of the disturbed areas during construction to minimize water quality impacts to adjoining resource areas. Erosion and sedimentation barriers, consisting of compost-filled silt socks and floating sedimentation fence, will be installed to reduce the chance of soil or sediment migration under and beyond the sedimentation barrier.

Temporarily impacted areas will be restored to existing conditions upon completion of the project. Erosion controls will remain in place and in proper working order until the site is completely stabilized. A stockpile of erosion control materials will be kept on-site for emergency and routine replacement.

4.2 WATER CONTROLS AND DEWATERING

Every attempt will be made to minimize the extent and duration of hydrologic disruption within Cold Brook. The dredging work is anticipated to take less than a week, at which time the cofferdams installed across the stream channel will be removed. These larger temporary cofferdams placed across the river will prevent flow from entering the limit of work. Because the stream is slow-moving, under typical conditions the culvert functions as an “equalizer” between the two sides of Concord Street. Placement of the cofferdams for a short duration should have a minimal effect on the hydrology of the stream. Use of diversion structures will minimize sedimentation Cold Brook and will allow work to be performed in the dry, thereby avoiding or minimizing turbidity within the river during construction.

Smaller temporary cofferdams will also be placed around the wingwalls of the culvert so the contractor can conduct the concrete work required for the new wingwall caps. These cofferdams will be in place for approximately 1 month each, however, they will be installed surrounding the wingwalls and should not impede the flow of the stream.

Dewatering of the work area will be completed to avoid an increase over the baseline conditions. The Contractor will be responsible for developing an acceptable dewatering plan that will meet the requirements above. This plan will be submitted to the Town for approval and can be submitted to the Commission for approval as well. Work will comply with any Time of Year restrictions.

4.3 VEGETATED BANK RESTORATION

Once the work on the culvert is complete, the area of temporary vegetated bank alteration (389 sf) will be restored in-place, in-kind. Loam will be placed within the areas of disturbance and the area will then be seeded using a diverse native seed mix that contains both upland and wetland species (Appendix C). Use of this mix will result in species growth within their natural habitat, as there are upland portions of the Bank as well as wet portions of the Bank.

4.4 STORMWATER MANAGEMENT

According to the Stormwater Management Standards (310 CMR 10.05(6)(k-q)), the majority of the proposed work constitutes a Redevelopment Project because the work will substantially occur within an existing paved roadway. Redevelopment projects are required to meet Standards 1 and 7 through 10 fully; and, Standards 2 through 6 only to the maximum extent practicable but must at least improve existing conditions.

Repairing the Concord Road Culvert will result in a minimal increase in impervious area within the Project limits from the construction of the HMA swale necessary to prevent erosion. The Project is considered a "Redevelopment" project and, as such, is required to meet the stormwater standards to the maximum extent practicable. Erosion and sedimentation controls will be installed around any areas to be used for bridge repair ancillary work, including but not limited to construction staging.

5.0 ALTERNATIVES ANALYSIS

Due to the unique demands and limitations associated with Bridge crossings and roadway work, there are no practicable and substantially equivalent economic alternatives to the proposed Project with less adverse effects on the interests of the Act.

6.0 REGULATORY COMPLIANCE

The Concord Road Culvert Repair Project in Sudbury is being filed under the Limited Project provision found in the WPA Regulations at 310 CMR 10.53(3)(i)²; however, it has been designed to meet all of the WPA General Performance Standards to the extent practicable and feasible. The Project, as proposed, results in the following impacts:

² 310 CMR 10.53(3)(i) states, "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 CMR10.51 through 10.60 (April 1, 1983)."

Sudbury, Massachusetts

- Bank** - 67 lf of temporary alteration to the top of Bank
- 38 lf of temporary alteration to the low Bank boundary
- 2 lf of permanent impacts to the top of Bank
- LUW** - 449 sf of temporary impact to LUW
- BLSF** - 986 sf of temporary impact to BLSF
- 6 sf of permanent impact to BLSF
- RA** - 986 sf of impact within previously Degraded RA
- 6 sf of permanent RA impacts.

6.1 MASSACHUSETTS WETLANDS PROTECTION ACT REGULATIONS— 310 CMR 10.00

The General Performance Standards at 310 CMR 10.54(4)³, 10.56(4)⁴, and 310 CMR 10.57(4)(a)⁵ will be met fully. The majority of the impacts resource areas are temporary as specified above.

6.1.1.1 BANK, LUW AND BLSF GENERAL PERFORMANCE STANDARDS COMPLIANCE

The wildlife interests of the Act for Bank, LUW, and BLSF are presumed to be protected, as permanent alterations are less than the thresholds requiring a wildlife habitat analysis (see footnotes 3-5). Additionally, because disturbed areas will be restored once the work is complete and vegetated bank will be restored in-kind in the same location, there will be no adverse impact to wildlife habitat two years following the completion of activities at the Site. The majority of the impacts to Bank result from the installation of the temporary coffer dams, removal of concrete debris from the failed headwall, and construction of the HMA spillway. Temporary impacts to LUW result from installation of water control/diversion structures, mechanical excavation of sediment deposits (~15 cubic yards), which will restore grades under water and increase the LUW functions and values. Impacts to BLSF result from construction of new moment slab headwalls, pavement repairs, and installation of the HMA swale.

6.1.1.2 RA GENERAL PERFORMANCE STANDARDS COMPLIANCE

The majority of the impacts to RA result from roadway improvements and headwall construction within Previously Degraded RA (986 sf)⁶ and from construction of the HMA swale within non-degraded RA (6 sf).

Work within Previously Degraded RA is subject to the General Performance Standards at 310 CMR 10.58(5). These standards are met to the maximum extent practicable, as:

³ Work along the Bank will meet the General Performance Standards at 310 CMR 10.54(4) as work will not affect the stability of the bank, impair the water carrying capacity of the existing channel within the bank, impair ground or surface water quality, and the permanent impacts to Bank do not exceed thresholds for wildlife habitat impairment (50 lf or 10%, whichever is less).

⁴ Work within LUW will meet the General Performance Standards at 310 CMR 10.56(4) as work will not impair the water carrying capacity within the defined channels, impair ground or surface water quality, or permanently exceed thresholds for wildlife habitat impairment (5,000 square feet or 10%, whichever is less).

⁵ Work within BLSF will meet the General Performance Standards at 310 CMR 10.57(4)(a) as there will be no flood storage volume lost as a result of the proposed Project, the work will not change the flood stage or velocity, and will not permanently exceed thresholds for wildlife habitat impairment (5,000 square feet or 10%, whichever is less).

⁶ The majority of the Riverfront Area on the Project Site meets the definition of previously degraded in accordance with 310 CMR 10.58(5) as the area was fully degraded prior to August 7, 1996 due to the presence of impervious surfaces from existing pavement associated with the roadway.

Sudbury, Massachusetts

- a. Work will result in an improvement over existing conditions, as concrete debris is proposed to be removed from Cold Brook, which will increase Site's capacity to protect the following interests of the Act: pollution prevention, flood control, storm damage prevention, wildlife habitat, and protection of ground water supply.
- b. Stormwater management is provided to the maximum extent practical in accordance with the General Performance Standards and regulations.
- c. Permanent alterations are not proposed closer to the River than existing conditions, except the HMW swale proposed to control stormwater and prevent erosion.
- d. Work is located outside the RA to the extent practicable
- e. The area of work does not exceed the amount of existing degraded area, except the HMW swale proposed to control stormwater and prevent erosion
- f – h. These standards do not apply, as RA restoration is not required nor proposed for this Project

Work within non-degraded RA consists solely of the construction of the HMA swale to convey stormwater and prevent erosion. This will impact 6 sf of RA, however, because it is an improvement of an existing stormwater conveyance feature, these impacts can be excluded from consideration when applying the performance standards.⁷

6.2 TOWN OF SUDBURY WETLANDS BYLAW AND REGULATIONS

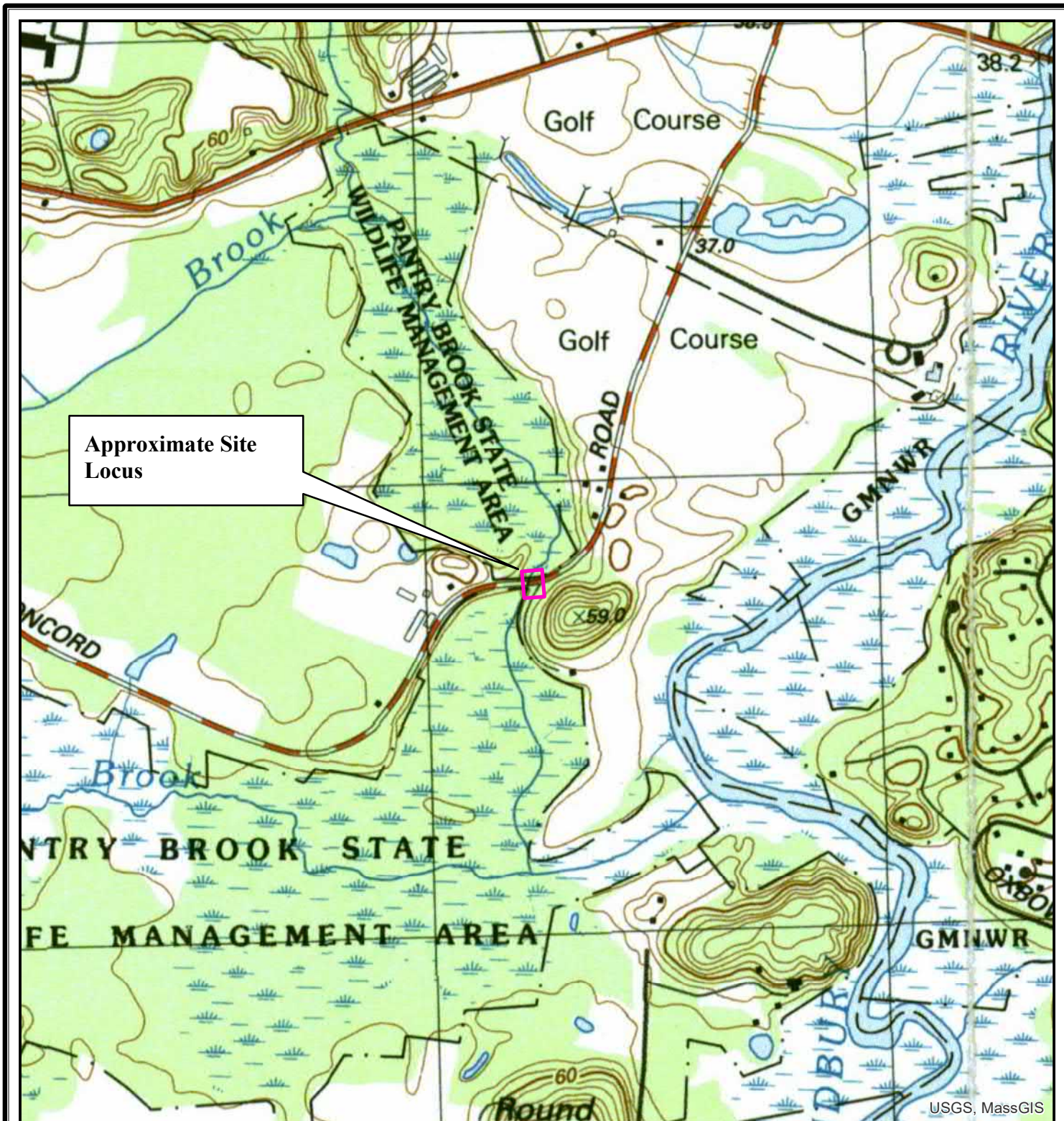
According to the Bylaw Regulations, the Conservation Commission uses its discretion in determining site and project-specific disturbance restrictions. The majority of the impacts associated with the Project are temporary and the disturbance will be limited to a small area surrounding the culvert. The proposed Project involves work within an area of existing non-conforming area and there is no other practicable alternative to the proposed work. No other additional Bylaw Performance Standards are applicable to this Project.

7.0 SUMMARY

The proposed Concord Road Culvert Repair Project will repair parts of the Cold Brook culvert to ensure that Concord Road remains a safe roadway for vehicular traffic. The Project has been designed to meet all local and state standards and comply with the performance standards for resource areas set forth in the Act and the WPA Regulations at 310 CMR 10.00, as well as, the Sudbury Wetland Bylaw and its Regulations, to the maximum extent practical and feasible. The Project Team feels the Commission has sufficient information to describe the site, the work, and the effect of the work on the interests identified in the Wetlands Protection Act (M.G.L. c. 131, § 40) and the Sudbury Bylaw Regulations.

⁷ 310 CMR 10.58(4)(d) – “The calculation also shall exclude areas used for structures stormwater management measures, provided there is not practicable alternative.

FIGURES

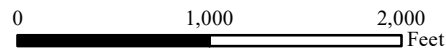
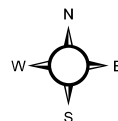


USGS, MassGIS



IMPROVING COMMUNITIES TOGETHER

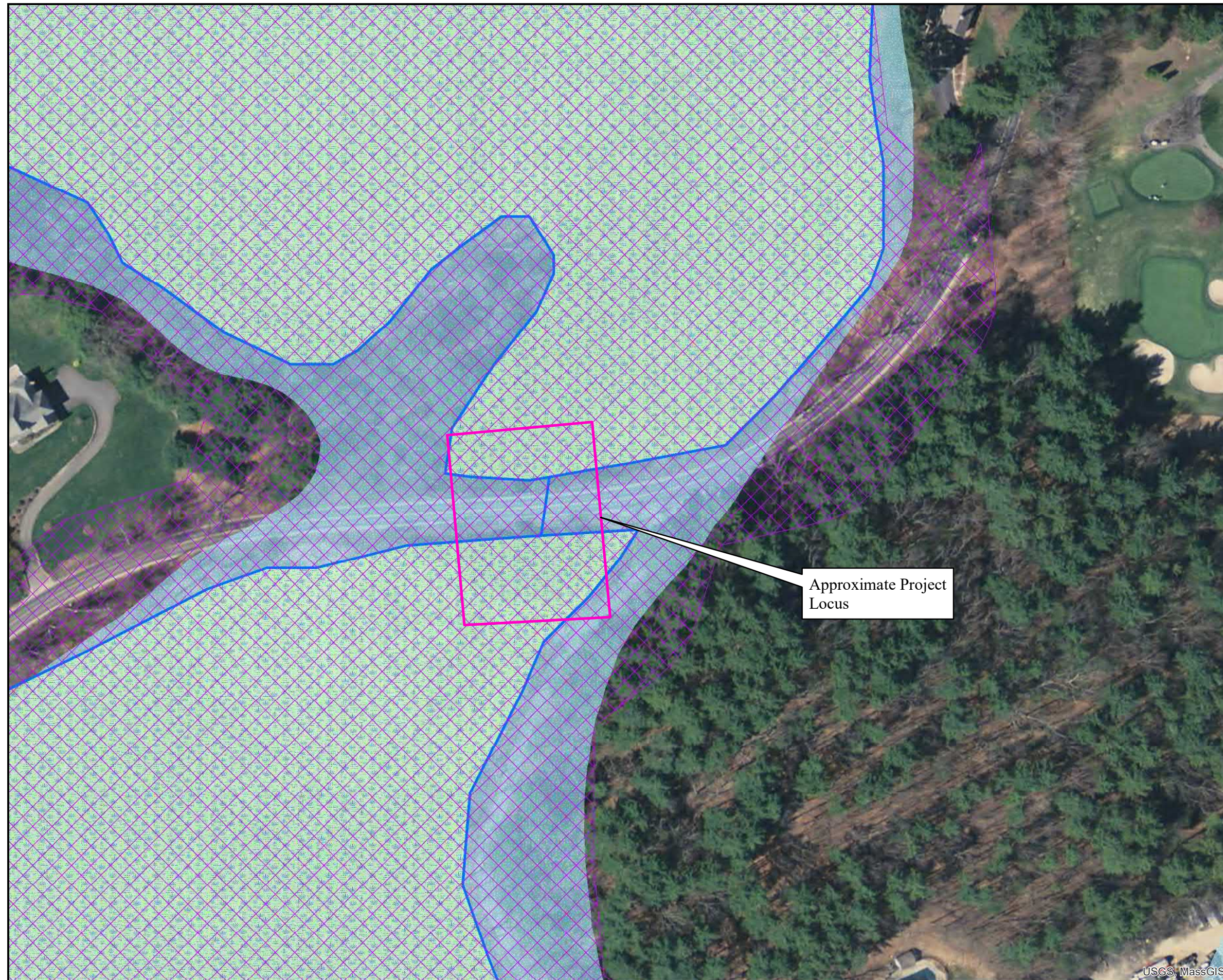
Figure 1
Site Locus
Concord Road Bridge
Sudbury, MA



1 inch = 1,000 feet

Data Source: MassGIS USGS Color Ortho Imagery (2009)

Figure 3
Environmental Resources Map
Concord Road Bridge
Sudbury, MA



Wetland Resources Legend

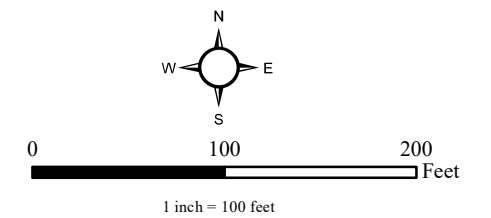
- MassDEP Hydrologic Feature
- Marsh/Bog
- Wooded marsh
- Open Water
- NFHL 100 Year Flood Zone
- Area of Critical Environmental Concern (ACEC)

Mapped Habitat Legend

- NHESP Potential Vernal Pool
- NHESP Certified Vernal Pool
- NHESP Estimated Habitat of Rare Wildlife
- NHESP Priority Habitat of Rare Species

Water Protection Legend

- ZONE A
- ZONE B
- ZONE C
- MassDEP Zone II
- Mass DEP IWPA
- Outstanding Resource Waters



Data Source: MassGIS USGS Color Ortho Imagery (2014), MassDEP Wetlands (1:12000) (2009), NHESP Potential Vernal Pools (2000), NHESP Certified Vernal Pools, NHESP Priority Habitats of Rare Species (2008), NHESP Estimated Habitats of Rare Species (2008), Areas of Critical Environmental Concern (2009), FEMA National Flood Hazard Layer (2014).



National Flood Hazard Layer FIRMette



42°24'48.43"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

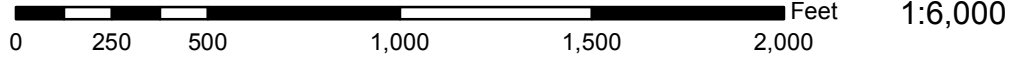
- | | | |
|------------------------------------|--|---|
| SPECIAL FLOOD HAZARD AREAS | | Without Base Flood Elevation (BFE)
Zone A, V, A99 |
| | | With BFE or Depth Zone AE, AO, AH, VE, AR |
| | | Regulatory Floodway |
| OTHER AREAS OF FLOOD HAZARD | | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X |
| | | Future Conditions 1% Annual Chance Flood Hazard Zone X |
| | | Area with Reduced Flood Risk due to Levee. See Notes. Zone X |
| | | Area with Flood Risk due to Levee Zone D |
| OTHER AREAS | | NO SCREEN Area of Minimal Flood Hazard Zone X |
| | | Effective LOMRs |
| | | Area of Undetermined Flood Hazard Zone D |
| GENERAL STRUCTURES | | Channel, Culvert, or Storm Sewer |
| | | Levee, Dike, or Floodwall |
| OTHER FEATURES | | 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation |
| | | 17.5 |
| | | Coastal Transect |
| | | Base Flood Elevation Line (BFE) |
| | | Limit of Study |
| | | Jurisdiction Boundary |
| MAP PANELS | | Digital Data Available |
| | | No Digital Data Available |
| | | Unmapped |
- The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.



This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/9/2019 at 11:22:20 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



USGS The National Map: Orthoimagery. Data refreshed April, 2019.

42°24'21.87"N

71°22'23.99"W

71°23'1.45"W

Photographic Documentation

Photo 1



View of the Bank (WF1 Series) of Cold Brook south of Concord Road—facing west

Photo 2



View of the Bank (WF1 Series) at the headwall of Cold Brook—facing northwest

PHOTOGRAPHIC DOCUMENTATION

Concord Road Bridge

Sudbury, Massachusetts

Photographs Documented August 8, 2019

Photo 3



View of the low-flow channel of Cold Brook below the vegetated Bank (WF1 Series) south of Concord Road - facing southwest.

Photo 4



View of the low-flow channel of Cold Brook below the vegetated Bank (WF2 Series) north of Concord Road - facing north.

PHOTOGRAPHIC DOCUMENTATION

Concord Road Bridge

Sudbury, Massachusetts

Photographs Documented August 8, 2019

Photo 5



View of the Bank (WF2 Series) at the headwall of Cold Brook—facing southeast

Photo 6



View of Concord Road—facing west

PHOTOGRAPHIC DOCUMENTATION

Concord Road Bridge

Sudbury, Massachusetts

Photographs Documented August 8, 2019

Photo 7



View of the Bank (WF2 Series) at the headwall of Cold Brook—facing west

Photo 8



View of the WF1 Series (Flags WF1-100 through WF1-102) BVW along the Bank of Cold Brook, south of Concord Road—facing southwest

PHOTOGRAPHIC DOCUMENTATION

Concord Road Bridge

Sudbury, Massachusetts

Photographs Documented August 8, 2019

APPENDIX A –Resource Area Delineation Report

**Resource Area Boundary Delineation
Concord Road Bridge over Cold Brook
Sudbury, Massachusetts**

October 2, 2019

On August 8, 2019, BETA Group, Inc. (BETA) conducted resource area boundary delineations adjacent to the Concord Road Bridge over Cold Brook in Sudbury, Massachusetts (the Site). This report describes resource areas Subject to Protection under the Massachusetts Wetlands Protection Act (M.G.L. Chapter 131 Section 40 - the Act), Town of Sudbury Wetlands Administration Bylaw (Article XXII), the federal Clean Water Act CFR (33 U.S.C. §1251 et seq (1972)), the federal Rivers and Harbors Act (33 U.S.C. 403 (1899)), and the Massachusetts Clean Waters Act (MGL Chapter 21 Section 26-53), that exist on the Site and methodology used to delineate their boundaries.

Site Description

The Site is located on Concord Road in northern Sudbury, Massachusetts, generally south of Route 117 and north of the Pantry Brook State Wildlife Management Area (Figure 1 – Site Locus). The Concord Road Bridge spans Cold Brook, a perennial stream, and is located within a residential area. The Site is bound by undeveloped forested upland to the northwest and southeast and wetlands to the north/northeast and south/southwest, (Figure 2 – Environmental Resources Map).

According to the USDA Natural Resources Conservation Service – Soil Survey, mapped soils on the Site and in the vicinity of the Site are classified as Freetown Muck. Our field work generally confirmed the soil types within the wetland portions of the Site. The Custom Soil Resource Report for Middlesex County, Massachusetts is attached.

State jurisdictional resource areas identified on the Site include Bordering Vegetated Wetland (BVW); Bank (to perennial stream); Land Under Water (LUW); Bordering Land Subject to Flooding (BLSF); and Riverfront Area (RA). The MassGIS database was used as the initial step in identifying critical areas on or within proximity of the site that would be examined more closely if construction activities are proposed. The table below describes selected environmentally critical categories as determined through MassGIS.

Table 1. Selected MassGIS Environmental Data Layers

Mapped Resource On or Within Proximity to Site	Yes	No
Area of Critical Environmental Concern		✓
NHESP Certified Vernal Pool		✓
NHESP Potential Vernal Pool		✓
Coldwater Fisheries Resource		✓
NHESP Established Habitat of Rare Wildlife	✓	
NHESP Priority Habitat of Rare Species	✓	
Outstanding Resource Waters		✓
FEMA Flood Zones	✓	
Surface Water Protection Area (Zones A and B)		✓
Interim Wellhead Protection Area		✓
Zone II Wellhead Protection Area		✓

Source: MassGIS

Jurisdictional Wetland Resource Areas – Massachusetts Wetlands Protection Act

A Site inspection was conducted by BETA’s Wetland Scientists on August 8, 2019 to identify and delineate the boundaries of existing wetland resource areas on the Site and in the immediate vicinity of the Site. Resource area boundaries were identified and delineated in accordance with methods developed by the Massachusetts Department of Environmental Protection’s *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act*, dated 1995, as well as definitions set forth in the Wetland Regulations, 310 CMR 10.00. Several Areas Subject to Protection under the Act exist on the Site and are described below.

Bank (to perennial stream) – 310 CMR 10.54

According to 310 CMR 10.54(2), the definition of a Bank is the portion of the land surface which normally abuts and confines a water body, occurring between a water body and a vegetated bordering wetland and adjacent floodplain, or, in the absence of these, it occurs between a water body and an upland. The upper boundary of a Bank is the first observable break in the slope or the mean annual flood level, whichever is lower.

BETA identified the resource Bank to one (1) perennial stream, Cold Brook. The Banks of Cold Brook were delineated in the field with pink flagging.

Table 2: Bank to Perennial Stream Boundary Description

Flag Series	Waterbody Name	Description / Notes
<p><i>WF1 and WF2 Series Flags WF1-102 to WF1-114 And WF2-100 to WF2-114</i></p>	<p>Cold Brook</p>	<p>The top of the northern (<i>WF2 Series</i>) and southern (<i>WF1 Series</i>) f Banks/Mean Annual High Water (MAHW) marks of Cold Brook were delineated in the vicinity of the Site, where flow is conveyed southerly under Concord Road, flowing into the Pantry Brook Water Management Area. The Bank was delineated at the first observable break in slope, which is coincident with the mean annual flood level. The Bank, as delineated normally abuts and confines the Brook.</p> <p>Due to the low grade of the stream and low-lying surrounding areas, the vegetated area between the Top of the Bank of Cold Brook and the low flow channel is regulated as vegetated Bank. The Banks of Cold Brook are vegetated with cattail (<i>Typha latifolia</i>), buttonbush (<i>Cephalanthus occidentalis</i>), and purple loosestrife (<i>Lythrum salicaria</i>).</p>

Bordering Vegetated Wetland – 310 CMR 10.55

According to 310 CMR 10.55(2), the definition of BVW are freshwater wetlands which border on creeks, Rivers, streams, ponds and lakes and are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The boundary of BVW is the line within which 50% or more of the vegetation community consists of wetland indicator plants and saturated or inundated conditions exist.

BETA identified one (1) area of BVW in proximity to the Site bordering the Banks of Cold Brook. US Army Corps vegetated wetland boundary delineation field data sheets are attached documenting BETA’s observations of evidence of hydrology, soils, and hydrophytic vegetation at specific data plots.

Table 3: BVW Boundary Description

Flag Series	Location	Description / Notes
<p><i>WF1 Series</i> <i>Flags WF1-100 to WF1-102</i></p>	<p>Along the east bank of Cold Brook, south of Concord Road.</p>	<p>The BVW can be characterized as a partially forested wetland that transitions to an emergent aquatic wetland at the banks of Cold Brook. This wetland boundary was established based on evidence of hydrology (including hydric soils) and the presence of hydrophytic vegetation.</p>

Land Under Water – 310 CMR 10.56

According to 310 CMR 10.56(2), the definition of LUW is the land beneath any creek, river, stream, pond or lake and may be composed of organic muck or peat, fine sediments, rocks or bedrock. LUW exists between the Bank boundaries below the mean annual low water level of Hopping Brook. The boundary of LUW is the mean annual low water level. This boundary is not delineated in the field however the boundary can be estimated using the defined low-flow channel that can be observed on aerials.

Bordering Land Subject to Flooding– 310 CMR 10.57

According to the FEMA Flood Insurance Rate Map (FIRM) Numbers 25017C0367F (July 6, 2014) the Site is located within FEMA Flood Zone AE, with a base flood elevations (BFE) of 121 Feet. Work conducted below the BFE is Subject to Jurisdiction under the Act.

Riverfront Area – 310 CMR 10.58

According to its definition at 310 CMR 10.58(3), the boundary of RA is the area of land between a River’s mean annual high-water line measured horizontally outward from the River and a parallel line located 200 feet away. A River is any natural flowing body of water that empties to any ocean, lake, pond, or other River flowing throughout the year and is shown as perennial on the current United States Geological Survey or more recent map provided by the Department.

Cold Brook is a perennial stream (River), as defined under the Act, with an associated 200-foot RA from the MAHW boundary. The MAHW boundary on the Site is generally coincident with the Bank boundary (the WF1 and WF2 series). The RA should be measured 200 feet horizontally from the Bank flags.

Jurisdictional Wetland Resource Areas – Town of Sudbury Bylaw

The Town of Sudbury Wetlands Administration Bylaw (Article XXII) and regulations maintain the same wetland resource area definitions as provided in the Act for all resource areas except Bank, Vernal Pool, Isolated Land Subject to Flooding (ILSF), and Pond.

Bank - The Bylaw defines Bank as “the land area which normally abuts and confines a water body, the lower boundary being the mean annual low flow level and the upper boundary being the first observable break in the slope or the mean annual flood level, whichever is higher.” The Bank boundaries delineated onsite were delineated in accordance with this definition, as the first observable break in slope was coincident with the mean annual flood level.

Vernal Pool – The Bylaw defines “Vernal Pool” as “Any confined basin or depression not occurring in existing lawns, gardens, landscaped areas or driveways which, at least in most years, holds water for a minimum of two continuous months during the spring and/or summer, contains at least 200 cubic feet of water at some time during most years, is free of adult predatory fish populations, and provides essential breeding and rearing habitat functions for amphibian, reptile or other vernal pool community species, regardless of whether the site has been certified by the Massachusetts Division of Fisheries and Wildlife.” No confined basins or depressions were observed within 100 feet of the Site.

ILSF – The Bylaw defines ILSF as an “area, depression, or basin that holds at minimum one-eighth acre foot of water and at least six inches of standing water once a year.” No areas meeting the definition of ILSF were observed within 100 feet of the Site.

Pond – The Bylaw defines Pond as “any open body of fresh water with a surface area observed or recorded within the last ten years of at least 5,000 square feet. Ponds shall contain standing water except for periods of extended drought.” Although the flooded area to the south of Concord Road does have a surface area of greater than 5,000 square feet, water within this area is flowing within a defined channel. Therefore, the area does not meet the definition of a Pond.

The Bylaw also protects an “Adjacent Upland Resource Area” or AURA which is measured a set distance from specific resource area boundaries. The AURA for resource areas identified onsite are:

100 feet - Freshwater Wetlands, Bank to Intermittent Streams, BLSF

200 feet - Bank to Perennial Streams

The Bylaw also extends jurisdiction to all freshwater vegetated wetlands, however, no isolated vegetated wetlands were identified within 100 feet of the Site. As such, no additional jurisdictional areas protected under the local bylaw were found.

Jurisdictional Wetland Resource Areas – Federal Clean Water Act (Section 404)

The wetlands and perennial stream located on the Site are “Waters of the United States,” and are therefore subject to the federal Clean Water Act, 33 U.S.C. §1251 et seq (1972). The boundary to “waters of the United States” is the vegetated wetlands boundary, or, in the absence of vegetated wetlands, is the Ordinary High Water Mark (OHWM) for non-tidal rivers and streams, as specified at 33 CFR §328.4.

According to 33 CFR §328.3(c)(4), vegetated wetlands are defined as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” The wetland boundaries previously described in this report were delineated in accordance with this definition. US Army Corps vegetated wetland boundary delineation field data sheets are attached documenting BETA’s observations of evidence of hydrology, soils, and hydrophytic vegetation at specific data plots. The OHWM, as defined at 33 CFR §328.3(c)(6), is not delineated in the field at this time.

Work requiring filling below the boundary of vegetated wetlands or OHWM is Subject to Jurisdiction under Section 404 of the Clean Water Act.

Jurisdictional Wetland Resource Areas – Massachusetts Clean Waters Act (Section 401)

The limit of jurisdiction under Massachusetts Clean Waters Act (Section 401), as specified in 314 CMR 9.00, is the limit of Section 404 jurisdiction under the federal Clean Water Act. Exceedances of the jurisdictional threshold under 314 CMR 9.00 require filing for a Water Quality Certification under Section 401.

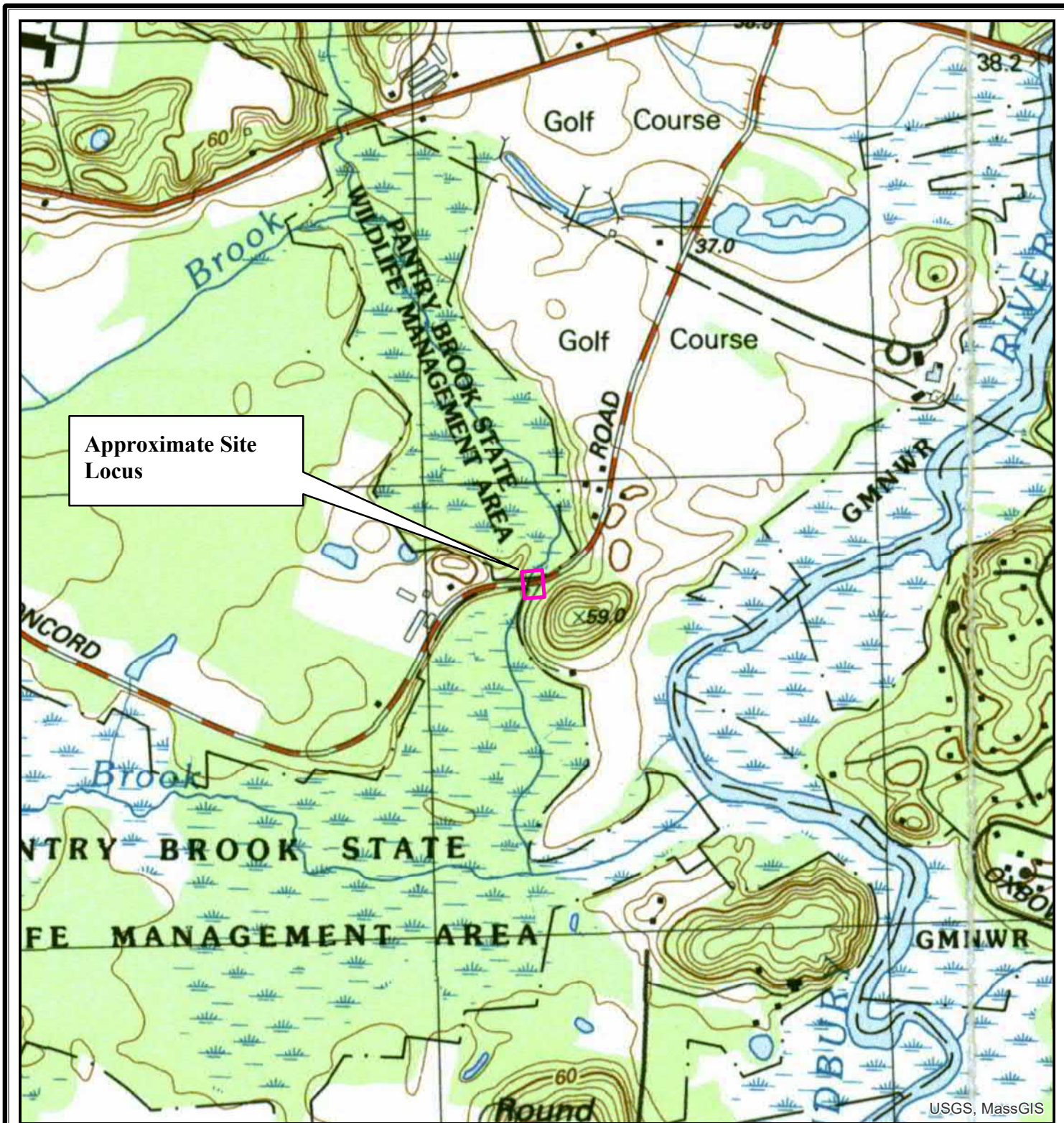
Findings and Recommendations

BETA has identified areas Subject to Protection and/or Jurisdiction under the Massachusetts Wetlands Protection Act, Sudbury Wetlands Administration Bylaw, the federal Clean Water Act, and the Massachusetts Clean Waters Act, on or within 100 feet of the Site, and have delineated the boundaries of Bank, MAHW, and BVW that exist on the Site. In order to definitively determine the extent of Conservation Commission jurisdiction, Army Corps jurisdiction, and MassDEP jurisdiction, the boundary flags would need to be located and depicted on a to-scale plan of the Site.

We appreciate the opportunity to provide you with expert wetland services. If you have any questions or need further assistance, please do not hesitate to call us.

Attachments: Figure 1 - Site Locus
Figure 2 – Environmental Resources Map
Figure 3 - FEMA FIRMette
Photographic Documentation
US Army Corps of Engineers' *Vegetated Wetland Boundary Delineation Field Data Sheets*
Custom Soil Report for Middlesex County, Massachusetts

Job No: 19.06733.00

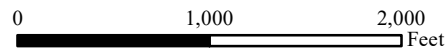
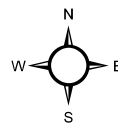


USGS, MassGIS



IMPROVING COMMUNITIES TOGETHER

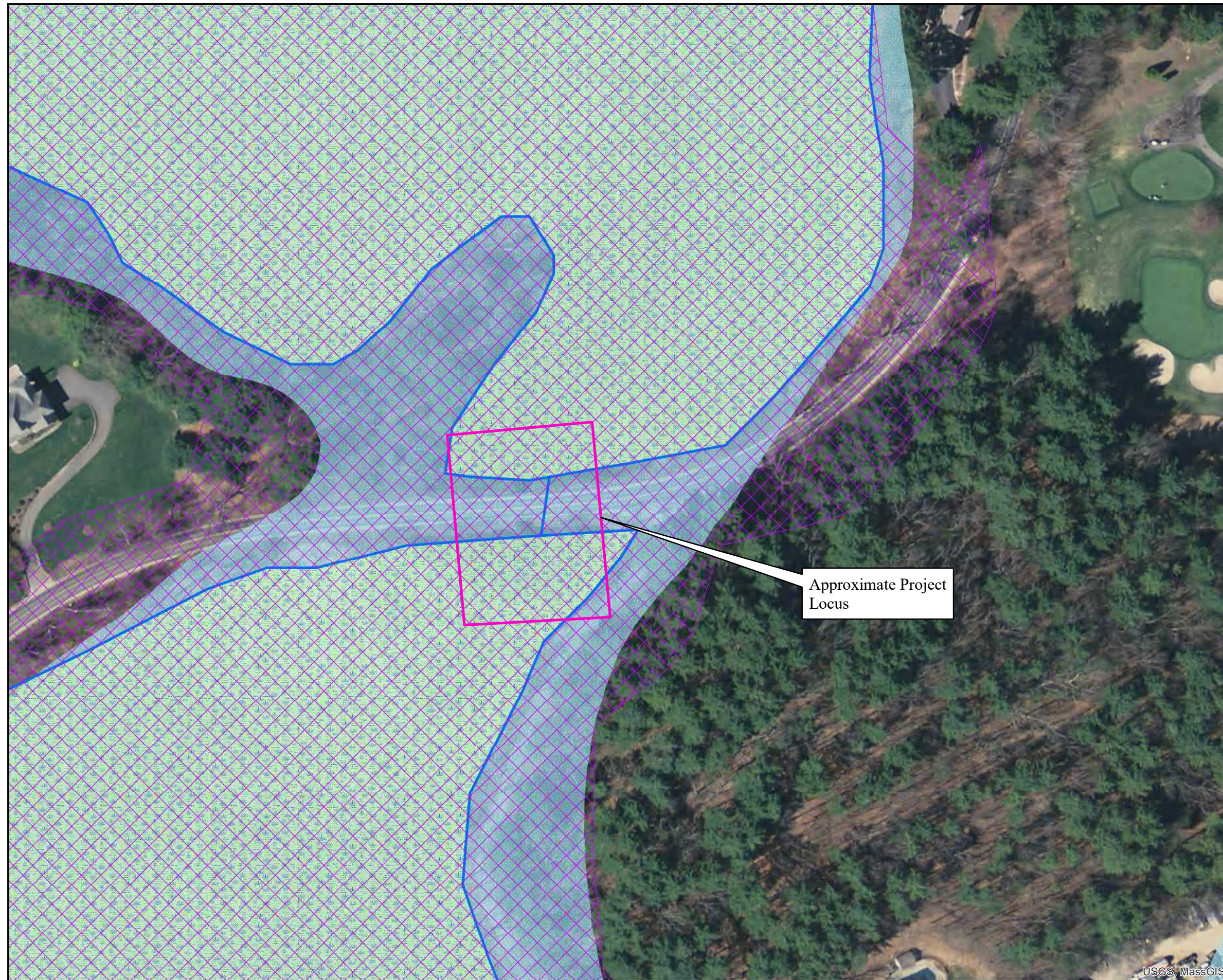
Figure 1
Site Locus
Concord Road Bridge
Sudbury, MA



1 inch = 1,000 feet

Data Source: MassGIS USGS Color Ortho Imagery (2009)

Figure 3
Environmental Resources Map
Concord Road Bridge
Sudbury, MA



Wetland Resources Legend

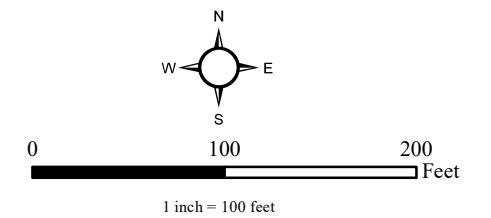
- MassDEP Hydrologic Feature
- Marsh/Bog
- Wooded marsh
- Open Water
- NFHL 100 Year Flood Zone
- Area of Critical Environmental Concern (ACEC)

Mapped Habitat Legend

- NHESP Potential Vernal Pool
- NHESP Certified Vernal Pool
- NHESP Estimated Habitat of Rare Wildlife
- NHESP Priority Habitat of Rare Species

Water Protection Legend

- ZONE A
- ZONE B
- ZONE C
- MassDEP Zone II
- Mass DEP IWPA
- Outstanding Resource Waters



Data Source: MassGIS USGS Color Ortho Imagery (2014), MassDEP Wetlands (1:12000) (2009), NHESP Potential Vernal Pools (2000), NHESP Certified Vernal Pools, NHESP Priority Habitats of Rare Species (2008), NHESP Estimated Habitats of Rare Species (2008), Areas of Critical Environmental Concern (2009), FEMA National Flood Hazard Layer (2014).



National Flood Hazard Layer FIRMette



42°24'48.43"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D

OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall

OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance
		17.5 Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
OTHER FEATURES		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature

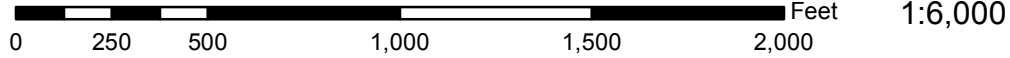
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/9/2019 at 11:22:20 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



USGS The National Map: Orthoimagery. Data refreshed April, 2019.

42°24'21.87"N

71°23'23.99"W

71°23'1.45"W



Photo 1



View of the Bank (WF1 Series) of Cold Brook south of Concord Road—facing west

Photo 2



View of the Bank (WF1 Series) at the headwall of Cold Brook—facing northwest

PHOTOGRAPHIC DOCUMENTATION

Concord Road Bridge

Sudbury, Massachusetts

Photographs Documented August 8, 2019

Photo 3



View of the low-flow channel of Cold Brook below the vegetated Bank (WF1 Series) south of Concord Road - facing southwest.

Photo 4



View of the low-flow channel of Cold Brook below the vegetated Bank (WF2 Series) north of Concord Road - facing north.

PHOTOGRAPHIC DOCUMENTATION

Concord Road Bridge

Sudbury, Massachusetts

Photographs Documented August 8, 2019

Photo 5



View of the Bank (WF2 Series) at the headwall of Cold Brook—facing southeast

Photo 6



View of Concord Road—facing west

PHOTOGRAPHIC DOCUMENTATION

Concord Road Bridge

Sudbury, Massachusetts

Photographs Documented August 8, 2019

Photo 7



View of the Bank (WF2 Series) at the headwall of Cold Brook—facing west

Photo 8



View of the WF1 Series (Flags WF1-100 through WF1-102) BVW along the Bank of Cold Brook, south of Concord Road—facing southwest

PHOTOGRAPHIC DOCUMENTATION

Concord Road Bridge

Sudbury, Massachusetts

Photographs Documented August 8, 2019

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Concord Road City/County: Sudbury Sampling Date: 8/8/2019
 Applicant/Owner: Town of Sudbury State: MA Sampling Point: WF1-101
 Investigator(s): Laura Krause, Noel Lioce Section, Township, Range: Middlesex County Upland
 Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____
 Slope (%): 0 - 1 Lat: 42°24'34.70"N Long: 71°22'41.43"W Datum: _____
 Soil Map Unit Name: 53A Freetown Muck NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/> Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/> If yes, optional Wetland Site ID: _____
Remarks: (Explain alternative procedures here or in a separate report.) This upland area is adjacent to a private drive entrance and the eastbound lane of Concord Road. Part of this upland is maintained lawn.	

HYDROLOGY

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply) <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Aquatic Fauna (B13) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Marl Deposits (B15) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)	Secondary Indicators (minimum of two required) <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? (includes capillary fringe) Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____	Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available: _____ _____	
Remarks: _____ _____	

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30 ft.</u>)					
1. <u>Eastern White Pine (<i>Pinus strobus</i>)</u>	<u>38.0</u>	<u>yes</u>	<u>FACU</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>5</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>20</u> (A/B)	
2. <u>American elm (<i>Ulmus americana</i>)</u>	<u>20.5</u>	<u>yes</u>	<u>FACW</u>		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
5. _____	_____	_____	_____		
6. _____	_____	_____	_____		
7. _____	_____	_____	_____		
<u>58.5</u> = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>15 ft.</u>)					
1. <u>Northern Red Oak (<i>Quercus rubra</i>)</u>	<u>3.0</u>	<u>yes</u>	<u>FACU</u>		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
5. _____	_____	_____	_____		
6. _____	_____	_____	_____		
7. _____	_____	_____	_____		
<u>3.0</u> = Total Cover				Hydrophytic Vegetation Indicators: <input type="checkbox"/> Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> Dominance Test is >50% <input type="checkbox"/> Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
Herb Stratum (Plot size: <u>5 ft.</u>)					
1. <u>Common Ragweed (<i>Ambrosia artemisiifolia</i>)</u>	<u>20.5</u>	<u>yes</u>	<u>FACU</u>		
2. <u>Upland Grasses</u>	<u>10.5</u>	<u>no</u>	<u>UPL</u>		
3. <u>Red Clover (<i>Trifolium pretense</i>)</u>	<u>10.5</u>	<u>no</u>	<u>FACU</u>		
4. <u>Common Yarrow (<i>Achillea millefolium</i>)</u>	<u>10.5</u>	<u>no</u>	<u>FACU</u>		
5. <u>Interrupted Fern (<i>Osmunda claytoniana</i>)</u>	<u>3.0</u>	<u>no</u>	<u>FAC</u>		
6. _____	_____	_____	_____		
7. _____	_____	_____	_____		
8. _____	_____	_____	_____		
9. _____	_____	_____	_____		
10. _____	_____	_____	_____		
11. _____	_____	_____	_____		
12. _____	_____	_____	_____		
<u>55.0</u> = Total Cover				Definitions of Vegetation Strata: Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vines – All woody vines greater than 3.28 ft in height.	
Woody Vine Stratum (Plot size: <u>30 ft.</u>)					
1. <u>Oriental Bittersweet (<i>Celastrus orbiculatus</i>)</u>	<u>10.5</u>	<u>yes</u>	<u>UPL</u>		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
<u>10.5</u> = Total Cover				Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>	
Remarks: (Include photo numbers here or on a separate sheet.)					

SOIL

Sampling Point: Upland

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0 – 2	10YR 3/2						sandy loam	
2 – 14	10YR 4/4						fine sand	
14 – 18	2.5YR 5/3						fine sand	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Dark Surface (S7) (LRR R, MLRA 149B)

- Polyvalue Below Surface (S8) (LRR R, MLRA 149B)
- Thin Dark Surface (S9) (LRR R, MLRA 149B)
- Loamy Mucky Mineral (F1) (LRR K, L)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) (LRR K, L, MLRA 149B)
- Coast Prairie Redox (A16) (LRR K, L, R)
- 5 cm Mucky Peat or Peat (S3) (LRR K, L, R)
- Dark Surface (S7) (LRR K, L)
- Polyvalue Below Surface (S8) (LRR K, L)
- Thin Dark Surface (S9) (LRR K, L)
- Iron-Manganese Masses (F12) (LRR K, L, R)
- Piedmont Floodplain Soils (F19) (MLRA 149B)
- Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes _____ No

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Concord Road City/County: Sudbury Sampling Date: 8/8/2019
 Applicant/Owner: Town of Sudbury State: MA Sampling Point: WF1-101
 Investigator(s): Laura Krause, Noel Lioce Section, Township, Range: Middlesex County Wetland
 Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____
 Slope (%): 0 – 1 Lat: 42°24'34.51"N Long: 71°22'41.86"W Datum: _____
 Soil Map Unit Name: 53A Freetown Muck NWI classification: PEM1Ed

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____ If yes, optional Wetland Site ID: <u>WF1 Series</u>
Remarks: (Explain alternative procedures here or in a separate report.) Wetland 1 is a vegetated freshwater emergent wetland with a culverted connection to wetland 2 under Concord Road. This wetland is fed by Cold Brook. There is a manmade berm on the w/sw boundary of this wetland with an opening for flow connection to the continuing wetlands to the south.	

HYDROLOGY

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)	Secondary Indicators (minimum of two required)
<input checked="" type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input checked="" type="checkbox"/> Saturation (A3) <input checked="" type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)	<input checked="" type="checkbox"/> Water-Stained Leaves (B9) <input checked="" type="checkbox"/> Aquatic Fauna (B13) <input type="checkbox"/> Marl Deposits (B15) <input checked="" type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input checked="" type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
Field Observations: Surface Water Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): _____ Water Table Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0"</u> Saturation Present? (includes capillary fringe) Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0"</u>	
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	

VEGETATION – Use scientific names of plants.

Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30 ft.</u>)				
1. <u>American elm (<i>Ulmus americana</i>)</u>	<u>38.0</u>	<u>yes</u>	<u>FACW</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>7</u> (A) Total Number of Dominant Species Across All Strata: <u>9</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>77.8%</u> (A/B)
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
	<u>38</u>	= Total Cover		
Sapling/Shrub Stratum (Plot size: <u>15 ft.</u>)				
1. <u>Buttonbush (<i>Cephalanthus occidentalis</i>)</u>	<u>10.5</u>	<u>yes</u>	<u>OBL</u>	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
2. <u>Green Ash (<i>Faxinus pennsylvanica</i>)</u>	<u>10.5</u>	<u>yes</u>	<u>FACW</u>	
3. <u>Glossy Buckthorn (<i>Frangula alnus</i>)</u>	<u>10.5</u>	<u>yes</u>	<u>FAC</u>	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
	<u>31.5</u>	= Total Cover		
Herb Stratum (Plot size: <u>5 ft.</u>)				
1. <u>Purple Loosestrife (<i>Lythrum salicaria</i>)</u>	<u>38.0</u>	<u>yes</u>	<u>OBL</u>	Hydrophytic Vegetation Indicators: <input type="checkbox"/> Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> Dominance Test is >50% <input type="checkbox"/> Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
2. <u>Jewelweed (<i>Impatiens capensis</i>)</u>	<u>20.5</u>	<u>yes</u>	<u>FACW</u>	
3. <u>Woolgrass (<i>Scirpus cyperinus</i>)</u>	<u>10.5</u>	<u>no</u>	<u>OBL</u>	
4. <u>Sensitive Fern (<i>Onoclea sensibilis</i>)</u>	<u>10.5</u>	<u>no</u>	<u>FACW</u>	
5. <u>Common Ragweed (<i>Ambrosia artemisiifolia</i>)</u>	<u>10.5</u>	<u>no</u>	<u>FACU</u>	
6. <u>Green Arrow Arum (<i>Peltandra virginica</i>)</u>	<u>3.0</u>	<u>no</u>	<u>OBL</u>	
7. <u>Broadleaf Cattail (<i>Typha latifolia</i>)</u>	<u>3.0</u>	<u>no</u>	<u>OBL</u>	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
	<u>96.0</u>	= Total Cover		
Woody Vine Stratum (Plot size: <u>30 ft.</u>)				
1. <u>Groundnut (<i>Apios americana</i>)</u>	<u>20.5</u>	<u>yes</u>	<u>FACW</u>	Definitions of Vegetation Strata: Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vines – All woody vines greater than 3.28 ft in height.
2. <u>Fox Grape (<i>Vitis labrusca</i>)</u>	<u>20.5</u>	<u>yes</u>	<u>FACU</u>	
3. <u>Oriental Bittersweet (<i>Celastrus orbiculatus</i>)</u>	<u>10.5</u>	<u>yes</u>	<u>UPL</u>	
4. _____	_____	_____	_____	
	<u>51.5</u>	= Total Cover		
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____				
Remarks: (Include photo numbers here or on a separate sheet.)				

SOIL

Sampling Point: Wetland

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0 – 4”	10YR 2/1						mucky sand	
4 – 14”	10YR 2/1						silt/sand	
14 – 20”	10YR 2/2						coarse sand	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

- | | |
|---|---|
| Hydric Soil Indicators: | Indicators for Problematic Hydric Soils³: |
| <input type="checkbox"/> Histosol (A1) | <input type="checkbox"/> 2 cm Muck (A10) (LRR K, L, MLRA 149B) |
| <input type="checkbox"/> Histic Epipedon (A2) | <input type="checkbox"/> Coast Prairie Redox (A16) (LRR K, L, R) |
| <input checked="" type="checkbox"/> Black Histic (A3) | <input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR K, L, R) |
| <input type="checkbox"/> Hydrogen Sulfide (A4) | <input type="checkbox"/> Dark Surface (S7) (LRR K, L) |
| <input type="checkbox"/> Stratified Layers (A5) | <input type="checkbox"/> Polyvalue Below Surface (S8) (LRR K, L) |
| <input type="checkbox"/> Depleted Below Dark Surface (A11) | <input type="checkbox"/> Thin Dark Surface (S9) (LRR K, L) |
| <input type="checkbox"/> Thick Dark Surface (A12) | <input type="checkbox"/> Iron-Manganese Masses (F12) (LRR K, L, R) |
| <input type="checkbox"/> Sandy Mucky Mineral (S1) | <input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 149B) |
| <input type="checkbox"/> Sandy Gleyed Matrix (S4) | <input type="checkbox"/> Mesic Spodic (TA6) (MLRA 144A, 145, 149B) |
| <input type="checkbox"/> Sandy Redox (S5) | <input type="checkbox"/> Red Parent Material (TF2) |
| <input type="checkbox"/> Stripped Matrix (S6) | <input type="checkbox"/> Very Shallow Dark Surface (TF12) |
| <input type="checkbox"/> Dark Surface (S7) (LRR R, MLRA 149B) | <input type="checkbox"/> Other (Explain in Remarks) |
| <input type="checkbox"/> Polyvalue Below Surface (S8) (LRR R, MLRA 149B) | |
| <input type="checkbox"/> Thin Dark Surface (S9) (LRR R, MLRA 149B) | |
| <input type="checkbox"/> Loamy Mucky Mineral (F1) (LRR K, L) | |
| <input type="checkbox"/> Loamy Gleyed Matrix (F2) | |
| <input type="checkbox"/> Depleted Matrix (F3) | |
| <input type="checkbox"/> Redox Dark Surface (F6) | |
| <input type="checkbox"/> Depleted Dark Surface (F7) | |
| <input type="checkbox"/> Redox Depressions (F8) | |

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):	Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Type: _____	
Depth (inches): _____	

Remarks:



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Middlesex County, Massachusetts



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

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scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

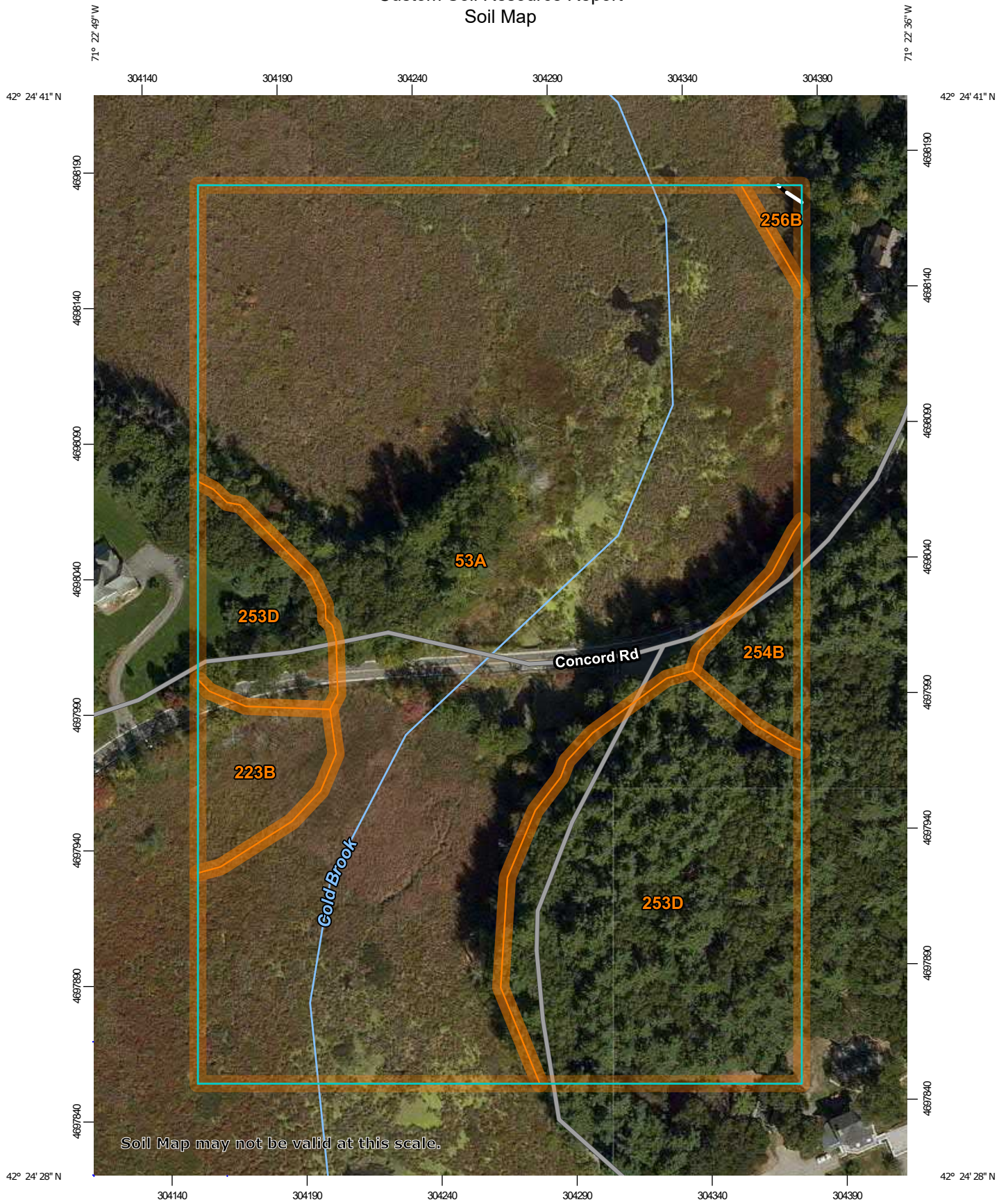
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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

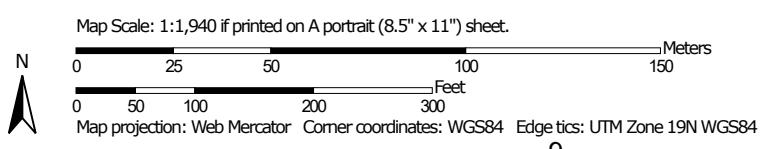
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map




Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)




















Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

Special Point Features

-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features


Water Features

 Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
 Survey Area Data: Version 18, Sep 7, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
53A	Freetown muck, ponded, 0 to 1 percent slopes	13.0	70.6%
223B	Scio very fine sandy loam, 3 to 8 percent slopes	0.6	3.3%
253D	Hinckley loamy sand, 15 to 25 percent slopes	4.3	23.1%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	0.4	2.4%
256B	Deerfield loamy fine sand, 3 to 8 percent slopes	0.1	0.6%
Totals for Area of Interest		18.4	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

53A—Freetown muck, ponded, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2qc
Elevation: 0 to 1,140 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of unique importance

Map Unit Composition

Freetown, ponded, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freetown, Ponded

Setting

Landform: Bogs, swamps, kettles, marshes, depressions, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material

Typical profile

Oe - 0 to 2 inches: mucky peat
Oa - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high
(0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Scarboro

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope

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Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman, ponded

Percent of map unit: 5 percent
Landform: Depressions on ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea, ponded

Percent of map unit: 5 percent
Landform: Depressions, kettles, bogs, swamps, marshes, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

223B—Scio very fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9906
Elevation: 0 to 2,100 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Scio and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scio

Setting

Landform: Depressions, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Loamy and/or silty glaciofluvial deposits

Typical profile

H1 - 0 to 8 inches: very fine sandy loam
H2 - 8 to 35 inches: very fine sandy loam

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H3 - 35 to 65 inches: silt loam

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)

Depth to water table: About 18 to 24 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 1 percent

Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: B/D

Hydric soil rating: No

Minor Components

Haven

Percent of map unit: 10 percent

Landform: Plains, terraces

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Tread, rise

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Tisbury

Percent of map unit: 5 percent

Landform: Plains, terraces

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Tread, dip

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent

Landform: Terraces, plains

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Tread, dip

Down-slope shape: Linear

Across-slope shape: Concave

Hydric soil rating: No

253D—Hinckley loamy sand, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2svmc
Elevation: 0 to 1,460 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Outwash terraces, outwash deltas, kame terraces, kames, outwash plains, eskers, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser
Down-slope shape: Linear, concave, convex
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 8 percent
Landform: Kames, outwash terraces, eskers, moraines, outwash plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, crest, head slope, nose slope, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Eskers, moraines, kame terraces, kames, outwash plains, outwash terraces, outwash deltas
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, crest, head slope, nose slope, riser
Down-slope shape: Convex, concave, linear
Across-slope shape: Concave, linear, convex
Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent
Landform: Outwash deltas, kame terraces, eskers, outwash terraces, outwash plains, moraines
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear, convex
Across-slope shape: Concave, linear, convex
Hydric soil rating: No

254B—Merrimac fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyqs
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Merrimac and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Moraines, outwash terraces, outwash plains, kames, eskers

Landform position (two-dimensional): Backslope, footslope, summit, shoulder

Landform position (three-dimensional): Side slope, crest, riser, tread

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam

Bw1 - 10 to 22 inches: fine sandy loam

Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand

2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat excessively drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 2 percent

Salinity, maximum in profile: Nonsaline (0.0 to 1.4 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 1.0

Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s

Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent

Landform: Terraces, deltas, outwash plains

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Tread, dip

Down-slope shape: Concave

Across-slope shape: Linear

Hydric soil rating: No

Custom Soil Resource Report

Hinckley

Percent of map unit: 5 percent

Landform: Outwash plains, eskers, kames, deltas

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise

Down-slope shape: Convex

Across-slope shape: Linear, convex

Hydric soil rating: No

Windsor

Percent of map unit: 3 percent

Landform: Outwash plains, deltas, dunes, outwash terraces

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Tread, riser

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Hydric soil rating: No

Agawam

Percent of map unit: 2 percent

Landform: Stream terraces, moraines, outwash terraces, outwash plains, kames, eskers

Landform position (three-dimensional): Rise

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

256B—Deerfield loamy fine sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2xfg9

Elevation: 0 to 1,190 feet

Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 145 to 240 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Deerfield and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Deerfield

Setting

Landform: Outwash deltas, outwash terraces, outwash plains, kame terraces

Landform position (three-dimensional): Tread

Down-slope shape: Concave, convex, linear

Across-slope shape: Linear, convex, concave

Custom Soil Resource Report

Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

Ap - 0 to 9 inches: loamy fine sand
Bw - 9 to 25 inches: loamy fine sand
BC - 25 to 33 inches: fine sand
Cg - 33 to 60 inches: sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: About 15 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 11.0
Available water storage in profile: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 7 percent
Landform: Outwash deltas, outwash terraces, outwash plains, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave, convex
Across-slope shape: Concave, linear, convex
Hydric soil rating: No

Wareham

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury

Percent of map unit: 2 percent
Landform: Outwash plains, kame terraces, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex, concave
Across-slope shape: Concave, linear, convex
Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent
Landform: Outwash plains, outwash terraces, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear

Custom Soil Resource Report

Across-slope shape: Convex, concave
Hydric soil rating: No

References

- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
- American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
- Federal Register. July 13, 1994. Changes in hydric soils of the United States.
- Federal Register. September 18, 2002. Hydric soils of the United States.
- Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.
- National Research Council. 1995. Wetlands: Characteristics and boundaries.
- Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262
- Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577
- Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580
- Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.
- United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.
- United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374
- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

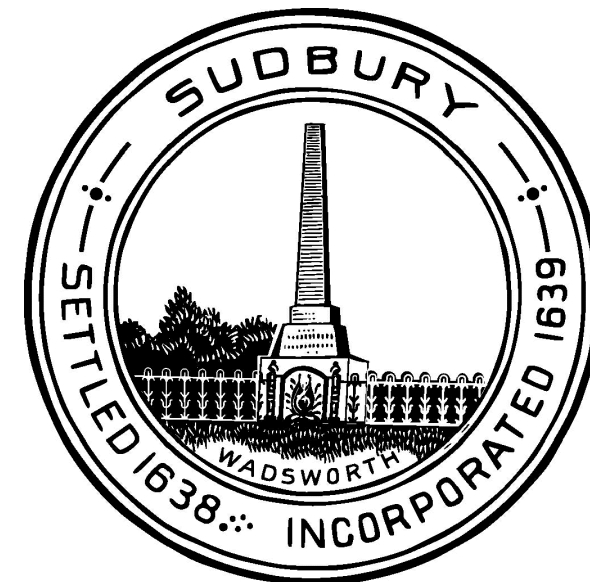
United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX B – Project Plans

TOWN OF SUDBURY, MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

CONCORD ROAD CULVERT REPAIRS

DECEMBER 2019

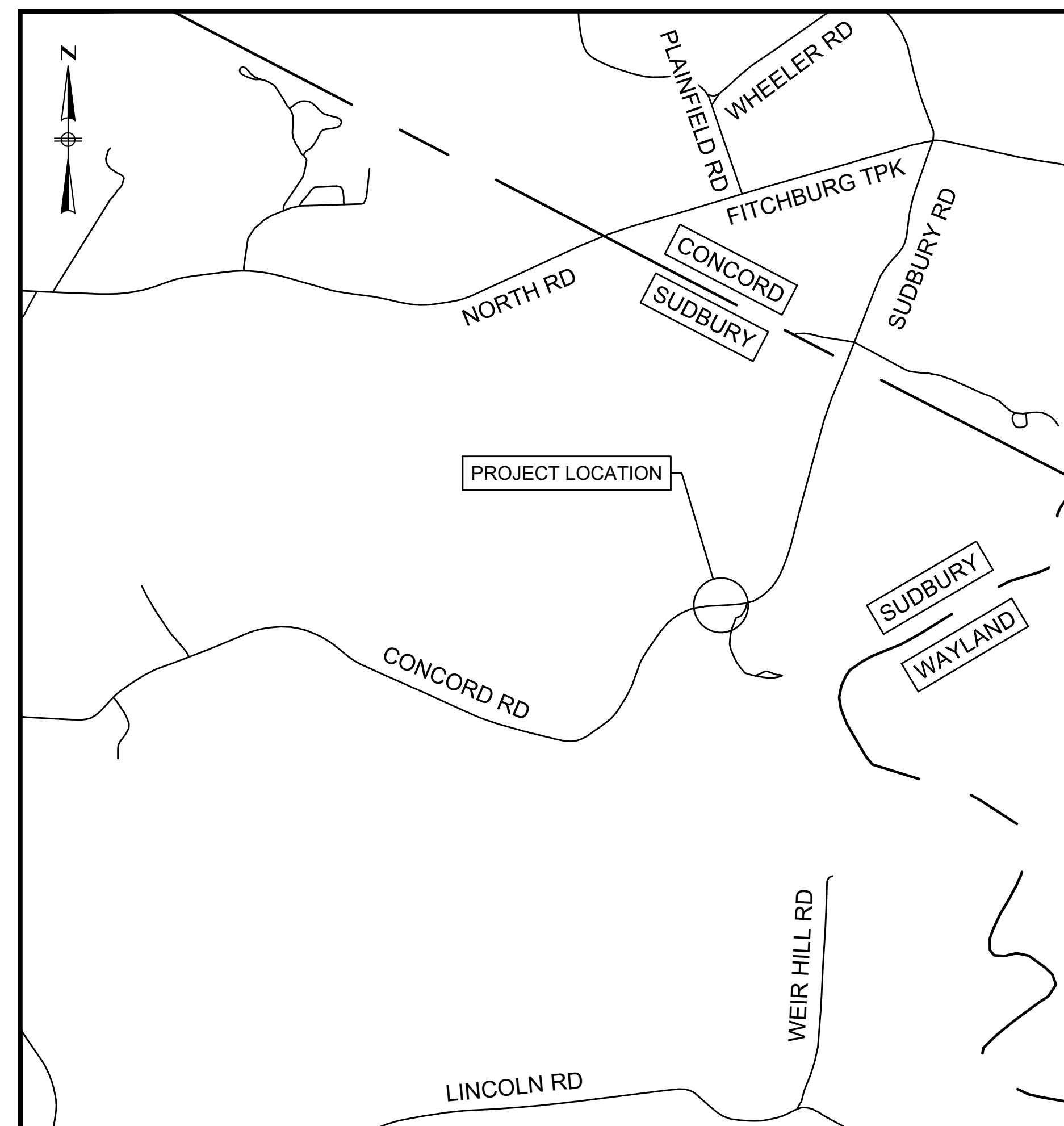


BOARD OF SELECTMEN

JENNIFER ROBERTS
DANIEL E. CARTY
WILLIAM SCHINELLER
PATRICIA BROWN
JANIE W. DRETHER

DEPARTMENT OF PUBLIC WORKS

DANIEL NASON, DIRECTOR



○ PROJECT LOCATION

LOCATION MAP

1" = 1000'

PLAN INDEX

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	ROADWAY CONSTRUCTION PLAN
3	RESOURCE IMPACTS
4	TEMPORARY TRAFFIC CONTROL PLAN
5	TEMPORARY TRAFFIC CONTROL PLAN
6	TEMPORARY TRAFFIC CONTROL PLAN
7	DETOUR PLAN
8	STRUCTURAL PLAN, ELEVATION, & LONGITUDINAL SECTION
9	STRUCTURAL DETAILS (1 OF 2)
10	STRUCTURAL DETAILS (2 OF 2)

PREPARED BY:



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GPS PT: 5002
 N: 2974346.616 (NAD83)
 E: 688852.165 (NAD83)
 ELEV: 118.157 (NAVD88)
 DESC: GPS PT 2

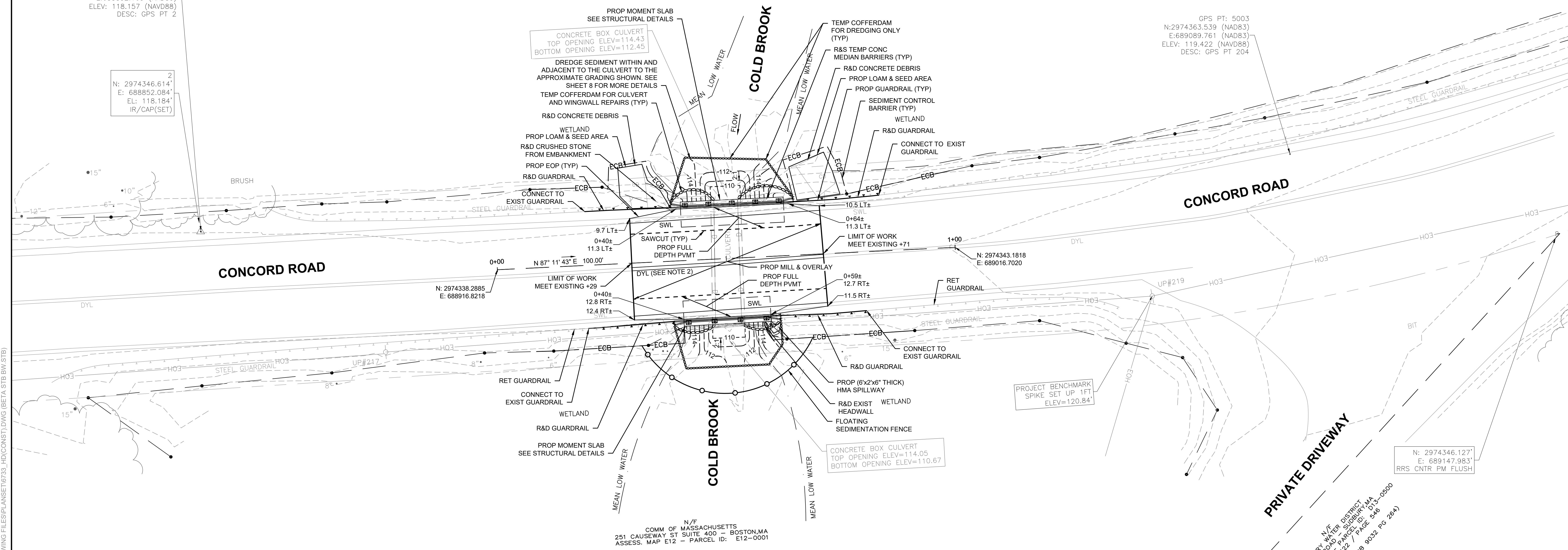
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 E: 688852.084'
 EL: 118.184'
 IR/CAP(SET)

N/F
 COMM OF MASSACHUSETTS
 251 CAUSEWAY ST SUITE 400 - BOSTON, MA
 ASSESS. MAP D13 - PARCEL ID: D13-0008

GPS PT: 5003
 N: 2974363.539 (NAD83)
 E: 689089.761 (NAD83)
 ELEV: 119.422 (NAVD88)
 DESC: GPS PT 204

- PAVEMENT NOTES**
- PROPOSED FULL DEPTH PAVEMENT**
- SURFACE COURSE: 1.75" HMA SURFACE COURSE (MODIFIED TOP) MATERIAL OVER
- INTERMEDIATE COURSE: 1.75" HMA INTERMEDIATE COURSE (MODIFIED TOP) MATERIAL OVER ASPHALT EMULSION TACK COAT RS-1H OVER
- BASE COURSE: 3.5" HMA BASE COURSE MATERIAL OVER
- SUB-BASE: 4" DENSE GRADED CRUSHED STONE OVER GRAVEL BORROW, TYPE b (SEE LIMITS SHOWN ON DETAIL SHEET 9)
- HMA SPILLWAY**
- 6" HMA SURFACE COURSE (MODIFIED TOP)
- PAVEMENT MILLING & OVERLAY**
- SURFACE COURSE: 1.75" HMA SURFACE COURSE (MODIFIED TOP) MATERIAL OVER ASPHALT EMULSION TACK COAT RS-1H OVER
- PAVEMENT MILLING: 1.75" PAVEMENT MICROMILLING
1. TACK COAT SHALL BE APPLIED FOR UNIFORM COVERAGE OF 90% AT RATE OF 0.07 TO 0.09 GALLONS PER SQUARE YARD FOR MILLED SURFACES AND 0.06 TO 0.08 GALLONS PER SQUARE YARD OVER SMOOTH TIGHT PAVEMENTS PRIOR TO PAVING AND OVERLAY.

- HIGHWAY GUARD DETAILS**
- CONNECT TO EXIST STA. 0+19.68 LT
 GUARDRAIL, TL-2 (SINGLE FACED) STA. 0+19.68 LT TO STA. 0+32.18 LT
 THRIE BEAM TRANSITION STA. 0+32.18 LT TO STA. 0+38.43 LT
 CONNECT TO BRIDGE GUARDRAIL STA. 0+38.43 LT
- CONNECT TO BRIDGE GUARDRAIL STA. 0+65.18 LT
 THRIE BEAM TRANSITION STA. 0+65.18 LT TO STA. 0+71.42 LT
 GUARDRAIL, TL-2 (SINGLE FACED) STA. 0+71.42 LT TO STA. 0+83.92 LT
 CONNECT TO EXIST STA. 0+83.92 LT
- CONNECT TO EXIST STA. 0+19.30 RT
 GUARDRAIL, TL-2 (SINGLE FACED) STA. 0+19.30 RT TO STA. 0+31.75 RT
 THRIE BEAM TRANSITION STA. 0+31.75 RT TO STA. 0+38.00 RT
 CONNECT TO BRIDGE GUARDRAIL STA. 0+38.00 RT
- CONNECT TO BRIDGE GUARDRAIL STA. 0+61.25 RT
 THRIE BEAM TRANSITION STA. 0+61.25 RT TO STA. 0+67.50 RT
 GUARDRAIL, TL-2 (SINGLE FACED) STA. 0+67.50 RT TO STA. 0+80.00 RT
 CONNECT TO EXIST STA. 0+80.00 RT



- NOTES:**
- THE COORDINATES, IN FEET, ARE BASED UPON MASSACHUSETTS STATE PLANE - MAINLAND ZONE NAD83 (2011) EPOCH 2010.00 - US FEET. THE VERTICAL DATUM IS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID 12B) - US FEET.
 - DYL SHALL EXTEND TO TEMPORARY SIGNAL STOP LINES WHERE EXISTING MARKINGS WHERE REMOVED. FOR CLARITY PURPOSES DYL HAS ONLY BEEN SHOWN IN MILL AND OVERLAY AREAS ON THIS PLAN

NUMBER	DATE	MADE BY	CHECKED BY	REVISIONS

DRAWN BY:
SD

DESIGNED BY:
SD

CHECKED BY:
CWJ

REGISTERED PROFESSIONAL

PREPARED BY

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SCALE

SCALE IN FEET: 1"=10'

UNLESS OTHERWISE NOTED OR CHANGED BY REPRODUCTION

TITLE

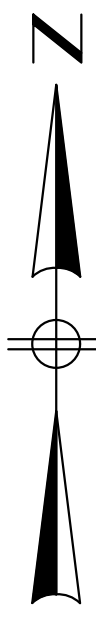
Concord Road over Cold Brook
Sudbury, Massachusetts
ROADWAY CONSTRUCTION PLAN

BETA JOB NO. 6733

ISSUE DATE

SHEET NO. 2

12/12/2019 2:16 PM O:\B70506733 - SUDBURY - CONCORD RD CULVERT\DRAWING FILES\PLANSET\0733_HDCONST.DWG (BETA STB BW STB)



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 ELEV: 118.157 (NAVD88)
 DESC: GPS PT 2

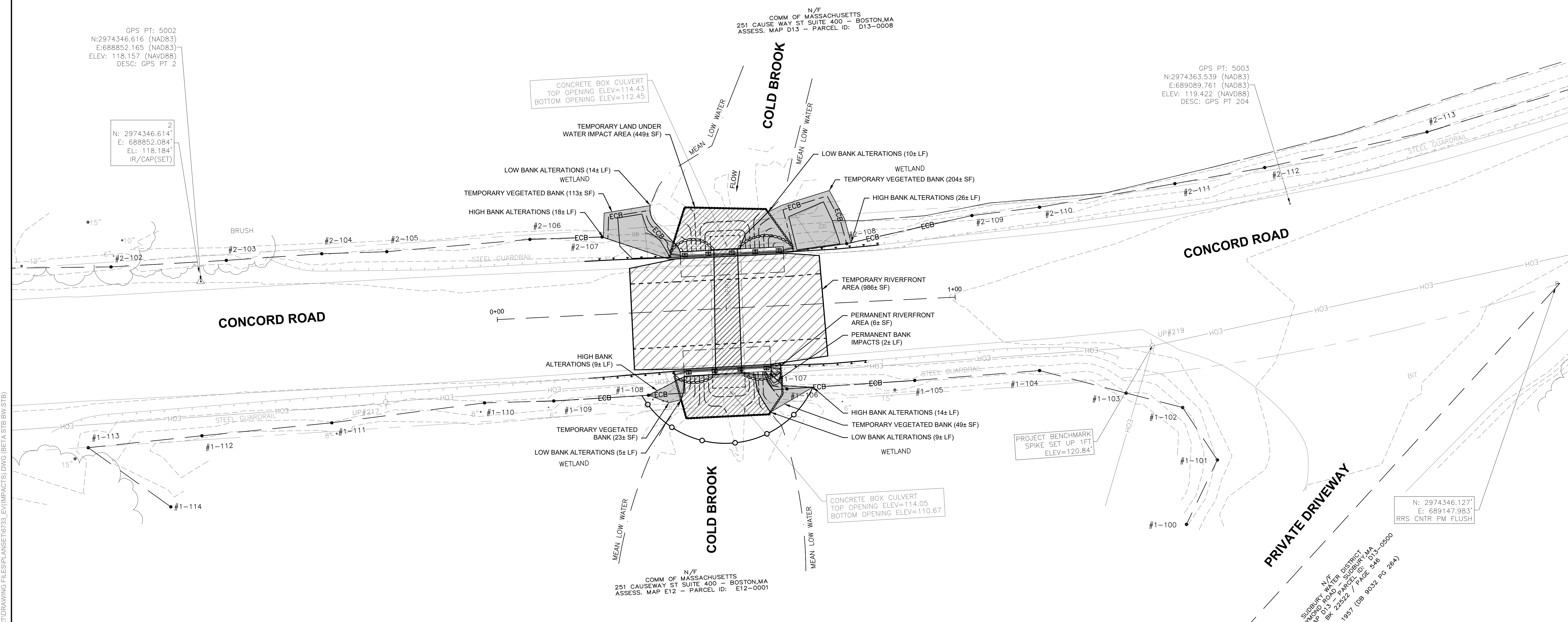
2
 N: 2974346.614'
 E: 688852.084'
 EL: 118.184'
 IR/CAP(SET)

N/F
 COMM OF MASSACHUSETTS
 251 CAUSEWAY ST SUITE 400 - BOSTON, MA
 ASSESS. MAP D13 - PARCEL ID: D13-0008

GPS PT: 5003
 N: 2974363.539 (NAD83)
 E: 689089.761 (NAD83)
 ELEV: 119.422 (NAVD88)
 DESC: GPS PT 204

LEGEND

- TEMPORARY LAND UNDER WATER IMPACT AREA (449± SF)
- TEMPORARY VEGETATED BANK IMPACT AREA (389± SF)
- PERMANENT RIVERFRONT AREA (6± SF)
- TEMPORARY RIVERFRONT AREA (986± SF)
- PERMANENT BANK IMPACTS (2± LF)
- HIGH BANK ALTERATIONS (67± LF)
- LOW BANK ALTERATIONS (38± LF)



N: 2974346.127'
 E: 689147.983'
 RRS CNTR PM FLUSH

SUBURRY N/F DISTRICT
 RAMPING ROCK WATER SUBURRY, MA
 ASSESS. MAP D13 PARCEL ID: D13-0008
 DEED Bk 22522 / PAGE 546
 PL 1445 OF 1957 (OB 9032 Pg 284)

- NOTES:**
- THE COORDINATES, IN FEET, ARE BASED UPON MASSACHUSETTS STATE PLANE - MAINLAND ZONE NAD83 (2011) EPOCH 2010.00 - US FEET. THE VERTICAL DATUM IS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID 12B) - US FEET.
 - ENTIRE SITE IS BELOW BASE FLOOD ELEVATION.
 - ENTIRE SITE IS WITHIN RIVERFRONT AREA.
 - ENTIRE SITE IS WITHIN AN AURA (BY LAW RESOURCE AREA).

NUMBER	DATE	MADE BY	CHECKED BY	REVISIONS

DRAWN BY:
DW

DESIGNED BY:
DW

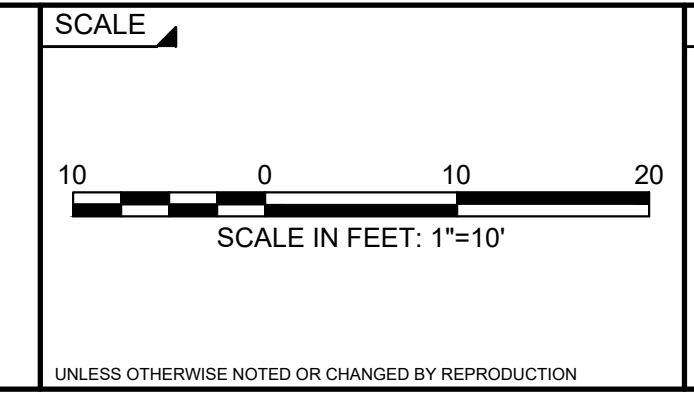
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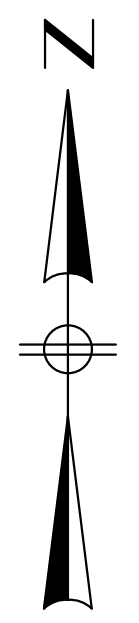
Concord Road over Cold Brook
Sudbury, Massachusetts
RESOURCE IMPACTS

BETA JOB NO. 6733

ISSUE DATE

SHEET NO. 3

12/12/2019 2:16 PM C:\B70506733 - SUBURRY - CONCORD RD CULVERT\DRAWING FILES\PLANSET\0733_EV\IMPACTS\DWG (BETA STB BW) (STB)



N/F
NIELSEN DAVID V& LINDA CREGG
1021 CONCORD RD - SUDBURY, MA
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DEED BK 28669 / PAGE 4
PL 80 OF 1997 (DB 27015 PG 377)

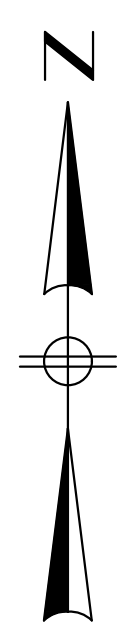
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COMM OF MASSACHUSETTS
251 CAUSEWAY ST SUITE 400 - BOSTON, MA
ASSESS. MAP D13 - PARCEL ID: D13-0008

N/F
COMM OF MASSACHUSETTS
251 CAUSEWAY ST SUITE 400 - BOSTON, MA
ASSESS. MAP E12 - PARCEL ID: E12-0001

N/F
SUBURBY WATER DISTRICT
21 MONROE ROAD SUDBURY, MA
ASSESS. MAP D11 - PARCEL ID: D11-0900
ED BK 22522 / PAGE 546
PL 1937 (DB 9032 PG 284)

CONCORD ROAD

CONSTRUCTION PHASE 1



N/F
NIELSEN DAVID V& LINDA CREGG
1021 CONCORD RD - SUDBURY, MA
ASSESS. MAP D12 - PARCEL ID: D12-0203
DEED BK 28669 / PAGE 4
PL 80 OF 1997 (DB 27015 PG 377)

N/F
COMM OF MASSACHUSETTS
251 CAUSEWAY ST SUITE 400 - BOSTON, MA
ASSESS. MAP D13 - PARCEL ID: D13-0008

N/F
COMM OF MASSACHUSETTS
251 CAUSEWAY ST SUITE 400 - BOSTON, MA
ASSESS. MAP E12 - PARCEL ID: E12-0001

N/F
SUBURBY WATER DISTRICT
21 MONROE ROAD SUDBURY, MA
ASSESS. MAP D11 - PARCEL ID: D11-0900
ED BK 22522 / PAGE 546
PL 1937 (DB 9032 PG 284)

CONCORD ROAD

CONSTRUCTION PHASE 2

12/12/2019 2:17 PM O:\67005\6733 - SUDBURY - CONCORD RD CULVERT\DRAWING FILES\PLANS\SET6733_HD(TMP).DWG (BETA STB BW STB)

NUMBER	DATE	MADE BY	CHECKED BY	REVISIONS

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AA

DESIGNED BY:
AA

CHECKED BY:
GL

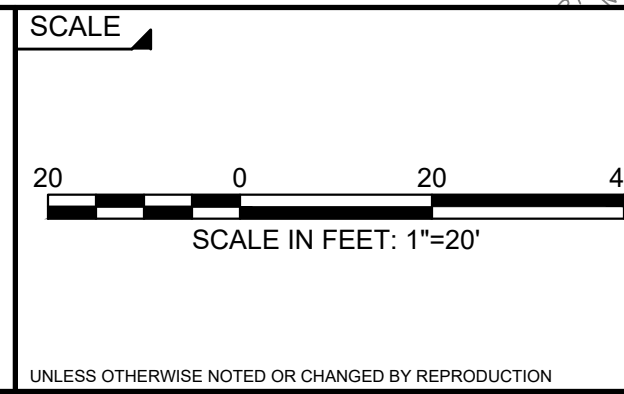
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TITLE

**Concord Road over Cold Brook
Sudbury, Massachusetts**

TEMPORARY TRAFFIC CONTROL PLAN

BETA JOB NO. 6733

ISSUE DATE #####

SHEET NO. 4

SEQUENCE AND TIMING CHART FOR FULLY ACTUATED SIGNAL CONTROL (TEMPORARY)									
PHASE/EMERGENCY PRE-EMPTION			Ø1			Ø2			FLASH OPER.
STREET	DIRECTION	HOUSINGS	1	2	3	4	5	6	OPER.
CONCORD ROAD	WB	A,B	G	Y	R	R	R	R	FR
CONCORD ROAD	EB	C,D	R	R	R	G	Y	R	FR

TIMING IN SECONDS									
MINIMUM GREEN	10			10					
VEHICLE EXTENSION	2			2					
MAXIMUM GREEN	30			30					
CLEARANCE INTERVAL	4			10			4		
DETECTOR MEMORY	NON-LOCK			NON-LOCK					
RECALL SWITCH	OFF			OFF					

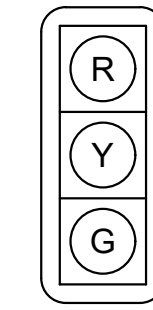
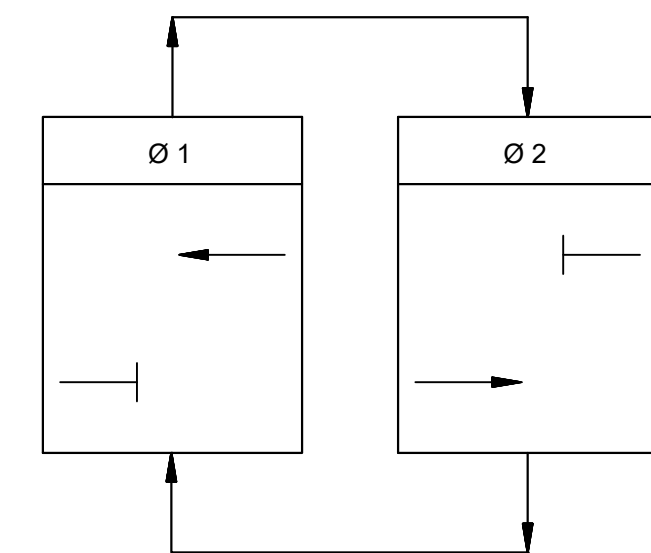
TRAFFIC SIGNAL NOTES:

- FLASHING OPERATION IS FOR EMERGENCY OPERATION ONLY. THE SIGNAL SHALL PROVIDE STOP AND GO OPERATION 24 HOURS DAILY.
- VEHICLE DETECTION MAY BE VIA MICROWAVE OR VIDEO.

DETECTOR GROUP NO.	VIDEO CAMERA NO.	NO. SECTION/ SIZE	OPERATIONS	EXTENSION (SECONDS)	CALL DELAY (SECONDS)	CALL PHASE	SWITCH	EXTEND PHASE
1	1	1 - 6'x60'	PRESENCE	0	0	Ø1	-	Ø1
2	2	1 - 6'x60'	PRESENCE	0	0	Ø2	-	Ø2

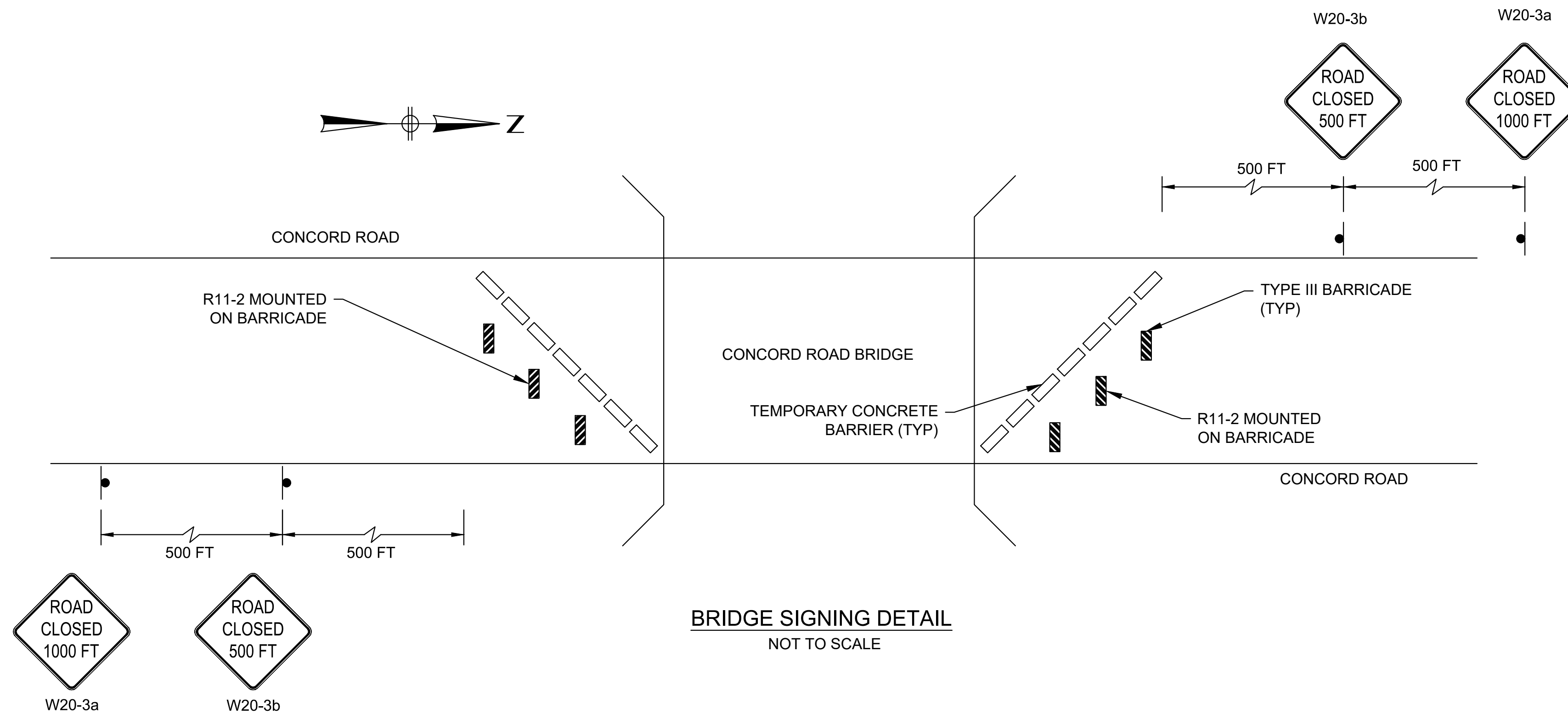
MAJOR ITEMS	
QUANTITY	DESCRIPTION
2	TEMPORARY TRAFFIC SIGNAL UNIT WITH VEHICLE DETECTION
PLUS ALL MISCELLANEOUS EQUIPMENT AND MATERIAL NECESSARY TO PROVIDE A COMPLETE OPERATING TRAFFIC CONTROL SIGNAL	

PROPOSED SIGNAL PHASING



LOCATION:
A,B,C,D

SIGNAL HEAD DESIGNATIONS
NOT TO SCALE



BRIDGE SIGNING DETAIL
NOT TO SCALE

CONSTRUCTION SIGN SUMMARY

IDENTIFICATION NUMBER	SIZE OF SIGN		TEXT	DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA IN SQUARE FEET	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW		BACK-GROUND	LEGEND	BORDER			
M4-8a	24 in	18 in	END DETOUR				2	ORANGE	BLACK	BLACK	P-5 2	3.0	6.0
M4-9L	30 in	24 in	DETOUR ←				1	ORANGE	BLACK	BLACK	MOUNT W/ MA-D3-1	5.0	5.0
M4-9R	30 in	24 in	DETOUR →				2	ORANGE	BLACK	BLACK	MOUNT W/ MA-D3-1	5.0	10.0
M4-9V	30 in	24 in	DETOUR ↑				3	ORANGE	BLACK	BLACK	MOUNT W/ MA-D3-1	5.0	15.0
M4-10L	48 in	18 in	← DETOUR				1	ORANGE	BLACK	BLACK	MOUNT ON BARRICADE	6.0	6.0
M4-10R	48 in	18 in	DETOUR →				1	ORANGE	BLACK	BLACK	MOUNT ON BARRICADE	6.0	6.0
R10-6	24 in	30 in	STOP HERE ON RED				2	WHITE	BLACK	BLACK	P-5 2	5.0	10.0
R11-2	48 in	30 in	ROAD CLOSED				2	WHITE	BLACK	BLACK	MOUNT ON BARRICADE	10.0	20.0
R11-4	60 in	30 in	ROAD CLOSED TO THRU TRAFFIC				2	WHITE	BLACK	BLACK	MOUNT ON BARRICADE	12.5	25.0
W1-4R	36 in	36 in	Right Turn Arrow				1	ORANGE	BLACK	BLACK	SEE NOTES	9.0	9.0
W3-3	36 in	36 in	Three Red Lights				2	ORANGE	BLACK	BLACK	P-5 2	9.0	18.0
W5-1	36 in	36 in	ROAD NARROWS				2	ORANGE	BLACK	BLACK	P-5 2	9.0	18.0
W13-1P	24 in	24 in	XX M.P.H.				2	ORANGE	BLACK	BLACK	MOUNT W/ W20-4	4.0	8.0
W20-3a	36 in	36 in	ROAD CLOSED 1000 FT				2	ORANGE	BLACK	BLACK	P-5 2	9.0	18.0
W20-3b	36 in	36 in	ROAD CLOSED 500 FT				2	ORANGE	BLACK	BLACK	P-5 2	9.0	18.0
W20-4	36 in	36 in	ONE LANE ROAD AHEAD				2	ORANGE	BLACK	BLACK	P-5 2	9.0	18.0
W21-5A	36 in	36 in	RIGHT SHOULDER CLOSED				2	ORANGE	BLACK	BLACK	P-5 2	9.0	18.0
MA-D3-1	36 in	12 in	Concord Rd	6/4D	3 3		7	ORANGE	BLACK	BLACK	P-5 (2) 7	3.0	21.0
MA-W20-7b	36 in	36 in	POLICE OFFICER AHEAD				2	ORANGE	BLACK	BLACK	P-5 2	9.0	18.0
SP-1	60 in	30 in	CONCORD RD BRIDGE CLOSED FOLLOW DETOUR	6C 5C 4C	4 3.5 3.5 4		3	ORANGE	BLACK	BLACK	P-5 (2) 3	12.5	38.0

SEE 2009 MUTCD STANDARDS

12/12/2019 2:17 PM O:\6700569733 - SUDBURY - CONCORD RD CULVERTDRAWING FILES\PLANS\SET\6733_HD(TMP).DWG (BETA STB BW STB)

NUMBER	DATE	MADE BY	CHECKED BY	REVISIONS

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DESIGNED BY: AA		CHECKED BY: GL	
		www.BETA-Inc.com	

SCALE

SCALE IN FEET: 1"=20'

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TITLE

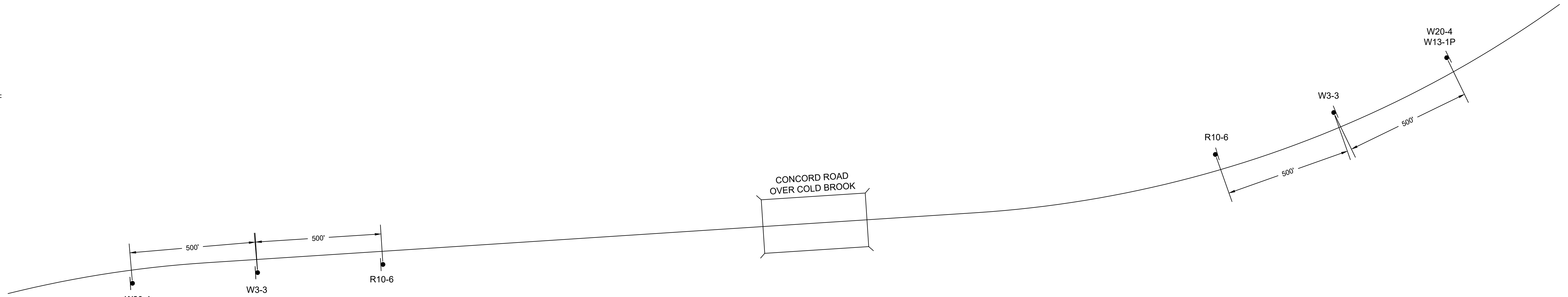
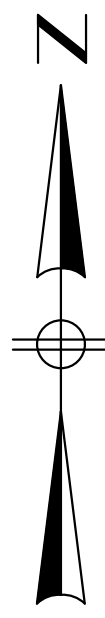
**Concord Road over Cold Brook
Sudbury, Massachusetts**

TEMPORARY TRAFFIC CONTROL PLAN

BETA JOB NO. 6733

ISSUE DATE #####

SHEET NO. 5



ADVANCED SIGNING DETAIL
NOT TO SCALE

NOTES:

1. ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE 2009 EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS.
2. ALL SIGN LEGENDS, BORDERS AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD, EXCEPT THAT BACKGROUND COLOR SHALL BE FLUORESCENT ORANGE, IN ACCORDANCE WITH MASSDOT SPECIFICATIONS.
3. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
4. 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.
5. SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, AND REFLECTORIZED PLASTIC DRUMS WITH LIGHTING DEVICES MOUNTED ON THEM, MUST PASS THE CRITERIA SET FORTH IN THE "MANUAL FOR ACCESSING SAFETY HARDWARE" (MASH).
6. CONTRACTORS SHALL 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.
7. THE FIRST TEN PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH SEQUENTIAL FLASHING LIGHTS.
8. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
9. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
10. MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
11. MINIMUM LANE WIDTH IS TO BE 11 FEET UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
12. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.
13. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL NOT COVERED IN THE PLAN SHALL REFER TO MASSDOT "STANDARD DETAILS AND DRAWINGS FOR THE DEVELOPMENT OF TRAFFIC MANAGEMENT PLANS".
14. W1-4 SIGN SHALL BE MOUNTED USING A TEMPORARY SUPPORT WHICH CAN BE MAINTAINED FOR SIGN VISIBILITY.
15. DYI REMOVED DURING CONSTRUCTION SHALL BE RE-STRIPED UPON COMPLETION OF CONSTRUCTION. TEMPORARY STOP LINES FOR TEMPORARY SIGNAL INSTALLATION SHALL BE REMOVED UPON REMOVAL OF TEMPORARY SIGNALS.

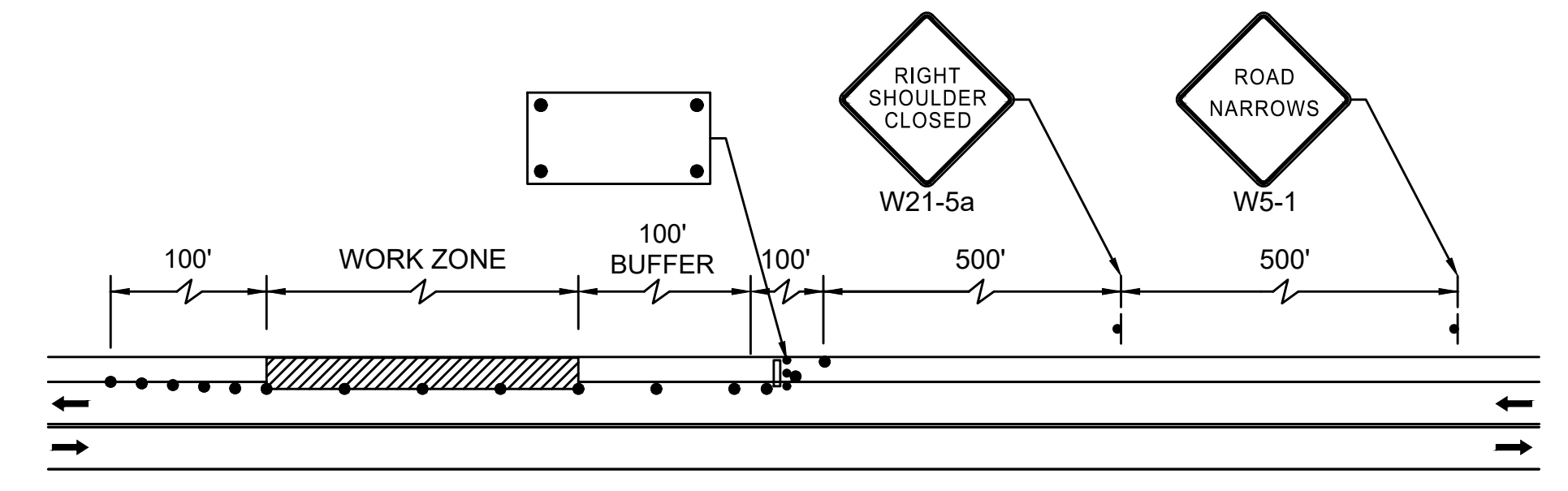
LEGEND:

- REFLECTORIZED PLASTIC DRUM
- ▨ TYPE III BARRICADE
- ⬇️ FLASHING ARROW PANNEL
- ⬇️ FLASHING ARROW PANNEL
- ▨ WORK ZONE
- ➡️ DIRECTION OF TRAFFIC
- ⊘ IMPACT ATTENUATOR
- ▭ MEDIAN BARRIER
- ⊘ MEDIAN BARRIER WITH WARNING LIGHTS
- 🚚 WORK VEHICLE
- ⊘ TRUCK MOUNTED ATTENUATOR
- ⬅️ TRAFFIC OR PEDESTRIAN SIGNAL
- SIGN
- P POLICE DETAIL
- F FLAGGER

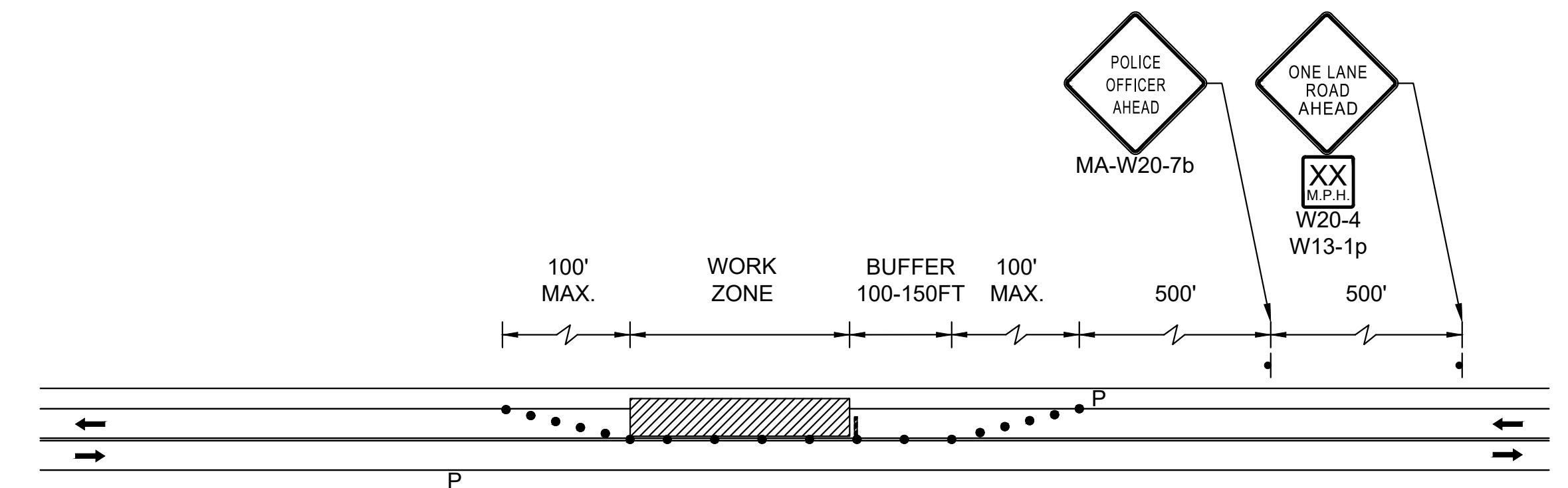
TAPER LENGTH

SPEED LIMIT	FORMULA
40 MPH or Less	$L = WS^2/60$
45 MPH or Greater	$L = W \times S$

L = TAPER LENGTH IN FEET
W = WIDTH OF OFFSET IN FEET
S = POSTED SPEED IN MPH

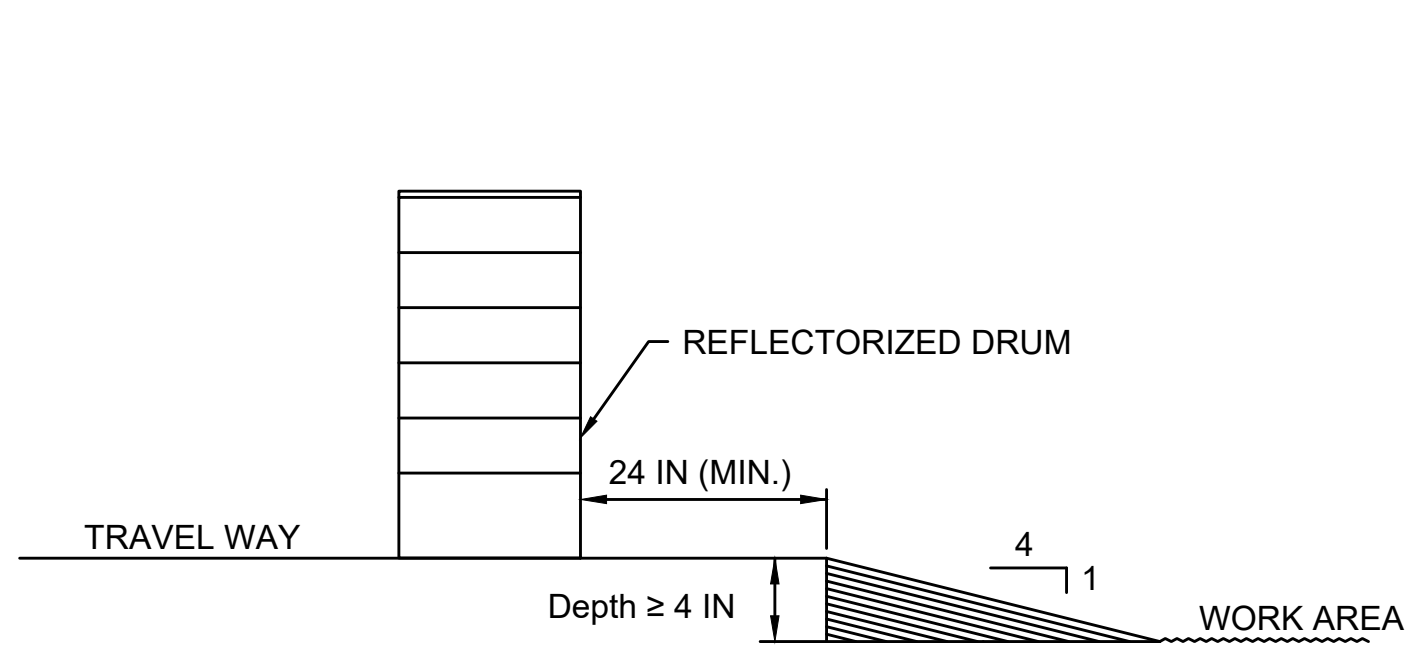


TWO-LANE ROAD - SHOULDER CLOSED
NOT TO SCALE

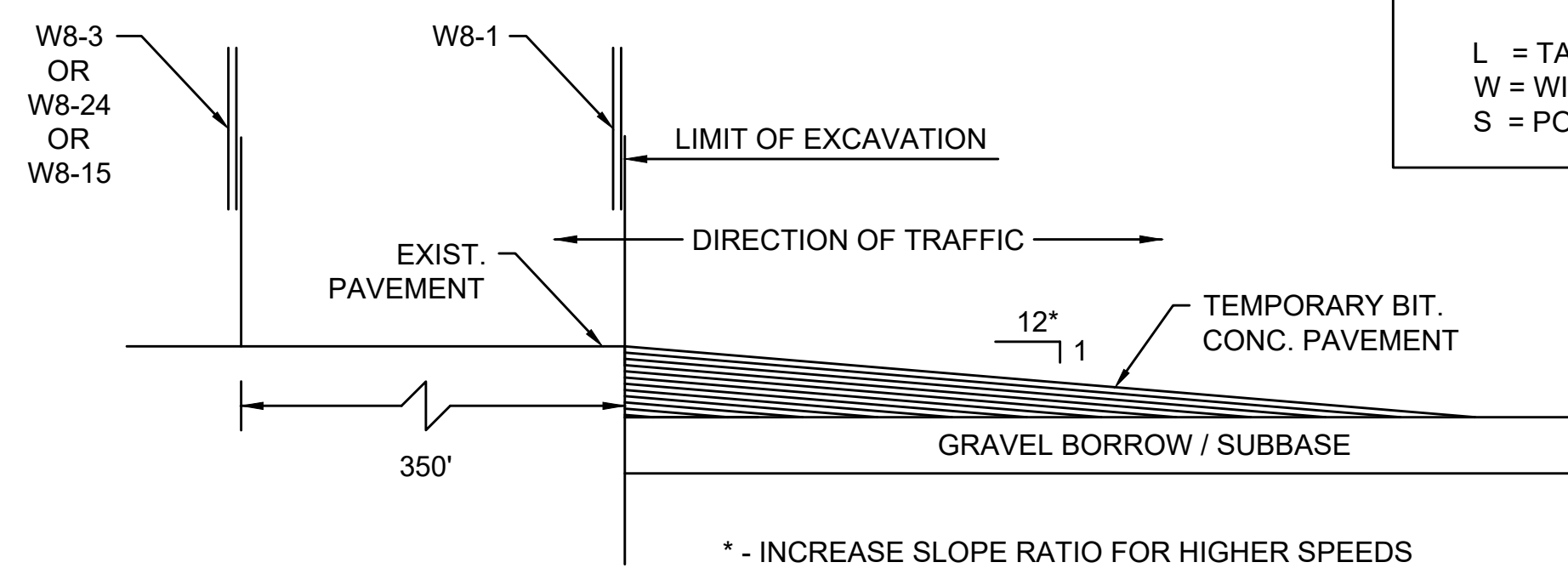


TWO-LANE ROAD - ONE LANE ALTERNATING TRAFFIC
WITH POLICE DETAIL
NOT TO SCALE

NOTE: ONE LANE ALTERNATING WITH POLICE DETAIL SHALL BE USED IN SHORT TERM SCENARIOS SUCH AS GUARDRAIL PLACEMENT OR PLACEMENT AND REMOVAL OF TRAFFIC CONTROL DEVICES. IT SHALL NOT BE USED AS AN ALTERNATIVE TO ONE WAY ALTERNATING TRAFFIC WITH TRAFFIC SIGNAL CONTROL.



LATERAL DROP-OFF DETAIL
NOT TO SCALE



LONGITUDINAL DROP-OFF DETAIL
NOT TO SCALE

* - INCREASE SLOPE RATIO FOR HIGHER SPEEDS

12/12/2019 2:17 PM O:\670056\6733 - SUDBURY - CONCORD RD CULVERT\DRAWING FILES\PLANS\SET\6733_HD(TMP).DWG (BETA STB BW STB)

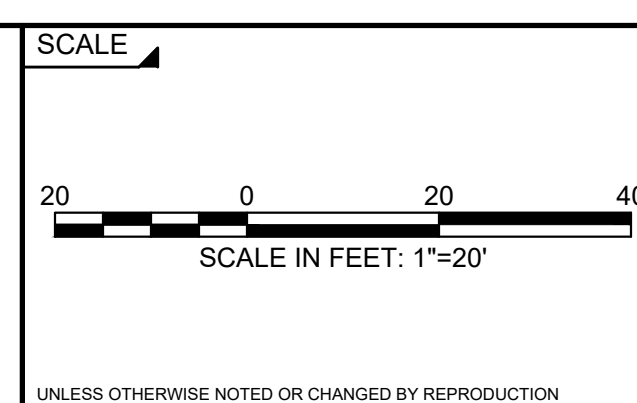
NUMBER	DATE	MADE BY	CHECKED BY	REVISIONS

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DESIGNED BY:	AA
CHECKED BY:	GL

REGISTERED PROFESSIONAL

PREPARED BY

SUBCONSULTANT

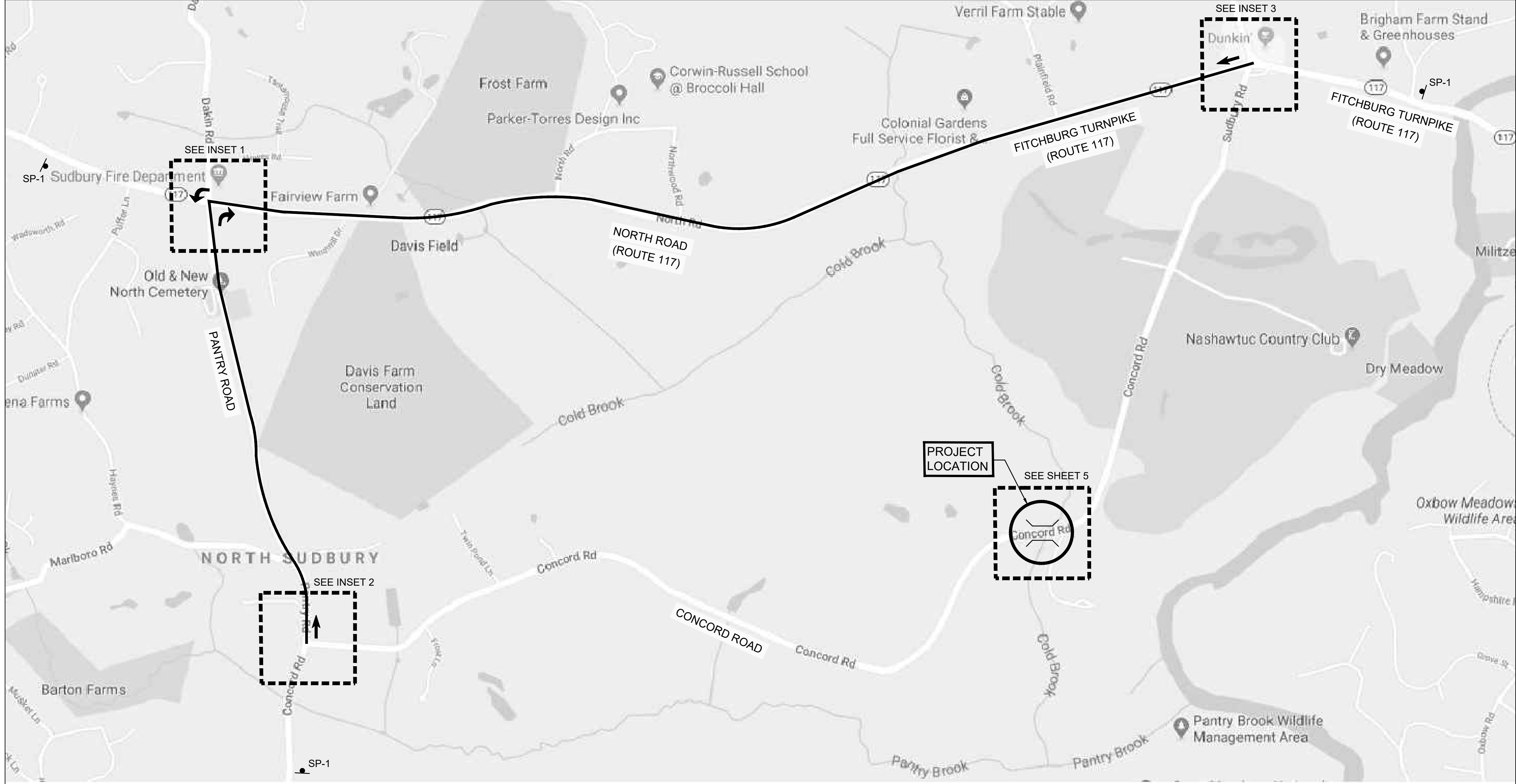
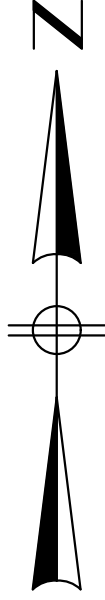


TITLE

**Concord Road over Cold Brook
Sudbury, Massachusetts**

TEMPORARY TRAFFIC CONTROL PLAN

BETA JOB NO.	6733
ISSUE DATE	#####
SHEET NO.	6

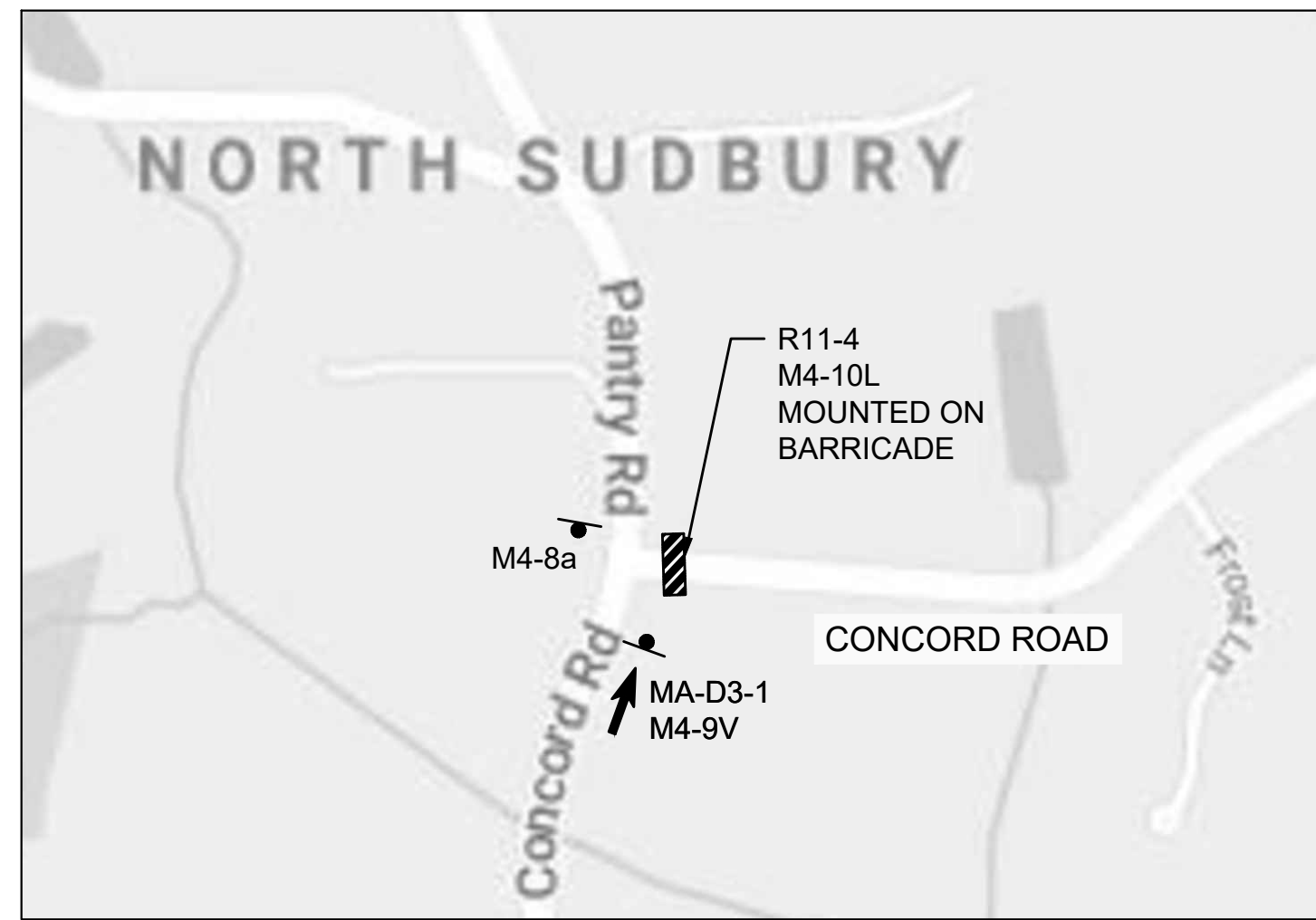


NOTE: DETOUR SIGNS SHALL BE COVERED WHEN DETOUR IS NOT IN ACTIVE USE.

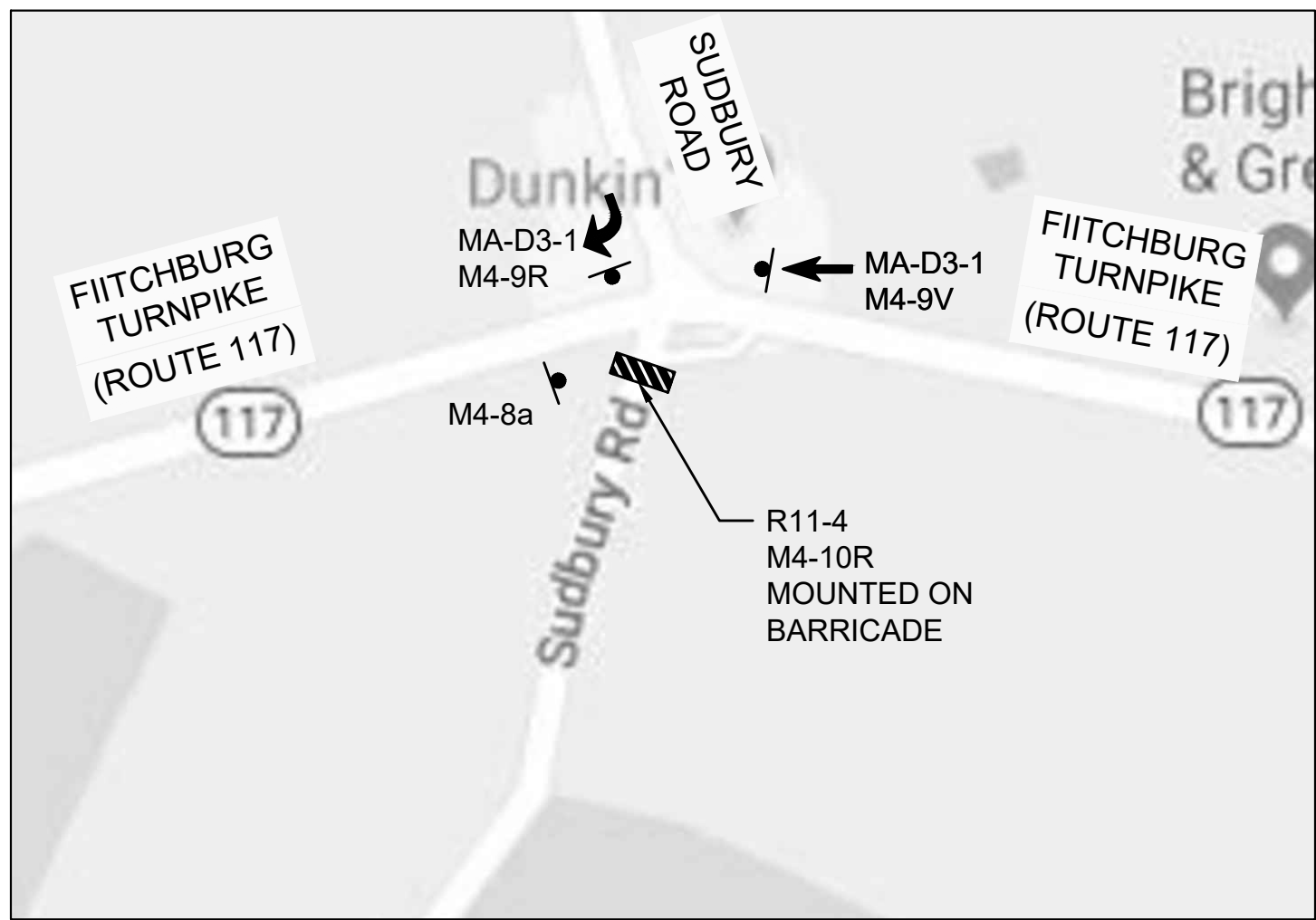
DETOUR PLAN
NOT TO SCALE



INSET 1
NOT TO SCALE



INSET 2
NOT TO SCALE



INSET 3
NOT TO SCALE

12/12/2019 2:17 PM O:\67005\6733 - SUDBURY - CONCORD RD CULVERT\DRAWING FILES\PLAN\INSET1\6733_HIDETOUR.DWG (BETA STB BW STB)

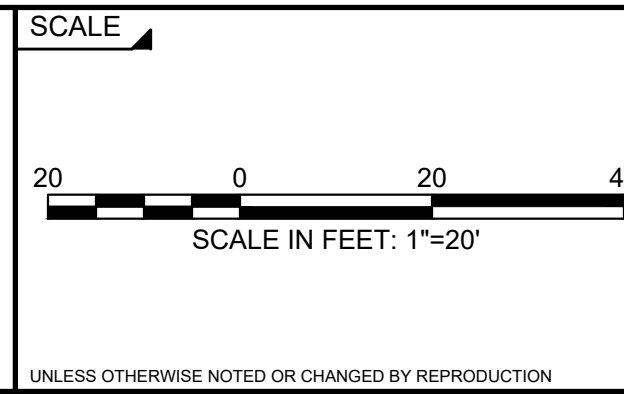
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AA
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AA
CHECKED BY:
GL

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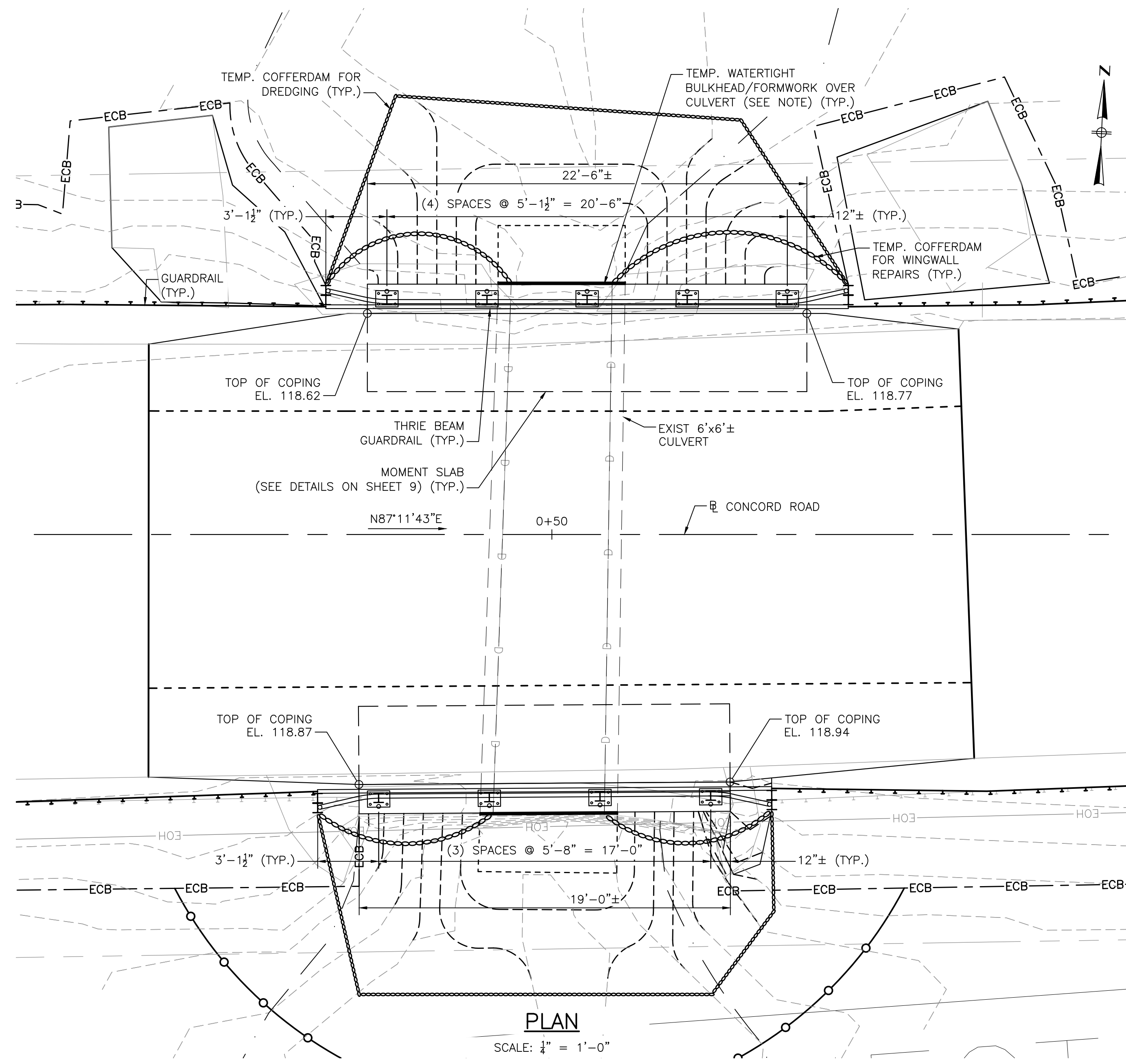


TITLE

**Concord Road over Cold Brook
Sudbury, Massachusetts**
DETOUR PLAN

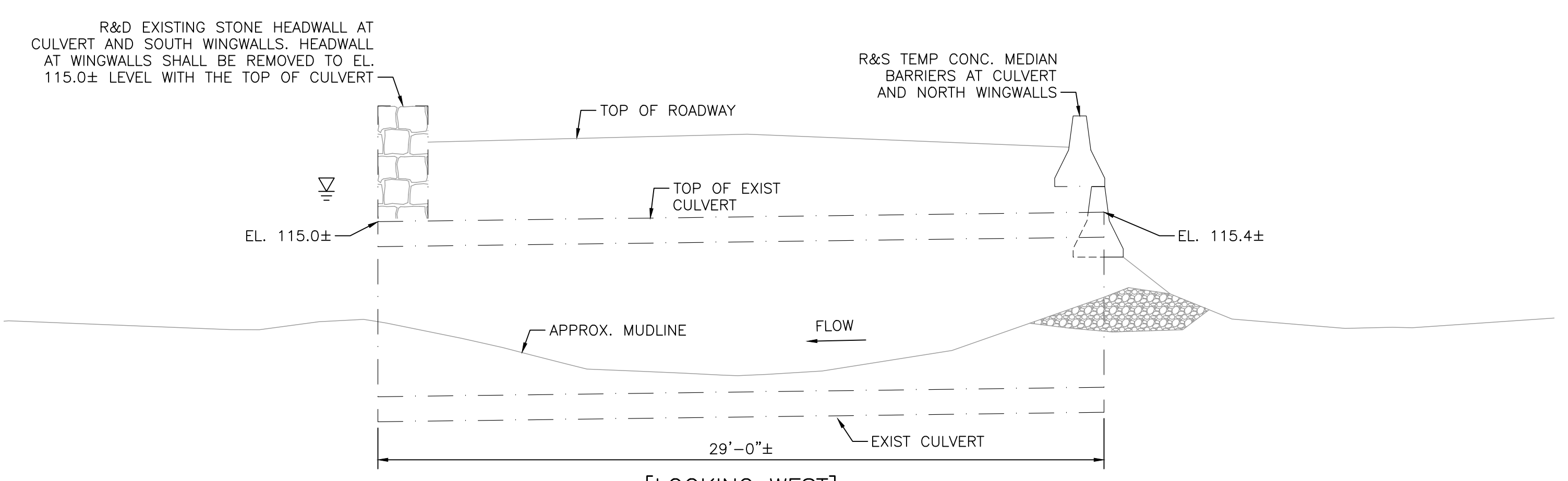
BETA JOB NO. 6733
ISSUE DATE #####
SHEET NO. 7

NOTE:
 1. CONTRACTOR SHALL DETERMINE AN APPROPRIATE METHOD FOR POURING THE MOMENT SLAB IN THE DRY.



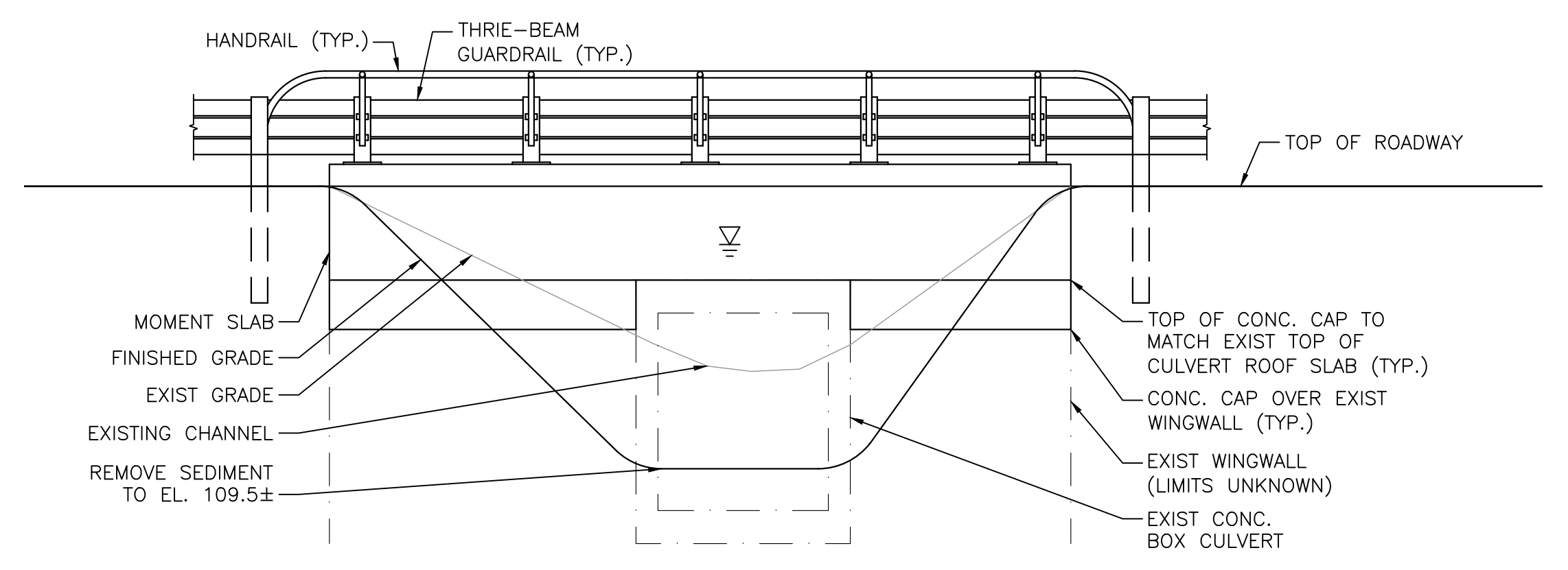
PLAN

SCALE: 1/4" = 1'-0"



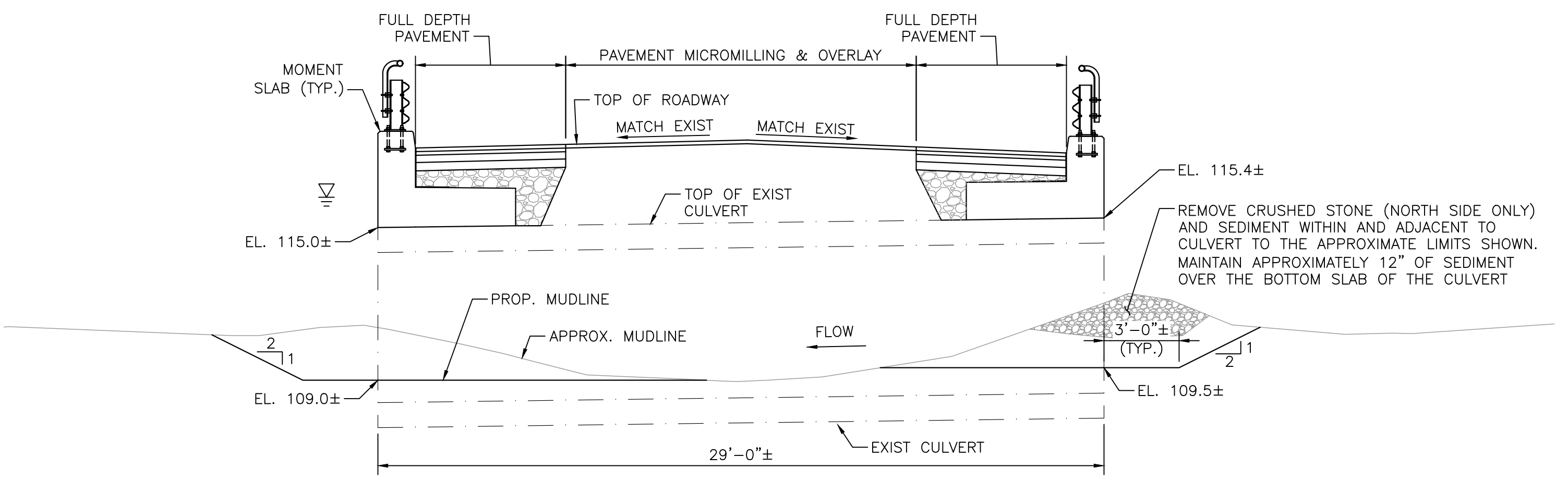
**[LOOKING WEST]
EXISTING LONGITUDINAL SECTION**

SCALE: 1/4" = 1'-0"



**[LOOKING SOUTH]
ELEVATION**

SCALE: 1/4" = 1'-0"



**[LOOKING WEST]
LONGITUDINAL SECTION**

SCALE: 1/4" = 1'-0"

12/12/2019 2:18 PM C:\B70506733 - SUDBURY - CONCORD RD CULVERT\DRAWING FILES\PLANSET\0733_SR(1).DWG (BETA STB BNW.STB)

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DW

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SCALE

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TITLE

**Concord Road Over Cold Brook
Sudbury, Massachusetts**

STRUCTURAL PLAN, ELEVATION, & LONGITUDINAL SECTION

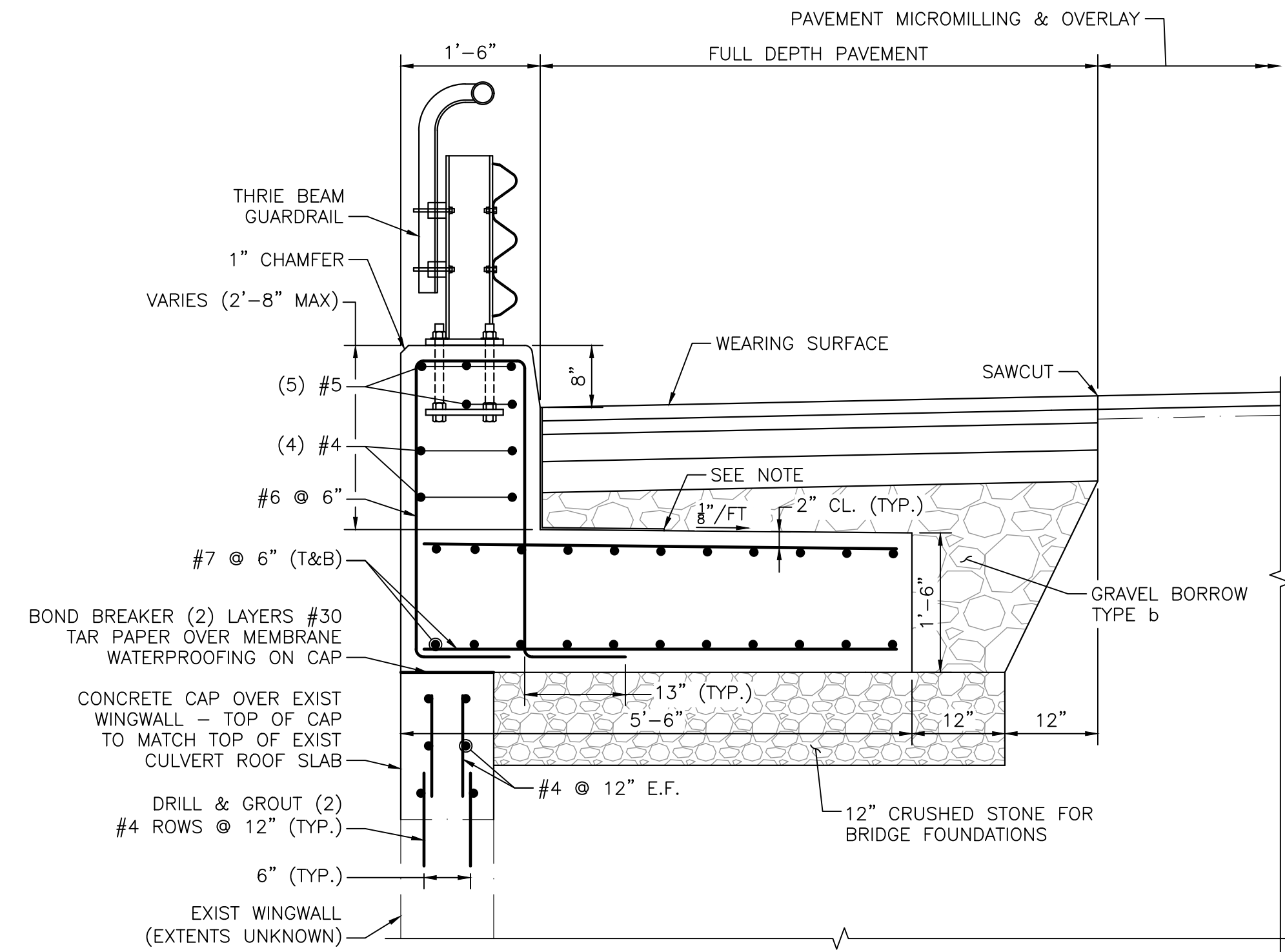
BETA JOB NO. 6733

ISSUE DATE

SHEET NO. 8

MOMENT SLAB NOTES:

1. MOMENT SLAB CONCRETE SHALL BE 5000 PSI, 3/4 IN., 685 HP CEMENT CONCRETE.
2. ALL REINFORCING SHOWN IN THESE DETAILS SHALL BE EPOXY COATED.

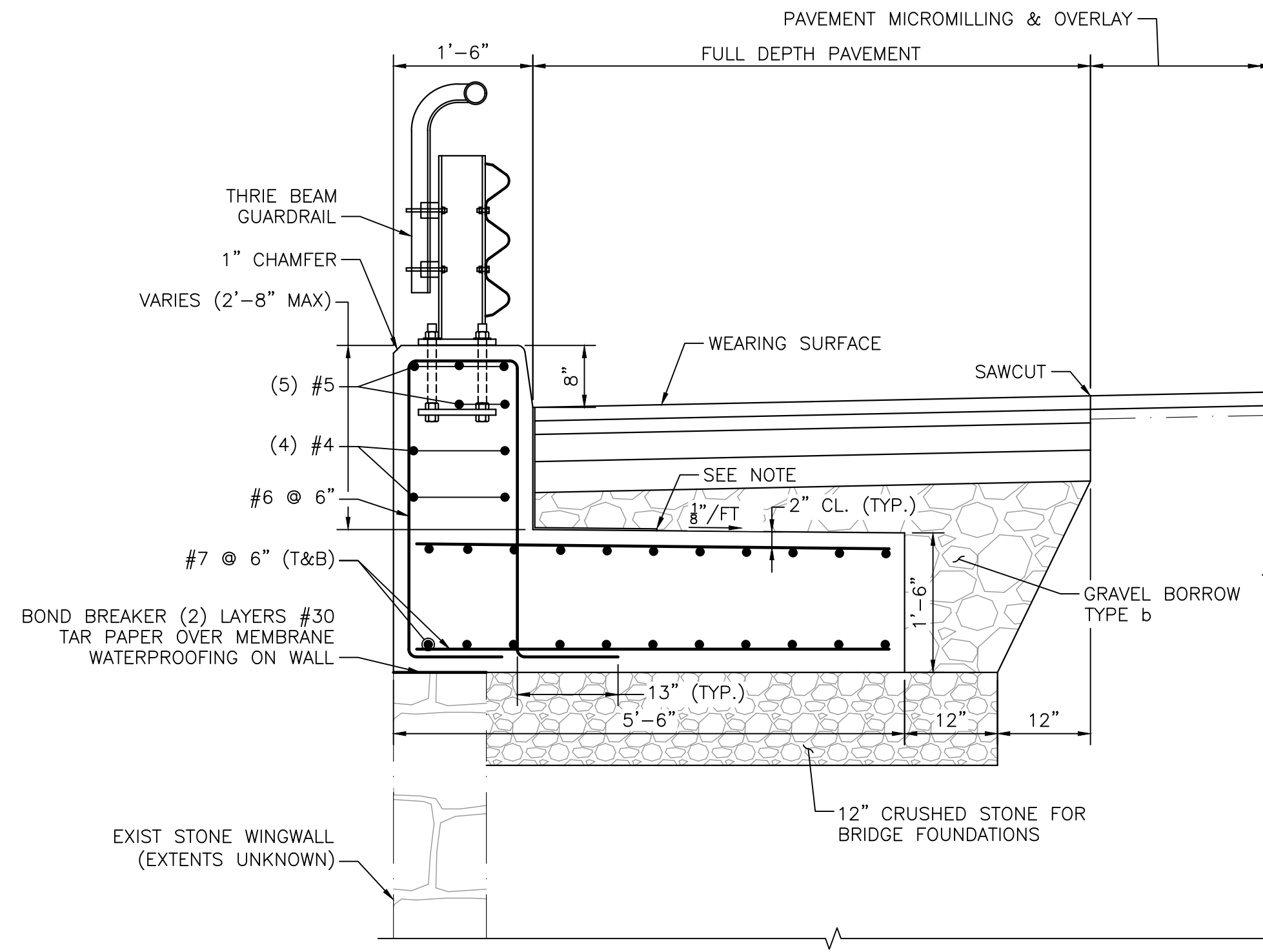


NOTE:

MEMBRANE WATERPROOFING AND 8"x16"x2", 4000 PSI, 3/4 IN., 610 CEMENT CONCRETE BLOCKS LAID IN MORTAR OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN 2" THICK AS SPECIFIED IN STANDARD SPECIFICATIONS.

MOMENT SLAB DETAIL OVER NORTH WINGWALLS

SCALE: 3/4" = 1'-0"

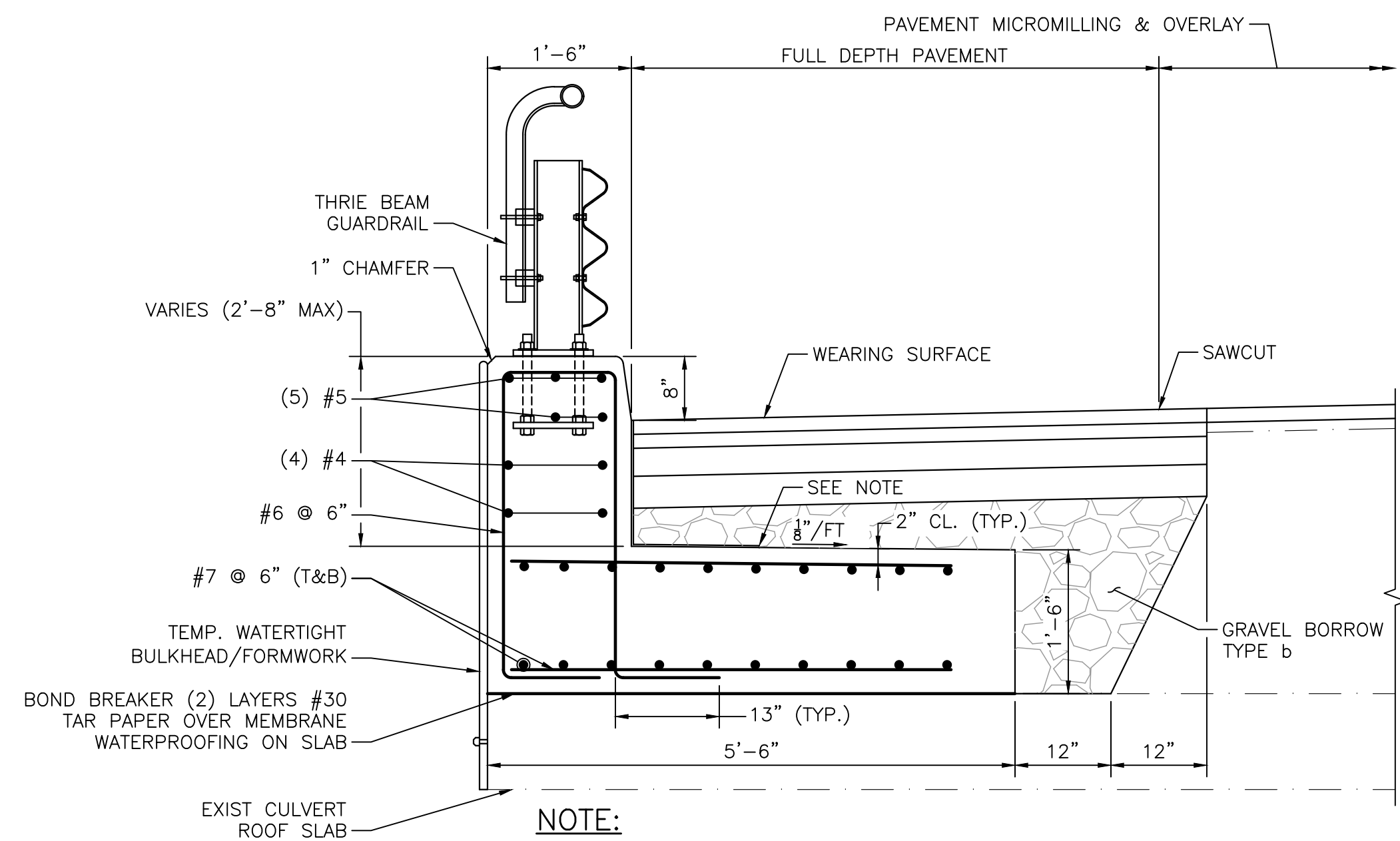


NOTE:

MEMBRANE WATERPROOFING AND 8"x16"x2", 4000 PSI, 3/4 IN., 610 CEMENT CONCRETE BLOCKS LAID IN MORTAR OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN 2" THICK AS SPECIFIED IN STANDARD SPECIFICATIONS.

MOMENT SLAB DETAIL OVER SOUTH WINGWALLS

SCALE: 3/4" = 1'-0"



NOTE:

MEMBRANE WATERPROOFING AND 8"x16"x2", 4000 PSI, 3/4 IN., 610 CEMENT CONCRETE BLOCKS LAID IN MORTAR OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN 2" THICK AS SPECIFIED IN STANDARD SPECIFICATIONS.

MOMENT SLAB DETAIL OVER CULVERT

SCALE: 3/4" = 1'-0"

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NUMBER	DATE	MADE BY	CHECKED BY	REVISIONS

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CHECKED BY: CWJ			

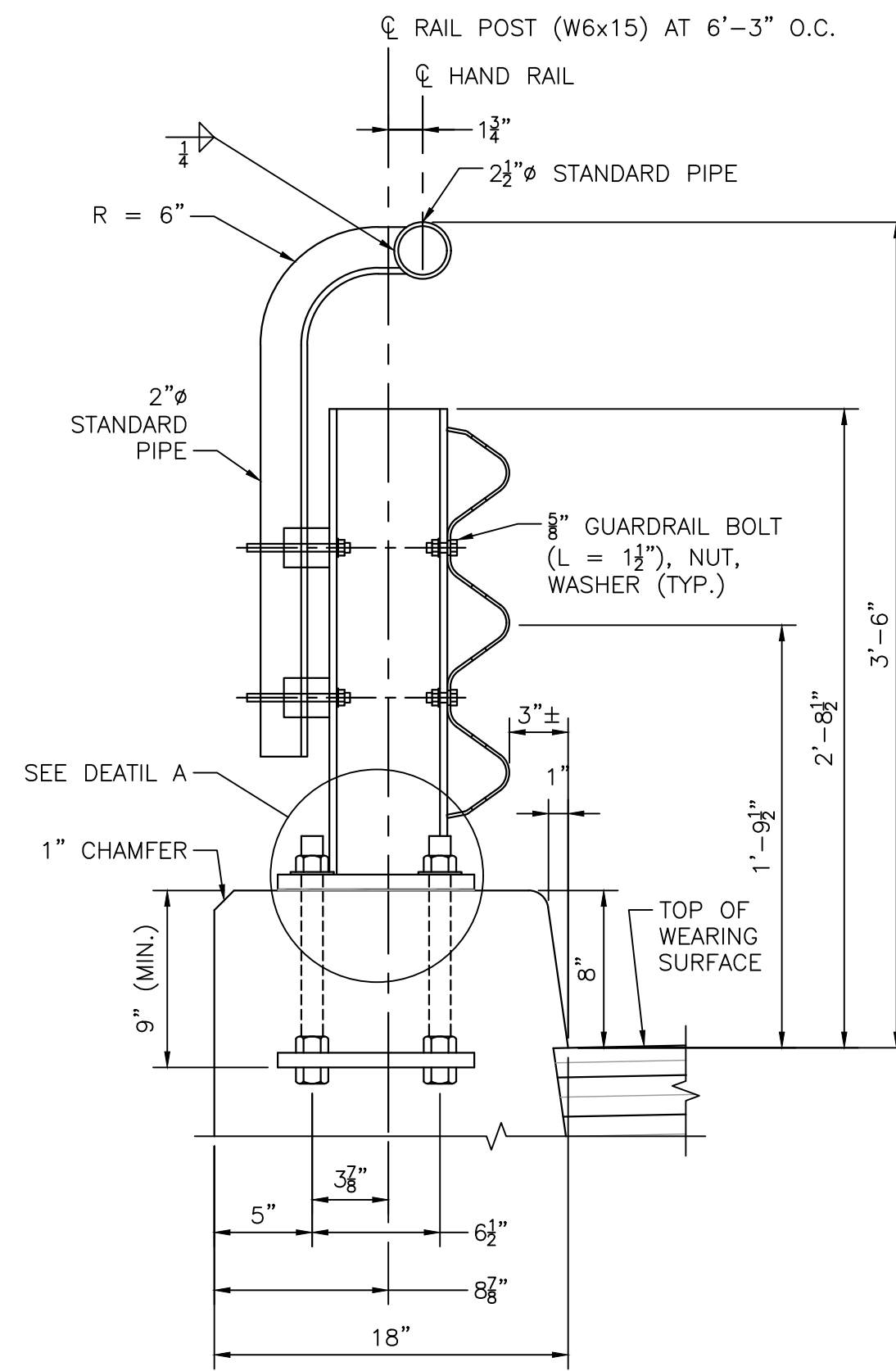


SCALE	TITLE
AS SHOWN	

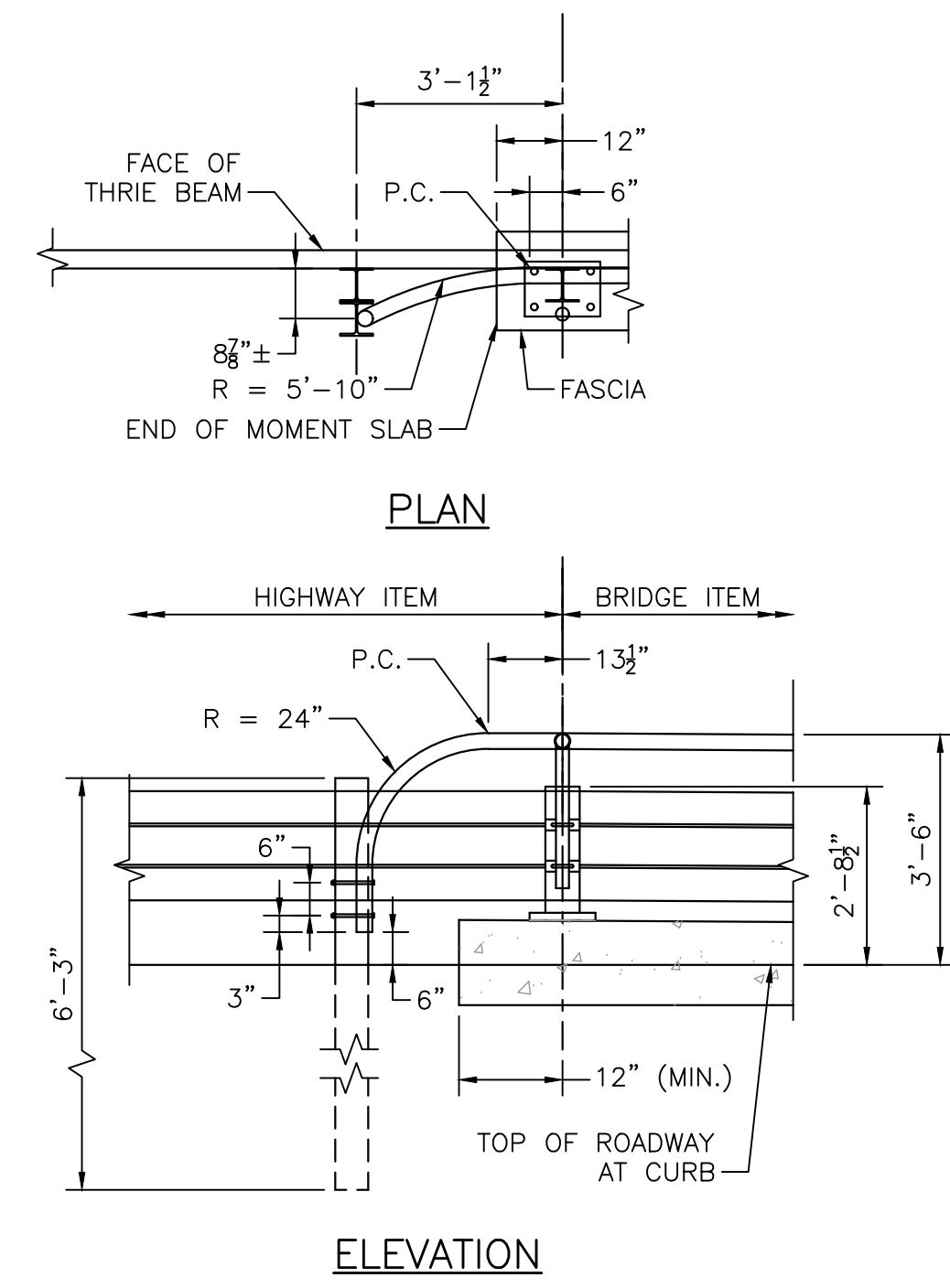
<p>Concord Road over Cold Brook Sudbury, Massachusetts</p> <p>STRUCTURAL DETAILS (1 OF 2)</p>	
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BETA JOB NO.	6733
ISSUE DATE	
SHEET NO.	9

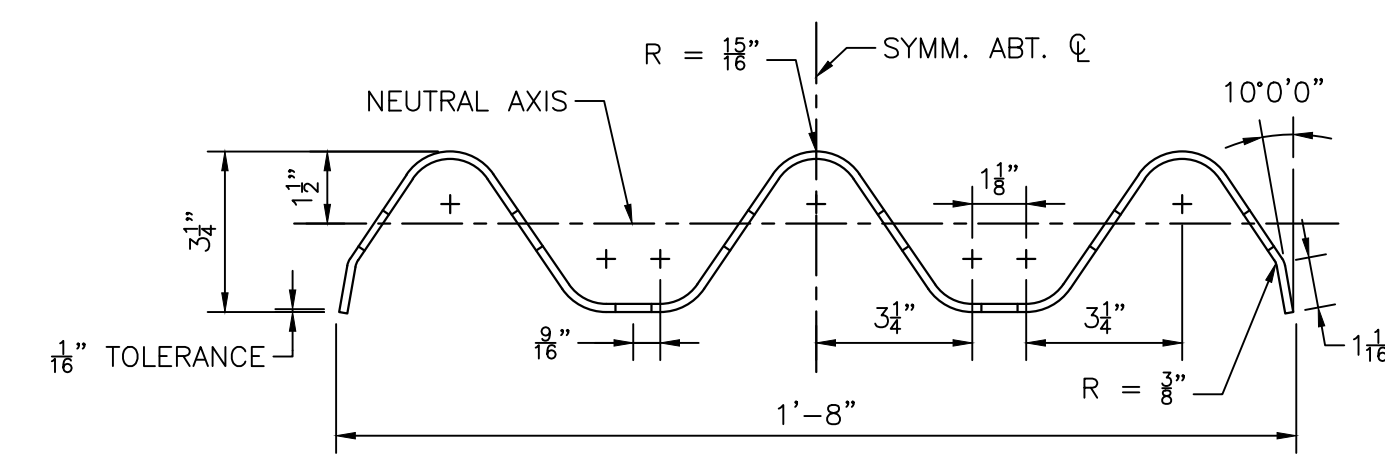
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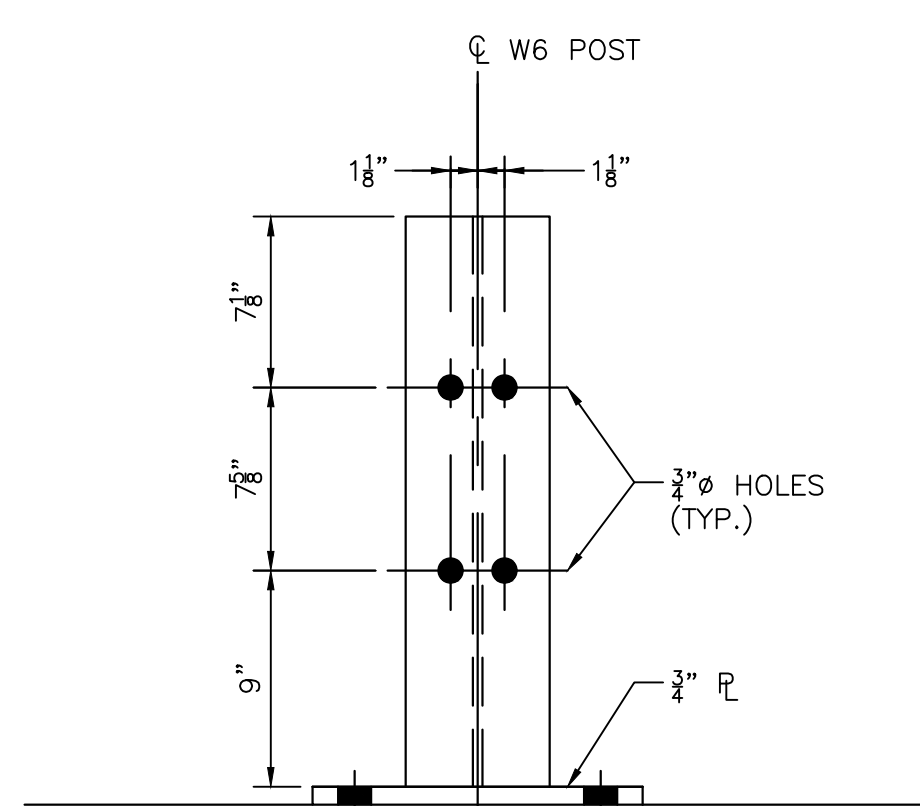
THRIE BEAM SECTION
SCALE: 1 1/2" = 1'-0"



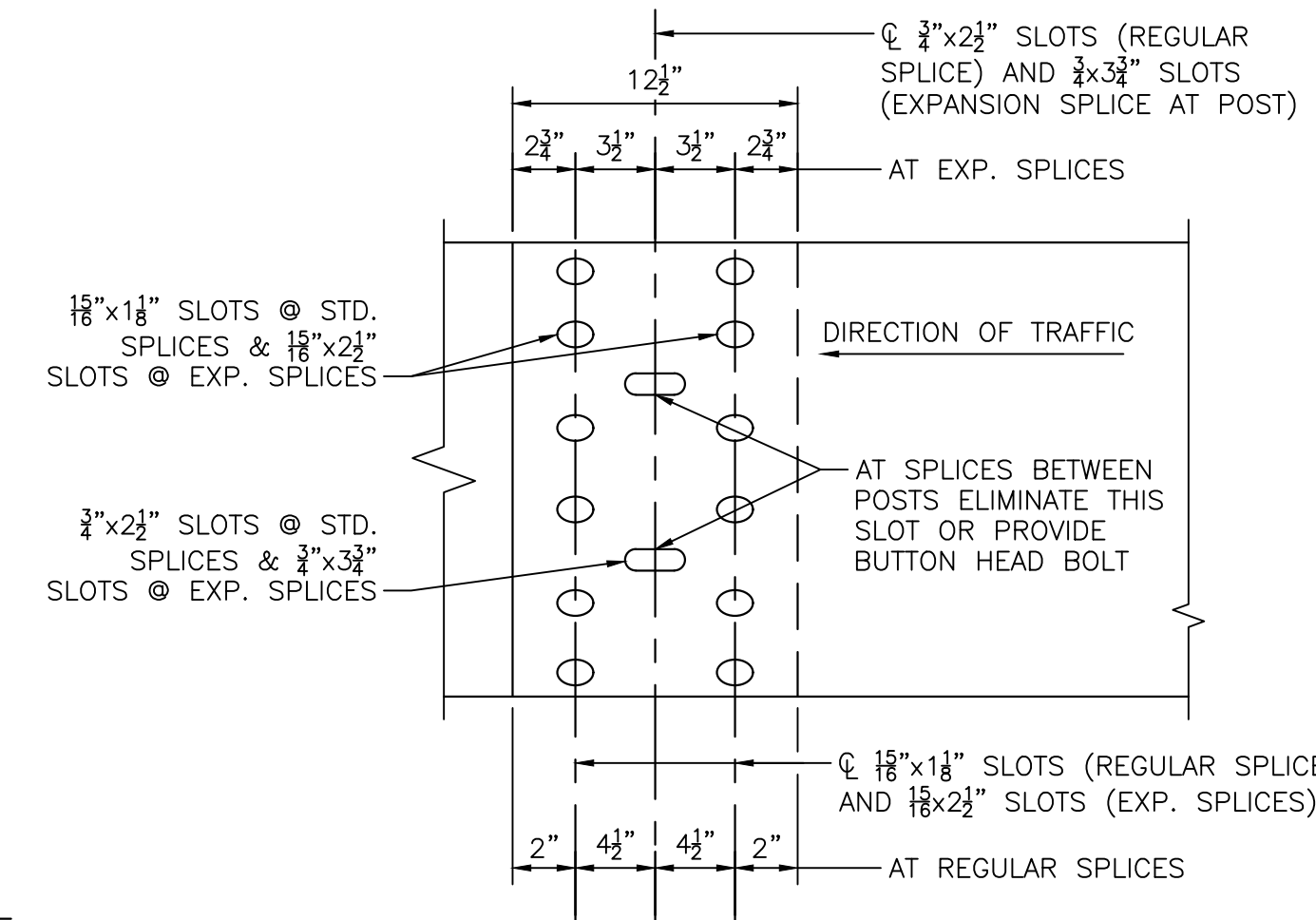
TRANSITION DETAILS
SCALE: 3/8" = 1'-0"



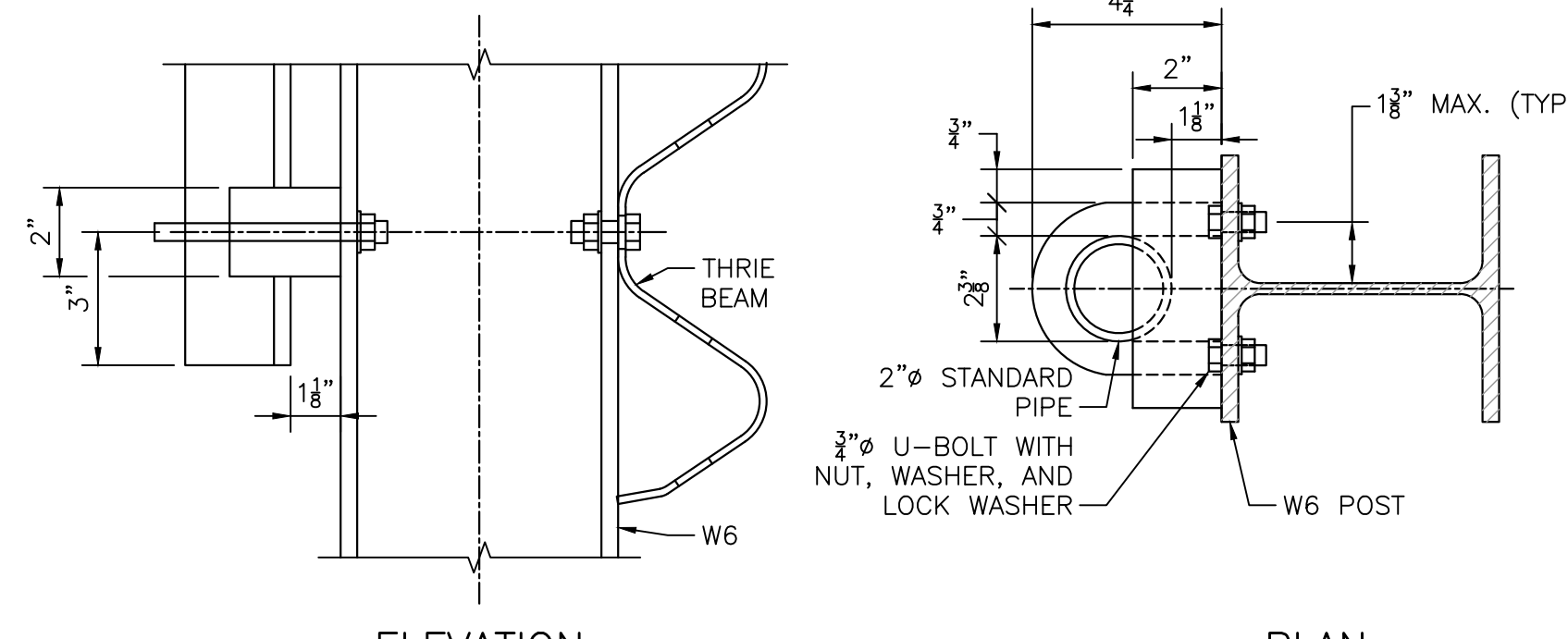
SECTION THRU THRIE BEAM RAIL
SCALE: 3" = 1'-0"



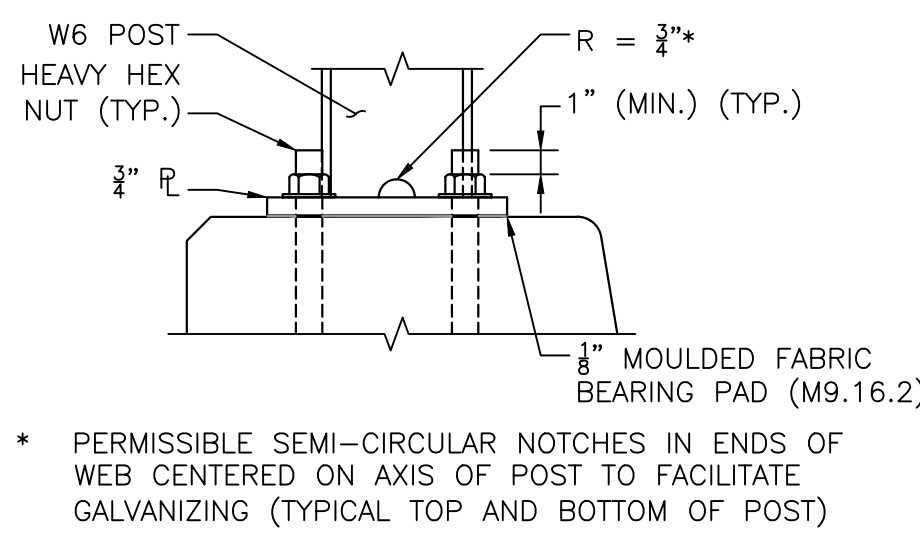
RAIL POST DETAIL (FRONT VIEW)
SCALE: 1 1/2" = 1'-0"



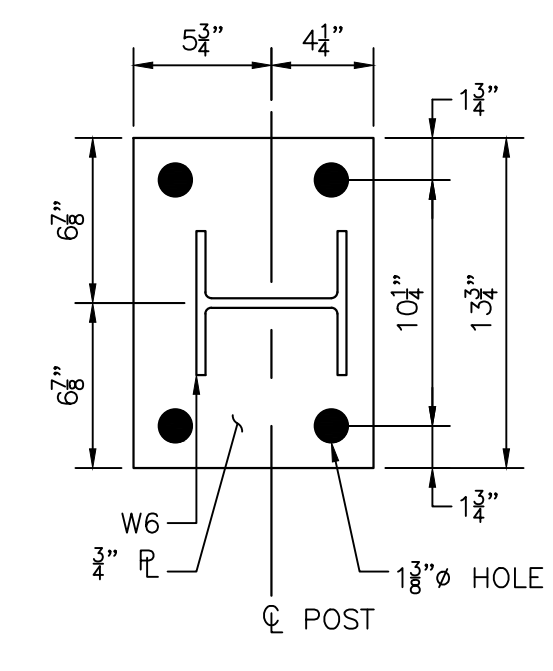
THRIE BEAM RAIL SPlice
SCALE: 1 1/2" = 1'-0"



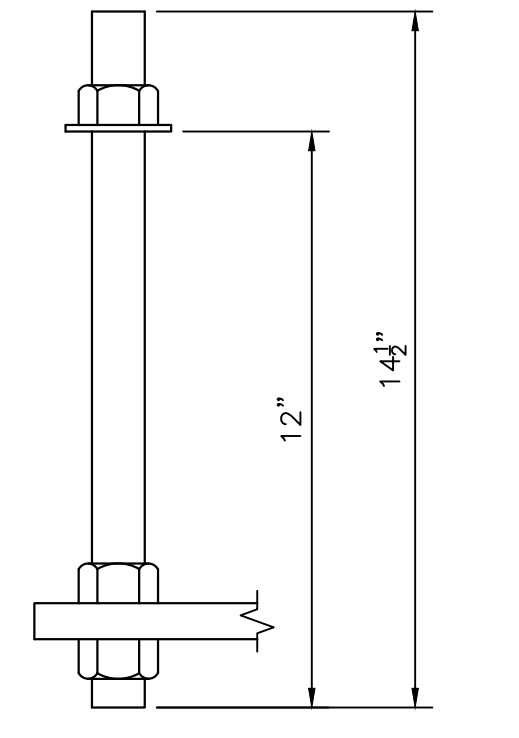
SADDLE DETAILS
SCALE: 3" = 1'-0"



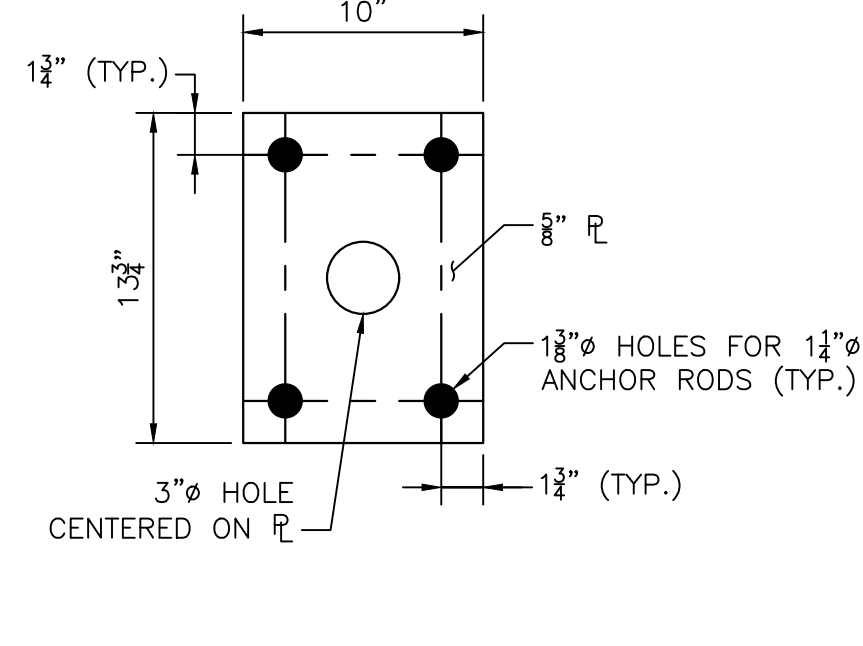
DETAIL A
SCALE: 1 1/2" = 1'-0"



BASE PLATE DETAIL
SCALE: 1 1/2" = 1'-0"



ANCHOR ROD DETAIL
NOT TO SCALE



ANCHOR PLATE DETAIL
SCALE: 1 1/2" = 1'-0"

THRIE BEAM NOTES:

1. ALL STEEL CONNECTING BOLTS AND FASTENERS FOR POSTS AND RAILING SHALL CONFORM TO ASTM A307 AND SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232. ALL ANCHOR RODS SHALL CONFORM TO F1554 GRADE 105 AND SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232.
2. RAIL POSTS AND ANCHOR PLATES SHALL BE SEATED ON MOULDED FABRIC BEARING PADS MEETING M9.16.2 AND HAVING THE SAME DIMENSIONS AS THE PLATE. ADDITIONAL PADS OR HALF PADS MAY BE USED IN SHIMMING FOR ALIGNMENT. POST HEIGHTS SHOWN WILL INCREASE BY THE THICKNESS OF THE PAD.
3. RAIL POSTS SHALL BE SET PERPENDICULAR TO ROADWAY PROFILE GRADE AND VERTICALLY IN CROSS SECTION, EXCEPT THAT THE RAIL POSTS SHALL BE ALIGNED BY THE USE OF SHIMS SO THAT IN THE FINAL ADJUSTMENT NO PART SHALL DEVIATE MORE THAN ONE INCH FROM TRUE HORIZONTAL ALIGNMENT. THE SHIMS SHALL BE 3"x1 1/2" AND PLACED BETWEEN THE POST AND THE THRIE BEAM RAIL. THE THICKNESS OF THE SHIMS SHALL BE DETERMINED BY THE CONTRACTOR AND VERIFIED BY THE ENGINEER BEFORE ORDERING MATERIAL FOR THIS WORK.
4. MINIMUM LENGTH OF THE THRIE BEAM SECTIONS IS EQUAL TO ONE POST SPACE.
5. THRIE BEAM GUARDRAIL STEEL SHALL CONFORM TO THE AASHTO M180, CLASS A, TYPE II AND SHALL BE 3/8" THICK.
6. POSTS, ANCHOR PLATES, AND BASE PLATES SHALL BE FABRICATED FROM STEEL CONFORMING TO AASHTO M270M GR. 250 STEEL AND SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M111.
7. SPECIAL DRILLING OF THE THRIE BEAM MAY BE REQUIRED AT THE SPlices. (ALL DRILLING DETAILS ARE TO BE SHOWN ON THE SHOP DRAWINGS).
8. HANDRAIL STEEL SHALL CONFORM TO ASTM A53 GR. B OR A501 AND SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M111.
9. PLACE A REFLECTORIZED WASHER IN THE UPPER VALLEY OF THRIE BEAM EVERY THIRD POST.

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NUMBER	DATE	MADE BY	CHECKED BY	REVISIONS

DRAWN BY:	DW
DESIGNED BY:	DW
CHECKED BY:	CWJ

REGISTERED PROFESSIONAL
PREPARED BY



SUBCONSULTANT

SCALE
AS SHOWN

TITLE

**Concord Road over Cold Brook
Sudbury, Massachusetts**
STRUCTURAL DETAILS (2 OF 2)

BETA JOB NO. 6733
ISSUE DATE
SHEET NO. 10

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APPENDIX C – Seed Mix Specification

ITEM 765. 553 SEEDING – WETLAND/BASIN MIX RIPARIAN SQUARE YARD

The work under this item shall conform to the relevant provisions of Section 765 of the Standard Specifications and the following:

The work shall consist of planting and establishing a stand of grass in the areas shown on the plans or as required by the Engineer.

For the purposes of these specifications, the term “grass” shall apply to all the forbs, grasses, sedges, and rushes included in the materials.

All seeding shall be done by a company having a minimum of five years of experience with native grass establishment. Prior to beginning work, the applicator shall furnish proof of qualifications to the Engineer for approval. Proof of qualifications includes providing documentation to demonstrate knowledge and expertise with native seeding and proof of having completed successful native seeding projects.

SEEDING SEASON

Seeding seasons shall be April 1 through May 15 and October 1 through November 15 for dormant seeding. For seeding that occurs outside of these periods, the seed rate shall be increased by 50%.

MATERIALS

Seed

Samples and Submittals

- 1) Certificate of Materials. Prior to ordering, the Contractor shall submit to the Engineer the manufacturer or supplier’s notarized Certificate of Materials. This document shall not be used as proof of purchase, proof of material delivered, or proof of material seeded, but simply to verify supplier availability of seed listed on the date certified. The species listed shall match those specified on the plans or herein, however, cultivars may vary due to availability. Substantial substitutions or changes in the mix from that specified on the plans or herein shall be approved by MassDOT Landscape Design Section.
- 2) Seed Tag Certification. All seed lots have a seed analysis tag as required by State and Federal law. The contractor shall submit seed tags for each bag of seed used on the project site or ensure that each tag is photo documented by the Engineer. Number of tags shall match number of bags sent by the supplier to meet rate of Pure Live Seed specified on the plans. Tag must include: kind and variety of seed; lot number; origin of seed; net weight; % purity; germination; dormant seed; germination test date; inert matter; weed, noxious and other crop seed; and name and address of company responsible for the analysis. Seeding may be considered unacceptable for payment if no tags are submitted.
- 3) Certificate of Compliance. Prior to payment, contractor shall submit a signed, dated and notarized Certificate of Compliance from the Supplier that serves as proof of purchase or bill of lading. This document shall include kind and variety of seed, lot number, net weight

shipped, date of sale, invoice number under which seed was purchased, and name and address of Supplier or Manufacturer. All information must be included on the notarized form, including lot number and net weight shipped for specified job. This information shall match Seed Tag Certification and quantity of seed applied on the job. Seeding may be considered unacceptable for payment if information is incomplete.

- 4) Seed Sample. Contractor may be asked, prior to seeding, to submit a seed sample for testing. Testing shall be incidental to this item.

Quantities specified are Pure Live Seed (PLS). Greater quantities of ordered seed may be required to achieve actual specified seeding rates. Pure Live Seed is defined as the fraction of pure seed species within the mix that, by standard seed testing practices, will germinate. This is determined by multiplying the percent of seed purity by the percent of seed germination.

Seed mix shall be a custom blend as shown on the plans or shall be as specified below. Seed cultivars shall be those that are as regional to New England or the local ecotype as possible.

	<u>Botanical Name</u>	<u>Common Name</u>	<u>% PLS By Weight</u>
Grass			
	Sorghastrum nutans NY Eco	Indiangrass NY Ecotype	14.00%
	Schizachyrium scoparium	Little Blue Stem	14.00%
	Elymus riparius	Riverbank Wild Rye	10.00%
	Elymus virginicus	Virginia Wild Rye	10.00%
	Panicum clandestinum 'Tioga'	Deer Tongue 'Tioga'	9.00%
	Andropogon gerardii NY Eco	Big Bluestem NY Eco	8.00%
	Carex vulpinoidea	Fox Sedge	7.00%
	Panicum virgatum	Switchgrass	3.00%
	Juncus effusus	Soft Rush	2.00%
	Agrostis perennans	Upland Bentgrass	2.00%
	Scirpus atrovirens	Green Bulrush	1.00%
			<hr/> 80.00%
Herb/Forb			
	Chamaecrista fasciculata	Partridge Pea	3.00%
	Verbena hastata	Blue Vervain	3.00%
	Asclepias incarnata	Swamp Milkweed	3.00%
	Heliopsis helianthoides	Ox-Eye Sunflower	2.00%
	Eupatorium perfoliatum	Boneset	2.00%
	Aster umbellatus	Flat Topped White Aster	1.00%
	Aster prenanthoides	Zig Zag Aster	1.00%
	Aster puniceus	Aster – Swamp	1.00%
	Aster novae-angliae	New England Aster	1.00%
	Eupatorium maculatum	Joe-pye Weed	1.00%
	Monarda fistulosa	Wild Bergamot	1.00%
	Vernonia noveboracensis	New York Ironweed	1.00%
			<hr/> 20.00%
			<hr/> 100.00%

Seeding Rate

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

FOR USE ON SLOPES: Add 30 lbs/acre of a cover crop. For a cover crop use either grain oats (1 Jan to 31 July) or grain rye (1 Aug to 31 Dec). Cover crop shall be incidental to seeding item.

Any species substitutions shall be with a species having similar characteristics and native to New England. Substantial changes in the mix shall be approved by the Engineer.

Fertilizer

No fertilizers shall be applied.

Water

Water, including hose and all other watering equipment required for the work, shall be furnished by the Contractor to the site at no additional cost. Water shall be suitable for irrigation and free from ingredients harmful to plant life. All plants injured or work damaged due to the lack of water or the use of too much water shall be the Contractor's responsibility to correct.

Mulch

Seed areas shall be separately mulched with hydromulch, straw or as specified below when incorporated with compost topsoil.

CONSTRUCTION

Surface Preparation

Soil preparation and seeding shall occur only when the bed is in a friable condition, not muddy or hard. Bare soils shall be raked to remove large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. All ruts and any depressions caused by settlement, erosion or rolling shall be filled with additional loam or compost and the soil shall be re-graded to a smooth and even finish corresponding to the required grades. No tracking or rolling shall be done on wet soil.

Prior to seeding, site preparation shall be approved by the Engineer.

Seeding Methods

Seeding on Loam

Seeding application shall be by broadcast methods followed by hydromulching. Seed may be broadcast by using a cyclone or whirlwind seeder, or by hand.

If spread by hand, small or light-seeded species such as bluestem may be mixed with approved filler (e.g., sawdust, rice, kitty litter, or clean damp sand) to achieve an even distribution. Broadcast seeding

shall be undertaken in two separate passes at ninety degrees to each other. One-half the seeding rate shall be applied in each direction. Seed shall be incorporated 1/8 to 1/4-inch deep by raking or dragging, culti-packing, or tracking with heavy machinery. Raked areas shall be rolled with a weighted roller to provide good seed to soil contact. Do not roll or track the seed if the soil is wet.

Immediately following completion of broadcast seeding and packing, area shall be hydromulched. Hydromulch shall be per the Standard Specifications and per the manufacturer's directions. Mulch for hydroseeding shall be wood fiber only.

Seeding in Combination with Compost Topsoil

If proposed in the contract, compost topsoil shall be as specified under Item 751.7 Compost Topsoil.

Seeding shall be done as a second operation after placement of compost has been approved by the Engineer. Seeding shall be broadcast followed by hydro-mulching.

Contractor shall notify Engineer prior to seeding operation to obtain written approval of site preparation and compost topsoil application.

Irrigation

After seeding and mulching, water seeded areas to moisten soil to a depth of at least 2 inches.

No seeding shall be done if soils are muddy or dry and compacted.

Care during Seed Germination

Contractor shall care for seeded areas as required. Care shall include irrigation and weed removal as necessary for germination and healthy growth.

Over-seeding

If, in the opinion of the Engineer, there are numerous areas of bare ground greater than 10-12 inches, these areas shall be over-seeded. Areas where seed fails to germinate and that become invaded by weeds shall be mowed as low as possible and over-seeded. Soil that is compacted shall be raked or roughened prior to seeding to ensure seed to soil contact.

Over-seeding application rates and methods shall be the same as those listed above. After seeding, areas shall be mulched with straw mulch or 1/4 - 1/2 inch compost topsoil and watered with a fine mist to moisten soil to a depth of at least 2 inches.

Over-seeding shall be incidental and shall not be paid for separately.

Care during Grass Establishment

Following germination of seeded species, the contractor shall maintain the stand of grasses to ensure healthy growth.

Work shall include mowing or weed whacking for weed control, irrigation if necessary, and monitoring for invasive plants. Watering shall provide uniform coverage without eroding soil or grassed surfaces. Treatment of invasive plants shall be per the requirements of the Engineer.

The Contractor shall provide all labor, equipment, materials, and water required for establishment. Contractor shall water all seeded areas as necessary to a depth of 2 inches or greater.

EXPECTATIONS OF ESTABLISHMENT

Native upland grasses and forbs will not look like turf grass. Many of the native grasses are bunch type grasses and will not form a uniform growth or have a sod-type appearance. However, seeded area shall show general uniform growth of the seeded species throughout the area. Areas with gaps of bare soil greater than 10-12 inches will be considered unacceptable and shall be over-seeded.

A well-established stand of grasses at the end of one full growing season (June-September), as determined by the Engineer will be required for acceptance. At least 80-90 percent of the grass established shall be the seeded species and any invasive or aggressive weeds (mugwort, ragweed, or knapweed) shall have been cut or otherwise managed.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 765.553 will be measured for payment by the square yard at the end of one full growing season upon approval of establishment by the Engineer.

Item 765.553 will be paid for at the Contract unit price per Square Yard upon receipt of required submittals as specified above and upon approval of established stand of grass as specified above. This price shall include surface preparation prior to seeding as specified under Surface Preparation, and as required by the Engineer, seeding, reseeding, irrigation, care during germination and establishment, labor materials, equipment, and all incidental costs required to complete the work.

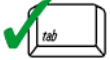
APPENDIX D – Stormwater Checklist



Checklist for Stormwater Report

A. Introduction

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



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

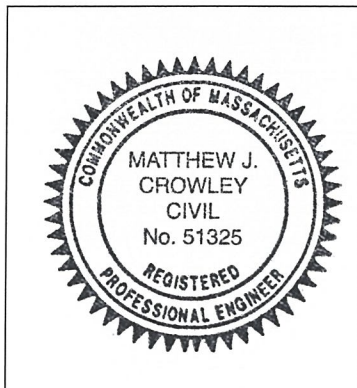
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Matthew Crowley 12/13/19

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of “country drainage” versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): _____

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does **not** cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

SUMMARY OF COMPLIANCE WITH THE TEN STORMWATER MANAGEMENT STANDARDS

The Town of Sudbury is proposing to repair the Concord Road Culvert over Cold Brook. The following narrative discusses the project as it relates to the Massachusetts Stormwater Handbook's Ten Stormwater Management Standards.

LID Measures:

The project proposes the continued use of country drainage as a low impact development technique. Also, no trees or shrubs will be disturbed as part of the project.

Standard 1: No New Untreated Discharges

The project does not propose any new untreated discharges to wetland resources. The stabilization of an eroded slope by installing a paved waterway will mitigate erosion potential in proximity to wetland resources.

Standard 2: Peak Rate Attenuation

The project includes the installation of a negligible amount of new impervious area, comprised of a new paved waterway to stabilize and eroded slope; however, is anticipated to be fully offset by the removal of an area of concrete debris located to the north of the culvert. With no measurable increase in impervious area there will be no increase in peak runoff rates to wetland resources.

Standard 3: Recharge

Due to limited areas of available land, proximity of wetlands and waterbodies, and the presence of soils that are not anticipated to be suitable for infiltration (Freetown Muck, Hydrologic Soil Group B/D), the installation of recharge BMPs are not practicable as part of this project. The continued use of country drainage will provide some opportunity for recharge.

Standard 4: Water Quality

Due to limited areas of available land, proximity of wetlands and waterbodies, and other site constraints, the installation of structural BMPs are not practicable as part of this project. The stabilization of an eroded slope by installing a paved waterway will reduce sedimentation to wetland resource areas and represents an improvement over the existing conditions. The project is located within the Assabet River Watershed, an impaired water body with Final Total Maximum Daily Loads (TMDLs) for Total Phosphorus. Vegetative uptake, through the continued use of country drainage, will provide for some reduction in phosphorus loading.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

The project does not include Land Uses with Higher Potential Pollutant Loads.

Standard 6: Critical Areas

The project is not located in proximity to a critical area, including public water supply watersheds, cold-water fisheries, and Outstanding Resource Waters; therefore, this standard does not apply.

Standard 7: Redevelopment

The project is classified as a redevelopment project under the second definition “Development, rehabilitation, expansion and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area.”

Standards 1, 8, 9 and 10 are met as required and the project will improve existing conditions by stabilizing and existing eroded slope.

Standard 8: Construction Period Pollution Prevention and Erosion and Sediment Control

The project will not disturb in excess of one acre of land; therefore, the preparation of a Stormwater Pollution Prevention Plan (SWPPP) and filing a Notice of Intent with EPA is not required. BMPs for erosion and sedimentation control will be adhered to for all phases of construction. Refer to Section 4.0 (Mitigation Measures) within the NOI Project Narrative and the project plans for a full description, details, and locations of proposed erosion and sedimentation controls.

Standard 9: Long Term Operation and Maintenance Plan

There is no existing drainage system within the project limits and no structural BMPs are proposed. General maintenance of the roadway including sweeping, cleaning and inspection of the paved waterway, and maintenance of roadside vegetation will be conducted by the Department of Public Works in accordance with standard Town operations.

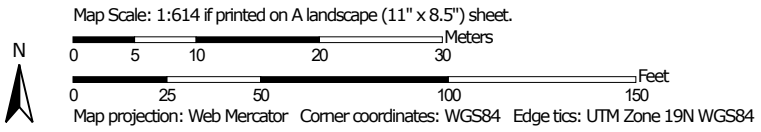
Standard 10: Prohibition of Illicit Discharges

Based upon available information there are no existing discharges within the project limits that are not entirely comprised of stormwater. The proposed project does not propose any illicit discharges and all illicit discharges are prohibited in the future.

Hydrologic Soil Group—Middlesex County, Massachusetts



Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines


 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
 Survey Area Data: Version 19, Sep 12, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
53A	Freetown muck, ponded, 0 to 1 percent slopes	B/D	1.8	92.0%
223B	Scio very fine sandy loam, 3 to 8 percent slopes	B/D	0.0	1.9%
253D	Hinckley loamy sand, 15 to 25 percent slopes	A	0.1	6.2%
Totals for Area of Interest			1.9	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher