STATE OF NEW HAMPSHIRE
INTER-DEPARTMENT COMMUNICATION

DATE: January 10, 2022

FROM: Andrew O'Sullivan, Wetlands Program Manager

AT (OFFICE): Department of Transportation, Bureau of Environment

SUBJECT Dredge & Fill Application, Bath, 43247

TO Karl Benedict, Public Works Permitting Officer
New Hampshire Wetlands Bureau
29 Hazen Drive, P.O. Box 95
Concord, NH 03302-0095

Forwarded herewith is the application package prepared by NH DOT Bureau of Highway Design for the subject major impact project. This project is classified as major under Env-Wt 900. The project is located along US Route 302 in the Town of Bath, NH. The project will replace an existing 6' wide and 3' high x 40' long concrete box culvert carrying an unnamed stream under US 302. The proposed structure is a 9' span x 3' clear rise and 40' long precast concrete box culvert embedded 12" below the stream bed. The elevation and placement of the structure will be the same as what currently exists.

This project was reviewed at the Natural Resource Agency Coordination Meeting on July 21, 2021. A copy of the minutes has been included with this application package. A copy of this application and plans can be accessed on the Departments website via the following link: http://www.nh.gov/dot/org/projectdevelopment/environment/units/program-management/wetland-applications.htm.

NHDOT anticipates and request that this project be reviewed and permitted by the Army Corp of Engineers through the State Programmatic General Permit process. A copy of the application has been sent to the Army Corp of Engineers.

Mitigation was determined to not be required as the proposed work was determined to be self-mitigating.

The lead people to contact for this project are Kirk Mudgett, Bureau of Highway Design (271-3668 or Kirk.Mudgett@dot.nh.gov) or Andrew O'Sullivan, Wetlands Program Manager, Bureau of Environment (271-3226 or Andrew.O'Sullivan@dot.nh.gov).

A payment voucher has been processed for this application (Voucher #668552) in the amount of $588.00.

If and when this application meets with the approval of the Bureau, please send the permit directly to Andrew O'Sullivan, Wetlands Program Manager, Bureau of Environment.

AMO:amo
cc:
BOE Original
Town of Bath (4 copies via certified mail)
Ammonoosuc River LAC (1 copy via certified mail)
David Trubey, NH Division of Historic Resources (Cultural Review Within)
Carol Henderson, NH Fish & Game (via electronic notification)
Maria Tur, US Fish & Wildlife (via electronic notification)
Beth Alafat & Jeanie Brochi, US Environmental Protection Agency (via electronic notification)
Michael Hicks & Rick Kristoff, US Army Corp of Engineers (via electronic notification)
Kevin Nyhan, BOE (via electronic notification)

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STANDARD DREDGE AND FILL WETLANDS PERMIT APPLICATION

Water Division/Land Resources Management Wetlands Bureau

Check the Status of your Application

RSA/Rule: RSA 482-A/Env-Wt 100-900

APPLICANT'S NAME: **NH Dept. of Transportation** **TOWN NAME:** Bath

Administrative Use Only	Administrative Use Only	Administrative Use Only	File No.:
			Check No.:
			Amount:
			Initials:

A person may request a waiver of the requirements in Rules Env-Wt 100-900 to accommodate situations where strict adherence to the requirements would not be in the best interest of the public or the environment but is still in compliance with RSA 482-A. A person may also request a waiver of the standards for existing dwellings over water pursuant to RSA 482-A:26, III(b). For more information, please consult the Waiver Request Form.

SECTION 1 - REQUIRED PLANNING FOR ALL PROJECTS (Env-Wt 306.05; RSA 482-A:3, I(d)(2)) Please use the Wetland Permit Planning Tool (WPPT), the Natural Heritage Bureau (NHB) DataCheck Tool, the Aquatic Restoration Mapper, or other sources to assist in identifying key features such as: priority resource areas (PRAs), protected species or habitats, coastal areas, designated rivers, or designated prime wetlands.	
Has the required planning been completed?	☒ Yes ☐ No
Does the property contain a PRA? If yes, provide the following information:	☒ Yes ☐ No
• Does the project qualify for an Impact Classification Adjustment (e.g. NH Fish and Game Department (NHF&G) and NHB agreement for a classification downgrade) or a Project-Type Exception (e.g. Maintenance or Statutory Permit-by-Notification (SPN) project)? See Env-Wt 407.02 and Env-Wt 407.04.	☐ Yes ☒ No
• Protected species or habitat? ○ If yes, species or habitat name(s): ○ NHB Project ID #:	☐ Yes ☒ No
• Bog?	☐ Yes ☒ No
• Floodplain wetland contiguous to a tier 3 or higher watercourse?	☒ Yes ☐ No
• Designated prime wetland or duly-established 100-foot buffer?	☐ Yes ☒ No
• Sand dune, tidal wetland, tidal water, or undeveloped tidal buffer zone?	☐ Yes ☒ No
Is the property within a Designated River corridor? If yes, provide the following information: • Name of Local River Management Advisory Committee (LAC): Ammonoosuc River LAC • A copy of the application was sent to the LAC on Month: Day: Year:	☒ Yes ☐ No

For dredging projects, is the subject property contaminated? • If yes, list contaminant:	☐ Yes ☒ No
Is there potential to impact impaired waters, class A waters, or outstanding resource waters?	☐ Yes ☒ No
For stream crossing projects, provide watershed size (see WPPT or Stream Stats): Streamstats 408 AC (not used) LIDAR 1023 AC	

SECTION 2 - PROJECT DESCRIPTION (Env-Wt 311.04(i))

Provide a **brief** description of the project and the purpose of the project, outlining the scope of work to be performed and whether impacts are temporary or permanent. DO NOT reply "See attached"; please use the space provided below.

The project will replace an existing 6' wide x 3' high x 40' long concrete box culvert carrying an un-named stream under US 302 located approximately 1.6 miles south of Cate Rd. The proposed structure is a 9' span x 3' clear rise x 40' long precast concrete box culvert embedded 12" below streambed. The proposed structure will be in the same location and the streambed will be at the same elevation as existing. The proposed structure will have straight concrete headwalls similar the existing headwalls. Incidental work is limited to matching the existing stream channel to the new culvert.

SECTION 3 - PROJECT LOCATION

Separate wetland permit applications must be submitted for each municipality within which wetland impacts occur.

ADDRESS: US 302, approximately 1.6 miles south of Cate Road.

TOWN/CITY: Bath, NH

TAX MAP/BLOCK/LOT/UNIT: N/A

US GEOLOGICAL SURVEY (USGS) TOPO MAP WATERBODY NAME: un-named stream
☒ N/A

(Optional) LATITUDE/LONGITUDE in decimal degrees (to five decimal places):	44.183281° North 71.94151° West

SECTION 4 - APPLICANT (DESIRED PERMIT HOLDER) INFORMATION (Env-Wt 311.04(a)) If the applicant is a trust or a company, then complete with the trust or company information.		
NAME: NH Dept. of Transportation		
MAILING ADDRESS: PO Box 483		
TOWN/CITY: Concord	STATE: NH	ZIP CODE: 03303
EMAIL ADDRESS: Kirk.Mudgett@dot.nh.gov		
FAX:	PHONE: 603-271-1598	
ELECTRONIC COMMUNICATION: By initialing here: KM, I hereby authorize NHDES to communicate all matters relative to this application electronically.		
SECTION 5 - AUTHORIZED AGENT INFORMATION (Env-Wt 311.04(c)) ☐ N/A		
LAST NAME, FIRST NAME, M.I.:		
COMPANY NAME:		
MAILING ADDRESS:		
TOWN/CITY:	STATE:	ZIP CODE:
EMAIL ADDRESS:		
FAX:	PHONE:	
ELECTRONIC COMMUNICATION: By initialing here , I hereby authorize NHDES to communicate all matters relative to this application electronically.		
SECTION 6 - PROPERTY OWNER INFORMATION (IF DIFFERENT THAN APPLICANT) (Env-Wt 311.04(b)) If the owner is a trust or a company, then complete with the trust or company information. ☒ Same as applicant		
NAME:		
MAILING ADDRESS:		
TOWN/CITY:	STATE:	ZIP CODE:
EMAIL ADDRESS: Andrew.OSullivan@dot.nh.gov		
FAX:	PHONE: 603-271-3226	
ELECTRONIC COMMUNICATION: By initialing here AMO, I hereby authorize NHDES to communicate all matters relative to this application electronically.		

SECTION 7 - RESOURCE-SPECIFIC CRITERIA ESTABLISHED IN Env-Wt 400, Env-Wt 500, Env-Wt 600, Env-Wt 700, OR Env-Wt 900 HAVE BEEN MET (Env-Wt 313.01(a)(3))
Describe how the resource-specific criteria have been met for each chapter listed above (please attach information about stream crossings, coastal resources, prime wetlands, or non-tidal wetlands and surface waters): In accordance with Env-Wt 400 the jurisdictional areas within the project limits have been delineated by: NHDOT Personnel Sarah Large and Heidi Stortz. The jurisdictional areas are referenced on the attached included wetland impact plans. The project has been designed in accordance with Env-Wt 527, and Env-Wt 900 to the maximum extent practicable. The application includes a technical report as well as details within the supplemental narrative to address Env-Wt 904.10- Alternative Designs. Unavoidable impacts to wetlands have been minimized to the maximum extent practicable. Project specific information is contained within this permit application.

SECTION 8 - AVOIDANCE AND MINIMIZATION
Impacts within wetland jurisdiction must be avoided to the maximum extent practicable (Env-Wt 313.03(a)).* Any project with unavoidable jurisdictional impacts must then be minimized as described in the Wetlands Best Management Practice Techniques For Avoidance and Minimization and the Wetlands Permitting: Avoidance, Minimization and Mitigation Fact Sheet. For minor or major projects, a functional assessment of all wetlands on the project site is required (Env-Wt 311.03(b)(10)).* Please refer to the application checklist to ensure you have attached all documents related to avoidance and minimization, as well as functional assessment (where applicable). Use the Avoidance and Minimization Checklist, the Avoidance and Minimization Narrative, or your own avoidance and minimization narrative. **See Env-Wt 311.03(b)(6) and Env-Wt 311.03(b)(10) for shoreline structure exemptions.*

SECTION 9 - MITIGATION REQUIREMENT (Env-Wt 311.02) If unavoidable jurisdictional impacts require mitigation, a mitigation pre-application meeting must occur at least 30 days but not more than 90 days prior to submitting this Standard Dredge and Fill Permit Application.
Mitigation Pre-Application Meeting Date: Month: 7 Day: 21 Year: 2021 (☒ N/A - Mitigation is not required)

SECTION 10 - THE PROJECT MEETS COMPENSATORY MITIGATION REQUIREMENTS (Env-Wt 313.01(a)(1)c)
Confirm that you have submitted a compensatory mitigation proposal that meets the requirements of Env-Wt 800 for all permanent unavoidable impacts that will remain after avoidance and minimization techniques have been exercised to the maximum extent practicable: ☐ I confirm submittal. (☒ N/A – Compensatory mitigation is not required)

SECTION 11 - IMPACT AREA (Env-Wt 311.04(g))

For each jurisdictional area that will be/has been impacted, provide square feet (SF) and, if applicable, linear feet (LF) of impact, and note whether the impact is after-the-fact (ATF; i.e., work was started or completed without a permit).

For intermittent and ephemeral streams, the linear footage of impact is measured along the thread of the channel. *Please note, installation of a stream crossing in an ephemeral stream may be undertaken without a permit per Rule Env-Wt 309.02(d), however other dredge or fill impacts should be included below.*

For perennial streams/rivers, the linear footage of impact is calculated by summing the lengths of disturbances to the channel and banks.

Permanent impacts are impacts that will remain after the project is complete (e.g., changes in grade or surface materials).

Temporary impacts are impacts not intended to remain (and will be restored to pre-construction conditions) after the project is completed.

JURISDICTIONAL AREA		PERMANENT			TEMPORARY		
		SF	LF	ATF	SF	LF	ATF
Wetlands	Forested Wetland			☐			☐
	Scrub-shrub Wetland			☐			☐
	Emergent Wetland			☐			☐
	Wet Meadow			☐			☐
	Vernal Pool			☐			☐
	Designated Prime Wetland			☐			☐
	Duly-established 100-foot Prime Wetland Buffer			☐			☐
Surface Water	Intermittent / Ephemeral Stream			☐			☐
	Perennial Stream or River	175	20	☐	667	93	☐
	Lake / Pond			☐			☐
	Docking - Lake / Pond			☐			☐
	Docking - River			☐			☐
Banks	Bank - Intermittent Stream			☐			☐
	Bank - Perennial Stream / River	114	40	☐	514	187	☐
	Bank / Shoreline - Lake / Pond			☐			☐
Tidal	Tidal Waters			☐			☐
	Tidal Marsh			☐			☐
	Sand Dune			☐			☐
	Undeveloped Tidal Buffer Zone (TBZ)			☐			☐
	Previously-developed TBZ			☐			☐
	Docking - Tidal Water			☐			☐
TOTAL		289	60		**1181**	**280**	

SECTION 12 - APPLICATION FEE (RSA 482-A:3, I)

☐ **MINIMUM IMPACT FEE**: Flat fee of $400.

☐ **NON-ENFORCEMENT RELATED, PUBLICLY-FUNDED AND SUPERVISED RESTORATION PROJECTS, REGARDLESS OF IMPACT CLASSIFICATION:** Flat fee of $400 (refer to RSA 482-A:3, 1(c) for restrictions).

☒ **MINOR OR MAJOR IMPACT FEE:** Calculate using the table below:

Permanent and temporary (non-docking):	1470 SF	× $0.40 =	$ 588
Seasonal docking structure:	SF	× $2.00 =	$
Permanent docking structure:	SF	× $4.00 =	$
Projects proposing shoreline structures (including docks) add $400 =			$
Total =			$
The application fee for minor or major impact is the above calculated total or $400, whichever is greater =			$ 588

SECTION 13 - PROJECT CLASSIFICATION (Env-Wt 306.05) Indicate the project classification.		
☐ Minimum Impact Project	☐ Minor Project	☒ Major Project

SECTION 14 - REQUIRED CERTIFICATIONS (Env-Wt 311.11)	
Initial each box below to certify:	
Initials: KOM	To the best of the signer's knowledge and belief, all required notifications have been provided.
Initials: KOM	The information submitted on or with the application is true, complete, and not misleading to the best of the signer's knowledge and belief.
Initials: KOM	The signer understands that: • The submission of false, incomplete, or misleading information constitutes grounds for NHDES to: 1. Deny the application. 2. Revoke any approval that is granted based on the information. 3. If the signer is a certified wetland scientist, licensed surveyor, or professional engineer licensed to practice in New Hampshire, refer the matter to the joint board of licensure and certification established by RSA 310-A:1. • The signer is subject to the penalties specified in New Hampshire law for falsification in official matters, currently RSA 641. • The signature shall constitute authorization for the municipal conservation commission and the Department to inspect the site of the proposed project, except for minimum impact forestry SPN projects and minimum impact trail projects, where the signature shall authorize only the Department to inspect the site pursuant to RSA 482-A:6, II.
Initials: KOM	If the applicant is not the owner of the property, each property owner signature shall constitute certification by the signer that he or she is aware of the application being filed and does not object to the filing.

SECTION 15 - REQUIRED SIGNATURES (Env-Wt 311.04(d); Env-Wt 311.11)		
SIGNATURE (OWNER): Kirk Mudgett	PRINT NAME LEGIBLY: Kirk Mudgett	DATE: 12-30-21
SIGNATURE (APPLICANT, IF DIFFERENT FROM OWNER):	PRINT NAME LEGIBLY:	DATE:
SIGNATURE (AGENT, IF APPLICABLE):	PRINT NAME LEGIBLY:	DATE:

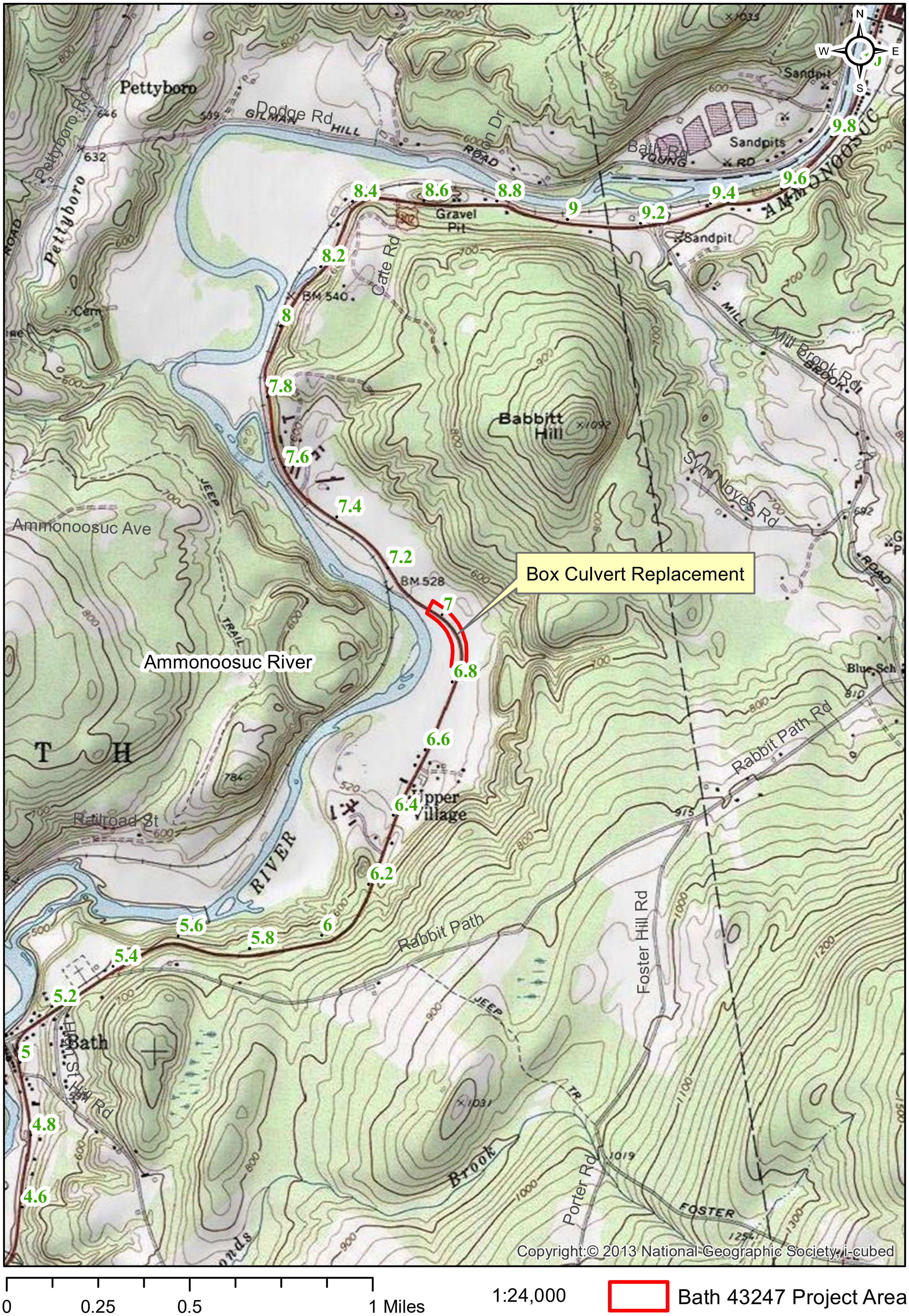
SECTION 16 - TOWN / CITY CLERK SIGNATURE (Env-Wt 311.04(f))	
As required by RSA 482-A:3, I(a)(1), I hereby certify that the applicant has filed four application forms, four detailed plans, and four USGS location maps with the town/city indicated below.	
TOWN/CITY CLERK SIGNATURE:	PRINT NAME LEGIBLY: State agency exempt per RSA 482-A:3,I(a)
TOWN/CITY: 4 copies via cert. mail	DATE: exempt per Env-Wt 311.05(a)(14)

DIRECTIONS FOR TOWN/CITY CLERK:
Per RSA 482-A:3, I(a)(1)

1. IMMEDIATELY sign the original application form and four copies in the signature space provided above.
2. Return the signed original application form and attachments to the applicant so that the applicant may submit the application form and attachments to NHDES by mail or hand delivery.
3. IMMEDIATELY distribute a copy of the application with one complete set of attachments to each of the following bodies: the municipal Conservation Commission, the local governing body (Board of Selectmen or Town/City Council), and the Planning Board.
4. Retain one copy of the application form and one complete set of attachments and make them reasonably accessible for public review.

DIRECTIONS FOR APPLICANT:
Submit the original permit application form bearing the signature of the Town/City Clerk, additional materials, and the application fee to NHDES by mail or hand delivery at the address at the bottom of this page. Make check or money order payable to “Treasurer – State of NH”.

Bath 43247



Box Culvert Replacement
Ammonoosuc River
Babbitt Hill
Pettyboro
Upper Village
Bath
Dodge Rd
Bath Rd
Cate Rd
Mill Brook Rd
Sym Noyes Rd
Rabbit Path Rd
Rabbit Path
Foster Hill Rd
Porter Rd
Railroad St
Ammonoosuc Ave
Pettyboro Rd
Sandpit
Sandpits
Gravel Pit
BM 528
BM 540
4.6
4.8
5
5.2
5.4
5.6
5.8
6
6.2
6.4
6.6
6.8
7
7.2
7.4
7.6
7.8
8
8.2
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8.8
9
9.2
9.4
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9.8
Copyright:© 2013 National Geographic Society, i-cubed
0
0.25
0.5
1 Miles
1:24,000
Bath 43247 Project Area

STANDARD DREDGE AND FILL WETLANDS PERMIT APPLICATION ATTACHMENT A: MINOR AND MAJOR PROJECTS

Water Division/Land Resources Management
Wetlands Bureau
Check the Status of your Application

RSA/ Rule: RSA 482-A/ Env-Wt 311.10; Env-Wt 313.01(a)(1); Env-Wt 313.03

APPLICANT'S NAME: **NH Dept. of Transportation** **TOWN NAME:** Bath

Attachment A is required for *all minor and major projects*, and must be completed *in addition* to the Avoidance and Minimization Narrative or Checklist that is required by Env-Wt 307.11.

For projects involving construction or modification of non-tidal shoreline structures over areas of surface waters having an absence of wetland vegetation, only Sections I.X through I.XV are required to be completed.

PART I: AVOIDANCE AND MINIMIZATION

In accordance with Env-Wt 313.03(a), the Department shall not approve any alteration of any jurisdictional area unless the applicant demonstrates that the potential impacts to jurisdictional areas have been avoided to the maximum extent practicable and that any unavoidable impacts have been minimized, as described in the Wetlands Best Management Practice Techniques For Avoidance and Minimization.

SECTION I.I - ALTERNATIVES (Env-Wt 313.03(b)(1))
Describe how there is no practicable alternative that would have a less adverse impact on the area and environments under the Department's jurisdiction.

A FULLY COMPLIANT STREAM CROSSING DESIGN WOULD INVOLVE REPLACING THE EXISTING 6' WIDE X 3' HIGH CONCRETE BOX CULVERT WITH A 16' SPAN X 5' HIGH BRIDGE. THE CURRENT CONSTRUCTION COST ESTIMATE FOR THIS OPTION IS $1,428,366. THE 5' HEIGHT IS SET TO MEET THE BRIDGE DESIGN REQUIREMENT OF PASSING THE 100-YEAR STORM WITH 1' OF FREEBOARD. THIS WOULD REQUIRE RAISING THE US 302 PROFILE APPROXIMATELY 3', SIGNIFICANT WIDENING OF THE INLET AND OUTLET CHANNELS, ADDITIONAL FILL IN THE 100 YEAR FLOODPLAIN, AND PERMANENT ROW OR EASEMENT ACQUISITIONS. MATERIAL WOULD NEED TO BE EXCAVATED ELSEWHERE TO OFFSET THE NEW FILL IN THE FLOODPLAIN, LIKELY REQUIRING ROW ACQUISITION OF SOME CROPLAND. THIS ALTERNATIVE IS NOT CONSIDERED PRACTICABLE UNDER THIS PROGRAM.

A HYDRAULIC DESIGN WAS ALSO CONSIDERED, THAT WOULD PASS THE 50 YEAR STORM WITHOUT SUBMERGING THE INLET AND WOULD MAINTAIN THE EXISTING 3' CLEAR HEIGHT. THIS WOULD BE A 30' SPAN X 3' HIGH (CLEAR OPENING) EMBEDDED BOX CULVERT. THIS CONFIGURATION IS NOT PROPOSED AS SPANS OVER 10' ARE CLASSIFED AS BRIDGES REQUIRING THE ABOVE NOTED FREEBOARD AND ASSOCIATED RAISE IN THE US 302 PROFILE.

REPLACEMENT-IN-KIND (6' SPAN) AND SPANS SMALLER THAN THE PROPOSED 9' SPAN WERE ALSO CONSIDERED. IMPACTS FOR REPLACEMENT WITH SMALLER SPAN STRUCTURES WOULD BE THE SAME AND THE ADDITIONAL COST FOR THE 9' SPAN IS WITHIN THE PROJECT BUDGET.

PERMANENT IMPACTS ARE THE MINIMUM NECESSARY TO MATCH THE STREAM CHANNEL TO THE NEW CULVERT.

TEMPORARY IMPACTS ARE THE MINIMUM NECESSARY FOR WATER DIVERSION AND EROSION CONTROLS.

SECTION I.II - MARSHES (Env-Wt 313.03(b)(2))

Describe how the project avoids and minimizes impacts to tidal marshes and non-tidal marshes where documented to provide sources of nutrients for finfish, crustacean, shellfish, and wildlife of significant value.

There are no marshes delineated within the project area.

SECTION I.III - HYDROLOGIC CONNECTION (Env-Wt 313.03(b)(3))

Describe how the project maintains hydrologic connections between adjacent wetland or stream systems.

The existing culvert provides a hydrologic connection between the upstream and downstream channels of the un-named stream. There is no existing perch at the inlet or outlet. The invert of the proposed culvert will be set such that the simulated streambed material inside the culvert matches the existing streambed upstream and downstream. No change to the stream alignment or slope is proposed.

Temporary disturbance to inlet and outlet areas will be restored such that there is no change to the existing streambed grade. The hydrologic connection between the upstream and downstream channels will remain the same post construction.

SECTION I.IV - JURISDICTIONAL IMPACTS (Env-Wt 313.03(b)(4))

Describe how the project avoids and minimizes impacts to wetlands and other areas of jurisdiction under RSA 482-A, especially those in which there are exemplary natural communities, vernal pools, protected species and habitat, documented fisheries, and habitat and reproduction areas for species of concern, or any combination thereof.

The project has been designed in accordance with ENV-Wt 400, 500, and 900. Unavoidable impacts to wetlands have been minimized to the maximum extent practicable; the Department has addressed Env-Wt 311.07 Avoidance and Minimization through the checklist document included with this application.

The resources present within the project area are: the un-named perennial stream, the floodplain of the Ammonoosuc River, and the protected shoreland of the Ammonoosuc River. The proposed culvert replacement is located outside of the protected shoreland buffer, however, the project limit for traffic control work to the north of the crossing is located within 250' of the Ammonoosuc River. This work will remain entirely within the existing roadway and is exempt from permitting pursuant to RSA 483-B:5-b.VII.

The project area is within the range of the northern long eared bat (NLEB) which is listed as a threatened species under the Federal Endangered Species Act. The US Fish and Wildlife Service (USFW) Information for Planning and Conservation webtool was used to determine that the project qualifies for the December 15, 2016 FHWA Range-wide Programmatic Biological Opinion for NLEB and and the USFWS has concurred that the project has a May Affect, Likely to Adversely Affect determination due to the need to clear trees during the NLEB active season, all appropriate Avoidance and Minimzation Measures will be included in the contract document and no further consultation is necessary.

There are no vernal pools, exemplary natural communinties, or State listed species known to occur in the project area. The NH Natural Heritage Bureau reviewed the project and found no records of sensitive species in the project area.

SECTION I.V - PUBLIC COMMERCE, NAVIGATION, OR RECREATION (Env-Wt 313.03(b)(5))

Describe how the project avoids and minimizes impacts that eliminate, depreciate or obstruct public commerce, navigation, or recreation.

The proposed design/work will allow traffic to continue to flow along US 302 during construction minimizing the impact to local and regional commuting and commerce. In the project area, the un-named stream is not used for water recreation nor is it an identified fishing location. The site is not a suitable nor feasible recreation area and therefore the level of impact to recreation will be minimal to none.

SECTION I.VI - FLOODPLAIN WETLANDS (Env-Wt 313.03(b)(6))

Describe how the project avoids and minimizes impacts to floodplain wetlands that provide flood storage.

In the project area, there are no delineated wetlands adjacent to the un-named stream that provide flood storage. The adjacent farm fields are not delineated wetlands, but do provide flood storage. The project will not permanently impact the fields or change their flood storage function.

SECTION I.VII - RIVERINE FORESTED WETLAND SYSTEMS AND SCRUB-SHRUB – MARSH COMPLEXES (Env-Wt 313.03(b)(7))

Describe how the project avoids and minimizes impacts to natural riverine forested wetland systems and scrub-shrub – marsh complexes of high ecological integrity.

There are no riverine forested or scrub-shrub wetlands delineated within the project area.

SECTION I.VIII - DRINKING WATER SUPPLY AND GROUNDWATER AQUIFER LEVELS (Env-Wt 313.03(b)(8)) Describe how the project avoids and minimizes impacts to wetlands that would be detrimental to adjacent drinking water supply and groundwater aquifer levels.
The project will have no effect on wetlands that would be detrimental to adjacent drinking water supply and groundwater aquifer levels.
SECTION I.IX - STREAM CHANNELS (Env-Wt 313.03(b)(9)) Describe how the project avoids and minimizes adverse impacts to stream channels and the ability of such channels to handle runoff of waters.
Avoidance of all impacts is not practical due to the poor structural condition of the existing culvert. The proposed new culvert will improve the hydraulic capacity of the crossing and add simulated streambed inside the culvert without causing adverse impacts to the upstream and downstream channels. Permanent impacts to the stream channel are the minimum necessary to match the new culvert to the existing stream channel. The stream channel will continue to capture, contain, and convery stormwater runoff in the same manner as it does today. The surrounding landscape topography will not be changed as a result of this project, therefore stormwater runoff will enter the stream system the same way it currently does.

SECTION I.X - SHORELINE STRUCTURES - CONSTRUCTION SURFACE AREA (Env-Wt 313.03(c)(1)) Describe how the project has been designed to use the minimum construction surface area over surface waters necessary to meet the stated purpose of the structures.
N/A - The project does not involve shoreline structures.
SECTION I.XI - SHORELINE STRUCTURES - LEAST INTRUSIVE UPON PUBLIC TRUST (Env-Wt 313.03(c)(2)) Describe how the type of construction proposed is the least intrusive upon the public trust that will ensure safe docking on the frontage.
N/A

SECTION I.XII - SHORELINE STRUCTURES – ABUTTING PROPERTIES (Env-Wt 313.03(c)(3)) Describe how the structures have been designed to avoid and minimize impacts on ability of abutting owners to use and enjoy their properties.
N/A

SECTION I.XIII - SHORELINE STRUCTURES – COMMERCE AND RECREATION (Env-Wt 313.03(c)(4)) Describe how the structures have been designed to avoid and minimize impacts to the public's right to navigation, passage, and use of the resource for commerce and recreation.
N/A

SECTION I.XIV - SHORELINE STRUCTURES – WATER QUALITY, AQUATIC VEGETATION, WILDLIFE AND FINFISH HABITAT (Env-Wt 313.03(c)(5)) Describe how the structures have been designed, located, and configured to avoid impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.
N/A

SECTION I.XV - SHORELINE STRUCTURES – VEGETATION REMOVAL, ACCESS POINTS, AND SHORELINE STABILITY (Env-Wt 313.03(c)(6)) Describe how the structures have been designed to avoid and minimize the removal of vegetation, the number of access points through wetlands or over the bank, and activities that may have an adverse effect on shoreline stability.
N/A

PART II: FUNCTIONAL ASSESSMENT
REQUIREMENTS Ensure that project meets the requirements of Env-Wt 311.10 regarding functional assessment (Env-Wt 311.04(j); Env-Wt 311.10).
FUNCTIONAL ASSESSMENT METHOD USED: US Army Corps of Engineers Highway Methodology
NAME OF CERTIFIED WETLAND SCIENTIST (FOR NON-TIDAL PROJECTS) OR QUALIFIED COASTAL PROFESSIONAL (FOR TIDAL PROJECTS) WHO COMPLETED THE ASSESSMENT: SARAH LARGE AND HEIDI STORTZ, NHDOT DELINEATION PER ENV-WT406
DATE OF ASSESSMENT: 05/14/2020
Check this box to confirm that the application includes a NARRATIVE ON FUNCTIONAL ASSESSMENT: ☐
For minor or major projects requiring a standard permit without mitigation, the applicant shall submit a wetland evaluation report that includes completed checklists and information demonstrating the RELATIVE FUNCTIONS AND VALUES OF EACH WETLAND EVALUATED. Check this box to confirm that the application includes this information, if applicable: ☐ Note: The Wetlands Functional Assessment worksheet can be used to compile the information needed to meet functional assessment requirements.

CULVERT REHABILITATION
US ROUTE 302 OVER UN-NAMED BROOK
BATH, NH
NHDOT PROJECT NO. 43247
SUPPLEMENTAL NARRATIVE

Project Description

The project will replace an existing 6’ wide x 3’ high x 40’ long concrete box culvert carrying an un-named stream under US 302 located approximately 1.6 miles south of Cate Rd. The proposed structure is a 9’ span x 3’ clear rise x 40’ long precast concrete box culvert embedded 12” below streambed. The proposed structure will be in the same location and the streambed will be at the same elevation as existing. The proposed structure will have straight concrete headwalls similar the existing headwalls. Incidental work is limited to matching the existing stream channel to the new culvert.

This is a federally funded culvert rehabilitation project. The proposed Advertising Date is March 22, 2022, with construction anticipated in the summer or fall of 2022.

This project was initiated and is funded under NHDOT’s Federal Culvert Replacement/Rehabilitation & Drainage Repair (CRDR) Program. The Program purpose is to address major culvert and drainage needs statewide that are not being addressed through current or future Capital Improvement or other programmatic projects. The Program receives $2,000,000 in total funding annually, which includes construction, engineering, and ROW costs. Projects are selected and scheduled based primarily on the condition of the culvert (risk of failure), Road Tier, traffic volume, depth of fill, and detour length (potential impact of failure). The Program funding is fully committed for at least the next three years. This culvert is one of the highest statewide priority locations out of nearly 50 known locations eligible for the Program. Failure to address the structural deficiency of this culvert risks collapse of the culvert which could cause serious impacts to public/private infrastructure and the travelling public.

Existing Conditions

The crossing is 6’ span x 3’ high x 40’ long concrete box culvert originally constructed in 1930. Original length was 36'. No record of lengthening was found. (see Exhibit 1, Archive Plan, on page 28 of the application package). The culvert slope is very flat (about 0.25%) and both ends have straight concrete headwalls. Fill height above the top of the culvert is very low (less than 1’ on the outlet side).

The crossing is a Tier 3 based on drainage area of 1023 acres, or about 1.6 Sq miles based on LIDAR contours. Streamstats boundary was significantly less at 0.64 sq mi (408 acres) partially due to the stream network not matching actual conditions. The DES permit planning tool showed the same stream network but returned an area of 0.78 sq mi.

US302 is classified as a Tier 2 roadway (Principal Arterial), with average daily traffic volume in 2019 of 3,582 vehicles per day. US 302 is the only major route connecting Haverhill, Bath, and Lisbon to Littleton and the I-93 corridor. This culvert was selected for the Program based on structural condition, risk of failure, and lack of suitable detour routes.

The culvert is in very poor condition due to age related concrete deterioration. NHDOT District 1 Maintenance reports some repairs have been made in the past, including placing a steel plate over the top of the culvert. Further repairs are not practical.

There are active agricultural operations on both sides of US 302 in the vicinity of the crossing. The culvert inlet channel is about 5‘wide x 3‘deep at 2.3% average slope, and is bordered by crops on both sides. The outlet channel bends sharply to the right, runs just outside the ROW for about 300‘, then bends sharply to the left and runs another 200’ before it connects with the Ammonoosuc River. The outlet channel is about 4’ to 6’ wide x 2‘deep, at 0.8% average slope. Field review found no evidence of erosion or sedimentation caused by the culvert.

Both the inlet and outlet channels are shallow and have relatively low capacities before overtopping occurs. There was evidence of recent agricultural channel maintenance, with the adjacent tilled fields being a likely chronic sediment source. There was no perch at the inlet or outlet. There was an inch or two of sediment in the culvert providing the appearance of a natural bottom.

NHDOT District 1 Maintenance reports no history of flooding related to this culvert, but there is a history of roadway overtopping due to water levels and ice jams in the Ammonoosuc River. The FEMA 100-year flood elevation in the vicinity of the culvert is about 5’ higher than US 302 and up to 9’ higher than the lowest parts of the surrounding fields.

NHDOT sent letters to the two abutters requesting information on flood history, damage, or impact to farm operations. Abutter Miles (south side of inlet) had no specific concerns about the existing culvert. He did note that the inlet and outlet channels require periodic maintenance and suggested that the inlet channel be straightened out. The other abutter did not respond.

A stream assessment was performed by NHDOT on 5/14/2020. The stream flows through a very highly channelized and influenced stream channel for several hundred feet upstream and downstream of the crossing as the stream traverses the agricultural landscape and Ammonoosuc River’s floodplain down to its confluence with the River. Bankfull width upstream was 8.0’ and downstream was 9.3’.

The reference reach was upstream and outside of the area of influence of the crossing and in an area where the influence by the surrounding agricultural development was minimized to the maximum extent practical. Farther upstream of the reference reach the stream’s slope and characteristics change to a mountainous system. The reference and stream reach near the crossing is at the inflection point where the stream’s slope and characteristics reflect the stream’s position within the Ammonoosuc River’s floodplain (more gradual slope, finer sediments, and more entrenched. Bankfull widths for the reference reach were 8.8’ and 8.0’. Floodprone width varied from 11.4’ to 9.0’. The reference reached was determined to be a Rosgen Stream Type “A”.

Based on the reference reach’s Rosgen Stream Type the entrenchment ratio multipliers are 1.0 to 1.4. Using the average bankfull width of 8.5’ and average entrenchment ratio of 1.2, the compliant structure span would be 10.2’, rounded to 10’ for design.

Natural and Cultural Resources

Threatened and Endangered Species:
The project area is within the range of the Northern Long Eared Bat. There are very few trees in the project area, and only a few greater than 3” dbh on the inlet side near the upstream limit of work. USFWS has verified that this project may rely on the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat. The project has a may affect - not likely to adversely affect determination for NLEB and no further consultation is needed.

The Natural Heritage Bureau data check:
No records were found in the vicinity of the project area.

NH Fish & Game Coordination:
There are no concerns for impacts to species under NHFG jurisdiction.

Cultural Resources:
The project area is located entirely within the Bath Upper Village Historic District which is eligible for listing on the National Register of Historic Places. The proposed work will be limited to existing disturbed areas associated with the US Route 302 and the culvert does not retain historical integrity due to previous widening. The proposed work was reviewed by the Department’s Cultural Resources Program and it was determined that this project will have no potential to cause effects on historical resources.

Wetlands:
Wetland resources in the project area are limited to the un-named stream channel and banks. No other wetland resources were identified.

Water Quality:
The level of disturbance meets the Bureau of Alteration of terrain (AOT) threshold of greater than 2,500 SF disturbance within 50’ of a surface water, however, the project is consistent with the AOT Permit-by-Rule. The project does not propose to increase the amount of impervious surface. It is anticipated that the project will not result in a negative impact on water quality in the project area and therefore, no permanent stormwater treatment is proposed. A NPDES Discharge General Permit may be required if dewatering within the stream is required. Best Management practices will be utilized to prevent and reduce the likelihood of erosion or sediment entering the wetlands system. See the included erosion control plans for more details regarding BMPs.

Impaired Waters:
The un-named stream is not in the list of impaired waters in Bath (2018-303d list).

Contamination:
No point source or PFAS concerns were identified.
Limited Reuse Soils (LRS) excavated from within the operational State right-of-way shall be addressed in accordance with applicable NHDES rules, waivers, and/or Soils Management Plans.

Invasive Species: None identified in the project area. If invasive species are found during construction, the Contractor will be required to perform all work activities in accordance with the Department publication “Best Management Practices for the Control of Invasive and Noxious Plant Species”

Prime Wetlands, Designated Rivers, and Shoreland Water Quality Protection Act:
There are no prime wetlands in the vicinity of the project area. The Ammonoosuc River is a Designated River and the project is within ¼ mile. An initial letter was sent to the Ammonoosuc Local River Advisory Committee on April 14, 2021, however, no response has been received to date. The Ammonoosuc River is a Shoreland Water Quality Protection Act protected waterbody. The project area is outside the 250'protected buffer. No impacts within Shoreland jurisdiction are proposed.

Floodplains:
The Ammonoosuc River is within a FEMA mapped floodplain (Zone AE with established Base Flood Elevations). No regulatory floodway is present. The digital FIRM map (Map# 33009C0240E) was downloaded, referenced to the project location, and floodplain lines were traced onto the Plans.

Bath is a participating community in the National Flood Insurance Program, however, the project will not propose new developments, construction or fill that would increase the 100-year flood elevations by more than 1 foot. No additional coordination is necessary.

Conservation Lands: No conservation lands were identified in the project impact area.

NHDES Aquatic Restoration Mapper: Review of the mapper found no data available for this crossing.

Conservation Commission: The Town of Bath Conservation Commission was contacted via letter on June 10th, 2021 requesting information about the project area and feedback on the proposed work. No response has been received to date.

Hydrology / Hydraulics

Streamstats predicts Q100 at 249 cfs for the revised 1023 ac boundary. Confidence limits were not provided due to the boundary being revised. Streamstats was not used for determining design flows.

The FHWA Regression Equations predict Q100 between 287 and 388 cfs.

The SCS Method (Hydrocadd) was used for analysis, using the NOAA Atlas 14, 24 hr rainfall predictions.

Design flows are as follows:
Q2 = 27 cfs Q10 = 116 cfs Q50 = 269 cfs Q100 = 350 cfs

The lowest edge of US302 pavement is about EL 517.5, which would be the control for “flooding” of US 302. Overtopping of US 302 would occur at headwater elevations greater than the centerline elevation of 518.02.

Analysis indicates the existing culvert can pass just under a 10-year design storm (about 3” of rain in a 24 hour period) before bypass occurs. At higher flows, bypass flow would occur into the fields to the south and eventually to another box culvert crossing under US 302 located about 1,750’ to the south. The adjacent field to the north is lower than the culvert inlet channel bank and provides about 5 ac-ft of storage for incoming runoff from the north. With bypass flow included, the existing crossing can accommodate the 100-year storm with headwater depth about 0.2’ higher than the lowest edge of US 302 pavement and 0.33’ below the overtopping elevation. There is no indication that bypass flow causes any damage.

The downstream channel capacity was evaluated using an average section and slope from survey, and roughness representing a clean channel, finding a capacity of approximately 114 cfs before overtopping. Flow that overtops the downstream channel would flow across the field to the southwest and into the River.

The current effective FEMA flood study (FIS# 33009CV001A, Feb. 2008) was reviewed and no reference to detailed study of the un-named stream or existing box culvert was found. Note that the FEMA Study and Map elevations are on NGVD29 vertical datum. 100-year flood elevations referenced elsewhere in this application have been converted to NAVD88 vertical datum to match NHDOT survey and LIDAR. In this area, the NAVD88 datum is approximately 0.37’ lower than the NGVD29 datum.

The FEMA study (Flood Profiles, page 88) does not show the stream or existing culvert or any change in water surface elevation related to the culvert flow (between sections AG and AH). For the 100-year storm, the Ammonoosuc River water surface elevation is approximately 5.8’ higher than US 302, completely submerging the culvert and entire project area. The interpolated FEMA Map 100-year elevation is 524.25 (NAVD29 datum) or about 523.85 for NAVD88 datum.

Alternatives

Alternatives considered included replace in kind with a 6’ span structure, replacement with a 9’ span structure, and replacement with a rules compliant 10’ span structure. Span structures in the 6’ – 9’ range would not be classified as bridges whereas a span of 10’ or more would be a bridge. Span structure alternatives in the 6’ to 9’ range would all be precast concrete box culverts, embedded 12” to improve AOP, and with a 3’ clear height to avoid impacting the US302 road profile. According to archive plans, the US 302 profile is at 0% (EL 518.02) from 2,457’ south to 660’ north of the culvert.

Bridge design criteria requires an opening large enough to pass the Q100 with 1’ of freeboard. Hydraulic design for this criteria (and the Q100 design flow of 350 cfs) finds a 5’ clear height x 16’ span structure would be required. Assuming the crossing location, length, and streambed inverts are the same as existing and using a bridge deck thickness of 12”, this size structure would require raising the US 302 profile approximately 3’, significant widening of the inlet and outlet channels, additional fill in the 100-year floodplain, and permanent ROW or easement acquisitions. Material would need to be excavated elsewhere to offset the new fill in the floodplain, likely requiring ROW acquisition of some cropland. Roadway reconstruction would extend about 450’ north and south of the culvert. Raising the US302 profile and adding guardrail may be considered an adverse effect under Section 106 as the project area is located entirely within the Bath Upper Village Historic District (NR Eligible).

Cost for this option is estimated at $1,428,336. See the attached detailed cost estimate located on page 63 of the application package.
Securing funding and additional design time would require a delay in the start of construction of 3 – 5 years. This alternative is not considered practicable under this Program.

A hydraulic design was also considered, that would pass the 50 year storm without submerging the inlet and would maintain the existing 3' clear height. would be a 30' span x 3' high (clear opening) embedded box culvert. This configuration would not be proposed as spans over 10' are classifed as bridges requiring the above noted freeboard and associated raise in the US 302 profile.

The minimum acceptable alternative would be replacement in-kind with a 6’ span culvert, with the addition of 12” of simulated streambed material in the culvert. The new 6’ span culvert would be constructed at the same location, same length, and same streambed inverts, and would only require minimal temporary impacts outside the ROW. The new culvert would be constructed using one lane alternating two-way traffic controlled by a temporary signal. The current construction cost estimate for this option is $467,338.

Note that the estimates provided are only for construction cost. Design engineering, permit fees, mitigation cost (if any), ROW impacts, and reimbursable utility impacts are not included.

Small increases in the span were found to provide minimal benefit to passage of larger storms due to the flat stream and culvert slopes, the small size of the inlet and outlet channels, and the low elevation of the adjacent fields.

Increasing the span from 6’ to 9’ would improve capacity enough to pass the 10 year design storm without bypass, about 3.37” of rain in 24 hours (vs 3” rainfall capacity for the existing culvert). Construction methods, duration, and resource impacts would be about the same as for the replace in kind option. The cost of increasing the structure span from 6’ to 9’ is within the project budget.

Hydraulic performance for (non-bridge) alternatives was evaluated using the Hydrocadd model as follows: The existing culvert invert is 513.08, Bypass flow begins at EL 516.0 (Headwater depth just under 3').

Capacity at bypass EL 516.0:

Existing 6' x 3'	75 cfs	(assuming clean concrete bottom, n = 0.012)
Replacement 6' x 3'	72 cfs	(assuming natural bottom, n = 0.03).
Replacement 9' x 3'	109 cfs	(assuming natural bottom, n = 0.03).

In terms of rainfall, capacity at bypass EL 516.0:

Existing 6' x 3'	3.04" of rain in 24 hours
Replacement 6' x 3'	3.0" of rain in 24 hours
Replacement 9' x 3'	3.37" of rain in 24 hours (approximately 10-year storm event)

For the 2-year storm (27 cfs) and 10-year storm (116 cfs), outlet velocities are as follows:

	2-year	10-year
Existing 6' x 3'	4.1 ft/s	6.0 ft/s
Replacement 6' x 3'	3.9 ft/s	5.8 ft/s
Replacement 9' x 3'	3.4 ft/s	5.5 ft/s

For the 100-year storm (350 cfs inflow), model results are as follows:

	Headwater Elevation	Flow through Box (cfs)	Outlet Velocity (ft/s)
Existing 6' x 3'	517.13	119.8	6.7
Replacement 6' x 3'	517.15	114.9	6.4
Replacement 9' x 3'	516.98	168.1	6.4

Note that the "Flow through the Box" value is a model representation based on the bypass elevation and topography in the area of the culvert inlet (from NHDOT survey). LIDAR coverage upstream of the survey limits indicates numerous additional opportunities for incoming flow to overtop the inlet channel and bypass into the fields to the south. The model result for "Flow through the Box" is a conservative estimate of the maximum flow and velocity that could be discharged from the culvert if no tailwater influence from the Ammonoosuc River was present. As previously noted, the entire project area is submerged by over 5' at the 100-year event and is likely submerged for the 50-year event (the FEMA Study did not report 50-year water surface elevations). Based on these conditions, a 10-year event is the most appropriate measure for comparison of existing and proposed hydraulics for similar sized replacement structures for this crossing.

Modelling shows that an increase in span provides a small increase in capacity and the wider span and rougher natural bottom reduces velocities slightly over a range of flows. Consideration of costs, benefits, and impacts, resulted in selection of a 9' span x 3' clear height embedded box culvert as the preferred alternative and proposed design.

Proposed Design

The proposed design is 40’ long x 9’ span x 3’ high embedded box culvert. The new culvert will be in the same location, same length, and with the same streambed inverts. It will have straight concrete headwalls at inlet and outlet similar to the existing headwalls. Changes to the roadway and adding guardrail are not proposed.

The proposed culvert will have some additional capacity and slightly lower outlet velocities, but there will not be a significant change to overall flow conditions. The frequency of overtopping of the inlet channel may decrease slightly, and the proposed culvert will pass the 10 year storm without bypass. The downstream channel can accommodate the additional flow without overtopping. Higher flows would continue to bypass to the south and the entire project area would continue to be submerged by the Ammonoosuc River in high flow events.

There will be no significant effect on velocity, flooding, or sediment transport.
There will be no effect on FEMA maps or downstream structures.
The replacement culvert will be within the existing ROW.

Total project duration is expected to be about 3 months. The current construction cost estimate for the proposed design is $532,938. See the attached detailed cost estimate located on page 65 of the application package.

The project will be under the 1 acre threshold for earth disturbance for CGP coverage. Total disturbed area is estimated at 16,500 SF (0.38 acres). This area includes existing pavement that will be removed and replaced.

Permanent stream impacts will be required for grading around the new headwalls and for channel matches. Limits were set at 10’ upstream and 10’ downstream of the existing culvert.

Simulated streambed material will be used to match the new culvert to the existing streambed. Streambanks in the match area will be excavated, leaving native (organic) material as the bank surface. Newly graded banks will be stabilized using wetland seed mix and erosion control matting.

Stream Simulation

FHWA’s HY-8 Culvert Analysis Program was used for stream simulation design. The program evaluates water depths, velocities, and channel stability upstream and downstream of the crossing and compares the results to depths, velocities, and bed stability within the proposed culvert. Stream cross sections used were at 50’, 110’, and 240’ upstream and 50’, 120’, and 225’ downstream of the proposed culvert ends.

HY-8 uses “Low, High, and Peak” flows to evaluate the design. Low flow was set to the minimum 1 cfs allowed by the Program. High flow was set at the 2-year flow of 27 cfs. Peak flow was set at the 10-year flow of 116 cfs. As previously noted, flows greater than the 10-year overtop the inlet and outlet channels and the entire area would be subject to flooding from the River and would not be representative of flow in the channels.

Digital photo gradation analysis was used to determine existing streambed substrate gradation. FHWA’s Hydraulic Toolbox and upstream and downstream photos of the streambed were used for this analysis. HY-8 uses the existing upstream and downstream gradations to design the gradation for the simulated streambed material inside the culvert. This gradation is then transferred to NHDOT’s Simulated Streambed Material specification (located on page 67 of the application package).

Note that the HY-8 program is based on FHWA's Hydraulic Engineering Circular 26 (HEC-26). Guidance in this document suggests the embedment depth should be the larger of: 20% of the culvert rise, 1 times the largest streambed material size, or 2'. The proposed 12" of embedment material meets the first two of these criteria. The 2' minimum embedment depth is intended to provide a factor of safety for typical long term lowering of a natural channel which is not likely at this site. Due to the adjacent cropland, a steady source of fine sediment inflow is expected. The relatively flat slope of the channel and associated low velocities will likely result in sediment accumulation rather than the typical long term natural lowering of the channel.

Using 12" embedment within the culvert does not change the hydraulic calculations for depth, velocity, or erosive force used by HY-8 to evaluate stability, velocity, and depth.

Program results are provided on page 69 of the application package.
See Table 1 on page 2 of the program output for comparison of culvert outlet depth to tailwater depth and culvert outlet velocity to tailwater velocity. For this site, tailwater results are for the average downstream channel cross section without influence from flooding by the Ammonoosuc River.

Stream simulation results indicate that the proposed simulated streambed material is stable at peak flow and high flow, but depth and velocity did not match well for low flows due to the culvert span being larger than the channel bed width.

The simulated streambed material inside the culvert will be shaped to match the bed width of the upstream and downstream channels (approximately 4' wide), such that flow depth and velocity will be similar to that in the upstream channels for the lower range of flows. See the detail in the Plans.

Construction and access considerations

Access to the culvert will be from the edges of US 302. Roadway embankment slopes are relatively flat maintained grass and there are farm access roads adjacent to the culvert inlet and outlet. No special access road considerations are anticipated.

In order to maintain one lane of traffic through the work zone, the new culvert will be constructed in two phases. A sheet pile cofferdam or other approved method will be used to support the portion of roadway open to traffic. Temporary paved widening will be required on the inlet side of the culvert so that traffic can be shifted away from the phase 1 culvert construction area. No additional wetland impacts are required for the temporary widening. After installation of the phase 1 box culvert sections, traffic will be shifted to the outlet side of the culvert and phase 2 will complete the new culvert installation. No need for temporary widening is anticipated for the phase 2 traffic location. Project limits for traffic control will extend to about 300' north and south of the culvert.

Temporary construction easements will be required at the inlet and outlet for staging areas, water diversion, and erosion controls. Easement areas will be restored to existing conditions. No impact to agricultural operations is anticipated.

Temporary Impacts to the stream channel and banks will be required for access, water diversion, and erosion controls. Upstream limit is about 45' from the existing inlet and downstream limit is about 68' from the existing outlet.

Water diversion will likely be through a temporary pipe installed just outside the culvert excavation limits.
The Contractor's water diversion plan will address specific means and methods for managing water.

Summary

The proposed culvert replacement is presented as an Alternative Design under Env-Wt 904.10 because the proposed culvert would not meet the compliant span requirement and would not provide a vegetated bank or wildlife shelf within the structure.

The proposed culvert will meet all of the general design criteria under 904.01 and comply with all of the other 904.07 provisions to the maximum extent practicable.

Discussion of specific Stream Crossing Rule requirements is presented elsewhere in this application.

Archive Plan Bath-Landaff State #50445, Sheet 12 (1930)

AVOIDANCE AND MINIMIZATION CHECKLIST

Water Division/Land Resources Management
Wetlands Bureau

Check the Status of your Application

RSA/Rule: RSA 482-A/ Env-Wt 311.07(c)

This checklist can be used in lieu of the written narrative required by Env-Wt 311.07(a) to demonstrate compliance with requirements for Avoidance and Minimization (A/M), pursuant to RSA 482-A:1 and Env-Wt 311.07(c).

For the construction or modification of non-tidal shoreline structures over areas of surface waters without wetland vegetation, complete only Sections 1, 2, and 4 (or the applicable sections in Attachment A: Minor and Major Projects (NHDES-W-06-013).

The following definitions and abbreviations apply to this worksheet:

- "A/M BMPs" stands for Wetlands Best Management Practice Techniques for Avoidance and Minimization dated 2019, published by the New England Interstate Water Pollution Control Commission (Env-Wt 102.18).
- "Practicable" means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes (Env-Wt 103.62).

SECTION 1 - CONTACT/LOCATION INFORMATION	
APPLICANT LAST NAME, FIRST NAME, M.I.: NH Dept. of Transporation	
PROJECT STREET ADDRESS: US Route 302, 1.6 miles south of Cate Rd	PROJECT TOWN: Bath
TAX MAP/LOT NUMBER: N/A NHDOT ROW	

SECTION 2 - PRIMARY PURPOSE OF THE PROJECT		
Env-Wt 311.07(b)(1)	Indicate whether the primary purpose of the project is to construct a water-access structure or requires access through wetlands to reach a buildable lot or the buildable portion thereof.	☐ Yes ☒ No

If you answered "no" to this question, describe the purpose of the "non-access" project type you have proposed:

The purpose of this project is to replace a structurally deficient 6' wide x 3' high x 40' long concrete box culvert, a valuable state asset, in order to support long term and safe use of the State's public transportation network.

SECTION 3 - A/M PROJECT DESIGN TECHNIQUES Check the appropriate boxes below in order to demonstrate that these items have been considered in the planning of the project. Use N/A (not applicable) for each technique that is not applicable to your project.		
Env-Wt 311.07(b)(2)	For any project that proposes new permanent impacts of more than one acre or that proposes new permanent impacts to a Priority Resource Area (PRA), or both, whether any other properties reasonably available to the applicant, whether already owned or controlled by the applicant or not, could be used to achieve the project's purpose without altering the functions and values of any jurisdictional area, in particular wetlands, streams, and PRAs.	☐ Check ☒ N/A
Env-Wt 311.07(b)(3)	Whether alternative designs or techniques, such as different layouts, construction sequencing, or alternative technologies could be used to avoid impacts to jurisdictional areas or their functions and values.	☒ Check ☐ N/A
Env-Wt 311.07(b)(4) Env-Wt 311.10(c)(1) Env-Wt 311.10(c)(2)	The results of the functional assessment required by Env-Wt 311.03(b)(10) were used to select the location and design for the proposed project that has the least impact to wetland functions.	☐ Check ☒ N/A
Env-Wt 311.07(b)(4) Env-Wt 311.10(c)(3)	Where impacts to wetland functions are unavoidable, the proposed impacts are limited to the wetlands with the least valuable functions on the site while avoiding and minimizing impacts to the wetlands with the highest and most valuable functions.	☐ Check ☒ N/A
Env-Wt 313.01(c)(1) Env-Wt 313.01(c)(2) Env-Wt 313.03(b)(1)	No practicable alternative would reduce adverse impact on the area and environments under the department's jurisdiction and the project will not cause random or unnecessary destruction of wetlands.	☒ Check ☐ N/A
Env-Wt 313.01(c)(3)	The project would not cause or contribute to the significant degradation of waters of the state or the loss of any PRAs.	☒ Check ☐ N/A
Env-Wt 313.03(b)(3) Env-Wt 904.07(c)(8)	The project maintains hydrologic connectivity between adjacent wetlands or stream systems.	☒ Check ☐ N/A
Env-Wt 311.10 A/M BMPs	Buildings and/or access are positioned away from high function wetlands or surface waters to avoid impact.	☒ Check ☐ N/A
Env-Wt 311.10 A/M BMPs	The project clusters structures to avoid wetland impacts.	☐ Check ☒ N/A
Env-Wt 311.10 A/M BMPs	The placement of roads and utility corridors avoids wetlands and their associated streams.	☐ Check ☒ N/A
A/M BMPs	The width of access roads or driveways is reduced to avoid and minimize impacts. Pullouts are incorporated in the design as needed.	☐ Check ☒ N/A
A/M BMPs	The project proposes bridges or spans instead of roads/driveways/trails with culverts.	☐ Check ☒ N/A

A/M BMPs	The project is designed to minimize the number and size of crossings, and crossings cross wetlands and/or streams at the narrowest point.	☐ Check ☒ N/A
Env-Wt 500 Env-Wt 600 Env-Wt 900	Wetland and stream crossings include features that accommodate aquatic organism and wildlife passage.	☒ Check ☐ N/A
Env-Wt 900	Stream crossings are sized to address hydraulic capacity and geomorphic compatibility.	☒ Check ☐ N/A
A/M BMPs	Disturbed areas are used for crossings wherever practicable, including existing roadways, paths, or trails upgraded with new culverts or bridges.	☒ Check ☐ N/A
SECTION 4 - NON-TIDAL SHORELINE STRUCTURES		
Env-Wt 313.03(c)(1)	The non-tidal shoreline structure has been designed to use the minimum construction surface area over surfaces waters necessary to meet the stated purpose of the structure.	☐ Check ☒ N/A
Env-Wt 313.03(c)(2)	The type of construction proposed for the non-tidal shoreline structure is the least intrusive upon the public trust that will ensure safe navigation and docking on the frontage.	☐ Check ☒ N/A
Env-Wt 313.03(c)(3)	The non-tidal shoreline structure has been designed to avoid and minimize impacts on the ability of abutting owners to use and enjoy their properties.	☐ Check ☒ N/A
Env-Wt 313.03(c)(4)	The non-tidal shoreline structure has been designed to avoid and minimize impacts to the public's right to navigation, passage, and use of the resource for commerce and recreation.	☐ Check ☒ N/A
Env-Wt 313.03(c)(5)	The non-tidal shoreline structure has been designed, located, and configured to avoid impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.	☐ Check ☒ N/A
Env-Wt 313.03(c)(6)	The non-tidal shoreline structure has been designed to avoid and minimize the removal of vegetation, the number of access points through wetlands or over the bank, and activities that may have an adverse effect on shoreline stability.	☐ Check ☒ N/A

BUREAU OF ENVIRONMENT
CONFERENCE REPORT

SUBJECT: NHDOT Monthly Natural Resource Agency Coordination Meeting
DATE OF CONFERENCE: July 21, 2021
LOCATION OF CONFERENCE: Virtual meeting held via Zoom

ATTENDED BY:

NHDOT
Andrew O'Sullivan
Matt Urban
Mark Hemmerlein
Rebecca Martin
Arin Mills
Samantha Fifield
Maggie Baldwin
Cassandra Burns
Jason Abdulla
Meli Dube
Marc Laurin
Trent Zanes
Tonty King
Sarah Healey
Jennifer Reczek
Kerry Ryan
Tim Boodey
Joseph Jorgens
Jim MacMahon

EPA
Jeanie Brochi

NHDES
Lori Sommer
Karl Benedict
Cheryl Bondi

NHB
Jessica Bouchard

Federal Highway
Jaimie Sikora

The Nature Conservancy
Pete Steckler

LCHIP
Paula Bellemore

Consultants/ Public Participants
Christine Perron
Susan Francher
Tracey Boisvert

PRESENTATIONS/ PROJECTS REVIEWED THIS MONTH: *(minutes on subsequent pages)*

Carol Henderson (NH Fish and Game) asked if the use of a single pipe instead of twin pipes had been considered. Rich responds that the rationale for selecting the twin pipe arch culverts was to achieve sufficient capacity to pass the 50-year storm event requirement under the constraint of the roadway's elevation above the streambed. Sandy added that the twin pipe arch design also allows less horizontal separation between the two pipes (14") than concrete pipe would (3'), and further, that corrugated pipe is better for organism passage that concrete as there is increased traction and sediment accumulation within the pipe. Carol then asks for further clarification about the consideration of using one pipe at this location. To which Sandy responds that it was not considered because one pipe would not work at this location. Arin states that not all elements could be met given the site constraints and that Sandy looked at these elements to make the best decision.

Cheryl then asked if the option of using a concrete box culvert with open bottom was considered for the purpose of maximizing horizontal width. Cheryl also questioned if twin pipes preclude the project from being classified as minimum impact. Sandy responded with regard to Cheryl's first question that a box culvert was not considered because cost and installation time are greatly increased and larger equipment is needed. Sandy noted that the no federal funds are being used for this project so the budget is relatively small.

Lori Sommer (NHDES) said that, as followup, she would need to confer with Karl Benedict (NHDES) and reserves further comments on design. She concurred with Cheryl that it was likely this project would be designated as minor impact rather than minimum, and that mitigation will not be required. Andy suggested that Rich follow up with Lori and Karl via email to clarify project impact type.

This project has been previously discussed at the Monthly Natural Resource Agency Coordination Meeting in January of 2021.

Bath, #43247, (X-A005(062))

Chris Carucci, NHDOT Bureau of Highway Design, introduced the project and provided a description of the project location, existing conditions, project purpose and need and proposed alternatives. The project is federally funded and is scheduled to advertise in February 2022 with anticipated construction in summer of 2022. The purpose of the project is to address the poor structural condition of an existing 6' wide x 3' high x 40' long concrete box culvert carrying an unnamed stream under US Route 302 approximately 1.6 miles south of Cate Road in the Town of Bath. The crossing is a Tier 3 based on drainage area of 1023 acres (1.6 sq. miles) based on LIDAR contours.

This culvert was selected for the Culvert Rehabilitation and Drainage Repair (CRDR) Program based on structural condition, risk of failure, and lack of suitable detour routes. The culvert slope is approximately 0.25% with a very low fill height of less than 1' of cover, and US 302 average daily traffic volume in 2019 was 3,582. US 302 is the only major route connecting Haverhill, Bath, and Lisbon to Littleton and the I-93 corridor. The existing culvert was originally constructed in 1930 at 36' long. No record of the lengthening was found, however, the current condition is 40' long. NHDOT District 1 Maintenance reports some repairs have been made in the past, including placing a steel plate over the top of the culvert. There is no history of flooding related to this culvert, but there is a history of roadway overtopping due to water levels and ice jams in the Ammonoosuc River. The FEMA 100 year flood elevation in the vicinity of the culvert is about 5' higher than US 302 and up to 9' higher than the lowest parts of the surrounding fields.

There are active agricultural operations on both sides of US 302 in the vicinity of the crossing. The culvert inlet channel is approximately 5' wide x 3' deep at 2.3% slope, and is bordered by crops on both sides. The outlet channel bends sharply to the right, runs just outside the ROW for about 300', then bends sharply to the left and runs another 200' before it connects with the Ammonoosuc River. The outlet channel is about 4' to 6' wide x 2' deep, at 0.8% slope. Field review found no evidence of erosion or sedimentation caused by the culvert. Both the inlet and outlet channels are shallow and have relatively low capacities before overtopping occurs. There was evidence of recent agricultural channel maintenance, with the adjacent tilled fields being a likely chronic sediment source. There was no perch at the inlet or outlet. There was an inch or two of sediment in the culvert providing the appearance of a natural bottom.

NHDOT sent letters to the two abutters requesting info on flood history, damage, or impact to farm operations. Abutter Miles (south side of inlet) had no specific concerns about the culvert. He did note that the inlet and outlet channels require periodic maintenance and suggested that the inlet channel be straightened out. The other abutter did not respond.

A stream assessment was performed by NHDOT on 5/14/2020. The stream flows through a very highly channelized and influenced stream channel for several hundred feet upstream and downstream of the crossing as the stream traverses the agricultural landscape and Ammonoosuc River's floodplain down to its confluence with the River. Bankfull width upstream was 8.0' and downstream was 9.3'. The reference reach was upstream and outside of the area of influence of the crossing and in an area where the influence by the surrounding agricultural development was minimized to the maximum extent practical. Farther upstream of the reference reach the stream's slope and characteristics change to a mountainous system. The reference and stream reach near the crossing is at the inflection point where the stream's slope and characteristics reflect the stream's position within the Ammonoosuc River's floodplain (more gradual slope, finer sediments, and more entrenched). Bankfull widths for the reference reach were 8.8' and 8.0'. Floodprone width varied from 11.4' to 9.0'. The reference reached was determined to be a Rosgen Stream Type "A". Based on the reference reach's Rosgen Stream Type the entrenchment ratio multipliers are 1.0 to 1.4. Using the average bankfull width of 8.5' and average entrenchment ratio of 1.2, the compliant structure span would be 10.2', rounded to 10' for design.

The entire project area is located in a FEMA flood zone AE due to proximity to the Ammonoosuc River, which is also a Designated River and subject to Shoreland jurisdiction. No impact to 100 year flood elevations or disturbance within the 250’ shoreland buffer is proposed. The LAC was contacted but no response has been received to date. The project is also located within the range of the federally threatened northern long-eared bat. Appropriate consultation with the US Fish and Wildlife Service will be completed. The NH Natural Heritage Bureau did not indicate records of any known protected species in the project area. The project area is located entirely within the Bath Upper Village Historic District (NR Eligible). The project is anticipated to qualify for the Section 106 Programmatic Appendix B, provided there are no significant visual impacts or permanent changes outside the existing ROW. Coordination with the Cultural Resources Program is underway. There are no anticipated adverse effects to water quality or proposed improvements that would require stormwater treatment. Review of the NHDES Aquatic Restoration Mapper found no data available for this crossing. Limited Reuse Soils will be managed appropriately. There are no point source contamination or PFAS concerns.

Streamstats predicts Q100 at 249 cfs for the revised 1023 ac boundary. Confidence limits were not provided.
The FHWA Regression Equations predict Q100 between 287 and 388 cfs. The SCS Method (Hydrocadd) was used for analysis, using the NOAA Atlas 14, 24 hr rainfall predictions. Design flows are as follows:
Q10 = 116 cfs   Q50 = 269 cfs   Q100 = 350 cfs
Analysis indicates the existing culvert can pass just under a 10-year design storm (about 3” of rain in a 24 hour period) before bypass occurs. At higher flows, bypass flow occurs into the fields to the south and eventually to another box culvert crossing under US 302 located about 1,750’ to the south. The adjacent field to the north is lower than the culvert inlet channel bank and provides about 5 ac-ft of storage for incoming runoff from the north. With bypass flow included, the existing crossing can accommodate the 100 year storm. There is no indication that bypass flow causes any damage.

Alternatives considered included replace in kind with a 6’ span structure, replacement with a 9’ span structure, and replacement with a rules compliant 10’ span structure. Span structures in the 6’ – 9’ range would not be classified as bridges whereas a span of 10’ or more would be a bridge. Span structures alternatives in the 6’ to 9’ range would all be precast concrete box culverts, embedded 12” to improve AOP, and with a 3’ clear height to avoid impacting the US302 road profile. Hydraulic requirements for a Bridge would require a span larger the 10’ compliant span. The Bridge option would be a 5’ clear height x 16’ span structure requiring raising the US 302 profile approximately 3’, significant widening of the inlet and outlet channels, additional fill in the 100 year floodplain, and permanent ROW or easement acquisitions. Material would need to be excavated elsewhere to offset the new fill in the floodplain, likely requiring ROW acquisition of some cropland. Roadway reconstruction would extend about 450’ north and south of the culvert. Cost for this option is estimated at $1.43 million. Funding and design time would require a delay in the start of construction of 3 – 5 years, making this alternative not practicable under this Program.

The minimum acceptable alternative would be replacement in-kind with a 6’ span culvert, with the addition of 12” of simulated streambed material in the culvert. Cost for this option is estimated at $467,000 and about 3 months to construct. The new culvert would be constructed at the same location, same length, and same streambed inverts, and would only require minimal temporary impacts outside the ROW. The new culvert would be constructed using one lane alternating two-way traffic controlled by a temporary signal. Consideration of costs, benefits, and impacts resulted in selection of a 9' span x 3' clear height embedded box culvert as the preferred alternative. Increasing the span from 6' to 9' would improve capacity enough to pass the 10 year design storm without bypass. Cost for this option is estimated at about $500,000. Construction methods, duration, and impacts would be about the same as for the replace in kind option.

The proposed culvert will be in the same location, same length, and with the same streambed inverts. It will have straight concrete headwalls at inlet and outlet similar to the existing headwalls. Changes to the roadway and adding guardrail are not proposed. The proposed culvert will increase capacity, from 73 cfs for existing to 109 cfs for proposed. The frequency of overtopping of the inlet channel will decrease slightly, and the proposed culvert will pass the 10 year storm without bypass. Higher flows would continue to bypass to the south. The downstream channel can accommodate the additional flow. There will be no significant effect on velocity, flooding, or sediment transport. There will be no effect on FEMA maps or downstream structures.

The replacement culvert will be within the existing ROW. Access to the culvert will be from the edge of US 302. Slopes are very flat and there are farm access points adjacent to the culvert inlet and outlet. No special access considerations are anticipated. Temporary construction easements will be required at the inlet and outlet for staging areas, water diversion, and erosion controls. Easement areas will be restored to existing conditions. No impact to agricultural operations is anticipated.

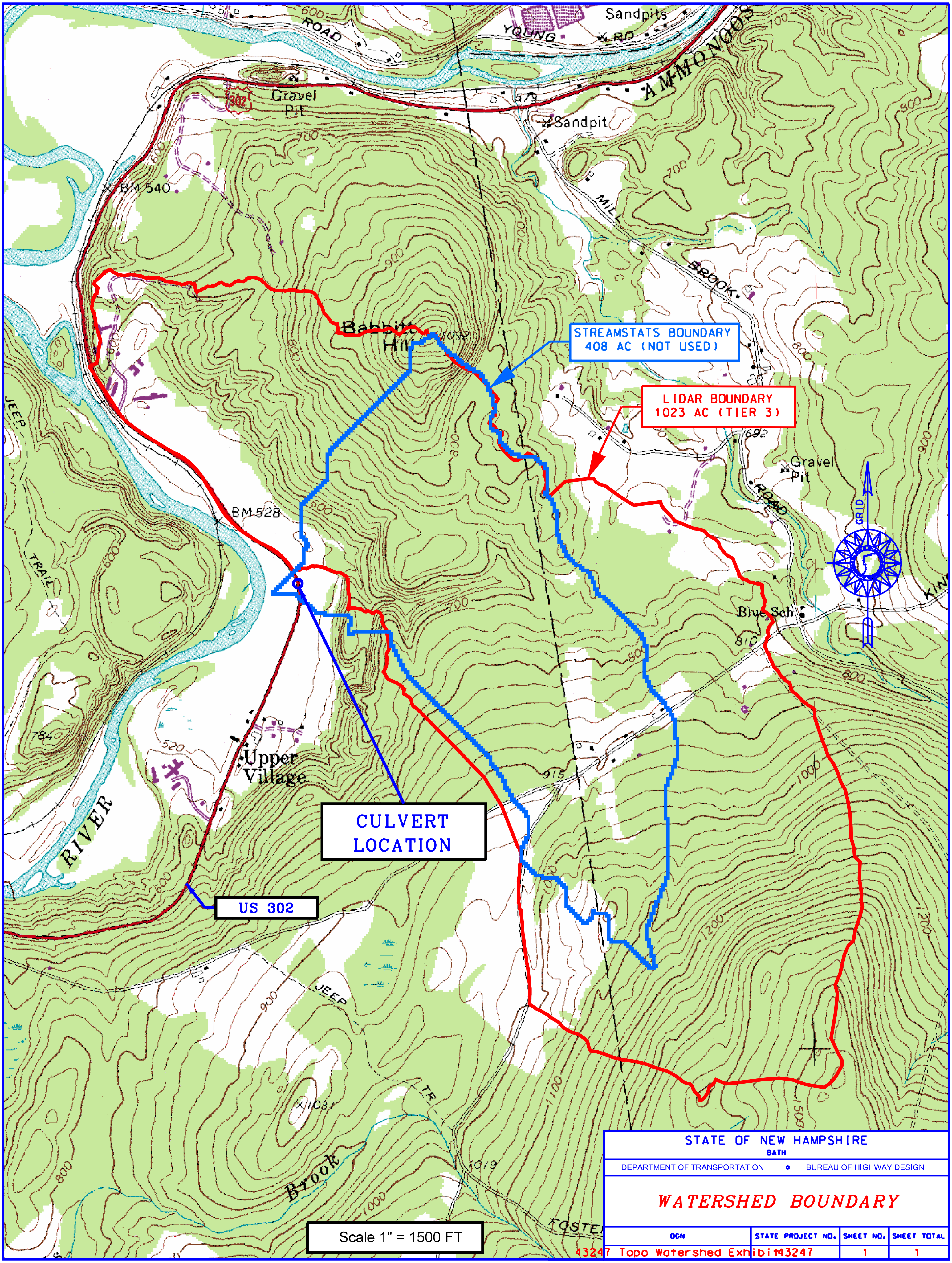
Total disturbed area for the project will be just over 1/3 acre (0.36 ac ~15,700 sf) including removal and replacement of pavement. There will be minimal clearing, as there are very few trees greater than 3" dbh. Water diversion will likely be through a temporary pipe installed just outside the culvert excavation limits.
Final water diversion plan will be per the Contractor's approved SWPPP. Permanent stream impacts will be required for grading around the new headwalls and for channel matches. Limits are about 10' upstream and downstream of the existing culvert. Temporary Impacts will be required for access, water diversion, and erosion controls. Upstream limit of temporary impact is about 45' from the existing inlet and downstream limit is about 68' from the existing outlet. Estimated impacts are as follows:
Permanent channel = 1785 SF, Permanent Bank = 114 SF, Total Permanent Impacts 289 SF / 60 LF,
Temporary impacts 1,181 SF / 277 LF, Total Project Impacts (Temp + Permanent) = 1,470 SF

NHDOT requests that no mitigation be required as the total SF and LF impacts are under the thresholds, the proposed culvert will increase capacity slightly and have no effect on any other function or value of the crossing, the existing streambed and banks have been altered by agricultural maintenance operations and will likely be altered again periodically, and no riprap or stone armor is proposed due to low velocities and to avoid interference with future agricultural maintenance. NHDOT also requests preliminary concurrence for replacement under 904.10 Alternative Design, because the proposed culvert would not meet at least one of the criteria under 904.07, specifically: 904.07(4) The culvert would not provide a vegetated bank or wildlife shelf within the structure. The proposed culvert would meet all of the general design criteria under 904.01 and comply with all of the other 904.07 provisions to the maximum extent practicable.

Lori Sommer, NHDES Wetlands Bureau, concurred that the project would require an alternative design and requested that the project narrative include details about the adjacent agricultural disturbance and other justifications for why a compliant structure is not feasible. L. Sommer also concurred that no mitigation would be necessary for the project as proposed. L. Sommer inquired about revegetating disturbed banks and C. Carucci responded that the Department will stabilize and seed areas disturbed as part of the project.

There were no further comments.
This project has not been previously discussed at a Natural Resource Agency Coordination Meeting.

Sandwich, #43487
Kerry Ryan, NHDOT Environmental Manager, gave an overview of the location of the proposed state funded bridge maintenance project, bridge 226/162, which carries NH Route 113A over Mill Brook in Sandwich. The existing structure is an elliptical corrugated metal pipe and was constructed in 1957. The surrounding area is rural/undeveloped. This is a Tier 3 crossing. Photos were shown of the project area from NH Route 113A, the structure and surrounding area at the inlet and the outlet of the pipe, existing rip rap at both the NW and SW corners of the bridge, and the existing perch.
Tim Boodey, NHDOT Bridge Maintenance Senior Engineer, described the proposed project which will include installation of a concrete invert inside the corrugated metal pipe, installation of fish weirs at the downstream side to eliminate an existing perched condition and allow for organism passage, and replacement of rip rap at the NW corner at the inlet side and SW corner at the outlet side to protect the existing infrastructure.
Preliminary wetland impact plans were shown identifying the locations of the existing rip rap, proposed rip rap replacement, proposed fish weir, sandbag cofferdam, work zone access path, and staging area. A sandbag cofferdam and a clean water bypass pipe through the structure will be installed for the concrete invert construction. The sandbag cofferdam and clean water bypass pipe will then be moved for the installation of the fish weir structure. The proposed rip rap at the SW corner was shown at a smaller scale. Tim further explained the installation of the rip rap at the SW corner will impact approximately 7 sf of delineated wetland above the ordinary high water, in addition to the existing rip rap footprint.
The longitudinal profile was shown and will be included in the permit application. The culvert outlet is slightly higher than the inlet, therefor retains water during most flows. Due to existing grades at the outlet, two fish weirs will be required to eliminate the existing perch during low flow and get the water level to the outlet elevation. Additional fill will also be included at the fish weir installation location at the outlet in order to eliminate the perched condition between the proposed invert and existing stream bed.
The proposed project is anticipated to begin November or December 2021 and will take approximately four months to complete. The construction sequence includes: installation of cofferdams, perimeter controls, and sedimentation basin; installation of a clean water bypass pipe; construction of concrete invert; relocate the sandbag cofferdam and clean water bypass pipe in order to construct the fish weirs; installation of fish weirs; installation of rip rap at the NW and SW



STATE OF NEW HAMPSHIRE

BATH

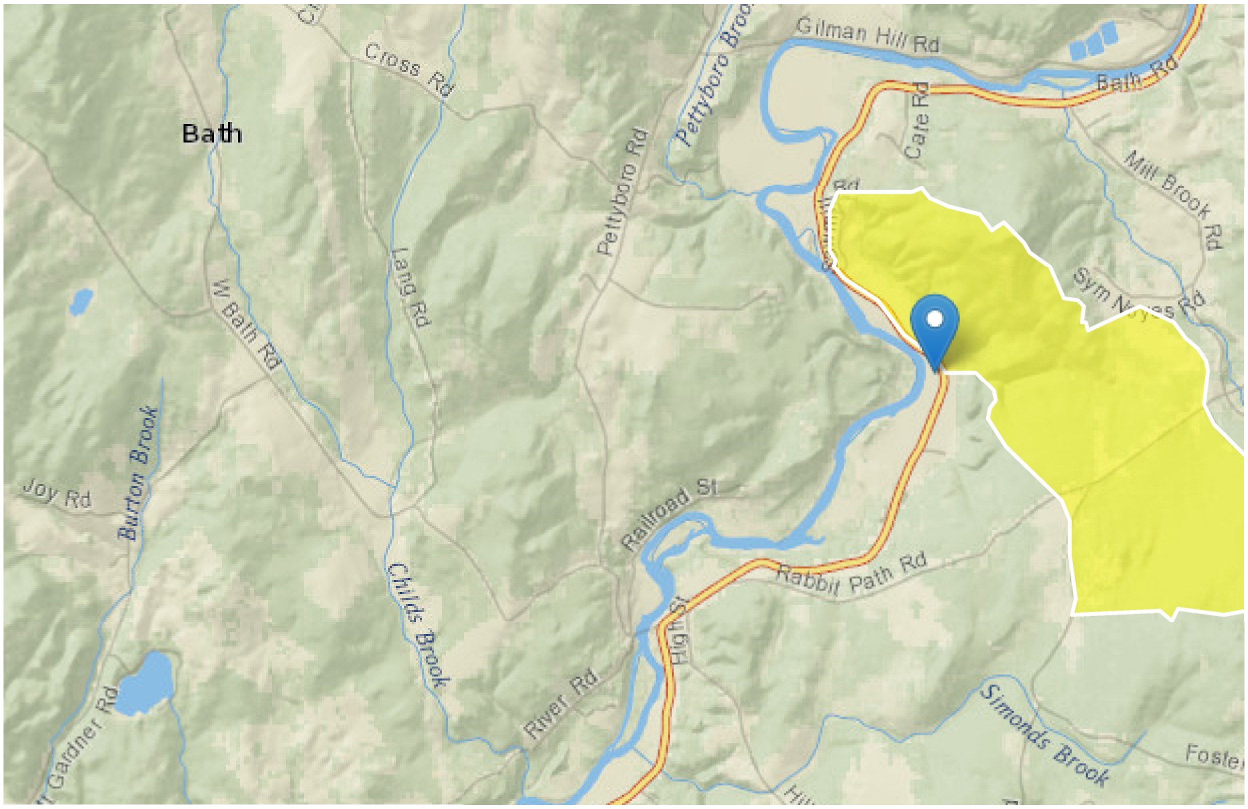
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

WATERSHED BOUNDARY

DGN	STATE PROJECT NO.	SHEET NO.	SHEET TOTAL
43247 Topo Watershed Exhibit	43247	1	1

StreamStats Report

Region ID: NH
Workspace ID: NH20210423175423587000
Clicked Point (Latitude, Longitude): 44.18268, -71.94208
Time: 2021-04-23 13:55:12 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1.61	square miles
APRAVPRE	Mean April Precipitation	2.771	inches
WETLAND	Percentage of Wetlands	0.6732	percent

Parameter Code	Parameter Description	Value	Unit
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	354	feet per mi
TEMP	Mean Annual Temperature	42.62	degrees F
PREG_06_10	Mean precipitation at gaging station location for June to October summer period	17.9	inches
CONIF	Percentaqe of land surface covered by coniferous forest	48.5029	percent
PREBC0103	Mean annual precipitation of basin centroid for January 1 to March 15 winter period	5.75	inches
BSLDEM30M	Mean basin slope computed from 30 m DEM	13.348	percent
MIXFOR	Percentage of land area covered by mixed deciduous and coniferous forest	32.3138	percent
PREG_03_05	Mean precipitation at gaging station location for March 16 to May 31 spring period	7.2	inches
TEMP_06_10	Basinwide average temperature for June to October summer period	59.987	degrees F
ELEVMAX	Maximum basin elevation	1523.014	feet
PRECIPOUT	Mean annual precip at the stream outlet (based on annual PRISM precip data in inches from 1971-2000)	37.2	inches
MINTEMP_W	Mean winter minimum air temperature over basin surface area	8.965	degrees F
SNOFALL	Mean Annual Snowfall	74.672	inches
PREBC_1112	Mean annual precipitation of basin centroid for November 1 to December 31 period	6.65	inches
PRECIPCENT	Mean Annual Precip at Basin Centroid	38.4	inches
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	915214.9	meters
CENTROIDY	Basin centroid vertical (y) location in state plane units	612706.9	meters

Parameter Code	Parameter Description	Value	Unit
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	4.66	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	1.66	percent
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	912015	feet
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	613425	feet

General Disclaimers

This watershed has been edited, computed flows and basin characteristics may not apply. For more information, submit a support request from the 'Help' button in the upper-right of the screen, attach a pdf of this report and request assistance from your local streamstats regional representative.

Peak-Flow Statistics Parameters [Peak Flow Statewide SIR2008 5206]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.61	square miles	0.7	1290
APRAVPRE	Mean April Precipitation	2.771	inches	2.79	6.23
WETLAND	Percent Wetlands	0.6732	percent	0	21.8
CSL10_85	Stream Slope 10 and 85 Method	354	feet per mi	5.43	543

Peak-Flow Statistics Disclaimers [Peak Flow Statewide SIR2008 5206]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Peak-Flow Statistics Flow Report [Peak Flow Statewide SIR2008 5206]

Statistic	Value	Unit
50-percent AEP flood	60.7	ft^3/s
20-percent AEP flood	97.4	ft^3/s
10-percent AEP flood	128	ft^3/s
4-percent AEP flood	172	ft^3/s
2-percent AEP flood	207	ft^3/s
1-percent AEP flood	249	ft^3/s
0.2-percent AEP flood	352	ft^3/s

Peak-Flow Statistics Citations

Olson, S.A.,2009, Estimation of flood discharges at selected recurrence intervals for streams in New Hampshire: U.S.Geological Survey Scientific Investigations Report 2008-5206, 57 p. (http://pubs.usgs.gov/sir/2008/5206/)

Low-Flow Statistics Parameters [Low Flow Statewide]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.61	square miles	3.26	689
TEMP	Mean Annual Temperature	42.62	degrees F	36	48.7
PREG_06_10	Jun to Oct Gage Precipitation	17.9	inches	16.5	23.1

Low-Flow Statistics Disclaimers [Low Flow Statewide]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report [Low Flow Statewide]

Statistic	Value	Unit

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.0864	ft^3/s
7 Day 10 Year Low Flow	0.0279	ft^3/s

Low-Flow Statistics Citations

Flynn, R.H. and Tasker, G.D.,2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S.Geological Survey Scientific Investigations Report 02-4298, 66 p. (http://pubs.water.usgs.gov/wrir02-4298)

Flow-Duration Statistics Parameters [Low Flow Statewide]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.61	square miles	3.26	689
PREG_06_10	Jun to Oct Gage Precipitation	17.9	inches	16.5	23.1
TEMP	Mean Annual Temperature	42.62	degrees F	36	48.7

Flow-Duration Statistics Disclaimers [Low Flow Statewide]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Flow-Duration Statistics Flow Report [Low Flow Statewide]

Statistic	Value	Unit
60 Percent Duration	0.768	ft^3/s
70 Percent Duration	0.526	ft^3/s
80 Percent Duration	0.302	ft^3/s
90 Percent Duration	0.153	ft^3/s
95 Percent Duration	0.094	ft^3/s
98 Percent Duration	0.0571	ft^3/s

Flow-Duration Statistics Citations

Flynn, R.H. and Tasker, G.D.,2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S.Geological Survey Scientific Investigations Report 02-4298, 66 p. (http://pubs.water.usgs.gov/wrir02-4298)

Seasonal Flow Statistics Parameters [Low Flow Statewide]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.61	square miles	3.26	689
CONIF	Percent Coniferous Forest	48.5029	percent	3.07	56.2
PREBC0103	Jan to Mar Basin Centroid Precip	5.75	inches	5.79	15.1
BSLDEM30M	Mean Basin Slope from 30m DEM	13.348	percent	3.19	38.1
MIXFOR	Percent Mixed Forest	32.3138	percent	6.21	46.1
PREG_03_05	Mar to May Gage Precipitation	7.2	inches	6.83	11.5
TEMP	Mean Annual Temperature	42.62	degrees F	36	48.7
TEMP_06_10	Jun to Oct Mean Basinwide Temp	59.987	degrees F	52.9	64.4
PREG_06_10	Jun to Oct Gage Precipitation	17.9	inches	16.5	23.1
ELEVMAX	Maximum Basin Elevation	1523.014	feet	260	6290

Seasonal Flow Statistics Disclaimers [Low Flow Statewide]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Seasonal Flow Statistics Flow Report [Low Flow Statewide]

Statistic	Value	Unit
Jan to Mar15 60 Percent Flow	0.552	ft^3/s
Jan to Mar15 70 Percent Flow	0.453	ft^3/s
Jan to Mar15 80 Percent Flow	0.413	ft^3/s
Jan to Mar15 90 Percent Flow	0.325	ft^3/s
Jan to Mar15 95 Percent Flow	0.264	ft^3/s
Jan to Mar15 98 Percent Flow	0.237	ft^3/s
Jan to Mar15 7 Day 2 Year Low Flow	0.451	ft^3/s
Jan to Mar15 7 Day 10 Year Low Flow	0.239	ft^3/s
Mar16 to May 60 Percent Flow	3.66	ft^3/s
Mar16 to May 70 Percent Flow	2.85	ft^3/s
Mar16 to May 80 Percent Flow	2.12	ft^3/s
Mar16 to May 90 Percent Flow	1.47	ft^3/s
Mar16 to May 95 Percent Flow	1.07	ft^3/s
Mar16 to May 98 Percent Flow	0.753	ft^3/s
Mar16 to May 7 Day 2 Year Low Flow	0.75	ft^3/s
Mar16 to May 7 Day 10 Year Low Flow	0.39	ft^3/s
Jun to Oct 60 Percent Flow	0.179	ft^3/s
Jun to Oct 70 Percent Flow	0.128	ft^3/s
Jun to Oct 80 Percent Flow	0.113	ft^3/s
Jun to Oct 90 Percent Flow	0.0699	ft^3/s
Jun to Oct 95 Percent Flow	0.0461	ft^3/s
Jun to Oct 98 Percent Flow	0.0395	ft^3/s
Jun to Oct 7 Day 2 Year Low Flow	0.0789	ft^3/s
Jun to Oct 7 Day 10 Year Low Flow	0.0248	ft^3/s
Nov to Dec 60 Percent Flow	1.45	ft^3/s
Nov to Dec 70 Percent Flow	1.07	ft^3/s
Nov to Dec 80 Percent Flow	0.777	ft^3/s

Statistic	Value	Unit
Nov to Dec 90 Percent Flow	0.477	ft^3/s
Nov to Dec 95 Percent Flow	0.294	ft^3/s
Nov to Dec 98 Percent Flow	0.174	ft^3/s
Oct to Nov 7 Day 2 Year Low Flow	0.782	ft^3/s
Oct to Nov 7 Day 10 Year Low Flow	0.292	ft^3/s

Seasonal Flow Statistics Citations

Flynn, R.H. and Tasker, G.D.,2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S.Geological Survey Scientific Investigations Report 02-4298, 66 p. (http://pubs.water.usgs.gov/wrir02-4298)

Recharge Statistics Parameters [Groundwater Recharge Statewide 2004 5019]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
PRECIPOUT	Mean Annual Precip at Gage	37.2	inches	35.83	53.11
TEMP	Mean Annual Temperature	42.62	degrees F	36.05	48.69
MINTEMP_W	Mean Winter Min Temperature	8.965	degrees F	0.8	19.88
CONIF	Percent Coniferous Forest	48.5029	percent	3.07	56.18
PREG_03_05	Mar to May Gage Precipitation	7.2	inches	6.83	11.54
SNOFALL	Mean Annual Snowfall	74.672	inches	54.46	219.07
PREG_06_10	Jun to Oct Gage Precipitation	17.9	inches	16.46	23.11
MIXFOR	Percent Mixed Forest	32.3138	percent	6.21	46.13
PREBC_1112	Nov to Dec Basin Centroid Precip	6.65	inches	6.57	15.2

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
PRECIPCENT	Mean Annual Precip at Basin Centroid	38.4	inches	37.44	75.91

Recharge Statistics Flow Report [Groundwater Recharge Statewide 2004 5019]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
GW_Recharge_Jan_to_Mar15	1.98	in	15.5
GW_Recharge_Mar16_to_May	5.46	in	12.4
GW_Recharge_Jun_to_Oct	3.22	in	26.5
GW_Recharge_Nov_to_Dec	1.33	in	15.8
GW_Recharge_Ann	12.1	in	12.4

Recharge Statistics Citations

Flynn, R.H. and Tasker, G.D.,2004, Generalized Estimates from Streamflow Data of Annual and Seasonal Ground-Water-Recharge Rates for Drainage Basins in New Hampshire, U.S. Geological Survey Scientific Investigations Report 2004-5019, 67 p. (http://pubs.usgs.gov/sir/2004/5019/http://pubs.usgs.gov/sir/2004/5019/)

Application Version: 4.5.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.1.1

NH Department of Transportation
Bureau of Highway Design
Project, #43247 Bath
Env-Wt 904.10 Alternative Design
TECHNICAL REPORT
Prepared by: C. Carucci, PE

Env-Wt 904.10(a) - If the applicant can demonstrate that installing the structure specified in the applicable rule is not practicable, as that term is defined in Env-Wt 103, the applicant may propose an alternative design in accordance with this section.

Please explain why the structure specified in the applicable rule *(a compliant structure)* is not practicable. Practicable is defined as *available and capable of being done after taking into consideration costs, existing technology, and logistics in light of overall project purposes.)*

This project was initiated and is funded under NHDOT's Federal Culvert Replacement/Rehabilitation & Drainage Repair (CRDR) Program. The Program purpose is to address major culvert and drainage needs statewide that are not being addressed through current or future Capital Improvement or other programmatic projects. The Program receives $2,000,000 in total funding annually, which includes construction, engineering, and ROW costs. Projects are selected and scheduled based primarily on the condition of the culvert (risk of failure), Road Tier, traffic volume, depth of fill, and detour length (potential impact of failure). The Program funding is fully committed for at least the next three years. This culvert is one of the highest statewide priority locations out of nearly 50 known locations eligible for the Program. Failure to address the structural deficiency of this culvert risks collapse of the culvert which could cause serious impacts to public/private infrastructure and the travelling public. Alternatives that significantly exceed the Project / Program budget are not practicable since over-allocating a significant portion of the Program funding to a single culvert would put the State at risk for failures elsewhere.

Env-Wt 904.10(c)(1) Explain how the proposed alternative meets the criteria for approval specified as applicable:

a. Detailed financial comparison of the costs of a structure that complies with all applicable design requirements, the proposed structure, and a structure that requires fewer waivers than the proposed structure, with a range of costs estimated for each;
   A fully compliant design would be a 16' span bridge. The estimated construction cost for this option is $1,428,366. See the attached detailed estimate for the compliant span alternative.

   A hydraulic design was also considered, which would pass the 50-year storm without submerging the inlet and without exceeding the existing 3' clear height. This would be a 30' wide x 3' high (clear opening) box culvert. This configuration would not be proposed as spans over 10' are classified as bridges which require passage of the 100-year storm with 1' of freeboard and associated raise in the US 302 profile. The minimum acceptable design would be replacement with a 6' wide x 3' high (clear opening) embedded box culvert. The proposed 9' wide x 3' high is the alternative that requires fewer waivers than the compliant span, with construction cost estimated at $532,938. See the attached detailed estimate.

The typical range of costs for the preliminary alternative estimates presented are from 10% under to 30% over the amount cited. The typical range of costs for the preferred alternative is 5% under to 20% over the amount cited.

b. A detailed description of the physical limitations of the site; and
The physical limitations for this site include the Ammonoosuc River floodplain, the very low depth of fill over the culvert, traffic volumes, and critical nature of the roadway above the culvert. Alternatives that require increasing the height of the culvert are not considered practicable due to the floodplain impacts associated with raising the US 302 profile. See the Supplemental Narrative for detailed information about the site and associated resources and constraints.

c. A hydraulic analysis to show the proposed stream crossing can accommodate the applicable design storm that the crossing, together with the associated roadway and roadway embankment, can safely accommodate overtopping flows;
The applicable stream crossing rule design storm is 100-year. The applicable NHDOT hydraulic design storm is 50-year. The proposed culvert, in combination with the existing bypass capacity, can accommodate the 100-year storm without overtopping US 302.

See the Supplemental Narrative and attachments for detailed information about hydraulic modelling and associated model results.

Env-Wt 904.10(c)(2)a – The proposed alternative design must meet the general design criteria established in Env-Wt 904.01:

See the Supplemental Narrative for additional information related to the responses below.

Env-Wt 904.01 General Design Considerations
(a) All stream crossings, whether over tidal or non-tidal waters, shall be designed and constructed so as to:

1) Not be a barrier to sediment transport;
The proposed design has no features that would be a barrier to sediment transport. The existing culvert has been in service for about 90 years, with no evidence of obstructing sediment transport. Flow conditions within the proposed culvert will be similar to existing conditions.

2) Not restrict high flows and maintain existing low flows;
The proposed culvert will slightly improve existing high flow hydraulic capacity. Low flows will pass through the culvert with flow depths and velocities similar to existing conditions.

3) Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction;
The proposed culvert will not obstruct the movement of aquatic life indigenous to the waterbody. The simulated streambed inside the new culvert will match the existing upstream and downstream channels. Velocities within the culvert will be similar to those in the upstream and downstream channels. The proposed design will not significantly change low flow conditions. With all of this in mind, current passage of aquatic life is not inhibited by the existing culvert and will remain the same post construction.

4) Not cause an increase in the frequency of flooding or overtopping of banks;
   The proposed culvert will have more capacity than the existing culvert, increasing from 74 cfs for existing to 109 cfs for the proposed culvert, at headwater elevation 516.0, when bypass begins. The frequency of overtopping of the inlet channel may decrease slightly. The outlet channel can accommodate the additional culvert flow so no change in frequency of overtopping downstream is anticipated.

5) Maintain or enhance geomorphic compatibility by:
   a. Minimizing the potential for inlet obstruction by sediment, wood, or debris; and
      The existing culvert does not have a history of sediment or debris blockage. The new culvert will have a 9' span, which will improve debris passage capability. Velocities in the new culvert will be similar to the upstream and downstream channels such that sediment will not be obstructed.

   b. Preserving the natural alignment of the stream channel;
      The proposed design will not alter the existing culvert or stream alignment. The existing culvert is approximately perpendicular to US 302, as constructed by the 1930 Project. The existing culvert aligns well with the inlet channel. The outlet channel bends sharply to the right, as shown on the 1930 plan. The outlet channel was likely modified to accommodate agricultural operations. Relocating or re-aligning the new culvert would not improve the overall stream alignment. This project is not making the alignment worse.

6) Preserve watercourse connectivity where it currently exists;
   The proposed design will preserve the connectivity provided by the existing culvert.

7) Restore watercourse connectivity where:
   a. Connectivity previously was disrupted as a result of human activity(ies); and
      The proposed culvert will include a simulated streambed which is an improvement over the existing non-embedded culvert.

   b. Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both;
      The proposed simulated streambed inside the culvert will provide a small benefit to connectivity.

8) Not cause erosion, aggradation, or scouring upstream or downstream of the crossing; and
   Velocities within the proposed culvert will be similar to those in the upstream and downstream channels such that sediment transport will not be obstructed or increased. No significant changes to the upstream or downstream channels are proposed.

9) Not cause water quality degradation.
   The project will have no effect on water quality. No new pavement or changes to drainage patterns is being proposed.

(b) For stream crossing over tidal waters, the stream crossing shall be designed to:

1) Match the velocity, depth, cross-sectional area, and substrate of the natural stream: and
   N/A – This is not a tidal crossing

2) Be of sufficient size to not restrict bi-directional tidal flow over the natural tide range above, below, and through the crossing.
   N/A – This is not a tidal crossing

Env-Wt 904.10(c)(2)b - The proposed alternative design meets the applicable design criteria established in Env-Wt 904.07 for Tier 2, Tier 3, and Tier 4 stream crossings to the *maximum extent practicable*, as specified below.

Env-Wt 904.07 Design Criteria for Tier 2, Tier 3, and Tier 4 Stream Crossings

(a) Unless otherwise specified, all design criteria in this section shall apply to new and replacement Tier 2 crossings, new and replacement Tier 3 crossings, as well as new and replacement Tier 4 tidal crossings that do not meet the requirements of Env-Wt 904.07.
The proposed 9' span replacement culvert is an Alternative Design because it does not meet the compliant span requirement and it does not provide vegetated banks or a wildlife shelf within the culvert.

(b) Tier 2 and tier 3 stream crossings shall be designed in accordance with the NH Stream Crossing Guidelines.
The replacement structure will meet the NH Stream Crossing Guidelines to the maximum extent practical. The proposed span is 9' vs the compliant span of 10'. Note that the data used to determine the compliant span varied, with results ranging from 8.5' to 11.9', with 10' selected as the compliant span. Larger spans or clear opening heights greater than 3' would require costs and impacts not considered practicable.

(c) Tier 2, tier 3, and tier 4 stream crossings shall be designed:

1) To meet the general design considerations specific in En-Wt 904.01;
   See responses above.

2) Of sufficient size to accommodate the greater of:
   a. The 100-year 24-hour design storm;
   b. Flows sufficient to:
      1. Prevent an increase in flooding on upstream and downstream properties; and
      2. Not affect flows and sediment transport characteristics in a way that would adversely affect channel stability; or
   c. Applicable federal, state, or local requirements;

   The proposed culvert, in combination with existing bypass capacity, will accommodate the 100-year 24-hour flow, which is greater than the NHDOT requirement of a 50 year storm design for this type of crossing. The existing culvert has performed well for over 90 years, with no evidence of obstructing sediment transport, causing channel instability, or causing damage to public or private property. The proposed culvert will have more capacity than the existing culvert. The proposed design will not significantly alter sediment transport capacity or flow conditions.

3) With bed forms and streambed characteristics necessary to cause water depths and velocities within the crossing structure at a variety of flows to be comparable to those found in the natural channel upstream and downstream of the stream crossing.

   The proposed culvert will have similar high flow capacity and velocities as the existing upstream and downstream channels. Simulated streambed material within the culvert will be shaped to match the bed width of the upstream and downstream channels such that low flow depths and velocities within the culvert are similar to those in the upstream and downstream channels.

4) To provide a vegetated bank on both sides of the watercourse or to provide a wildlife shelf of suitable substrate and access to allow for wildlife passage.
   It is not practicable to provide a vegetated bank on both sides of the watercourse or to provide a wildlife shelf inside the proposed culvert due to capacity constraints. The proposed 9' span is the maximum practicable span and still only increases capacity by a small amount. The shaped simulated streambed material within the culvert will have a low flow area similar in width to the upstream and downstream channels and will likely have some dry areas along the edges of the bed area in low flow conditions.

5) To preserve the natural alignment and gradient of the stream channel, so as to accommodate natural flow regimes and the functioning of the natural floodplain.
   It is not practicable to alter the alignment or gradient of the existing culvert to restore the natural alignment of the stream that it once was prior to the original culvert installation. The existing culvert location and stream alignment have been in place since at least 1930 and likely longer due to agricultural operations. The proposed design matches the existing culvert length and maintains the existing alignment and gradient of the crossing.

6) To simulate a natural stream channel.
   The simulated streambed material inside the culvert will be similar in gradation to the upstream and downstream channels and the material will be shaped to create a low flow area similar in width to the upstream and downstream channels.

7) So as not to alter sediment transport competence.
   The proposed design will not have a significant effect on sediment transport competence. Existing culvert velocities are sufficient to prevent aggregation of sediment inside the culvert. Proposed culvert velocities will be similar to those found in the upstream and downstream channels.

8) To avoid and minimize impacts to the stream in accordance with Env-Wt 313.03
   The project was designed to avoid and minimize wetland impacts to the maximum extent practicable. Additional details are provided in the Avoidance and Minimization checklist included elsewhere in the application.

(d) In addition to meeting the criteria specified in (c), above, new, repaired, rehabilitated, or replaced tier 4 stream crossing shall be designed: N/A – Crossing is not a Tier 4

1) Based on a hydraulic analysis that accounts for daily fluctuating tides, bidirectional flows, tidal inundation, and coastal storm surge;
2) To prevent creating a restriction on tidal flows; and
3) To account for tidal channel morphology and potential impacts due to sea level rise.

WETLANDS PERMIT APPLICATION
STREAM CROSSING WORKSHEET

Land Resources Management
Wetlands Bureau

RSA 482-A/ Env-Wt-900

NOTE: This worksheet can be used to accompany Wetlands Permit Applications when proposing stream crossings.

1. Tier Classifications

Determine the contributing watershed size at USGS StreamStats

Note: Plans for Tier 2 and 3 crossings shall be designed and stamped by a professional engineer who is licensed under RSA 310-A to practice in New Hampshire.

Size of contributing watershed at the crossing location:	___**1,023**___________ acres

☐ **Tier 1**: A *tier 1* stream crossing is a crossing located on a watercourse where the contributing watershed size is less than or equal to 200 acres

☐ **Tier 2**: A *tier 2* stream crossing is a crossing located on a watercourse where the contributing watershed size is greater than 200 acres and less than 640 acres

☒ **Tier 3**: A *tier 3* stream crossing is a crossing that meets any of the following criteria:

- ☒ On a watercourse where the contributing watershed is more than 640 acres
- ☒ Within a Designated River Corridor
- ☐ On a watercourse that is listed on the surface water assessment 305(b) report
- ☒ Within a 100-year floodplain (see *section 2* below)
- ☐ In a jurisdictional area having any protected species or habitat (NHB DataCheck)
- ☐ In or within 100 feet of a Prime Wetland

2. 100-year Floodplain

Use the FEMA Map Service Center to determine if the crossing is located within a 100-year floodplain. Please answer the questions below:

☐ **No**: The proposed stream crossing *is not* within the FEMA 100-year floodplain.

☒ **Yes**: The proposed project *is* within the FEMA 100-year floodplain. Zone = __**AE**__________

☒ Elevation of the 100-year floodplain at the inlet: **523.85 FEMA**___ feet (FEMA El. or Modeled El.)

3. Calculating Peak Discharge

Existing 100-year peak discharge (Q) calculated in cubic feet per second (CFS): ______**350**_______ CFS	Calculation method: __**SCS HydroCADD**
Estimated Bankfull discharge at the crossing location: ____**27**_________ CFS	Calculation method: __**SCS 2-Year**

Note: If Tier 1 then skip to Section 10

4. Predicted Channel Geometry based on Regional Hydraulic Curves

*For **Tier 2** and **Tier 3** Crossings Only*

Bankfull Width: _**15.7**____________ feet	Mean Bankfull Depth: ___**1.5**_________ feet
Bankfull Cross Sectional Area: __**22.8**__________ square feet	

5. Cross Sectional Channel Geometry:
Measurements of the Existing Stream within a Reference Reach
*For **Tier 2** and **Tier 3** Crossings Only*

Describe the reference reach location: _ 600' +- upstream__

Reference reach watershed size: __400___________ acres

Parameter	Cross Section 1 Describe bed form _Riffle,Pool____ (e.g. pool, riffle, glide)	Cross Section 2 Describe bed form _Riffle,Pool________ (e.g. pool, riffle, glide)	Cross Section 3 Describe bed form Riffle, Pool______ (e.g. pool, riffle, glide)	Range
Bankfull Width	_______8_______ feet	________7_______ feet	_______8_______ feet	______ 7-8____ feet
Bankfull Cross Sectional Area	_______6.7_______ SF	________7________ SF	_______10_________ SF	____6.7-10________ SF
Mean Bankfull Depth	______0.67_______ feet	_______0.78____ feet	_______1_________ feet	0.67-1________ feet
Width to Depth Ratio	_______11.94________	_______9________	_______8_________	____8-11.94_________
Max Bankfull Depth	______1.1_______ feet	_______1.2_____ feet	______1.6_______ feet	____1.1-1.6______ feet
Flood Prone Width	______11.4______ feet	_______9________ feet	______12_________ feet	____9-12_______ feet
Entrenchment Ratio	______1.43_________	_______1.29________	______1.50_________	_____1.29-1.50______

*Use **Figure 1** below to determine the measurements of the Reference Reach Attributes*

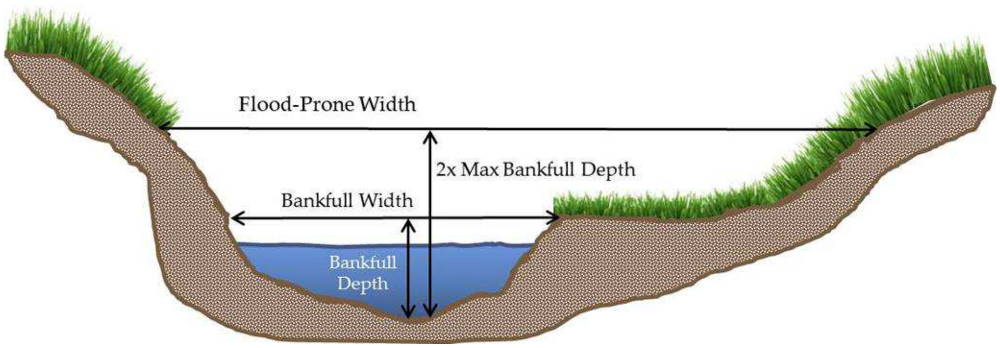


Figure 1: Determining the Reference Reach Attributes

6. Longitudinal Parameters of the Reference Reach and Crossing Location
*For **Tier 2** and **Tier 3** Crossings Only*

Average Channel Slope of the Reference Reach: _____1.9 %_______
Average Channel Slope at the Crossing Location: _____1.7 %_______

7. Plan View Geometry
*For **Tier 2** and **Tier 3** Crossings Only*

Sinuosity of the Reference Reach: _____1.21_______
Sinuosity of the Crossing Location: _____1.20_______
Note: Sinuosity is measured a distance of at least 20 times bankfull width, or 2 meander belt widths

8. Substrate Classification based on Field Observations *For **Tier 2** and **Tier 3** Crossings Only*	
% of reach that is *bedrock*	0 %
% of reach that is *boulder*	0 %
% of reach that is *cobble*	10 %
% of reach that is *gravel*	60 %
% of reach that is *sand*	30 %
% of reach that is *silt*	0 %

9. Stream Type of Reference Reach *For **Tier 2** and **Tier 3** Crossings Only*	
Stream Type of Reference Reach:	A

*Refer to Rosgen Classification Chart (**Figure 2**) below*

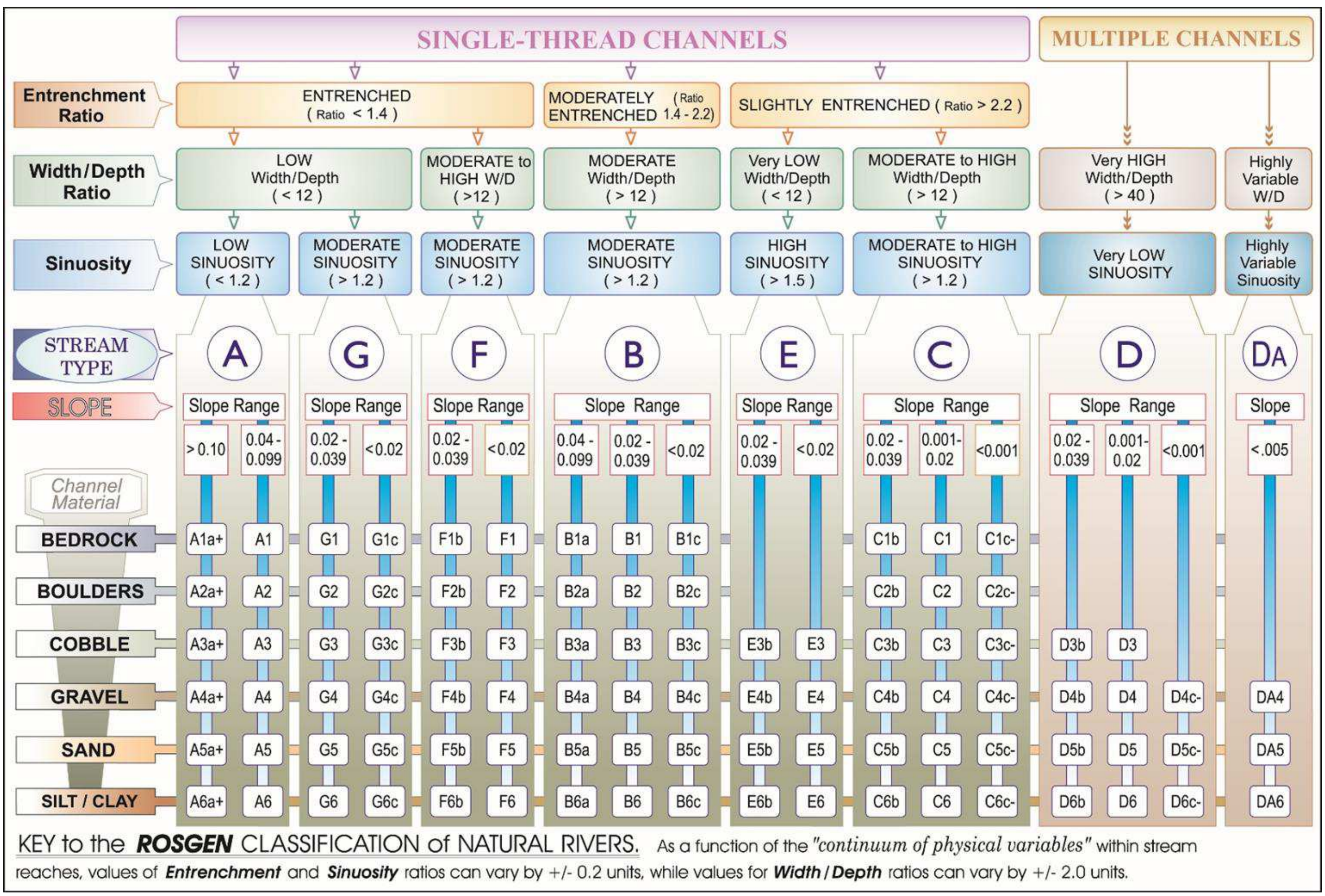


Figure 2. Reference from Applied River Morphology, Rosgen, 1996

10. Crossing Structure Metrics

Existing Conditions

Existing Structure Type:	☐ Bridge Span ☐ Pipe Arch ☐ Open-bottom Culvert ☒ Closed-bottom Culvert ☐ Closed-bottom Culvert with stream simulation ☐ Other: _		
Existing Crossing Span *(perpendicular to flow)*	_____6_______ feet	**Culvert Diameter** _____6x3_____ feet **Inlet Elevation** _____513.08______	
Existing Crossing Length *(parallel to flow)*	_____40_______ feet	**Outlet Elevation** ___512.98_______ **Culvert Slope** ____0.25%______	

Proposed Conditions

Proposed Structure Type:	**Tier 1**	**Tier 2**	**Tier 3**	**Alternative Design**
Bridge Span	☐	☐	☐	☐
Pipe Arch	☐	☐		☐
Closed-bottom Culvert	☐	☐		☐
Open-bottom Culvert	☐	☐	☐	☐
Closed-bottom Culvert with stream simulation	☐	☐	☒	☒

Proposed structure Span *(perpendicular to flow)*	_____9_______ feet	**Culvert Diameter** ___9x3_________ feet **Inlet Elevation** ______513.0_______
Proposed Structure Length *(parallel to flow)*	_____40_______ feet	**Outlet Elevation** ___511.9_________ **Culvert Slope** _____0.25%________
Proposed Entrenchment Ratio* *For **Tier 2** and **Tier 3** Crossings Only*	_____N/A________	*Note: To accommodate the entrenchment ratio, floodplain drainage structures may be utilized*

* *Note: Proposed Entrenchment Ratio must meet the minimum ratio for each stream type listed in **Figure 3**, otherwise the applicant must address the Alternative Design criteria listed in Env-Wt 904.09*

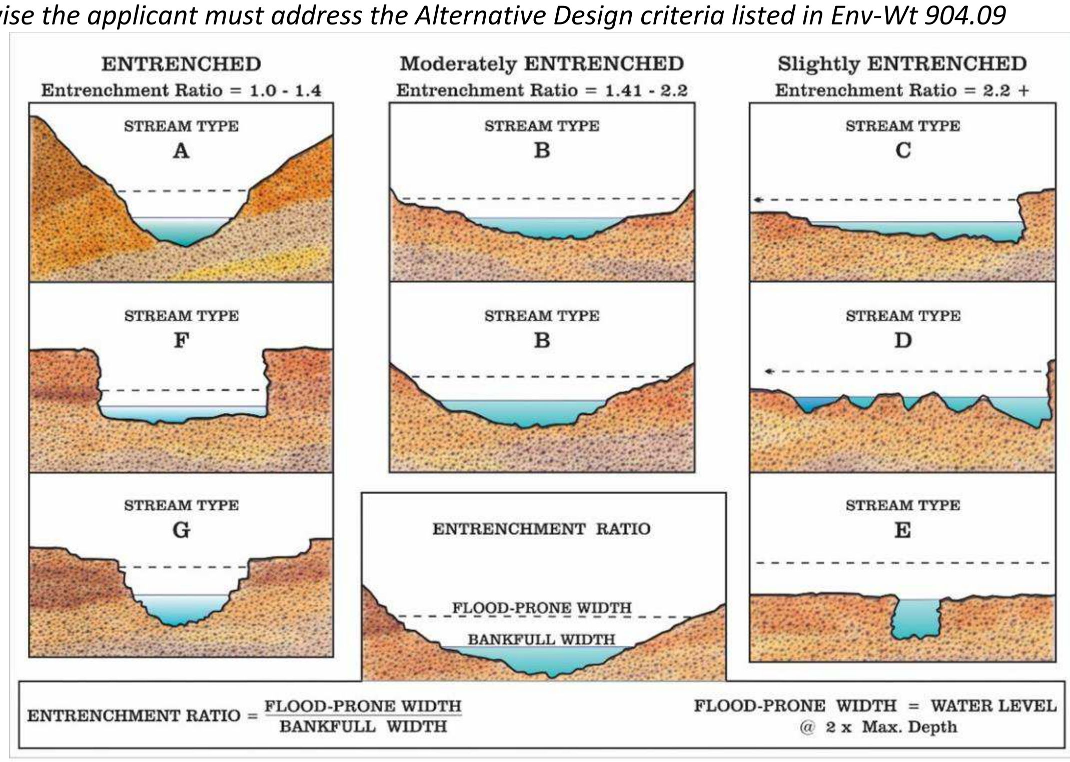


Figure 3. Reference from Applied River Morphology, Rosgen, 1996

11. Crossing Structure Hydraulics		
	Existing	**Proposed**
100 year flood stage elevation at inlet	______517.13___	516.98______
Flow velocity at outlet in feet per second (FPS)	______6.7_______	_____6.4_________
Calculated 100 year peak discharge (Q) for the <u>proposed</u> structure in CFS		168.1_____
Calculated 50 year peak discharge (Q) for the <u>proposed</u> structure in CFS		152.6________

12. Crossing Structure Openness Ratio

*For **Tier 2** and **Tier 3** Crossings Only*

Crossing Structure Openness Ratio = ____0.675________

Openness box culvert = (height x width)/length

Openness round culvert = (3.14 x radius^2)/length

13. General Design Considerations

Env-Wt 904.01 requires all stream crossings to be designed and constructed according to the following requirements. Check each box if the project meets these general design considerations.

All stream crossings shall be designed and constructed so as to:

- ☒ Not be a barrier to sediment transport.
- ☒ Prevent the restriction of high flows and maintain existing low flows.
- ☒ Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction.
- ☒ Not cause an increase in the frequency of flooding or overtopping of banks.
- ☒ Preserve watercourse connectivity where it currently exists.
- ☐ Restore watercourse connectivity where:
  (1) Connectivity previously was disrupted as a result of human activity(ies); and
  (2) Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both.
- ☒ Not cause erosion, aggradation, or scouring upstream or downstream of the crossing.
- ☒ Not cause water quality degradation.

14. Tier Specific Design Criteria

Stream crossings must be designed in accordance with the Tier specific design criteria listed in Part Env-Wt 904.

☒ The proposed project meets the Tier specific design criteria listed in Part Env-Wt 904 and each requirement has been addressed in the plans and as part of the wetland application.

15. Alternative Design

NOTE: If the proposed crossing does not meet all of the general design considerations, the Tier specific design criteria, or the minimum entrenchment ratio for each given stream type listed in **Figure 3**, then an alternative design plan and associated requirements must be addressed pursuant to Env-Wt 904.09.

☒ I have submitted an alternative design and addressed each requirement listed in Env-Wt 904.09

Stream Crossing Summary

Prepared by Sarah Large, Wetlands Program Analyst

Included is a completed NHDOT Stream Crossing Assessment Worksheet. Data that addresses Env-Wt 903.04(j) and 903.05(a) was collected on 5/14/2020. Please reference the data sheets for the information. The stream flows through a very highly channelized and influenced stream channel for several hundred feet upstream and downstream of the crossing as the stream traverses the agricultural landscape and Connecticut River's floodplain down to its conveyance into the Connecticut River. The reference reached keyed out to be a Rosgen Stream Type "A".

The reference reach was upstream and outside of the area of influence of the crossing and in an area where the influence by the surrounding agricultural development was minimized to the maximum extent practical. Farther upstream of the reference reach the stream's slope and characteristics change to a mountainous system. The reference and stream reach near the crossing is at the inflection point where the stream's slope and characteristics reflect the stream's position within the Connecticut River's floodplain (more gradual slope, finer sediments, and more entrenched.

Based on the reference reach's Rosgen Stream Type the entrenchment ratio multipliers are 1-1.4. Therefore, the range for a compliant sized crossing is 8.5' to 11.9' wide.

Photos were not taken within the stream reach.

Inlet

Standing above the inlet facing upstream

Outlet

Standing above the outlet facing downstream

43247 Bath Preliminary Estimate

Replace existing 6' x 3' x 40' box culvert under US 302

	By	CAC	6/9/2021
Rules Compliant Design - Bridge - 5' clear height x 16' span,	Checked	JJN	6/15/2021
Raise road profile by 3', new outlet channel, Phased Construction	**Updated**	CAC	6/29/2021
Larger than compliant span in order to pass Q100 with 1' of freeboard			

Item	Description	Unit	Quantity	Unit Price	Total
201.x	Clearing & Grubbing (included in Misc Items line)		0.00	0.00	$0.00
201.881	Invasive Species Control, Type 1 (included in Misc Items line)	SY	0.00	5.00	$0.00
201.882	Invasive Species Control, Type 2 (included in Misc Items line)	SY	0.00	10.00	$0.00
202.x	Removal of existing culvert	U	1.00	20,000.00	$20,000.00
203.X	Widen Inlet Channel (16' bed, 2:1 sides, 4' deep, to about 50' upstream	CY	207.41	20.00	$4,148.15
203.X	New Outlet Channel (16' bed, 2:1 sides, 4' deep, 350' long)	CY	1,451.85	20.00	$29,037.04
203.1	Common Ex (excavate equal to embankment placed in floodplain)	CY	740.00	20.00	$14,800.00
203.11	Common Ex - LRS - within ROW and above TOB	CY	50.00	35.00	$1,750.00
203.6	Embankment in Place (4:1 or flatter slopes)	CY	740.00	20.00	$14,800.00
214	Fine Grading (included in Misc Items line)	U	1.00	0.00	$0.00
304.201	Gravel	CY	689.00	35.00	$24,115.00
304.301	Crushed Gravel	CY	689.00	35.00	$24,115.00
	Crushed Gravel for Drives	CY	100.00	50.00	$5,000.00
403.11	Hot Bituminous Pavement 6" thick	Ton	1,027.00	125.00	$128,375.00
403.6	Joint Adhesive (3 joints @ 900 (worst case senario) = 2,700 LF	LF	2,700.00	8.00	$21,600.00
410.22	Asphalt Emulsion Tack Coat (0.04 gal/sy)	Gal	128.00	30.00	$3,840.00
417	Cold Planing (50'x32' + 25'x32') x 2 matches	SY	533.33	10.00	$5,333.33
503.101	Water Diversion	U	1.00	35,000.00	$35,000.00
503.201	Cofferdams	U	1.00	50,000.00	$50,000.00
xxx	Bridge cost from Bridge Estimate Template	U	1.00	370,000.00	$370,000.00
	Span = 16', Elev Diff from streambed to roadway finish grade = 8'				
	Match existing 40' length				
	No roadway guardrail				
585.3401	Simulated Streambed Material (16' wide x 12" thick x total length)	CY	266.67	75.00	$20,000.00
585.2	Stone Fill, Class B (armor channel subgrade from ROW to ROW)	CY	77.5	60.00	$4,651.80
593.421	Geotextile, Perm Control, CL-2, Non-Woven	SY	120.00	5.00	$600.00
606.417	Portable Conc Barrier for Traffic Control	LF	300	40.00	$12,000.00
606.9523	Temp Impact Atten Device, TL3 (posted 50 mph)	U	2	3,000.00	$6,000.00
616.161	Temp Signals (2 trailers, 4 months +-)	U	1	35,000.00	$35,000.00
618.61	Officers (1 day per week for 6 months)	$	14,784.00	1.00	$14,784.00
618.7	Flaggers (2 flaggers x 3 months x 5 days/week x 10 hrs/day)	HR	1,200.00	35.00	$42,000.00
619.1	Maintenance of Traffic (fixed amount, approx 5%)	U	1.00	65,000.00	$65,000.00
619.25	Portable Changeable Message Sign	U	2.00	3,000.00	$6,000.00
632.x	Pav't Markings (Temp & Permanent)	LF	5,000.00	0.50	$2,500.00
645.3	Erosion Stone	TON	80.00	30.00	$2,400.00
645.512	Compost Sock for Perimeter Berm	LF	1,350.00	3.00	$4,050.00
645.531	Silt Fence	LF	2,700.00	3.00	$8,100.00
645.7	Stormwater Pollution Prevention Plan	U	1.00	3,500.00	$3,500.00
645.71	Monitoring SWPPP (24 weeks x 6 hrs/week)	HR	144.00	90.00	$12,960.00
646.41	Turf Establishment with Mulch, Tack, and Humus	SY	4,000.00	7.00	$28,000.00
670.104	Temp Lighting	U	2.00	5,000.00	$10,000.00
697.11	Invasive Species control & Management Plan	U	1.00	2,500.00	$2,500.00
697.31	Project Operations Plan	U	1.00	2,500.00	$2,500.00

43247 Bath Preliminary Estimate

Replace existing 6' x 3' x 40' box culvert under US 302

By	CAC	6/9/2021
Checked	JJN	6/15/2021
Updated	CAC	6/29/2021

Rules Compliant Design - Bridge - 5' clear height x 16' span,
Raise road profile by 3', new outlet channel, Phased Construction
Larger than compliant span in order to pass Q100 with 1' of freeboard

Item	Description	Unit	Quantity	Unit Price	Total
698.13	Field Office, Type C (assume 6 months duration + 2 months)	MON	8.00	2,500.00	$20,000.00
699	Misc Temp Erosion Control	$	4,000.00	1.00	$4,000.00
1010.15	Fuel Adjustment ($500K - $1Mill = $10,000 $1 - $3 Mill = $20,000)	$	20,000.00	1.00	$20,000.00
1010.2	Asphalt Cement Adjustment (under 1000 Tons = 0, 1000 - 5000 Tons = $10,0	$	0.00	1.00	$0.00
1010.3	QC/QA Asphalt (5% of QC/QA Paving Items)	$	6,418.75	1.00	$6,418.75
	Sub-Total 1				**$1,084,878**
	Misc Items & Contingency (10% of Sub-Total 1)				$108,488
	Sub-Total 2				**$1,193,366**
692.	Mobilization (fixed amount Approx 8% of Contract Total)	U	1.00	105,000	$105,000
	Sub-Total 3 (Contract Total)				**$1,298,366**
	Construction Engineering (fixed amount Approx 10% of Contract Total)				$130,000
	Wetland Mitigation (ARM Fund Payment) $250 / LF of bed + bank +bank	LF	0.00	250.00	$0.00
	CONSTRUCTION TOTAL				**$1,428,366**

43247 Bath Preliminary Estimate

Replace existing 6' x 3' x 40' box culvert under US 302

	By	CAC	6/8/2021
Proposed Design - Upsize - Precast Box, 9' x 3' clear opening, embedded 12"	Updated	CAC	8/23/2021

Assumes that this can be built one half at a time, with temp signals

Item	Description	Unit	Quantity	Unit Price	Total
201.881	Invasive Species Control, Type 1 (included in Misc Items line)	SY	0.00	5.00	$0.00
201.882	Invasive Species Control, Type 2 (included in Misc Items line)	SY	0.00	10.00	$0.00
202.x	Removal of existing culvert	U	1.00	10,000.00	$10,000.00
203.X	channel widening	CY	50.00	50.00	$2,500.00
203.11	Common Ex - LRS - within ROW and above TOB	CY	40.00	50.00	$2,000.00
206.19	Common Structure Ex - Exploratory	CY	5.00	75.00	$375.00
214	Fine Grading	U	1.00	4,000.00	$4,000.00
304.201	Gravel 12" x 30' x 30'	CY	40.00	50.00	$2,000.00
304.301	Crushed Gravel 12" x 30' x 30'	CY	40.00	50.00	$2,000.00
	Crushed Gravel for Drives	CY	10.00	75.00	$750.00
403.11	Hot Bituminous Pavement	Ton	75.00	200.00	$15,000.00
403.6	Joint Adhesive	LF	350.00	8.00	$2,800.00
410.22	Asphalt Emulsion Tack Coat (0.04 gal/sy)	Gal	30.00	30.00	$900.00
417	Cold Planing	SY	175.00	35.00	$6,125.00
503.101	Water Diversion	U	1.00	25,000.00	$25,000.00
503.201	Cofferdams	U	1.00	25,000.00	$25,000.00
529.001	Precast Concrete Box Culvert	U	1.00	103,000.00	$103,000.00
	Includes headers, wings, excav, backfill, incidentals				
	4' high x 9' wide, 8" walls = 19.78 sf/lf x 40' long = 29.3 CY				
	Similar project cost $3,500 / CY x 29.3 CY = $102,550				
585.3401	Simulated Streambed Material (12" thick x 9' wide x 60' long)	CY	15.00	75.00	$1,125.00
585.2	Stone Fill, Class B not needed	CY	0.00	60.00	$0.00
593.421	Geotextile, Perm Control, CL-2, Non-Woven (under all stone)	SY	0.00	5.00	$0.00
595.5	Geogrid (between aggregate layers over box due to low cover)	SY	100.00	6.00	$600.00
606.417	Portable Conc Barrier for Traffic Control	LF	200	40.00	$8,000.00
606.9523	Temp Impact Atten Device, TL3 (posted 50 mph)	U	2	3,000.00	$6,000.00
616.161	Temp Signal (2 trailers)	U	1	25,000.00	$25,000.00
618.61	Officers	$	10,000.00	1.00	$10,000.00
618.7	Flaggers (2 flaggers x 4 weeks x 5 days/week x 10 hrs/day)	HR	400.00	35.00	$14,000.00
619.1	Maintenance of Traffic (fixed amount, approx 7%)	U	1.00	35,000.00	$35,000.00
619.25	Portable Changeable Message Sign	U	2.00	2,500.00	$5,000.00
632.x	Pav't Markings (Temp & Permanent)	U	1.00	2,500.00	$2,500.00
645.3	Erosion Stone	TON	40.00	30.00	$1,200.00
645.512	Compost Sock for Perimeter Berm	LF	500.00	3.00	$1,500.00
645.531	Silt Fence	LF	500.00	5.00	$2,500.00
645.7	Stormwater Pollution Prevention Plan	U	1.00	2,500.00	$2,500.00
645.71	Monitoring SWPPP (10 weeks x 5 hrs/week)	HR	50.00	90.00	$4,500.00
646.41	Turf Establishment with Mulch, Tack, and Humus	SY	750.00	7.00	$5,250.00
670.045x	Const & Remove Temp Widening	U	1.00	15,000.00	$15,000.00
670.104	Temp Lighting	U	2.00	5,000.00	$10,000.00
697.11	Invasive Species control & Management Plan	U	1.00	2,500.00	$2,500.00
697.31	Project Operations Plan	U	1.00	2,500.00	$2,500.00
698.13	Field Office, Type C	MON	5.00	2,500.00	$12,500.00

43247 Bath Preliminary Estimate

Replace existing 6' x 3' x 40' box culvert under US 302

By	CAC	6/8/2021
Updated	CAC	8/23/2021

Proposed Design - Upsize - Precast Box, 9' x 3' clear opening, embedded 12"

Assumes that this can be built one half at a time, with temp signals

Item	Description	Unit	Quantity	Unit Price	Total
699	Misc Temp Erosion Control	$	2,500.00	1.00	$2,500.00
1010.15	Fuel Adjustment	$	2,000.00	1.00	$2,000.00
	Sub-Total 1				**$373,125**
	Misc Items & Contingency (10% of Sub-Total 1)				$37,313
	Sub-Total 2				**$410,438**
692.	Mobilization (fixed amount Approx 15% of Contract Total)	U	1.00	70,000	$70,000
	Sub-Total 3 (Contract Total)				**$480,438**
	Construction Engineering (fixed amount Approx 10% of Contract Total)				$45,000
	Precast Concrete Inspection (based on similar projects)				$7,500
	Wetland Mitigation (ARM Fund Payment) $250 / LF of bed + bank +bank	LF	0.00	250.00	$0.00
	CONSTRUCTION TOTAL				**$532,938**

November 3, 2021

S P E C I A L   P R O V I S I O N

AMENDMENT TO SECTION 585 – STONE FILL

Item 585.3401 – Simulated Streambed Material

Add to Description:

1.2 This work shall consist of furnishing and placing Simulated Streambed Material at the following location on this project:

Simulated Streambed Material shall be placed at 12” nominal thickness at the inlet and outlet, and inside the culvert as shown on the Plans.

1.2.1 The intent is to replicate the natural streambed environments upstream and downstream of the culvert. The percentage of specific stream bed material was determined by photo image analysis of streambed areas immediately upstream and downstream of the existing culvert. The gradation of substrate particle sizes is based on the Wentworth scale as referenced in the Guidelines for Naturalized River Channel Design and Bank Stabilization.

Add to Materials:

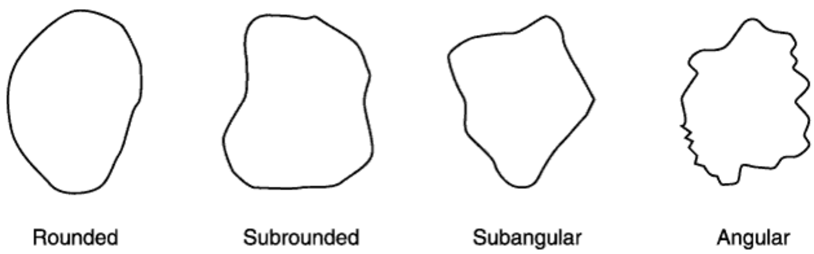
2.1.6 Simulated Streambed Material shall meet the following gradations:

Gradation Upstream, Downstream, and inside the Culvert		
	% by Weight	Sieve Sizes (in)
Sand	5%	0.003 to 0.08 (smaller than head of a match)
Gravel	90%	0.08 to 2.5 (between head of match and tennis ball)
Cobble	5%	2.5 to 6.0 (between tennis ball and volleyball)
Boulder	0%	6.0 to 12.0 (max of 12” on any axis)

2.1.6.1 Streambed Material depth shall be 12" nominal. The depth upstream and downstream may be modified as directed by the Engineer such that removal of bedrock and boulders below the elevation of the finished channel grade is not required. Any voids created by excavation below Plan sub-grade may be filled with material meeting the gradation in 2.1.6.

2.1.6.2 Gravel, Cobble, and Boulder particle shape shall be **Rounded** in accordance with the following:

R = Rounded, Sub-R = Subrounded, Sub-A = Subangular, A = Angular



2.1.6.3 Existing streambed material may be salvaged, stockpiled, and reused under this Item.

Add to 3.1:

3.1.3 In accordance with the *Guidelines for Naturalized River Channel Design and Bank Stabilization*, specifically 2.2.1.2 Semi-Natural Form Design, the Streambed Material shall be placed directly on the existing channel floor or subgrade as shown in the contract plans. In cases where scour protection or streambed anchorage material is required the scour/anchorage material shall be placed first. Then the Streambed Material shall be worked into the top 1'-0" filling voids, followed by the depth of Streambed Material specified.

3.1.4 Do not remove streambed material that is not disturbed by other construction operations.

Method of Measurement

Add to Method of Measurement:

4.2 Simulated Streambed Material will be measured by the cubic yard.

Basis of Payment

Add to Basis of Payment:

5.1.1 The accepted quantity of Simulated Streambed Material will be paid for at the Contract unit price per cubic yard complete in place.

Add to Pay Items and Units:

585.3401	Simulated Streambed Material	Cubic Yard

HY-8 Culvert Analysis Report

Site Data - 4x9 Embed 12in

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 512.00 ft

Outlet Station: 40.00 ft

Outlet Elevation: 511.90 ft

Number of Barrels: 1

Culvert Data Summary - 4x9 Embed 12in

Barrel Shape: Concrete Box

Barrel Span: 9.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 12.00 in

Barrel Manning's n: 0.0120 (top and sides)

Manning's n: 0.0300 (bottom)

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Roadway Data for Crossing: 4x9 Embed 12in

Roadway Profile Shape: Constant Roadway Elevation

Crest Elevation: 517.50 ft

Roadway Surface: Paved

Roadway Top Width: 25.00 ft

Tailwater Channel Data - 4x9 Embed 12in

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 4.00 ft

Side Slope (H:V): 1.00 (_:1)

Channel Slope: 0.0084

Channel Manning's n: 0.0300

Channel Invert Elevation: 512.90 ft

Table 1 - Culvert Summary Table: 3 x 9 (Clear Opening)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
1.00	1.00	513.17	0.111	0.170	3-M1t	0.155	0.073	0.176	0.176	0.630	1.358
12.50	12.50	513.85	0.670	0.845	3-M1t	0.717	0.391	0.797	0.797	1.743	3.270
27.00	27.00	514.36	1.120	1.362	3-M1t	1.149	0.654	1.246	1.246	2.409	4.132
35.50	35.50	514.61	1.344	1.611	3-M1t	1.360	0.785	1.455	1.455	2.711	4.473
47.00	47.00	514.91	1.617	1.910	3-M1t	1.618	0.946	1.702	1.702	3.068	4.841
58.50	58.50	515.18	1.862	2.180	3-M1t	1.854	1.095	1.921	1.921	3.384	5.143
70.00	70.00	515.43	2.092	2.428	3-M1t	2.074	1.234	2.119	2.119	3.671	5.400
81.50	81.50	515.66	2.310	2.660	3-M1t	2.282	1.366	2.300	2.300	3.938	5.625
93.00	93.00	515.88	2.519	2.878	3-M2t	2.479	1.491	2.468	2.468	4.187	5.826
104.50	104.50	516.09	2.724	3.086	3-M2t	2.669	1.612	2.625	2.625	4.423	6.008
116.00	116.00	516.28	2.926	3.284	3-M2t	2.852	1.728	2.774	2.774	4.647	6.174

****

Straight Culvert

Inlet Elevation (invert): 513.00 ft, Outlet Elevation (invert): 512.90 ft

Culvert Length: 40.00 ft, Culvert Slope: 0.0025

****

Aquatic Organism Culvert Crossing Passage Using Stream Simulation

AOP Reach Gradations

Gradation at station -240 through station -240

D50: 0.68 in

D84: 1.42 in

Gradation at station 40 through station 305

D50: 2.00 in

D84: 2.54 in

AOP Culvert Upper Bed Gradation

D5: 0.0066 in

D16: 0.1700 in

D50: 1.6995 in

D84: 2.3793 in

D95: 3.2291 in

AOP Culvert Lower Bed Gradation is Not necessary

AOP Discharges

Low AOP Flow: 1.00 cfs

High AOP Flow: 27.00 cfs

Peak AOP Flow: 116.00 cfs

Embedment Depth Check

Embedment Depth is NOT Acceptable See Designer Notes below

Embedment Depth: 1.00 ft

Acceptable Embedment Depth: 2.00 ft

Shear computed in Reach and Culvert Barrel

Bed is Stable under High Flow

Bed Mobility is Acceptable under High Flow, because it is stable

Shear Applied to Culvert Bed under High Flow: 0.10 lb/ft^2

Shear Permissible to Culvert Bed's Upper Layer: 0.61 lb/ft^2

Maximum Shear Applied to Reach Cross-Sections under High Flow: 1.29 lb/ft^2

Bed is Stable under Peak Flow

Lower Layer Bed is Stable under Peak Flow

Shear Applied to Culvert Bed under Peak Flow: 0.35 lb/ft^2

Maximum Shear Applied to Reach Cross-Sections under Peak Flow: 2.76 lb/ft^2

Velocity computed in Reach and Culvert Barrel

Culvert Velocity is Acceptable

Maximum Velocity within Culvert under High Flow: 1.97 ft/s

Maximum Velocity within Reach Cross-Sections under High Flow: 5.70 ft/s

Velocity computed in Reach and Culvert Barrel

Culvert Depth is Acceptable

Minimum Depth within Culvert under Low Flow: 0.18 ft

Minimum Depth within Reach Cross-Sections under Low Flow: 0.12 ft

Designer Notes:

See Table 1 on page 2 above for comparison of culvert outlet depth to tailwater depth and culvert outlet velocity to tailwater velocity. For this site, tailwater results are for the average downstream channel cross section without influence from flooding by the Ammonoosuc River.

See the Supplemental Narrative for explanation of proposed embedment depth and maximum and minimum velocities

New Hampshire Natural Heritage Bureau
NHB DataCheck Results Letter

To: Melilotus Dube
7 Hazen Drive
Concord, NH 03301

From: NH Natural Heritage Bureau

Date: 4/13/2021 (This letter is valid through 4/13/2022)

Re: Review by NH Natural Heritage Bureau of request dated 4/13/2021

Permit Types: General Permit
Wetland Standard Dredge & Fill - Major
Federal: NEPA Review

NHB ID: NHB21-1245

Applicant: Melilotus Dube

Location: Bath
Tax Map: N/A, Tax Lot: N/A
Address: N/A

Proj. Description: NHDOT Bath 42347. The proposed project will involve replacing an existing 6' wide x 4' high x 40' long box culvert carrying an unnamed stream under US Route 302 in the Town of Bath.

The NH Natural Heritage database has been checked for records of rare species and exemplary natural communities near the area mapped below. The species considered include those listed as Threatened or Endangered by either the state of New Hampshire or the federal government. We currently have no recorded occurrences for sensitive species near this project area.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

MAP OF PROJECT BOUNDARIES FOR: NHB21-1245

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
http://www.fws.gov/newengland

In Reply Refer To: August 03, 2021
Consultation Code: 05E1NE00-2021-SLI-2400
Event Code: 05E1NE00-2021-E-13139
Project Name: Bath 42347

Subject: Updated list of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

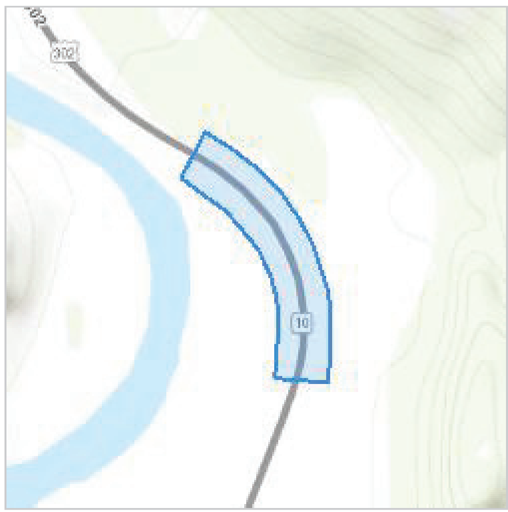
This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2021-SLI-2400
Event Code: 05E1NE00-2021-E-13139
Project Name: Bath 42347
Project Type: TRANSPORTATION
Project Description: The proposed project will replace an existing 6' wide x 4' high x 40' long box culvert carrying an unnamed brook under US Route 302 in the Town of Bath.
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@44.183067550000004,-71.94139969694544,14z



Counties: Grafton County, New Hampshire

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
http://www.fws.gov/newengland

In Reply Refer To: August 03, 2021
Consultation code: 05E1NE00-2021-I-2400
Event Code: 05E1NE00-2021-E-13140
Project Name: Bath 42347

Subject: Concurrence verification letter for the 'Bath 42347' project under the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

To whom it may concern:

The U.S. Fish and Wildlife Service (Service) has received your request to verify that the **Bath 42347** (Proposed Action) may rely on the concurrence provided in the February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (PBO) to satisfy requirements under Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C 1531 *et seq.*).

Based on the information you provided (Project Description shown below), you have determined that the Proposed Action is within the scope and adheres to the criteria of the PBO, including the adoption of applicable avoidance and minimization measures, and may affect, but is not likely to adversely affect (NLAA) the endangered Indiana bat (*Myotis sodalis*) and/or the threatened Northern long-eared bat (*Myotis septentrionalis*).

The Service has 14 calendar days to notify the lead Federal action agency or designated non-federal representative if we determine that the Proposed Action does not meet the criteria for a NLAA determination under the PBO. If we do not notify the lead Federal action agency or designated non-federal representative within that timeframe, you may proceed with the Proposed Action under the terms of the NLAA concurrence provided in the PBO. This verification period allows Service Field Offices to apply local knowledge to implementation of the PBO, as we may identify a small subset of actions having impacts that were unanticipated. In such instances, Service Field Offices may request additional information that is necessary to verify inclusion of the proposed action under the PBO.

For Proposed Actions that include bridge/structure removal, replacement, and/or maintenance activities: If your initial bridge/structure assessments failed to detect Indiana bats, but you later detect bats during construction, please submit the Post Assessment Discovery of Bats at Bridge/Structure Form (User Guide Appendix E) to this Service Office. In these instances, potential incidental take of Indiana bats may be exempted provided that the take is reported to the Service.

If the Proposed Action is modified, or new information reveals that it may affect the Indiana bat and/or Northern long-eared bat in a manner or to an extent not considered in the PBO, further review to conclude the requirements of ESA Section 7(a)(2) may be required. If the Proposed Action may affect any other federally-listed or proposed species, and/or any designated critical habitat, additional consultation between the lead Federal action agency and this Service Office is required. If the proposed action has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act may also be required. In either of these circumstances, please contact this Service Office.

Project Description

The following project name and description was collected in IPaC as part of the endangered species review process.

Name

Bath 42347

Description

The proposed project will replace an existing 6' wide x 4' high x 40' long box culvert carrying an unnamed brook under US Route 302 in the Town of Bath.

Determination Key Result

Based on your answers provided, this project(s) may affect, but is not likely to adversely affect the endangered Indiana bat and/or the threatened Northern long-eared bat, therefore, consultation with the U.S. Fish and Wildlife Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended 16 U.S.C. 1531 *et seq.*) is required. However, also based on your answers provided, this project may rely on the concurrence provided in the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

Qualification Interview

1. Is the project within the range of the Indiana bat[1]?

   [1] See Indiana bat species profile

   Automatically answered
   No
2. Is the project within the range of the Northern long-eared bat[1]?

   [1] See Northern long-eared bat species profile

   Automatically answered
   Yes
3. Which Federal Agency is the lead for the action?
   A) Federal Highway Administration (FHWA)
4. Are *all* project activities limited to non-construction[1] activities only? (examples of non-construction activities include: bridge/abandoned structure assessments, surveys, planning and technical studies, property inspections, and property sales)

   [1] Construction refers to activities involving ground disturbance, percussive noise, and/or lighting.

   No
5. Does the project include *any* activities that are **greater than** 300 feet from existing road/ rail surfaces[1]?

   [1] Road surface is defined as the actively used [e.g. motorized vehicles] driving surface and shoulders [may be pavement, gravel, etc.] and rail surface is defined as the edge of the actively used rail ballast.

   No
6. Does the project include *any* activities **within** 0.5 miles of a known Indiana bat and/or NLEB hibernaculum[1]?

   [1] For the purpose of this consultation, a hibernaculum is a site, most often a cave or mine, where bats hibernate during the winter (see suitable habitat), but could also include bridges and structures if bats are found to be hibernating there during the winter.

   No
7. Is the project located **within** a karst area?
   No

8. Is there *any* suitable[1] summer habitat for Indiana Bat or NLEB **within** the project action area[2]? (includes any trees suitable for maternity, roosting, foraging, or travelling habitat)

   [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

   [2] The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR Section 402.02). Further clarification is provided by the national consultation FAQs.

   No
9. Does the project include wetland or stream protection activities associated with compensatory wetland mitigation?

   No
10. Does the project include slash pile burning?

    No
11. Does the project include *any* bridge removal, replacement, and/or maintenance activities (e.g., any bridge repair, retrofit, maintenance, and/or rehabilitation work)?

    No
12. Does the project include the removal, replacement, and/or maintenance of *any* structure other than a bridge? (e.g., rest areas, offices, sheds, outbuildings, barns, parking garages, etc.)

    No
13. Will the project involve the use of **temporary** lighting *during* the active season?

    Yes
14. Is there *any* suitable habitat **within** 1,000 feet of the location(s) where **temporary** lighting will be used?

    Yes
15. Will the project install new or replace existing **permanent** lighting?

    No
16. Does the project include percussives or other activities (**not including tree removal/ trimming or bridge/structure work**) that will increase noise levels above existing traffic/ background levels?

    Yes
17. Will the activities that use percussives (**not including tree removal/trimming or bridge/ structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the active season[1]?

    [1] Coordinate with the local Service Field Office for appropriate dates.

    Yes

18. Will *any* activities that use percussives (**not including tree removal/trimming or bridge/ structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the inactive season[1]?

    [1] Coordinate with the local Service Field Office for appropriate dates.

    No

19. Are *all* project activities that are **not associated with** habitat removal, tree removal/ trimming, bridge and/or structure activities, temporary or permanent lighting, or use of percussives, limited to actions that DO NOT cause any additional stressors to the bat species?

    Examples: lining roadways, unlighted signage , rail road crossing signals, signal lighting, and minor road repair such as asphalt fill of potholes, etc.

    Yes

20. Will the project raise the road profile **above the tree canopy**?

    No

21. Is the location of this project consistent with a No Effect determination in this key?

    Automatically answered
    Yes, because the project action area is not within suitable Indiana bat and/or NLEB summer habitat and is outside of 0.5 miles of a hibernaculum.

22. **General AMM 1**
    Will the project ensure *all* operators, employees, and contractors working in areas of known or presumed bat habitat are aware of *all* FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable Avoidance and Minimization Measures?

    Yes

23. **Lighting AMM 1**
    Will *all* **temporary** lighting be directed away from suitable habitat during the active season?

    Yes

Project Questionnaire

1. Have you made a No Effect determination for *all* other species indicated on the FWS IPaC generated species list?

   N/A

2. Have you made a May Affect determination for *any* other species on the FWS IPaC generated species list?

   N/A

Avoidance And Minimization Measures (AMMs)

This determination key result includes the committment to implement the following Avoidance and Minimization Measures (AMMs):

LIGHTING AMM 1

Direct temporary lighting away from suitable habitat during the active season.

GENERAL AMM 1

Ensure all operators, employees, and contractors working in areas of known or presumed bat habitat are aware of all FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable AMMs.

Determination Key Description: FHWA, FRA, FTA Programmatic Consultation For Transportation Projects Affecting NLEB Or Indiana Bat

This key was last updated in IPaC on April 22, 2021. Keys are subject to periodic revision.

This decision key is intended for projects/activities funded or authorized by the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and/or Federal Transit Administration (FTA), which may require consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the Endangered Species Act (ESA) for the endangered **Indiana bat** (*Myotis sodalis*) and the threatened **Northern long-eared bat** (NLEB) (*Myotis septentrionalis*).

This decision key should only be used to verify project applicability with the Service's February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects. The programmatic biological opinion covers limited transportation activities that may affect either bat species, and addresses situations that are both likely and not likely to adversely affect either bat species. This decision key will assist in identifying the effect of a specific project/activity and applicability of the programmatic consultation. The programmatic biological opinion is not intended to cover all types of transportation actions. Activities outside the scope of the programmatic biological opinion, or that may affect ESA-listed species other than the Indiana bat or NLEB, or any designated critical habitat, may require additional ESA Section 7 consultation.

Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding

Appendix B Certification – Activities with Minimal Potential to Cause Effects

Date Reviewed: (Desktop or Field Review Date)	8/3/2021		
Project Name:	Bath		
State Number:	43247	**FHWA Number:**	X-A005(062)
Environmental Contact: Email Address:	Meli Dube Melilotus.M.Dube@dot.nh.gov	**DOT Project Manager:**	Kirk Mudgett

Project Description: The proposed project will address structural insufficiencies at an existing concrete box culvert carrying an unnamed stream under US Route 302 in Bath. The culvert is 6' wide, 4' high and 40' long and was constructed in 1930 and widened in 2001. The existing condition is very poor due to age related concrete deterioration. Due to flooding issues with roadway overtopping at this crossing, the preferred alternative is to replace the existing structure with a hydraulically sized structure.

Please select the applicable activity/activities:

Highway and Roadway Improvements	
☐	1. Modernization and general highway maintenance **that may require additional highway right-of-way or easement**, including: Choose an item. Choose an item.
☐	2. Installation of rumble strips or rumble stripes
☐	3. Installation or replacement of pole-mounted signs
☐	4. Guardrail replacement, provided any extension does not connect to a bridge older than 50 years old (unless it does already), and there is no change in access associated with the extension
Bridge and Culvert Improvements	
☒	5. Culvert replacement (excluding stone box culverts), when the culvert is less than 60" in diameter and excavation for replacement is limited to previously disturbed areas
☐	6. Bridge deck preservation and replacement, as long as no character defining features are impacted
☐	7. Non-historic bridge and culvert maintenance, renovation, or total replacement, **that may require minor additional right-of-way or easement**, including: Choose an item.
☐	8. Historic bridge maintenance activities within the limits of existing right-of-way, including: Choose an item. Choose an item.
☐	9. Stream and/or slope stabilization and restoration activities (including removal of debris or sediment obstructing the natural waterway, or any non-invasive action to restore natural conditions)
Bicycle and Pedestrian Improvements	
☐	10. Construction of pedestrian walkways, sidewalks, sidewalk tip-downs, small passenger shelters, and alterations to facilities or vehicles in order to make them accessible for elderly and handicapped persons
☐	11. Installation of bicycle racks
☐	12. Recreational trail construction
☐	13. Recreational trail maintenance when done on existing alignment
☐	14. Construction of bicycle lanes and shared use paths and facilities within the existing right-of-way
Railroad Improvements	

Appendix B Certification – Activities with Minimal Potential to Cause Effects

☐	15. Modernization, maintenance, and safety improvements of railroad facilities within the existing railroad or highway right-of-way, **provided no historic railroad features are impacted,** including, but not limited to: Choose an item. Choose an item.
☐	16. In-kind replacement of modern railroad features (i.e. those features that are less than 50 years old)
☐	17. Modernization/modification of railroad/roadway crossings provided that all work is undertaken within the limits of the roadway structure (edge of roadway fill to edge of roadway fill) and no associated character defining features are impacted
Other Improvements	
☐	18. Installation of Intelligent Transportation Systems
☐	19. Acquisition or renewal of scenic, conservation, habitat, or other land preservation easements where no construction will occur
☐	20. Rehabilitation or replacement of existing storm drains.
☐	21. Maintenance of stormwater treatment features and related infrastructure

Please describe how this project is applicable under Appendix B of the Programmatic Agreement.

This project was previously reviewed under 42957, but became a federal project under 43247. The existing 4'x6' box culvert on US RT 302 will be replaced with a new structure with work within the State ROW and only requiring temporary easements. Impacts will be primarily confined to already disturbed soils. Furthermore the 1930 culvert was altered and extended in 2001, and as such there is limited integrity remaining.

Please submit this Certification Form along with the Transportation RPR, including photographs, USGS maps, design plans and as-built plans, if available, for review. Note: The RPR can be waived for in-house projects, please consult Cultural Resources Program Staff.

Coordination Efforts:

Has an RPR been submitted to NHDOT for this project?	No	NHDHR R&C # assigned?	Click here to enter text.
Please identify public outreach effort contacts; method of outreach and date:	Contact letters were sent, including to the Conservation Commission, Fire Dept, Historical Society, Planning Board, Police Dept, Road Agent and Selectmen.		

Finding: (To be filled out by NHDOT Cultural Resources Staff)

☒	**No Potential to Cause Effects**	☐	**No Historic Properties Affected**
This finding serves as the Section 106 Memorandum of Effect. No further coordination is necessary.			
☐	**This project does *not* comply with Appendix B. Review will continue under Stipulation VII of the Programmatic Agreement. Please contact NHDOT Cultural Resources Staff to determine next steps.**		

NHDOT comments:

Sheila Charles

8/5/2021

NHDOT Cultural Resources Staff

Date

Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding

Appendix B Certification – Activities with Minimal Potential to Cause Effects

Coordination of the Section 106 process should begin as early as possible in the planning phase of the project (undertaking) so as not to cause a delay.

Project sponsors should not predetermine a Section 106 finding under the assumption a project is limited to the activities listed in Appendix B until this form is signed by the NHDOT Bureau of Environment Cultural Resources Program staff.

Every project shall be coordinated with, and reviewed by the NHDOT-BOE Cultural Resources Program in accordance with the *Programmatic Agreement Among the Federal Highway Administration, the New Hampshire State Historic Preservation Office, the Army Corps of Engineers, New England District, the Advisory Council on Historic Preservation, and the New Hampshire Department of Transportation Regarding the Federal Aid Highway Program in New Hampshire*. In accordance with the Advisory Council's regulations, we will continue to consult, as appropriate, as this project proceeds.

If any portion of the project is not entirely limited to any one or a combination of the activities specified in Appendix B (with, or without the inclusion of any activities listed in Appendix A), please continue discussions with NHDOT Cultural Resources staff.

This No Potential to Cause Effect or No Historic Properties Affected project determination is your Section 106 finding, as defined in the Programmatic Agreement.

Should project plans change, please inform the NHDOT Cultural Resources staff in accordance with Stipulation VII of the Programmatic Agreement.

US Army Corps of Engineers ®
New England District

Appendix B

Regional General Permits (GPs)
Required Information and Corps Secondary Impacts Checklist

In order for the Corps of Engineers to properly evaluate your application, applicants must submit the following information along with the New Hampshire DES Wetlands Bureau application or permit notification forms. Some projects may require more information. For a more comprehensive checklist, go to www.nae.usace.army.mil/regulatory, "Forms/Publications" and then "Application and Plan Guideline Checklist." Check with the Corps at (978) 318-8832 for project-specific requirements. For your convenience, this Appendix B is also attached to the State of New Hampshire DES Wetlands Bureau application and Permit by Notification forms.

All Projects:

- Corps application form (ENG Form 4345) as appropriate.
- Photographs of wetland/waterway to be impacted.
- Purpose of the project.
- Legible, reproducible black and white (no color) plans no larger than 11"x17" with bar scale. Provide locus map and plan views of the entire property.
- Typical cross-section views of all wetland and waterway fill areas and wetland replication areas.
- In navigable waters, show mean low water (MLW) and mean high water (MHW) elevations. Show the high tide line (HTL) elevations when fill is involved. In other waters, show ordinary high water (OHW) elevation.
- On each plan, show the following for the project:
- Vertical datum and the NAVD 1988 equivalent with the vertical units as U.S. feet. Don't use local datum. In coastal waters this may be mean higher high water (MHHW), mean high water (MHW), mean low water (MLW), mean lower low water (MLLW) or other tidal datum with the vertical units as U.S. feet. MLLW and MHHW are preferred. Provide the correction factor detailing how the vertical datum (e.g., MLLW) was derived using the latest National Tidal Datum Epoch for that area, typically 1983-2001.
- Horizontal state plane coordinates in U.S. survey feet based on the Traverse Mercator Grid system for the State of New Hampshire (Zone 2800) NAD 83.
- Show project limits with existing and proposed conditions.
- Limits of any Federal Navigation Project in the vicinity of the project area and horizontal State Plane Coordinates in U.S. survey feet for the limits of the proposed work closest to the Federal Navigation Project;
- Volume, type, and source of fill material to be discharged into waters and wetlands, including the area(s) (in square feet or acres) of fill in wetlands, below the ordinary high water in inland waters and below the high tide line in coastal waters.
- Delineation of all waterways and wetlands on the project site,:
- Use Federal delineation methods and include Corps wetland delineation data sheets. See GC 2 and www.nero.noaa.gov/hcd for eelgrass survey guidance.
- GP 3, Moorings, contains eelgrass survey requirements for the placement of moorings.
- For activities involving discharges of dredged or fill material into waters of the U.S., include a statement describing how impacts to waters of the U.S. are to be avoided and minimized, and either a statement describing how impacts to waters of the U.S. are to be compensated for (or a conceptual or detailed mitigation plan) or a statement explaining why compensatory mitigation should not be required for the proposed impacts. Please contact the Corps for guidance.

US Army Corps of Engineers®
New England District

New Hampshire General Permits (GPs)
Appendix B - Corps Secondary Impacts Checklist
(for inland wetland/waterway fill projects in New Hampshire)

1. Attach any explanations to this checklist. Lack of information could delay a Corps permit determination.
2. All references to “work” include all work associated with the project construction and operation. Work includes filling, clearing, flooding, draining, excavation, dozing, stumping, etc.
3. See GC 5, regarding single and complete projects.
4. Contact the Corps at (978) 318-8832 with any questions.

1. Impaired Waters	Yes	No
1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water? See http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm to determine if there is an impaired water in the vicinity of your work area.*		x
2. Wetlands	Yes	No
2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?	x	
2.2 Are there proposed impacts to SAS, special wetlands. Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) DataCheck Tool for information about resources located on the property at https://www2.des.state.nh.us/nhb_datacheck/. The book Natural Community Systems of New Hampshire also contains specific information about the natural communities found in NH.		x
2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?		
2.4 Would the project remove part or all of a riparian buffer? (Riparian buffers are lands adjacent to streams where vegetation is strongly influenced by the presence of water. They are often thin lines of vegetation containing native grasses, flowers, shrubs and/or trees that line the stream banks. They are also called vegetated buffer zones.)		x
2.5 The overall project site is more than 40 acres?		X
2.6 What is the area of the previously filled wetlands?	Unknown	
2.7 What is the area of the proposed fill in wetlands?	None	
2.8 What is the % of previously and proposed fill in wetlands to the overall project site?	Unknown	
3. Wildlife	Yes	No
3.1 Has the NHB & USFWS determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require an NHB ID number & a USFWS IPAC determination.) NHB DataCheck Tool: https://www2.des.state.nh.us/nhb_datacheck/ USFWS IPAC website: https://ecos.fws.gov/ipac/location/index		x

3.2 Would work occur in any area identified as either “Highest Ranked Habitat in N.H.” or “Highest Ranked Habitat in Ecological Region”? (These areas are colored magenta and green, respectively, on NH Fish and Game’s map, “2010 Highest Ranked Wildlife Habitat by Ecological Condition.”) Map information can be found at: • PDF: www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/highest_ranking_habitat.htm. • Data Mapper: www.granit.unh.edu. • GIS: www.granit.unh.edu/data/downloadfreedata/category/databycategory.html.		x
3.3 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?		x
3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?		x
3.5 Are stream crossings designed in accordance with the GC 21?		
4. Flooding/Floodplain Values	Yes	No
4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?	x	
4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?	n/a	
5. Historic/Archaeological Resources		
For a minimum, minor or major impact project - a copy of the Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) with your DES file number shall be sent to the NH Division of Historical Resources as required on Page 11 GC 8(d) of the GP document**		x

*Although this checklist utilizes state information, its submittal to the Corps is a Federal requirement.
** If your project is not within Federal jurisdiction, coordination with NH DHR is not required under Federal law.
`

Supplemental Information:

2.6 & 2.8 - The amount of fill previously placed in wetlands is unknown. Based on the width of the existing stream channel, the construction of the original culvert would have filled about 0.01 acres of wetlands.

4.2 - No fill in the 100 year floodplain is proposed.

By NHDOT Highway Design 4/17/2019

Culvert inlet

Wetland #2 (R2UB12) - Impact Area B Wetland #1 (Bank) - Impact Area A

By NHDOT Bureau of Environment 3/23/2020

Culvert inlet, looking upstream

Wetland #2 (R2UB12) – Impact Area B Wetland #1 & #3 (Banks) - Impact Areas A & C

By NHDOT Highway Design 4/17/2019

Inside culvert showing previous wall repair on right and deteriorated top slab

By NHDOT Bureau of Environment 3/23/2020

Site looking south. Bypass flow from inlet into field on left

No impacts in this photo

By NHDOT Bureau of Environment 3/23/2020

Culvert Outlet

Wetland #5 (R2UB12) – Impact Area E #4 & #6 (Banks) - Impact Areas D & F

By NHDOT Highway Design 4/17/2019

Outlet channel, just downstream of outlet.

Wetland #5 (R2UB12) – Impact Area E #4 & #6 (Banks) - Impact Areas D & F

By NHDOT Highway Design 4/17/2019

Site looking north, storage in field

No impacts in this photo

By NHDOT Bureau of Environment 3/23/2020

Site looking north and outlet channel

Wetland #5 (R2UB12) – Impact Area E #4 & #6 (Banks) - Impact Areas D & F

Bath 43247

CONSTRUCTION SEQUENCE

1. Perform necessary clearing operations for access and staging.
2. Install perimeter sediment controls and install necessary temporary erosion controls as specified on the strategies sheet. Include all staging areas. Set up dewatering basins.
3. Install Water Diversion (clean water bypass). An acceptable water diversion would be a temporary pipe installed just outside the box culvert excavation limits. The Contract will require the Contractor's water diversion plan be designed to accommodate a 2-year storm event.
4. Construct temporary paved widening on inlet side of the culvert. The width of widening is expected to be about 4' wide at the culvert, tapering to match the existing edge of US 302 at about 150' north and 150' south of the culvert. Limits of temporary slope work shown on the Plans include additional area for temporary gravel base course / shoulder. The actual width of widening will be as approved by the NHDOT Engineer, based on the Contractor's installation plan for the culvert.
5. Set up Phase 1 traffic control barrier (maintain 1 lane of traffic through work area, shifted toward inlet side of culvert).
6. Install Cofferdam to support the portion of US 302 open to traffic.
7. Remove approximately half of the existing box culvert (starting at the outlet side), install new box culvert sections, embedment material, outlet side headwall and grading to match existing channel and banks.
8. Stabilize outlet channel banks and over bank areas.
9. Modify cofferdam as needed for Phase 2 of culvert installation.
10. Set up Phase 2 traffic control (shift traffic toward outlet side of culvert).
11. Remove temporary widening constructed during Phase 1. Restore disturbed areas to original grade. Stabilize disturbed areas.
12. Remove remaining portion of the box culvert, install new box culvert sections, embedment material, inlet side headwall, and grading to match inlet channel and banks.
13. Stabilize inlet channel banks and over bank areas.
14. Remove cofferdam and traffic control barrier (maintain 1 lane of traffic using drums/cones, shift traffic as needed to accomplish remaining operations).
15. Remove diversion pipe, repair and stabilize areas disturbed by removal. Remove water diversion and re-establish flow through the new culvert.
16. Install final paving and pavement markings. Final pavement width and elevation will match the original US 302 conditions.
17. Stabilize remaining disturbed areas.
18. Remove all perimeter controls.

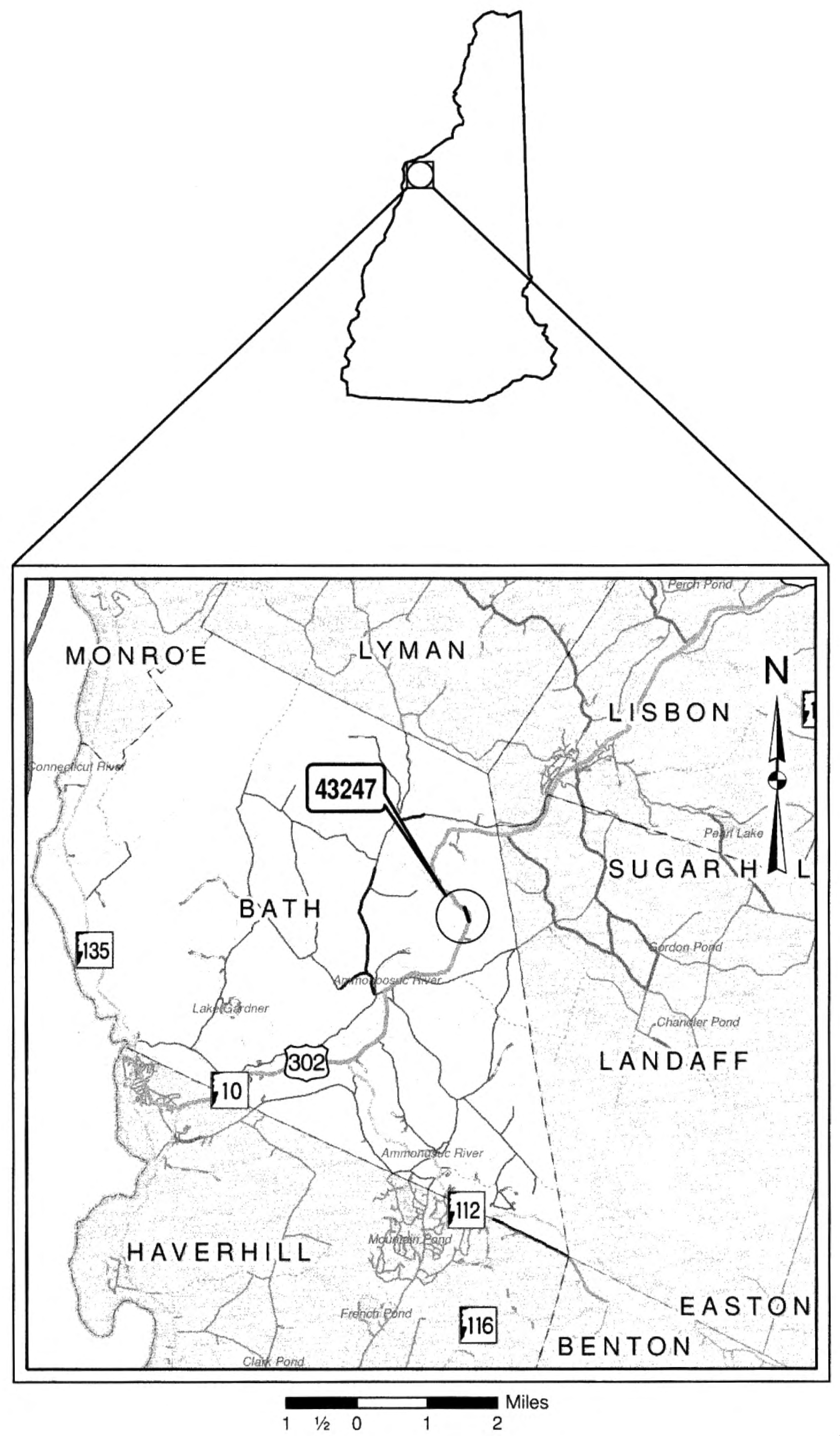
STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

WETLANDS PLANS
FEDERAL AID PROJECT

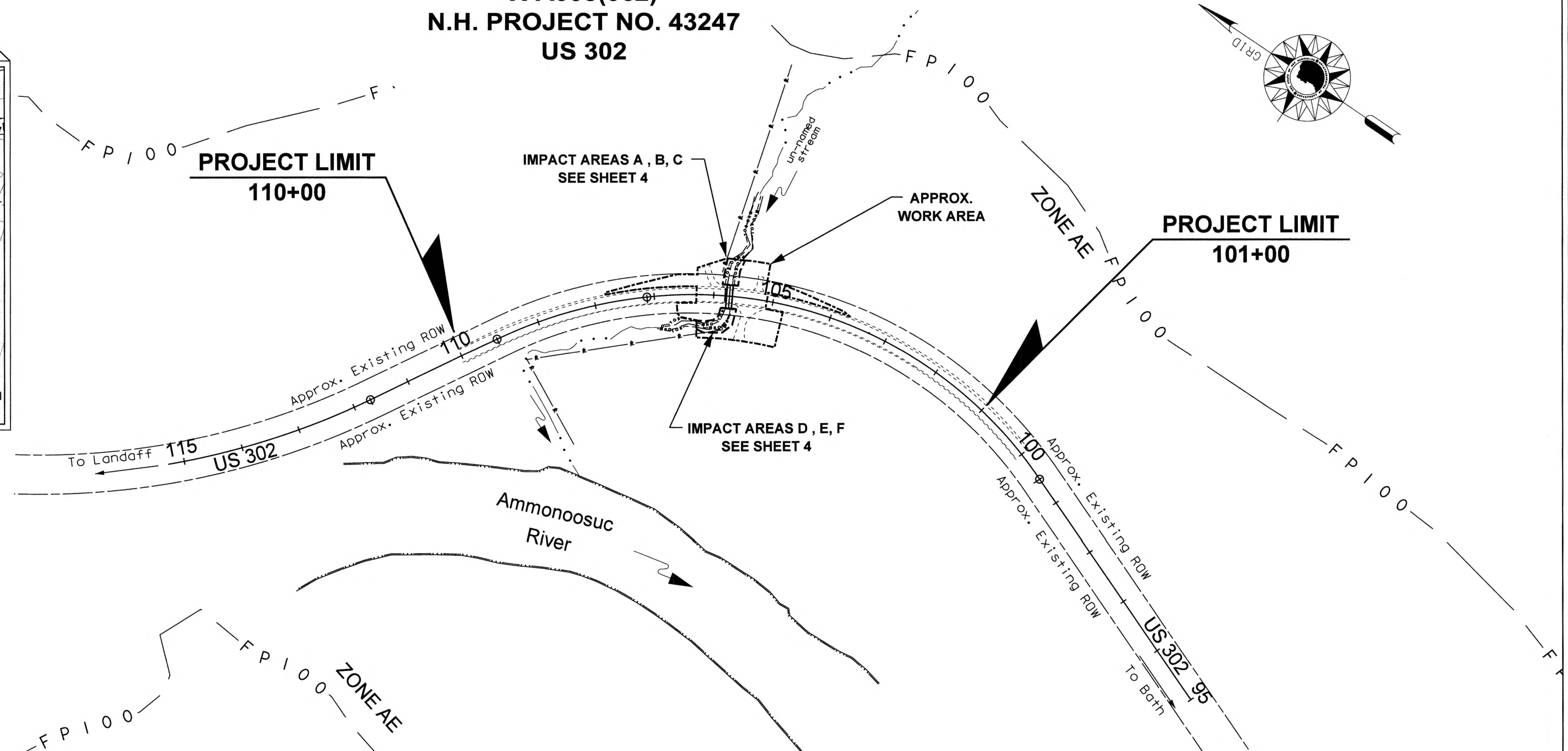
X-A005(062)
N.H. PROJECT NO. 43247
US 302

DESIGN DATA

AVERAGE DAILY TRAFFIC 20 21	4,200
AVERAGE DAILY TRAFFIC 20 41	5,100
PERCENT OF TRUCKS	9%
DESIGN SPEED	N/A
LENGTH OF PROJECT	40 LF (Culvert)



LOCATION MAP



INDEX OF SHEETS

Wetland Delineation per ENV-Wt 406 by:
NHDOT (Sarah Large and Heidi Stortz)
May 14, 2020

TOWN OF BATH
COUNTY OF GRAFTON
SCALE: 1" = 100'

Plans Prepared by:
Christopher Carucci, PE

DATE: 12/27/2021

Per Wetland Plans Rule(s)
Env-Wt 311.05

STATE OF NEW HAMPSHIRE
JAMES A. MARSHALL
No. 8232
LICENSED PROFESSIONAL ENGINEER

12/28/21

FOR CONSTRUCTION AND ALIGNMENT DETAILS - SEE CONSTRUCTION PLANS

DRAWN BY	JJN	DATE 8/2021
CHECKED BY	CAC	DATE 11/18/21

NHDOT THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

US ROUTE 302
Culvert Replacement
Wetland Impact and
Erosion Control Plans

FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
X-A005(062)	43247	1	8

GENERAL

EDGE OF PAVEMENT — PROPOSED ROADWAY; existing roadway; (pavement removed outside slope lines)

TRAVELED WAY

DRIVEWAYS — (label surface type)

BUILDINGS — (label house or type of building); (building to be removed)

FOUNDATION — (label type)

LEACH FIELD — leach field

BRIDGE CROSSINGS — STREAM; OVERPASS

STEPS AND WALK — (label type)

INTERMITTENT WATER COURSE

SHORE LINE — river/stream; pond (label name of water body)

POTENTIAL WET AREA SYMBOL

BRUSH OR WOODS LINE

TREES (PLANS) — (deciduous) (coniferous) (stump)

(show station, circumference in feet & type)

TREE OR STUMP (CROSS-SECTIONS)

HEDGE — (label type)

MONITORING WELL — mon

WELL

FLAG POLE — fp

ORIGINAL GROUND (TYPICALS)

ROCK OUTCROP

ROCK LINE (TYPICALS & SECTIONS ONLY)

	existing	PROPOSED
GUARDRAIL (label type)	bgr cgr	
JERSEY BARRIER		
CURB (LABEL TYPE)		
STONE WALL		
RETAINING WALL (LABEL TYPE)		(points toward retained ground)
FENCE (LABEL TYPE)		

SIGNS — (single post); (double post)

GAS PUMP — gp

FUEL TANK (ABOVE GROUND) — ft (label size & type)

STORAGE TANK FILLER CAP — fc

SEPTIC TANK — S

GRAVE — gr

MAILBOX — mb

VENT PIPE — vp

SATELLITE DISH ANTENNA — da

PHONE — ph

GROUND LIGHT/LAMP POST — gl lp

BORING LOCATION — B

TEST PIT — TP

INTERSTATE NUMBERED HIGHWAY — 293

UNITED STATES NUMBERED HIGHWAY — 3

STATE NUMBERED HIGHWAY — 102

SHORELAND - WETLAND

WETLAND DESIGNATION AND TYPE	2 PUB2E
DELINEATED WETLAND	DW
ORDINARY HIGH WATER	OHW
TOP OF BANK	TOB
TOP OF BANK & ORDINARY HIGH WATER	TOBOHW
NORMAL HIGH WATER	NHW
WIDTH AT BANK FULL	WBF
PRIME WETLAND	PWET
PRIME WETLAND 100' BUFFER	PWET100
NON-JURISDICTIONAL DRAINAGE AREA	NJDA
COWARDIN DISTINCTION LINE	CDL
TIDAL BUFFER ZONE	TBZ
DEVELOPED TIDAL BUFFER ZONE	DTBZ
HIGHEST OBSERVABLE TIDE LINE	HOTL
MEAN HIGH WATER	MHW
MEAN LOW WATER	MLW
VERNAL POOL	VP
SPECIAL AQUATIC SITE	SAS
REFERENCE LINE	REF
WATER FRONT BUFFER	WB50
NATURAL WOODLAND BUFFER	NWB150
PROTECTED SHORELAND	PS250
INVASIVE SPECIES LABEL	I.S. I; I.S. II
INVASIVE SPECIES	INV

FLOODPLAIN / FLOODWAY

500 YEAR FLOODPLAIN BOUNDARY	FP500
100 YEAR FLOODPLAIN BOUNDARY	FP100
FLOODWAY	FW

ENGINEERING

CONSTRUCTION BASELINE — 30 31 32

PC, PT, POT (ON CONST BASELINE)

PI (IN CONSTRUCTION BASELINES)

INTERSECTION OR EQUATION OF TWO LINES

ORIGINAL GROUND LINE (PROFILES AND CROSS-SECTIONS)

PROFILE GRADE LINE (PROFILES AND CROSS-SECTIONS)

CLEARING LINE — SLOPE LINE; CLEARING LINE

SLOPE LINE

SLOPE LINE (FILL)

SLOPE LINE (CUT)

PROFILES AND CROSS SECTIONS:

ORIGINAL GROUND ELEVATION (LEFT) — 72.5

FINISHED GRADE ELEVATION (RIGHT) — 79.14

SHEET 1 OF 2

STATE OF NEW HAMPSHIRE

BATH

DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

STANDARD SYMBOLS

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
11-21-2014	43247 stdsymb1-2	43247	2	8

DRAINAGE

	existing	PROPOSED
MANHOLE	d	
CATCH BASIN	cb	
DROP INLET	di	

- DRAINAGE PIPE (existing) — (label size & type)
- DRAINAGE PIPE (PROPOSED)
- UNDERDRAIN (existing) W/ FLUSHING BASIN — fb — (label size & type)
- UNDERDRAIN (PROPOSED) W/ FLUSHING BASIN
- show direction of flow
- HEADER (existing & PROPOSED) — (with stone outlet protection)
- END SECTION (existing & PROPOSED) — METAL or PLASTIC; RCP
- OPEN DITCH (PROPOSED)
- EROSION CONTROL/ STONE SLOPE PROTECTION

BOUNDARIES / RIGHT-OF-WAY

- RIGHT-OF-WAY LINE — (label type)
- RR RIGHT-OF-WAY LINE
- PROPERTY LINE — P — P
- PROPERTY LINE (COMMON OWNER) — Z — Z
- TOWN LINE — BOW / CONCORD
- COUNTY LINE — COOS / GRAFTON
- STATE LINE — MAINE / NEW HAMPSHIRE
- NATIONAL FOREST
- CONSERVATION LAND — LC — LC
- BENCH MARK / SURVEY DISK
- BOUND — bnd — (PROPOSED)
- STATE LINE/ TOWN LINE MONUMENT — S/L — T/L
- NHDOT PROJECT MARKER
- IRON PIPE OR PIN — ip
- DRILL HOLE IN ROCK — dh
- TAX MAP AND LOT NUMBER — 156 14 — 1642/341 — 6.80 Ac.±
- PROPERTY PARCEL NUMBER — 12
- HISTORIC PROPERTY — H

UTILITIES

existing / PROPOSED

- TELEPHONE POLE
- POWER POLE
- JOINT OCCUPANCY — (plot point at face not center of symbol)
- MISCELLANEOUS/UNKNOWN POLE
- GUY POLE OR PUSH BRACE
- LIGHT POLE
- LIGHT ON POWER POLE
- LIGHT ON JOINT POLE
- POLE STATUS: REMOVE, LEAVE, PROPOSED, OR TEMPORARY AS APPLICABLE e.g.: — R — L — P+04 25.0' — T+04 25.0'
- RAILROAD — (label ownership)
- RAILROAD SIGN
- RAILROAD SIGNAL
- UTILITY JUNCTION BOX — jb — JB
- OVERHEAD WIRE — OW — OW (label type)

UNDERGROUND UTILITIES

	existing	PROPOSED
WATER (on existing lines label size, type and note if abandoned)	W W	PW PW
SEWER	S S	PS PS
TELEPHONE	T T	PT PT
ELECTRIC	E E	PE PE
GAS	G G	PG PG
LIGHTING	L L	PL PL
INTELLIGENT TRANSPORTATION SYSTEM	ITS ITS	PITS PITS
FIBER OPTIC	FO FO	PFO PFO
WATER SHUT OFF	WSO	WSO
GAS SHUT OFF	GSO	GSO
HYDRANT	hyd	HYD

MANHOLES

	existing	PROPOSED
SEWER	s	MHS
TELEPHONE	t	MHT
ELECTRICAL	e	MHE
GAS	g	MHG
UNKNOWN	u	

TRAFFIC SIGNALS / ITS

	existing	PROPOSED
MAST ARM (existing)		30' MA (NOTE ANGLE FROM ℄)
OPTICOM RECEIVER		
OPTICOM STROBE		
TRAFFIC SIGNAL		
PEDESTAL WITH PEDESTRIAN SIGNAL HEADS AND PUSH BUTTON UNIT		
SIGNAL CONDUIT	C C C	PC PC PC
CONTROLLER CABINET	cc	CC
METER PEDESTAL	mp	MP
PULL BOX	pb	PB
LOOP DETECTOR (QUADRUPOLE)		(label size)
LOOP DETECTOR (RECTANGULAR)		(label size)
CAMERA POLE (CCTV)		
FIBER OPTIC DELINEATOR	fod	FOD
FIBER OPTIC SPLICE VAULT	f s	SVF
ITS EQUIPMENT CABINET	its	ITS
VARIABLE SPEED LIMIT SIGN		
DYNAMIC MESSAGE SIGN		
ROAD AND WEATHER INFO SYSTEM		

CONSTRUCTION NOTES

CURB MARK NUMBER - BITUMINOUS	B-1
CURB MARK NUMBER - GRANITE	G-1
CLEARING AND GRUBBING AREA	A
DRAINAGE NOTE	1
EROSION CONTROL NOTE	A
FENCING NOTE	A
GUARDRAIL NOTE	1
ITS NOTE	1
LIGHTING NOTE	A
TRAFFIC SIGNAL NOTE	1

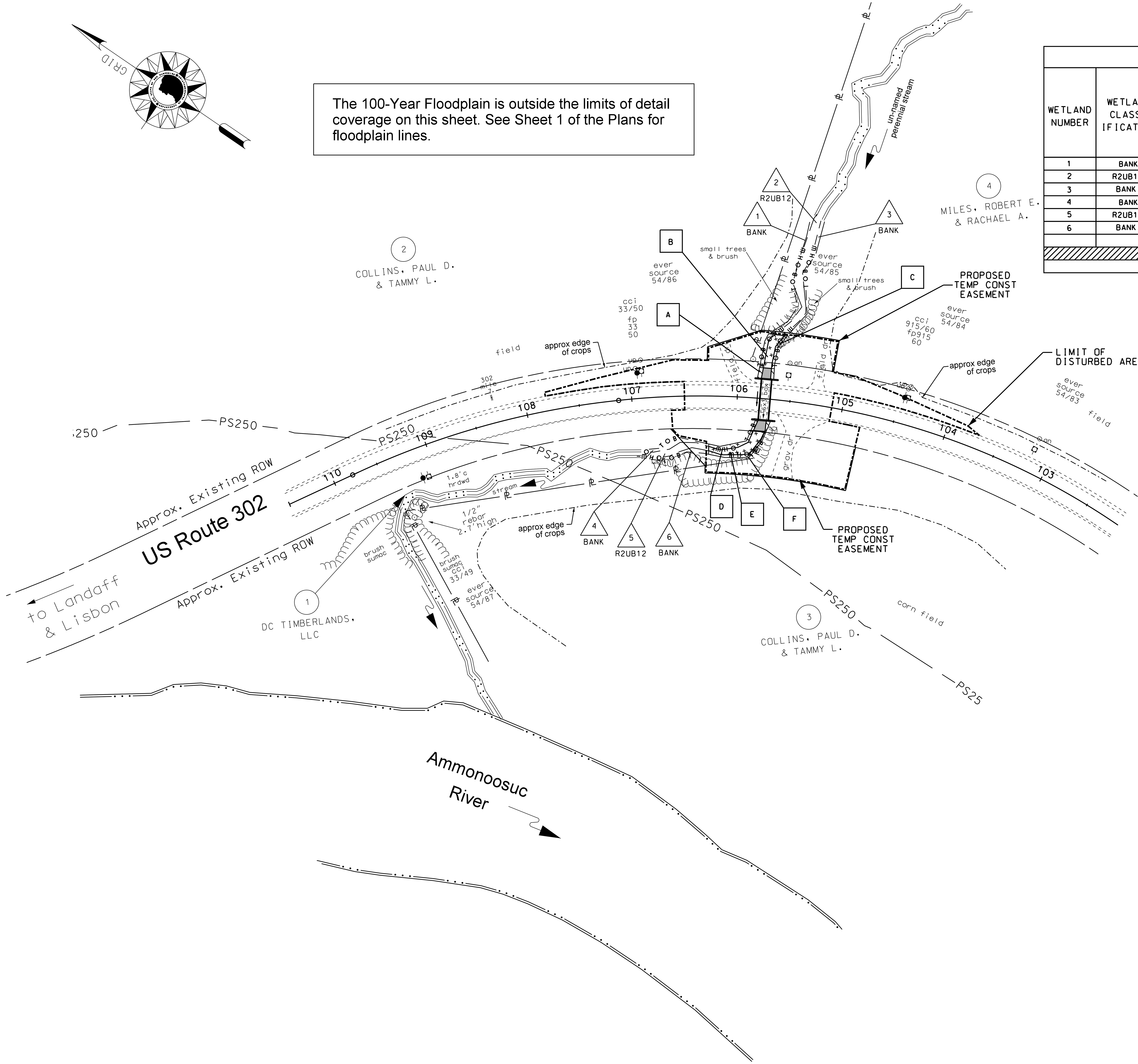
SHEET 2 OF 2

STATE OF NEW HAMPSHIRE
BATH
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

STANDARD SYMBOLS

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
9-1-2016	43247 stdsymb1-2	43247	3	8

The 100-Year Floodplain is outside the limits of detail coverage on this sheet. See Sheet 1 of the Plans for floodplain lines.



WETLAND IMPACT SUMMARY

WETLAND NUMBER	WETLAND CLASS-IFICATION	LOCATION	AREA IMPACTS: PERMANENT N.H.W.B. (NON-WETLAND) SF	LF	PERMANENT N.H.W.B. & A.C.O.E. (WETLAND) SF	LF	TEMPORARY SF	LF	LINEAR STREAM IMPACTS FOR MITIGATION: PERMANENT BANK LEFT LF	BANK RIGHT LF	CHANNEL LF
1	BANK	A	37	10			121	34			
2	R2UB12	B			82	10	264	35			
3	BANK	C	29	10			86	34			
4	BANK	D	24	10			148	51			
5	R2UB12	E			93	10	403	58			
6	BANK	F	24	10			159	68			
		TOTAL	114	40	175	20	1181	280	0	0	0

PERMANENT IMPACTS: 289 SF
TEMPORARY IMPACTS: 1181 SF
TOTAL IMPACTS: 1470 SF

LEGEND

TYPE OF WETLAND IMPACT	SHADING/ HATCHING
NEW HAMPSHIRE WETLANDS BUREAU (PERMANENT NON-WETLAND)	
NEW HAMPSHIRE WETLANDS BUREAU & ARMY CORP OF ENGINEERS (PERMANENT WETLAND)	
TEMPORARY IMPACTS	

\# WETLAND DESIGNATION NUMBER

\# WETLAND IMPACT LOCATION

\# WETLAND MITIGATION AREA

MITIGATION

WETLAND CLASSIFICATION CODES	
R2UB12	RIVERINE, LOWER PERENNIAL, UNCONSOLIDATED BOTTOM, COBBLE GRAVEL / SAND
BANK	BANK

SCOPE OF WORK:

STA 105+73.7: REPLACE EXISTING 6' WIDE X 3' HIGH X 40' LONG CONCRETE BOX CULVERT WITH 9' WIDE X 3' CLEAR HEIGHT X 40' LONG PRECAST CONCRETE BOX CULVERT, EMBEDDED 12" BELOW STREAMBED. CONSTRUCT STRAIGHT CONCRETE HEADWALLS AT BOTH ENDS. SEE DETAILS FOR MATCHING NEW CULVERT TO EXISTING STREAM.
USE WETLAND SEED MIX TO RESTORE JURISDICTIONAL WETLAND AREAS.

SEE PROFILE FOR CULVERT SLOPE AND INVERTS

50 0 50 100
SCALE IN FEET

STATE OF NEW HAMPSHIRE
BATH
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

WETLAND IMPACT PLAN

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
43247wetplans	43247	4	8

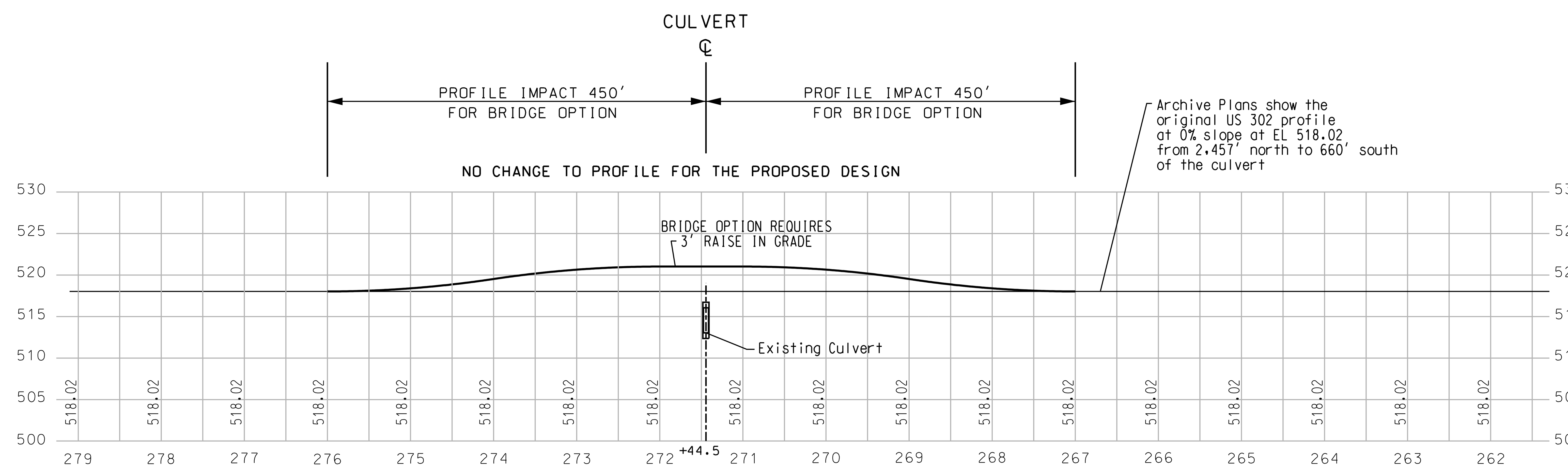
REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

SDR PROCESSED SEL DATE 6/2021
NEW DESIGN JJN DATE 10/2021
SHEET CHECKED CAC DATE 12/29/21
AS BUILT DETAILS DATE

CULVERT & STREAM PROFILE

CULVERT & STREAM PROFILE FROM NHDOT SURVEY (NAVD88 DATUM)



US 302 STATIONS AND ELEVATIONS ARE FROM THE 1930 ARCHIVE PLAN (NGVD29 DATUM)
RECENT NHDOT SURVEY INDICATES THAT APPROX 4.5" OF ADDITIONAL PAVEMENT HAS BEEN PLACED OVER THE ORIGINAL ROADWAY, AND THAT THE SHAPE OF THE PROFILE HAS NOT CHANGED.

ARCHIVE PLAN EXISTING US 302 PROFILE - NGVD29 DATUM

REVISIONS AFTER PROPOSAL

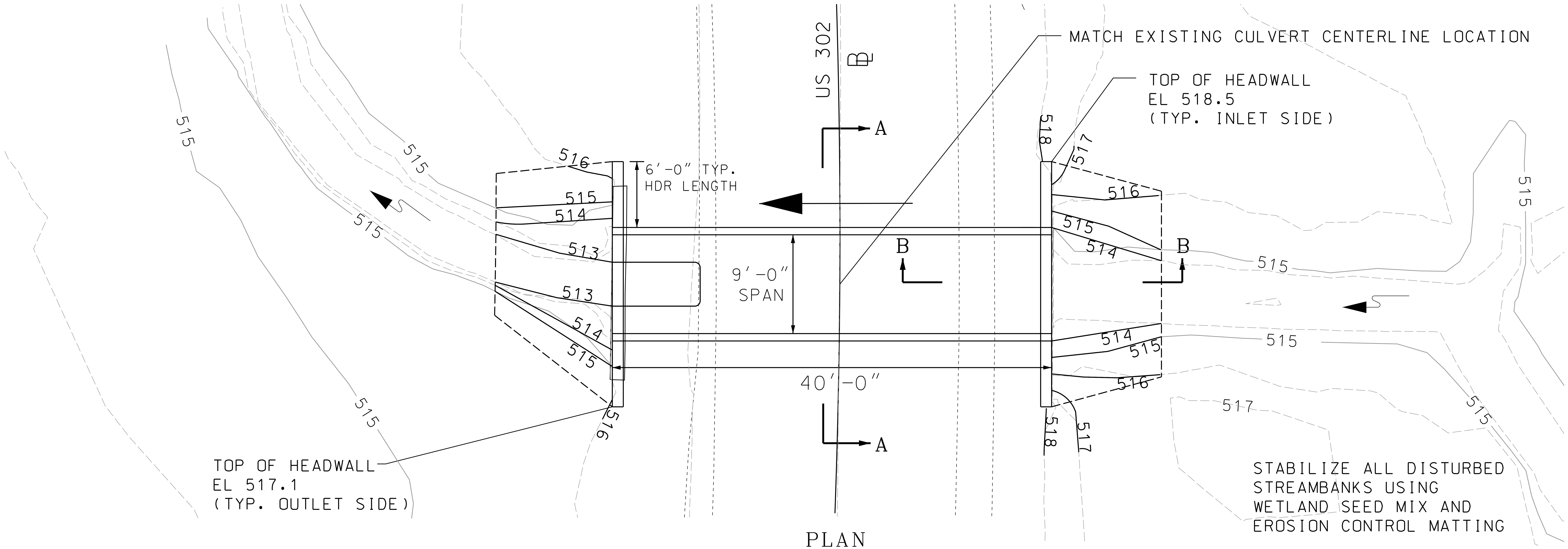
NUMBER	DATE	STATION	STATION	DESCRIPTION

SDR PROCESSED		DATE
NEW DESIGN	JJN	DATE 10/2021
SHEET CHECKED	CAC	DATE 12/29/21
AS BUILT DETAILS		DATE

STATE OF NEW HAMPSHIRE
BATH
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

PROFILES

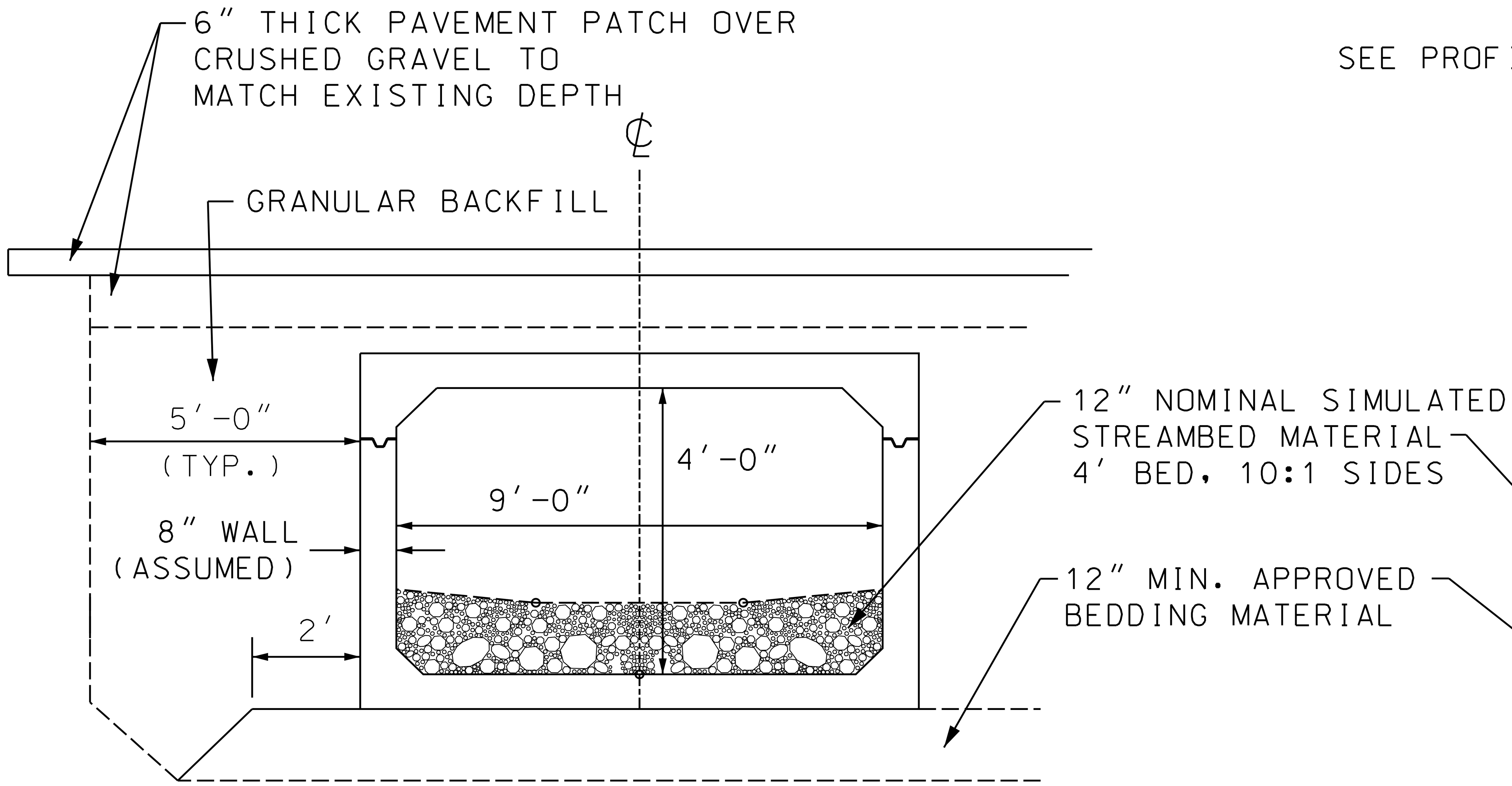
DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
43247profiles	43247	5	8



PLAN

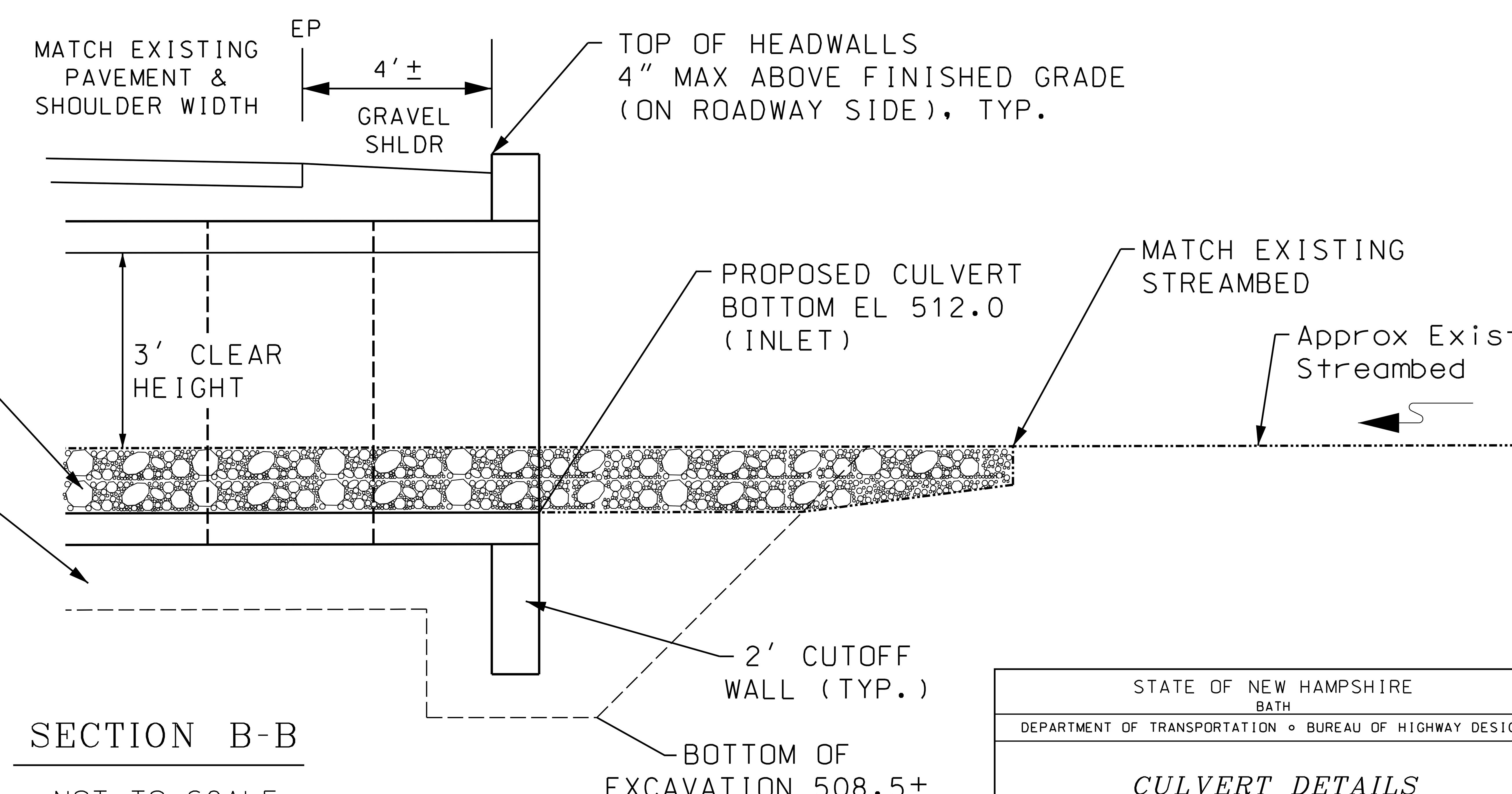
1" = 5', 1 FOOT CONTOURS

SEE PROFILES FOR EXISTING AND PROPOSED CULVERT INVERTS



SECTION A-A

NOT TO SCALE



SECTION B-B

NOT TO SCALE

STATE OF NEW HAMPSHIRE
BATH
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

CULVERT DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
43247wetdetails	43247	6	8

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

SDR PROCESSED		DATE
NEW DESIGN	CAC	DATE 7/2021
SHEET CHECKED	JJN	DATE 8/6/21
AS BUILT DETAILS		DATE

EROSION CONTROL STRATEGIES

1. ENVIRONMENTAL COMMITMENTS:
   - 1.1. THESE GUIDELINES DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH ANY CONTRACT PROVISIONS, OR APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS.
   - 1.2. THIS PROJECT WILL BE SUBJECT TO THE US EPA'S NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORM WATER CONSTRUCTION GENERAL PERMIT AS ADMINISTERED BY THE ENVIRONMENTAL PROTECTION AGENCY (EPA). THIS PROJECT IS SUBJECT TO REQUIREMENTS IN THE MOST RECENT CONSTRUCTION GENERAL PERMIT (CGP).
   - 1.3. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE NHDES WETLAND PERMIT, THE US ARMY CORPS OF ENGINEERS PERMIT, WATER QUALITY CERTIFICATION AND THE SPECIAL ATTENTION ITEMS INCLUDED IN THE CONTRACT DOCUMENTS.
   - 1.4. ALL STORM WATER, EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE NEW HAMPSHIRE STORMWATER MANUAL, VOLUME 3, EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION (DECEMBER 2008) (BMP MANUAL) AVAILABLE FROM THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES (NHDES).
   - 1.5. THE CONTRACTOR SHALL COMPLY WITH RSA 485-A:17, AND ALL PUBLISHED NHDES ALTERATION OF TERRAIN ENV-WQ 1500 REQUIREMENTS (HTTP://DES.NH.GOV/ORGANIZATION/COMMISSIONER/LEGAL/RULES/INDEX.HTM)
   - 1.6. THE CONTRACTOR IS DIRECTED TO REVIEW AND COMPLY WITH SECTION 107.1 OF THE CONTRACT AS IT REFERS TO SPILLAGE, AND ALSO WITH REGARDS TO EROSION, POLLUTION, AND TURBIDITY PRECAUTIONS.

2. STANDARD EROSION CONTROL SEQUENCING APPLICABLE TO ALL CONSTRUCTION PROJECTS:
   - 2.1. PERIMETER CONTROLS SHALL BE INSTALLED PRIOR TO EARTH DISTURBING ACTIVITIES. PERIMETER CONTROLS AND STABILIZED CONSTRUCTION EXITS SHALL BE INSTALLED AS SHOWN IN THE BMP MANUAL AND AS DIRECTED BY THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARER.
   - 2.2. EROSION, SEDIMENTATION CONTROL MEASURES AND INFILTRATION BASINS SHALL BE CLEANED, REPLACED AND AUGMENTED AS NECESSARY TO PREVENT SEDIMENTATION BEYOND PROJECT LIMITS THROUGHOUT THE PROJECT DURATION.
   - 2.3. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED IN ACCORDANCE WITH THE CONSTRUCTION GENERAL PERMIT AND SECTION 645 OF THE NHDOT SPECIFICATIONS FOR ROAD AND BRIDGES CONSTRUCTION.
   - 2.4. AN AREA SHALL BE CONSIDERED STABLE IF ONE OF THE FOLLOWING HAS OCCURRED:
     - (A) BASE COURSE GRAVELS HAVE BEEN INSTALLED IN AREAS TO BE PAVED;
     - (B) A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED;
     - (C) A MINIMUM OF 3" OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIP-RAP HAS BEEN INSTALLED;
     - (D) TEMPORARY SLOPE STABILIZATION CONFORMING TO TABLE 1 HAS BEEN PROPERLY INSTALLED
   - 2.5. ALL STOCKPILES SHALL BE CONTAINED WITH A PERIMETER CONTROL. IF THE STOCKPILE IS TO REMAIN UNDISTURBED FOR MORE THAN 14 DAYS, MULCHING WILL BE REQUIRED.
   - 2.6. A WATER TRUCK SHALL BE AVAILABLE TO CONTROL EXCESSIVE DUST AT THE DIRECTION OF THE CONTRACT ADMINISTRATOR.
   - 2.7. TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL REMAIN UNTIL THE AREA HAS BEEN PERMANENTLY STABILIZED.
   - 2.8. CONSTRUCTION PERFORMED ANY TIME BETWEEN NOVEMBER 30TH AND MAY 1ST OF ANY YEAR SHALL BE CONSIDERED WINTER CONSTRUCTION AND SHALL CONFORM TO THE FOLLOWING REQUIREMENTS.
     - (A) ALL PROPOSED VEGETATED AREAS WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15TH, OR WHICH ARE DISTURBED AFTER OCTOBER 15TH, SHALL BE STABILIZED IN ACCORDANCE WITH TABLE 1.
     - (B) ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15TH, OR WHICH ARE DISTURBED AFTER OCTOBER 15TH, SHALL BE STABILIZED TEMPORARILY WITH STONE OR IN ACCORDANCE WITH TABLE 1.
     - (C) AFTER NOVEMBER 30TH INCOMPLETE ROAD SURFACES, WHERE WORK HAS STOPPED FOR THE SEASON, SHALL BE PROTECTED IN ACCORDANCE WITH TABLE 1.
     - (D) WINTER EXCAVATION AND EARTHWORK SHALL BE DONE SUCH THAT NO MORE THAN 1 ACRE OF THE PROJECT IS WITHOUT STABILIZATION AT ONE TIME, UNLESS A WINTER CONSTRUCTION PLAN HAS BEEN APPROVED BY NHDOT THAT MEETS THE REQUIREMENTS OF ENV-WQ 1505.02 AND ENV-WQ 1505.05.
     - (E) A SWPPP AMENDMENT SHALL BE SUBMITTED TO THE DEPARTMENT, FOR APPROVAL, ADDRESSING COLD WEATHER STABILIZATION (ENV-WQ 1505.05) AND INCLUDING THE REQUIREMENTS OF NO LESS THAN 30 DAYS PRIOR TO THE COMMENCEMENT OF WORK SCHEDULED AFTER NOVEMBER 30TH.

GENERAL CONSTRUCTION PLANNING AND SELECTION OF STRATEGIES TO CONTROL EROSION AND SEDIMENT ON HIGHWAY CONSTRUCTION PROJECTS

3. PLAN ACTIVITIES TO ACCOUNT FOR SENSITIVE SITE CONDITIONS:
   - 3.1. CLEARLY FLAG AREAS TO BE PROTECTED IN THE FIELD AND PROVIDE CONSTRUCTION BARRIERS TO PREVENT TRAFFICKING OUTSIDE OF WORK AREAS.
   - 3.2. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS.
   - 3.3. PROTECT AND MAXIMIZE EXISTING NATIVE VEGETATION AND NATURAL FOREST BUFFERS BETWEEN CONSTRUCTION ACTIVITY AND SENSITIVE AREAS.
   - 3.4. WHEN WORK IS PERFORMED IN AND NEAR WATER COURSES, STREAM FLOW DIVERSION METHODS SHALL BE IMPLEMENTED PRIOR TO ANY EXCAVATION OR FILLING.
   - 3.5. WHEN WORK IS PERFORMED WITHIN 50 FEET OF SURFACE WATERS (WETLAND, OPEN WATER OR FLOWING WATER), PERIMETER CONTROL SHALL BE ENHANCED CONSISTENT WITH SECTION 2.1.2.1. OF THE 2012 NPDES CONSTRUCTION GENERAL PERMIT.

4. MINIMIZE THE AMOUNT OF EXPOSED SOIL:
   - 4.1. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS. MINIMIZE THE AREA OF EXPOSED SOIL AT ANY ONE TIME. PHASING SHALL BE USED TO REDUCE THE AMOUNT AND DURATION OF SOIL EXPOSED TO THE ELEMENTS AND VEHICLE TRACKING.
   - 4.2. UTILIZE TEMPORARY MULCHING OR PROVIDE ALTERNATE TEMPORARY STABILIZATION ON EXPOSED SOILS IN ACCORDANCE WITH TABLE 1.
   - 4.3. THE MAXIMUM AMOUNT OF DISTURBED EARTH SHALL NOT EXCEED A TOTAL OF 5 ACRES FROM MAY 1ST THROUGH NOVEMBER 30TH, OR EXCEED ONE ACRE DURING WINTER MONTHS, UNLESS THE CONTRACTOR DEMONSTRATES TO THE DEPARTMENT THAT THE ADDITIONAL AREA OF DISTURBANCE IS NECESSARY TO MEET THE CONTRACTORS CRITICAL PATH METHOD SCHEDULE (CPM), AND THE CONTRACTOR HAS ADEQUATE RESOURCES AVAILABLE TO ENSURE THAT ENVIRONMENTAL COMMITMENTS WILL BE MET.

5. CONTROL STORMWATER FLOWING ONTO AND THROUGH THE PROJECT:
   - 5.1. DIVERT OFF SITE RUNOFF OR CLEAN WATER AWAY FROM THE CONSTRUCTION ACTIVITY TO REDUCE THE VOLUME THAT NEEDS TO BE TREATED ON SITE.
   - 5.2. DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM DISTURBED AREAS, SLOPES, AND AROUND ACTIVE WORK AREAS AND TO A STABILIZED OUTLET LOCATION.
   - 5.3. CONSTRUCT IMPERMEABLE BARRIERS AS NECESSARY TO COLLECT OR DIVERT CONCENTRATED FLOWS FROM WORK OR DISTURBED AREAS.
   - 5.4. STABILIZE, TO APPROPRIATE ANTICIPATED VELOCITIES, CONVEYANCE CHANNELS OR PUMPING SYSTEMS NEEDED TO CONVEY CONSTRUCTION STORMWATER TO BASINS AND DISCHARGE LOCATIONS PRIOR TO USE.
   - 5.5. DIVERT OFF-SITE WATER THROUGH THE PROJECT IN AN APPROPRIATE MANNER SO NOT TO DISTURB THE UPSTREAM OR DOWNSTREAM SOILS, VEGETATION OR HYDROLOGY BEYOND THE PERMITTED AREA.

6. PROTECT SLOPES:
   - 6.1. INTERCEPT AND DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM UNPROTECTED AND NEWLY ESTABLISHED AREAS AND SLOPES TO A STABILIZED OUTLET OR CONVEYANCE.
   - 6.2. CONSIDER HOW GROUNDWATER SEEPAGE ON CUT SLOPES MAY IMPACT SLOPE STABILITY AND INCORPORATE APPROPRIATE MEASURES TO MINIMIZE EROSION.
   - 6.3. CONVEY STORMWATER DOWN THE SLOPE IN A STABILIZED CHANNEL OR SLOPE DRAIN.
   - 6.4. THE OUTER FACE OF THE FILL SLOPE SHOULD BE IN A LOOSE RUFFLED CONDITION PRIOR TO TURF ESTABLISHMENT. TOPSOIL OR HUMUS LAYERS SHALL BE TRACKED UP AND DOWN THE SLOPE, DISKED, HARROWED, DRAGGED WITH A CHAIN OR MAT, MACHINE-RAKED, OR HAND-WORKED TO PRODUCE A RUFFLED SURFACE.

7. ESTABLISH STABILIZED CONSTRUCTION EXITS:
   - 7.1. INSTALL AND MAINTAIN CONSTRUCTION EXITS, ANYWHERE TRAFFIC LEAVES A CONSTRUCTION SITE ONTO A PUBLIC RIGHT-OF-WAY.
   - 7.2. SWEEP ALL CONSTRUCTION RELATED DEBRIS AND SOIL FROM THE ADJACENT PAVED ROADWAYS AS NECESSARY.

8. PROTECT STORM DRAIN INLETS:
   - 8.1. DIVERT SEDIMENT LADEN WATER AWAY FROM INLET STRUCTURES TO THE EXTENT POSSIBLE.
   - 8.2. INSTALL SEDIMENT BARRIERS AND SEDIMENT TRAPS AT INLETS TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE SYSTEM.
   - 8.3. CLEAN CATCH BASINS, DRAINAGE PIPES, AND CULVERTS IF SIGNIFICANT SEDIMENT IS DEPOSITED.
   - 8.4. DROP INLET SEDIMENT BARRIERS SHOULD NEVER BE USED AS THE PRIMARY MEANS OF SEDIMENT CONTROL AND SHOULD ONLY BE USED TO PROVIDE AN ADDITIONAL LEVEL OF PROTECTION TO STRUCTURES AND DOWN-GRADIENT SENSITIVE RECEPTORS.

9. SOIL STABILIZATION:
   - 9.1. WITHIN THREE DAYS OF THE LAST ACTIVITY IN AN AREA, ALL EXPOSED SOIL AREAS, WHERE CONSTRUCTION ACTIVITIES ARE COMPLETE, SHALL BE STABILIZED.
   - 9.2. IN ALL AREAS, TEMPORARY SOIL STABILIZATION MEASURES SHALL BE APPLIED IN ACCORDANCE WITH THE STABILIZATION REQUIREMENTS (SECTION 2.2) OF THE 2012 CGP. (SEE TABLE 1 FOR GUIDANCE ON THE SELECTION OF TEMPORARY SOIL STABILIZATION MEASURES.)
   - 9.3. EROSION CONTROL SEED MIX SHALL BE SOWN IN ALL INACTIVE CONSTRUCTION AREAS THAT WILL NOT BE PERMANENTLY SEEDED WITHIN TWO WEEKS OF DISTURBANCE AND PRIOR TO SEPTEMBER 15, OF ANY GIVEN YEAR, IN ORDER TO ACHIEVE VEGETATIVE STABILIZATION PRIOR TO THE END OF THE GROWING SEASON.
   - 9.4. SOIL TACKIFIERS MAY BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND REAPPLIED AS NECESSARY TO MINIMIZE SOIL AND MULCH LOSS UNTIL PERMANENT VEGETATION IS ESTABLISHED.

10. RETAIN SEDIMENT ON-SITE AND CONTROL DEWATERING PRACTICES:
    - 10.1. TEMPORARY SEDIMENT BASINS (CGP-SECTION 2.1.3.2) OR SEDIMENT TRAPS (ENV-WQ 1506.10) SHALL BE SIZED TO RETAIN, ON SITE, THE VOLUME OF A 2-YEAR 24-HOUR STORM EVENT FOR ANY AREA OF DISTURBANCE OR 3,600 CUBIC FEET OF STORMWATER RUNOFF PER ACRE OF DISTURBANCE, WHICHEVER IS GREATER. TEMPORARY SEDIMENT BASINS USED TO TREAT STORMWATER RUNOFF FROM AREAS GREATER THAN 5-ACRES OF DISTURBANCE SHALL BE SIZED TO ALSO CONTROL STORMWATER RUNOFF FROM A 10-YEAR 24 HOUR STORM EVENT. ON-SITE RETENTION OF THE 10-YEAR 24-HOUR EVENT IS NOT REQUIRED.
    - 10.2. CONSTRUCT AND STABILIZE DEWATERING INFILTRATION BASINS PRIOR TO ANY EXCAVATION THAT MAY REQUIRE DEWATERING.
    - 10.3. TEMPORARY SEDIMENT BASINS OR TRAPS SHALL BE PLACED AND STABILIZED AT LOCATIONS WHERE CONCENTRATED FLOW (CHANNELS AND PIPES) DISCHARGE TO THE SURROUNDING ENVIRONMENT FROM AREAS OF UNSTABILIZED EARTH DISTURBING ACTIVITIES.

11. ADDITIONAL EROSION AND SEDIMENT CONTROL GENERAL PRACTICES:
    - 11.1. USE TEMPORARY MULCHING, PERMANENT MULCHING, TEMPORARY VEGETATIVE COVER, AND PERMANENT VEGETATIVE COVER TO REDUCE THE NEED FOR DUST CONTROL. USE MECHANICAL SWEEPERS ON PAVED SURFACES WHERE NECESSARY TO PREVENT DUST BUILDUP. APPLY WATER, OR OTHER DUST INHIBITING AGENTS OR TACKIFIERS, AS APPROVED BY THE NHDES.
    - 11.2. ALL STOCKPILES SHALL BE CONTAINED WITH TEMPORARY PERIMETER CONTROLS. INACTIVE SOIL STOCKPILES SHOULD BE PROTECTED WITH SOIL STABILIZATION MEASURES (TEMPORARY EROSION CONTROL SEED MIX AND MULCH, SOIL BINDER) OR COVERED WITH ANCHORED TARPS.
    - 11.3. EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSPECTED IN ACCORDANCE WITH SECTION 645 OF NHDOT SPECIFICATIONS, WEEKLY AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.25 IN. OF RAIN PER 24-HOUR PERIOD. EROSION AND SEDIMENT CONTROL MEASURES WILL ALSO BE INSPECTED IN ACCORDANCE WITH THE GUIDANCE MEMO FROM THE NHDES CONTAINED WITHIN THE CONTRACT PROPOSAL AND THE EPA CONSTRUCTION GENERAL PERMIT.
    - 11.4. THE CONTRACTOR SHOULD UTILIZE STORM DRAIN INLET PROTECTION TO PREVENT SEDIMENT FROM ENTERING A STORM DRAINAGE SYSTEM PRIOR TO THE PERMANENT STABILIZATION OF THE CONTRIBUTING DISTURBED AREA.
    - 11.5. PERMANENT STABILIZATION MEASURES WILL BE CONSTRUCTED AND MAINTAINED IN LOCATIONS AS SHOWN ON THE CONSTRUCTION PLANS TO STABILIZE AREAS. VEGETATIVE STABILIZATION SHALL NOT BE CONSIDERED PERMANENTLY STABILIZED UNTIL VEGETATIVE GROWTH COVERS AT LEAST 85% OF THE DISTURBED AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR EROSION AND SEDIMENT CONTROL FOR ONE YEAR AFTER PROJECT COMPLETION.
    - 11.6. CATCH BASINS: CARE SHALL BE TAKEN TO ENSURE THAT SEDIMENTS DO NOT ENTER ANY EXISTING CATCH BASINS DURING CONSTRUCTION. THE CONTRACTOR SHALL PLACE TEMPORARY STONE INLET PROTECTION OVER INLETS IN AREAS OF SOIL DISTURBANCE THAT ARE SUBJECT TO SEDIMENT CONTAMINATION.
    - 11.7. TEMPORARY AND PERMANENT DITCHES SHALL BE CONSTRUCTED, STABILIZED AND MAINTAINED IN A MANNER THAT WILL MINIMIZE SCOUR. TEMPORARY AND PERMANENT DITCHES SHALL BE DIRECTED TO DRAIN TO SEDIMENT BASINS OR STORM WATER COLLECTION AREAS.
    - 11.8. WINTER EXCAVATION AND EARTHWORK ACTIVITIES NEED TO BE LIMITED IN EXTENT AND DURATION, TO MINIMIZE POTENTIAL EROSION AND SEDIMENTATION IMPACTS. THE AREA OF EXPOSED SOIL SHALL BE LIMITED TO ONE ACRE, OR THAT WHICH CAN BE STABILIZED AT THE END OF EACH DAY UNLESS A WINTER CONSTRUCTION PLAN, DEVELOPED BY A QUALIFIED ENGINEER OR A CPESC SPECIALIST, IS REVIEWED AND APPROVED BY THE DEPARTMENT.
    - 11.9. CHANNEL PROTECTION MEASURES SHALL BE SUPPLEMENTED WITH PERIMETER CONTROL MEASURES WHEN THE DITCH LINES OCCUR AT THE BOTTOM OF LONG FILL SLOPES. THE PERIMETER CONTROLS SHALL BE INSTALLED ON THE FILL SLOPE TO MINIMIZE THE POTENTIAL FOR FILL SLOPE SEDIMENT DEPOSITS IN THE DITCH LINE.

BEST MANAGEMENT PRACTICES (BMP) BASED ON AMOUNT OF OPEN CONSTRUCTION AREA

12. STRATEGIES SPECIFIC TO OPEN AREAS LESS THAN 5 ACRES:
    - 12.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500: ALTERATION OF TERRAIN FOR CONSTRUCTION AND USE ALL CONVENTIONAL BMP STRATEGIES.
    - 12.2. SLOPES STEEPER THAN 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING.
    - 12.3. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT ALONE.
    - 12.4. AREAS WHERE HAUL ROADS ARE CONSTRUCTED AND STORMWATER CANNOT BE TREATED THE DEPARTMENT WILL CONSIDER INFILTRATION.
    - 12.5. FOR HAUL ROADS ADJACENT TO SENSITIVE ENVIRONMENTAL AREAS OR STEEPER THAN 5%, THE DEPARTMENT WILL CONSIDER USING EROSION STONE, CRUSHED GRAVEL, OR CRUSHED STONE BASE TO HELP MINIMIZE EROSION ISSUES.
    - 12.6. ALL AREAS THAT CAN BE STABILIZED SHALL BE STABILIZED PRIOR TO OPENING UP NEW TERRITORY.
    - 12.7. DETENTION BASINS SHALL BE DESIGNED AND CONSTRUCTED TO ACCOMMODATE A 2 YEAR STORM EVENT.

13. STRATEGIES SPECIFIC TO OPEN AREAS BETWEEN 5 AND 10 ACRES:
    - 13.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES WILL BE UTILIZED.
    - 13.2. DETENTION BASINS WILL BE CONSTRUCTED TO ACCOMMODATE THE 2-YEAR 24-HOUR STORM EVENT AND CONTROL A 10-YEAR 24-HOUR STORM EVENT.
    - 13.3. SLOPES STEEPER THAN A 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS. OTHER ALTERNATIVE MEASURES, SUCH AS BONDED FIBER MATRIXES (BFMS) OR FLEXIBLE GROWTH MEDIUMS (FGMS) MAY BE UTILIZED, IF MEETING THE NHDES APPROVALS AND REGULATIONS.
    - 13.4. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS.

14. STRATEGIES SPECIFIC TO OPEN AREAS OVER 10 ACRES:
    - 14.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES AND BETWEEN 5 AND 10 ACRES WILL BE UTILIZED.
    - 14.2. THE DEPARTMENT ANTICIPATES THAT SOIL BINDERS WILL BE NEEDED ON ALL SLOPES STEEPER THAN 3:1, IN ORDER TO MINIMIZE EROSION AND REDUCE THE AMOUNT OF SEDIMENT IN THE STORMWATER TREATMENT BASINS.
    - 14.3. THE CONTRACTOR WILL BE REQUIRED TO HAVE AN APPROVED DESIGN IN ACCORDANCE WITH ENV-WQ 1506.12 FOR AN ACTIVE FLOCCULANT TREATMENT SYSTEM TO TREAT AND RELEASE WATER CAPTURED IN STORM WATER BASINS. THE CONTRACTOR SHALL ALSO RETAIN THE SERVICES OF AN ENVIRONMENTAL CONSULTANT WHO HAS DEMONSTRATED EXPERIENCE IN THE DESIGN OF FLOCCULANT TREATMENT SYSTEMS. THE CONSULTANT WILL ALSO BE RESPONSIBLE FOR THE IMPLEMENTATION AND MONITORING OF THE SYSTEM.

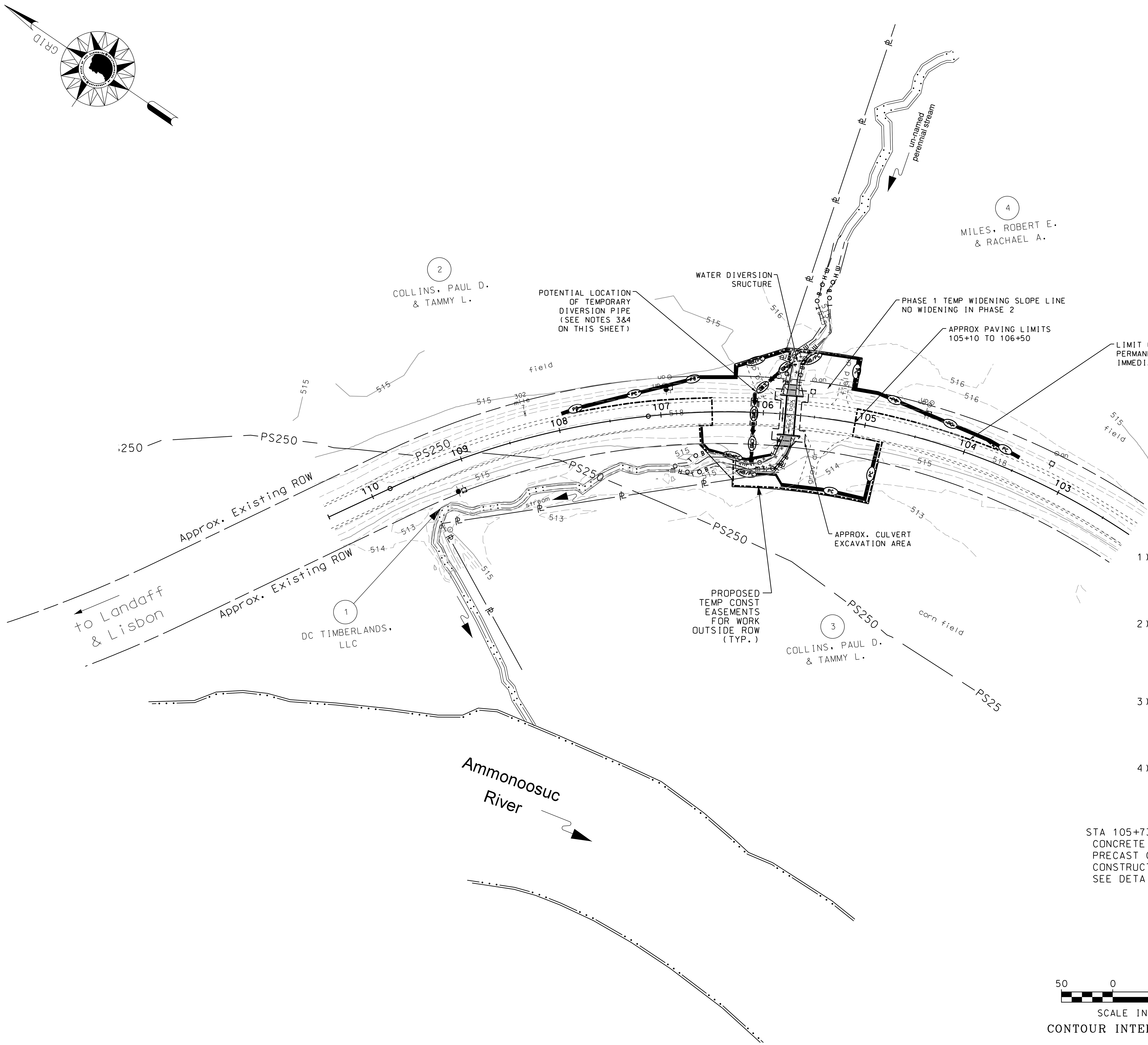
TABLE 1
GUIDANCE ON SELECTING TEMPORARY SOIL STABILIZATION MEASURES

APPLICATION AREAS	DRY MULCH METHODS				HYDRAULICALLY APPLIED MULCHES[2]				ROLLED EROSION CONTROL BLANKETS[3]			
	HMT	WC	SG	CB	HM	SMM	BFM	FRM	SNSB	DNSB	DNSCB	DNCB
SLOPES[1]												
STEEPER THAN 2:1	NO	NO	YES	NO	NO	NO	NO	YES	NO	NO	NO	YES
2:1 SLOPE	YES[1]	YES[1]	YES	YES	NO	NO	YES	YES	NO	YES	YES	YES
3:1 SLOPE	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	NO
4:1 SLOPE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
WINTER STABILIZATION	4T/AC	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES
CHANNELS												
LOW FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES
HIGH FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES

ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE
HMT	HAY MULCH & TACK	HM	HYDRAULIC MULCH	SNSB	SINGLE NET STRAW BLANKET
WC	WOOD CHIPS	SMM	STABILIZED MULCH MATRIX	DNSB	DOUBLE NET STRAW BLANKET
SG	STUMP GRINDINGS	BFM	BONDED FIBER MATRIX	DNSCB	2 NET STRAW-COCONUT BLANKET
CB	COMPOST BLANKET	FRM	FIBER REINFORCED MEDIUM	DNCB	2 NET COCONUT BLANKET

NOTES:
1. ALL SLOPE STABILIZATION OPTIONS ASSUME A SLOPE LENGTH ≤10 TIMES THE HORIZONTAL DISTANCE COMPONENT OF THE SLOPE, IN FEET.
2. PRODUCTS CONTAINING POLYACRYLAMIDE (PAM) SHALL NOT BE APPLIED DIRECTLY TO OR WITHIN 100 FEET OF ANY SURFACE WATER WITHOUT PRIOR WRITTEN APPROVAL FROM THE NH DEPARTMENT OF ENVIRONMENTAL SERVICES.
3. ALL EROSION CONTROL BLANKETS SHALL BE MADE WITH WILDLIFE FRIENDLY BIODEGRADABLE NETTING.

STATE OF NEW HAMPSHIRE				
BATH				
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN				
EROSION CONTROL STRATEGIES				
REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
12-21-2015	43247erosstrat	43247	7	8



EROSION CONTROL PLAN LEGEND

PC	PERIMETER CONTROL SILT FENCE EROSION CONTROL MIX BERM EROSION CONTROL MIX SOX TURBIDITY CURTAIN SHEET PILE COFFER DAM
NB/PC	NATURAL BUFFER/PERIMETER CONTROL SILT FENCE EROSION CONTROL MIX BERM EROSION CONTROL MIX SOX TURBIDITY CURTAIN SHEET PILE COFFER DAM
CP	CHANNEL PROTECTION STONE CHECK DAMS STRAW WATTLES CHANNEL MATTING CLASS D EROSION STONE CLASS C STONE
CWB	CLEAN WATER BYPASS PUMP THROUGH PIPE DRAIN THROUGH PIPE OR CHANNEL

GENERAL NOTES:

1) Limits of temporary disturbance are based on construction of the culvert half at a time while maintaining one lane of traffic through the work area. All areas of temporary disturbance shall be restored to existing grade.

2) A Cofferdam Item will be included in the Contract for support of the road and if necessary for support of the excavation and control of groundwater. Sediment bags for dewatering may be placed between the edge of pavement and the ROW, with appropriate separation from wetlands.

3) A Water Diversion Item will be included in the Contract for managing surface water. Stream flow shall be passed through the work area by an approved method. At a minimum, the Water Diversion shall be designed to accommodate a 2 year storm.

4) Cofferdam, dewatering, and water diversion details are designed by the Contractor and submitted to NHDOT for approval.

SCOPE OF WORK:

STA 105+73.7: REPLACE EXISTING 6' WIDE X 3' HIGH X 40' LONG CONCRETE BOX CULVERT WITH 9' WIDE X 3' CLEAR HEIGHT X 40' LONG PRECAST CONCRETE BOX CULVERT, EMBEDDED 12" BELOW STREAMBED. CONSTRUCT STRAIGHT CONCRETE HEADWALLS AT BOTH ENDS. SEE DETAIL FOR MATCHING NEW CULVERT TO EXISTING STREAM CHANNEL.

SEE PROFILE FOR CULVERT SLOPE AND INVERTS

50 0 50 100
SCALE IN FEET
CONTOUR INTERVAL 1 FOOT

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

SDR PROCESSED SEL DATE 6/2021
NEW DESIGN JJN DATE 10/2021
SHEET CHECKED CAC DATE 12/29/21
AS BUILT DETAILS DATE

STATE OF NEW HAMPSHIRE
BATH
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

EROSION CONTROL PLAN

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
43247ercplans	43247	8	8