STATE OF NEW HAMPSHIRE
INTER-DEPARTMENT COMMUNICATION

DATE: September 18, 2019

FROM: Andrew O'Sullivan
Wetlands Program Manager

AT (OFFICE): Department of Transportation

Bureau of Environment

SUBJECT Dredge & Fill Application
Shelburne, 42426

TO Craig Rennie, Inland Wetlands Supervisor
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 per Env-Wt 303.02(p). The project is located on US Route 2 in the Town of Shelburne, NH. The proposed work consists of replacing a hybrid 72" cmp / box culvert with a 5' high x 8' wide x 60' long precast concrete box embedded 12".

This project was reviewed at the Natural Resource Agency Coordination Meeting on June 19, 2019. 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

Mitigation was coordinated with Lori Sommer. Included is the correspondence. It was determined that the project would meet Env-Wt 904.07(c) so no mitigation would be required.

The lead people to contact for this project are Kirk Mudgett, Bureau of Highway Design (271-2731 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 #581463) in the amount of $334.20.

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:sel
Enclosures

cc:
BOE Original
Town of Shelburne (4 copies via certified mail)
David Trubey, NH Division of Historic Resources (Cultural Review Within)
Bureau of Construction
Carol Henderson, NH Fish & Game (via electronic notification)
Maria Tur, US Fish & Wildlife (via electronic notification)
Mark Kern, US Environmental Protection Agency (via electronic notification)
Michael Hicks, US Army Corp of Engineers (via electronic notification)
Kevin Nyhan, BOE (via electronic notification)

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New Hampshire DOT

US ROUTE 2 OVER KIDDER BROOK

Culvert Replacement

NH Standard Dredge & Fill Application

Shelburne
X-A004(842)
42426

September 2019

CONTENTS

NHDES Wetlands Permit Application Form

NHDES-W-06-012

WETLANDS PERMIT APPLICATION

Water Division/ Wetlands Bureau

Land Resources Management

Check the status of your application: www.des.nh.gov/onestop

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

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

1. REVIEW TIME: Indicate your Review Time below. To determine review time, refer to Guidance Document A for instructions.

☒ Standard Review (Minimum, Minor or Major Impact) ☐ Expedited Review (Minimum Impact only)

2. MITIGATION REQUIREMENT:

If mitigation is required, a Mitigation-Pre Application meeting must occur prior to submitting this Wetlands Permit Application. To determine if mitigation is required, please refer to the Determine if Mitigation is Required Frequently Asked Questions.

Mitigation Pre-Application Meeting Date: Month: __ Day: __ Year: ____

☒ N/A - Mitigation is not required

3. PROJECT LOCATION:

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

ADDRESS: **US Route 2** TOWN/CITY: **Shelburne**

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

USGS TOPO MAP WATERBODY NAME: **Kidder Brook** ☐ NA STREAM WATERSHED SIZE: **0.45 aq mi** ☐ NA

LOCATION COORDINATES (If known): **44.387354, -71.139135** ☒ Latitude/Longitude ☐ UTM ☐ State Plane

4. PROJECT DESCRIPTION:

Provide a brief description of the project outlining the scope of work. Attach additional sheets as needed to provide a detailed explanation of your project. DO NOT reply "See Attached" in the space provided below.

The project involves the replacement of a 72" cmp / box culvert carrying Kidder Brook under US Route 2. The concrete outlet segment is perched about 5'. The proposed replacement structure is a 5' high x 8' wide x 60' long precast concrete box culvert, embedded 12" with stream simulation, and precast headwalls and wing walls. The perched area at the outlet and scour holes in the existing bed will be repaired to subgrade elevations prior to placing simulated streambed material.

5. SHORELINE FRONTAGE:

☒ N/A This does not have shoreline frontage. SHORELINE FRONTAGE:

Shoreline Frontage is calculated by determining the average of the distances of the actual natural navigable shoreline frontage and a straight line drawn between the property lines, both of which are measured at the normal high water line (Env-Wt 101.89).

6. RELATED NHDES LAND RESOURCES MANAGEMENT PERMIT APPLICATIONS ASSOCIATED WITH THIS PROJECT:

Please indicate if any of the following permit applications are required and, if required, the status of the application.

To determine if other Land Resources Management Permits are required, refer to the Land Resources Management Webpage.

Permit Type	Permit Required	File Number	Permit Application Status
Alteration of Terrain Permit Per RSA 485-A:17	☐ YES ☒ NO	____	☐ APPROVED ☐ PENDING ☐ DENIED
Individual Sewerage Disposal per RSA 485-A:2	☐ YES ☒ NO	____	☐ APPROVED ☐ PENDING ☐ DENIED
Subdivision Approval Per RSA 485-A	☐ YES ☒ NO	____	☐ APPROVED ☐ PENDING ☐ DENIED
Shoreland Permit Per RSA 483-B	☐ YES ☒ NO	____	☐ APPROVED ☐ PENDING ☐ DENIED

7. NATURAL HERITAGE BUREAU & DESIGNATED RIVERS:

See the Instructions & Required Attachments document for instructions to complete a & b below.

a. Natural Heritage Bureau File ID: NHB **19**___- **1230**___.

b. ☐ This project is within a Designated River corridor. The project is within ¼ mile of: _____; and date a copy of the application was sent to the Local River Management Advisory Committee: Month: __ Day: __ Year: ____

☒ N/A – This project is not within a Designated River corridor.

8. APPLICANT INFORMATION (Desired permit holder)

LAST NAME, FIRST NAME, M.I.: **NH Dept. of Transportation**			
TRUST / COMPANY NAME:**NH Dept of Transportation**	MAILING ADDRESS: **PO Box 483**		
TOWN/CITY: **Concord**		STATE: **NH**	ZIP CODE: **03302**
EMAIL or FAX: **Kirk.Mudgett@dot.nh.gov**	PHONE: **603-271-1598**		
ELECTRONIC COMMUNICATION: By initialing here: _____, I hereby authorize NHDES to communicate all matters relative to this application electronically.			

9. PROPERTY OWNER INFORMATION (If different than applicant)

LAST NAME, FIRST NAME, M.I.: **NH Dept. of Transportation**			
TRUST / COMPANY NAME:**NH Dept. of Transportation**	MAILING ADDRESS: **PO Box 483**		
TOWN/CITY: **Concord**		STATE: **NH**	ZIP CODE: **03302**
EMAIL or FAX: **Andrew.O'Sullivan@dot.nh.gov**	PHONE: **271-3226**		
ELECTRONIC COMMUNICATION: By initialing here **AO** , I hereby authorize NHDES to communicate all matters relative to this application electronically.			

10. AUTHORIZED AGENT INFORMATION

LAST NAME, FIRST NAME, M.I.: **Perron, Christine**	COMPANY NAME:**McFarland Johnson**		
MAILING ADDRESS: **53 Regional Drive**			
TOWN/CITY: **Concord**		STATE: **NH**	ZIP CODE: **03301**
EMAIL or FAX: **cperron@mjin.com**	PHONE: **225-2978**		
ELECTRONIC COMMUNICATION: By initialing here **CJP** , I hereby authorize NHDES to communicate all matters relative to this application electronically.			

11. PROPERTY OWNER SIGNATURE:

See the Instructions & Required Attachments document for clarification of the below statements

By signing the application, I am certifying that:

1. I authorize the applicant and/or agent indicated on this form to act in my behalf in the processing of this application, and to furnish upon request, supplemental information in support of this permit application.
2. I have reviewed and submitted information & attachments outlined in the Instructions and Required Attachment document.
3. All abutters have been identified in accordance with RSA 482-A:3, I and Env-Wt 100-900.
4. I have read and provided the required information outlined in Env-Wt 302.04 for the applicable project type.
5. I have read and understand Env-Wt 302.03 and have chosen the least impacting alternative.
6. Any structure that I am proposing to repair/replace was either previously permitted by the Wetlands Bureau or would be considered grandfathered per Env-Wt 101.47.
7. I have submitted a Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) to the NH State Historic Preservation Officer (SHPO) at the NH Division of Historical Resources to identify the presence of historical/ archeological resources while coordinating with the lead federal agency for National Historic Preservation Act (NHPA) 106 compliance.
8. I authorize NHDES and the municipal conservation commission to inspect the site of the proposed project.
9. I have reviewed the information being submitted and that to the best of my knowledge the information is true and accurate.
10. I understand that the willful submission of falsified or misrepresented information to the NHDES is a criminal act, which may result in legal action.
11. I am aware that the work I am proposing may require additional state, local or federal permits which I am responsible for obtaining.
12. The mailing addresses I have provided are up to date and appropriate for receipt of NHDES correspondence. NHDES will not forward returned

Property Owner Signature	**Kirk Mudgett, PE** Print name legibly	/ / Date

MUNICIPAL SIGNATURES

12. CONSERVATION COMMISSION SIGNATURE

The signature below certifies that the municipal conservation commission has reviewed this application, and:

1. Waives its right to intervene per RSA 482-A:11;
2. Believes that the application and submitted plans accurately represent the proposed project; and
3. Has no objection to permitting the proposed work.

⇨	Print name legibly	Date

DIRECTIONS FOR CONSERVATION COMMISSION

1. Expedited review ONLY requires that the conservation commission's signature is obtained in the space above.

2. Expedited review requires the Conservation Commission signature be obtained **prior** to the submittal of the original application to the Town/City Clerk for signature.

3. The Conservation Commission may refuse to sign. If the Conservation Commission does not sign this statement for any reason, the application is not eligible for expedited review and the application will be reviewed in the standard review time frame.

13. TOWN / CITY CLERK SIGNATURE

As required by Chapter 482-A:3 (amended 2014), 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.

⇨	Print name legibly	Town/City	Date

DIRECTIONS FOR TOWN/CITY CLERK:

Per RSA 482-A:3,I

1. For applications where "Expedited Review" is checked on page 1, if the Conservation Commission signature is not present, NHDES will accept the permit application, but it will NOT receive the expedited review time.

2. IMMEDIATELY sign the original application form and four copies in the signature space provided above;

3. 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.

4. 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; and

5. Retain one copy of the application form and one complete set of attachments and make them reasonably accessible for public review.

DIRECTIONS FOR APPLICANT:

1. Submit the single, 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.

14. IMPACT AREA:

For each jurisdictional area that will be/has been impacted, provide square feet and, if applicable, linear feet of impact.

Permanent: *impacts that will remain after the project is complete.*

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

Intermittent Streams: *linear footage distance of disturbance is measured along the thread of the channel.*

Perennial Streams/ Rivers: *the total linear footage distance is calculated by summing the lengths of disturbance to the channel and each bank.*

JURISDICTIONAL AREA	PERMANENT Sq. Ft. / Lin. Ft.		TEMPORARY Sq. Ft. / Lin. Ft.	
Forested wetland		☐ ATF		☐ ATF
Scrub-shrub wetland		☐ ATF		☐ ATF
Emergent wetland		☐ ATF		☐ ATF
Wet meadow		☐ ATF		☐ ATF
Intermittent stream channel	/	☐ ATF	/	☐ ATF
Perennial Stream / River channel	1,061 / 85	☐ ATF	237 / 22	☐ ATF
Lake / Pond	/	☐ ATF	/	☐ ATF
Bank - Intermittent stream	/	☐ ATF	/	☐ ATF
Bank - Perennial stream / River	352 / 134	☐ ATF	21 / 38	☐ ATF
Bank - Lake / Pond	/	☐ ATF	/	☐ ATF
Tidal water	/	☐ ATF	/	☐ ATF
Salt marsh		☐ ATF		☐ ATF
Sand dune		☐ ATF		☐ ATF
Prime wetland		☐ ATF		☐ ATF
Prime wetland buffer		☐ ATF		☐ ATF
Undeveloped Tidal Buffer Zone (TBZ)		☐ ATF		☐ ATF
Previously-developed upland in TBZ		☐ ATF		☐ ATF
Docking - Lake / Pond		☐ ATF		☐ ATF
Docking - River		☐ ATF		☐ ATF
Docking - Tidal Water		☐ ATF		☐ ATF
Vernal Pool		☐ ATF		☐ ATF
TOTAL	1,413 / 219		258 / 60	

15. APPLICATION FEE: See the Instructions & Required Attachments document for further instruction

☐ Minimum Impact Fee: Flat fee of $ 200

☒ Minor or Major Impact Fee: Calculate using the below table below

Permanent and Temporary (non-docking)	**1,671** sq. ft.	X $0.20 =	$ **334.20**
Temporary (seasonal) docking structure:	sq. ft.	X $1.00 =	$
Permanent docking structure:	sq. ft.	X $2.00 =	$
Projects proposing shoreline structures (including docks) add $200 =			$
		Total =	$ **334.20**
The Application Fee is the above calculated Total or $200, whichever is greater =			$ **334.20**

Location Map

NH DEPARTMENT OF TRANSPORTATION

SHELBURNE, 42426

LOCATION

SCALE :	DATE :	FIGURE :
AS SHOWN	JULY 2019	1

McFarland Johnson

Attachment A – 20 Questions

WETLANDS PERMIT APPLICATION – ATTACHMENT A
MINOR AND MAJOR - 20 QUESTIONS

Land Resources Management

Wetlands Bureau

Check the Status of your application: www.des.nh.gov/onestop

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

Env-Wt 302.04 Requirements for Application Evaluation - For any major or minor project, the applicant shall demonstrate by plan and example that the following factors have been considered in the project's design in assessing the impact of the proposed project to areas and environments under the department's jurisdiction. Respond with statements demonstrating:
1. The need for the proposed impact.
This project is needed to address the deterioration of a 72" cmp/box culvert carrying Kidder Brook underneath US Route 2. The culvert is severely deteriorated. Delaying the replacement increases the risk of structural failure and associated impacts such as road closure, sediment discharge into the stream, and additional impacts associated with a temporary repair. **A dry laid stone retaining wall along the outlet side west bank is failing, and there is an eroded area near the end of the wall that has the potential to destabilize the US 2 roadway embankment.**
2. That the alternative proposed by the applicant is the one with the least impact to wetlands or surface waters on site.
A fully compliant structure based on stream crossing requirements was considered, which would be an 18' span bridge. This option would have significantly larger temporary and permanent stream impacts, larger impacts to adjacent private property and the travelling public, and a much larger financial commitment which the programmed funds can't support.

3. The type and classification of the wetlands involved.

The resources that will be impacted are Kidder Brook and its banks.

R3UB1, BANK

4. The relationship of the proposed wetlands to be impacted relative to nearby wetlands and surface waters.

The impacts include the bank and channel of Kidder Brook. There are no adjacent wetlands or surface waters. The culvert outlet is about 1,800' upstream of the Androscoggin River.

5. The rarity of the wetland, surface water, sand dunes, or tidal buffer zone area.

Kidder Brook is typical of streams found in this region. There are no exemplary natural communities or prime wetlands in the project area.

6. The surface area of the wetlands that will be impacted.

The project will result in 1,413 sq ft (219 linear feet) of permanent impacts and 258 sq ft (60 linear feet) of temporary impacts to the channel and banks of Kidder Brook.

7. The impact on plants, fish and wildlife including, but not limited to:
   a. Rare, special concern species;
   b. State and federally listed threatened and endangered species;
   c. Species at the extremities of their ranges;
   d. Migratory fish and wildlife;
   e. Exemplary natural communities identified by the DRED-NHB; and
   f. Vernal pools.

There are no state rare or special concern species located within the project area, therefore, the project will not result in impacts to rare species. Two federally listed species were identified as potentially occuring within the project area; the federally threatened northern long-eared bat (NLEB, Myotis septentrionalis) and the federally threatened Canada lynx (Lynx canadensis). There is no suitable habitat for lynx in the project area and this species is not expected to be found in the vicinity of the project. A bridge assessment was performed in May to determine the presence of bats within the structure. No sign of bats was observed during the assessmnet. However, the project includes approximately 0.07 acre of tree clearing during active bat season; therefore, it was determined the project may affect, and is likely to adversly affect NLEB. The USFWS confirmed that the project's effects are consistent with those analyzed in the Programmatic BO. The USFWS concurs that the project is not likely to jeopardize the continued existence of the northern long-eared bat

Consultation with NH Fish and Game indicated that stream surveys from surrounding streams/brooks in 2018 indicated the presence of blacknose dace, creek chub, slimy sculpin, and wild brook trout. The proposed project is intended to improve fish passage as the existing culvert is perched by approximately 5ft making it impassable for fish. The project design has been coordinated with NH Fish and Game, and questions and comments on the design have been addressed.

The NH Natural Heritage Bureau review indicated there is a Sugar maple-silver maple-white ash floodplain forest downstream of the project area. The proposed project will not impact this natural community.

There are no vernal pools in the project area.

8. The impact of the proposed project on public commerce, navigation and recreation.

The project will have a temporary impact to public commerce due to delays associated with traffic control. There will be no permanent impact to public commerce.

There will be no impact to navigation since the existing stream is too small to be navigable.

Acccess to the stream (within the work area) will be restricted during construction (about 2 month duration). There will be no permanent impact to potential recreational uses.

Best Management Practices (BMPs) will be used during construction to minimize any downstream water quality impacts.

9. The extent to which a project interferes with the aesthetic interests of the general public. For example, where an applicant proposes the construction of a retaining wall on the bank of a lake, the applicant shall be required to indicate the type of material to be used and the effect of the construction of the wall on the view of other users of the lake.

The proposed culvert replacement will not interfere with the aesthetic interest of the general public. Post construction conditions will be similar to existing conditions and no adverse visual impacts are anticipated.

Some vegetation clearing will be required for construction access and staging at the culvert inlet and outlet. This will result in temporary visual impact. Clearing areas are as follows:

Inlet side, west of brook = 475 SF

Inlet side, east of brook = 450 SF

Outlet side, west of brook = 700 SF

Outlet side, east of brook = 2,000 SF

Project Total = 3,625 sf

10. The extent to which a project interferes with or obstructs public rights of passage or access. For example, where the applicant proposes to construct a dock in a narrow channel, the applicant shall be required to document the extent to which the dock would block or interfere with the passage through this area.

The project will have no permanent impact to public rights of passage or access. There will be temporary impacts to traffic and access to areas of the stream within the work area will be restricted.

11. The impact upon abutting owners pursuant to RSA 482-A:11, II. For example, if an applicant is proposing to rip-rap a stream, the applicant shall be required to document the effect of such work on upstream and downstream abutting properties.

The project will not have a significant permanent effect on abutters. The majority of the work is within the existing ROW, stream banks, and undeveloped forest. Permanent drainage easements are proposed at the culvert inlet and outlet, and temporary construction easements will be acquired for access to areas outside the ROW. The proposed work will not change off site flow conditions or water levels, other than lowering high flow event water elevations on the inlet side of the culvert.

12. The benefit of a project to the health, safety, and well being of the general public.

The existing culvert is severely deteriorated and will eventually fail, causing potential harm to the general public. The proposed box culvert will allow for safe passage over Kidder Brook and the proposed guardrail will improve safety for the traveling public.

13. The impact of a proposed project on quantity or quality of surface and ground water. For example, where an applicant proposes to fill wetlands the applicant shall be required to document the impact of the proposed fill on the amount of drainage entering the site versus the amount of drainage exiting the site and the difference in the quality of water entering and exiting the site.

The project will not result in any changes in impervious surface or flood storage capacity, so no changes in the quantity or quality of stormwater runoff are anticipated. No changes to existing drainage flow patterns are proposed. The proposed culvert replacement will not have an effect on the surface or ground water within the project area.

Temporary impacts to water quality during construction will be minimized through the use of erosion and sedimentation controls.

14. The potential of a proposed project to cause or increase flooding, erosion, or sedimentation.

The proposed project will not increase flooding, erosion, or sedimentation. The proposed box cluvert will have a significant increase in capacity, lower headwater depths, and lower outlet velocity. Sediment transport capacity will be similar to that of the upstream and downstream channels.

15. The extent to which a project that is located in surface waters reflects or redirects current or wave energy which might cause damage or hazards.

The streams in the project area are relatively small and the project is not expected to alter current or wave energy.

16. The cumulative impact that would result if all parties owning or abutting a portion of the affected wetland or wetland complex were also permitted alterations to the wetland proportional to the extent of their property rights. For example, an applicant who owns only a portion of a wetland shall document the applicant's percentage of ownership of that wetland and the percentage of that ownership that would be impacted.

Temporary and permanent impacts are limited to relatively small areas on each end of the culvert, as well as areas for construction stagging and access. Cumulative impacts that would result from abutting property owner actions would likely not be substantial if the abutters impacts were also limited to small temporary and permanent impacts for the rehabilitation or replacement of existing structures.

17. The impact of the proposed project on the values and functions of the total wetland or wetland complex.

The project will result in a net benefit to the values and functions of Kidder Brook due to the substantial improvement to stream connectivity that is proposed.

18. The impact upon the value of the sites included in the latest published edition of the National Register of Natural Landmarks, or sites eligible for such publication.

No such sites are located near the project.

19. The impact upon the value of areas named in acts of congress or presidential proclamations as national rivers, national wilderness areas, national lakeshores, and such areas as may be established under federal, state, or municipal laws for similar and related purposes such as estuarine and marine sanctuaries.

No such areas are located near the project.

20. The degree to which a project redirects water from one watershed to another.

The project will not make any changes that would redirect water from one watershed to another.

Additional comments

Supplemental Project Description

CULVERT REHABILITATION

US ROUTE 2 OVER KIDDER BROOK

SHELBURNE, NH

NHDOT PROJECT NO. 42426

SUPPLEMENTAL NARRATIVE

Project Description

The project involves the replacement of a 72" cmp / box culvert carrying Kidder Brook under US Route 2. Location is approximately 1.05 miles east of the Gorham/Shelburne Town Line. The culvert crosses under US 2 at Sta 102+81.6. Incidental work will include repair of scoured/eroded areas downstream of the culvert outlet, replacement of a dry laid stone retaining wall at the outlet with a stone lined slope, and installation of guardrail on the outlet side.

The project is funded under the Federal Culvert Rehabilitation Program. The proposed Advertising date is 2/11/2020, with construction anticipated in summer of 2020.

Existing Conditions

US Route 2 is classified as a Tier 2 roadway (Statewide Corridor), with average annual daily traffic of 3,281 vehicles (2018). It is one of 3 principle east/west routes in northern part of the State, carrying a significant volume of commuter, tourism, and commercial traffic.

The crossing is a Tier 2 stream based on a drainage area of 0.45 sq miles (286 acres). The culvert outlet is about 1,800’ upstream of the Androscoggin River. There is a railroad culvert (size/type unknown) about 400’ downstream of the culvert outlet.

The existing culvert is 50’ long consisting of 10 LF of 72” cmp at the inlet, 6 LF of 5’ x 5’ stone box, 16 LF of 60” cmp, and 18 LF of variable dimension concrete box (max size 6’ wide x 6.5’ high at the outlet). The culvert is at a slight skew (about 8 degrees) relative to US 2. There are large dry laid stones around the existing 72” cmp inlet, extending about 20’ upstream on each bank. Average slope through the structure is 4.5%. The concrete box portion of the culvert was constructed in 1931. No plans were found for the various extensions/transitions.

The existing cmp and stone segments are in poor condition, with severe deterioration and voids which have caused sinkholes in the roadway. The concrete outlet segment is severely undermined and perched about 5’. The downstream channel has experienced significant erosion. A dry laid stone retaining wall (35’ long) along the east bank is failing.

NHDOT Highway Maintenance District 1 indicated no history of flooding at this location, except for an October 2017 event that overtopped US2. The adjacent property owner (White Birches Campground) confirmed that the culvert has overtopped only once in his 40+ year memory, in October 2017 due to debris blockage.

The upstream channel bed width varies from 6' – 10', with a cobble/gravel substrate and some large boulders. Average slope is about 4%. Banks have moderate to steep slopes, vegetated with a mix of small to large trees. There is evidence of significant erosion of fine bed material, with only larger gravel and cobbles visible on the surface. The area adjacent to the east bank is undeveloped forest. The area adjacent to the west bank is White Birches Campground, with various buildings, grass areas, and paved and gravel roads. There is at least a 20' forested buffer between the developed area and the top of bank.

The downstream channel bends sharply right at the culvert outlet. Channel bed width varies from 4' – 12', with a cobble/gravel substrate and some large boulders and finer sediment deposits. Slope in the vicinity of the culvert outlet varies from near 0% in the perched area to about 45% just downstream. Slope farther downstream varies from 6% to 10%. The 1931 project that constructed the box showed the outlet channel match sloped at 24%. Banks have steep to very steep slopes, vegetated with a mix of small to large trees. There is evidence of minor surface erosion in very steep bank areas and a slope failure (approximately 20' x 20') at the end of the dry laid retaining wall (Sta 103+25, Lt 50'). The area adjacent to the east bank is undeveloped forest. The area adjacent to the west bank is White Birches Campground, with a gravel access road, maintenance building, and some camps sites. Forested buffer between the developed area and the top of bank varies from 10' near the culvert outlet to at least 50' farther downstream.

NHDOT's consultant, McFarland Johnson, Inc., completed a Stream Assessment in May 2019, the results of which are included in this application. At the location of the crossing and the upstream reference reach, Kidder Brook is a moderately entrenched Type A/B stream.

Hydrology / Hydraulics

USGS Streamstats estimated the drainage area at 0.32 sq mi (205 acres). LIDAR data from UNH GRANIT was used to generate contours and check the drainage boundary. A significant difference was found along the southwest boundary, resulting in a revised drainage area of 0.45 sq miles (286 acres). The majority of the watershed is steep undeveloped forest, mostly within the White Mountain National Forest. About 16 ac is US 2, adjacent campground, residential development, and a gas pipeline ROW.

Streamstats runoff predictions using an approximate revised boundary were Q50 = 130 cfs and Q100 = 160 cfs. Stream slope and drainage area are outside the Streamstats study range, so results were not used.

FHWA Regression Method (FHWA-RD-77) predicts Q50 between 191 – 238 cfs and Q100 between 221 and 276 cfs. SCS Method (Hydrocadd) predicts Q50 between 214 – 235 cfs and Q100 between 277 and 346 cfs.

Design Flows were set at Q50 = 225 cfs and Q100 = 300 cfs.

Existing hydraulic capacity is about 200 cfs, just prior to overtopping US2 (El 784.5, Headwater depth 6.4'). Excess flow will overtop US 2 in a localized area (Sta 101+40 to Sta 102+20) and

would not return to the downstream channel until reaching the railroad embankment approximately 400’ downstream of the culvert outlet.

Proposed Design

The proposed replacement structure is a 5’ high x 8’ wide (clear opening) x 60’ long precast concrete box culvert, embedded 12” with stream simulation, and precast headwalls and wing walls. The new culvert will be about 6’ longer on the inlet end and 4’ longer on the outlet end. The proposed 60’ culvert length was selected to accommodate two 12’ travel lanes, potential future 4’ shoulders, and the potential for a future raise in the profile grade of US 2 (the existing US 2 vertical curves at this location are sub-standard, resulting in reduced sight distance for mainline traffic and adjacent access points). The proposed culvert alignment and slope will be similar to the existing culvert, at 11 degree skew relative to US 2 and 4% slope.

The proposed culvert will pass Q50 with headwater below the top of box (4.1’ HW depth vs 5’ clear height) and Q100 with headwater about 0.9’ below the adjacent campground driveway and 1 foot below the lowest US 2 edge of pavement elevation (5.2’ HW depth); therefore, no abutters will be flooded and the roadway will not be flooded/ overtopped.

Concrete grade controls are proposed every 8’ along the bottom of the box. Grade controls will be V shaped to ensure a defined thalweg and to maximize water depth during periods of low flow. Height will vary from 12” at the culvert sides to 8” in the center. Simulated streambed material will be placed in the space between the grade controls. In the event streambed material is scoured out of the culvert, grade controls will provide a minimum pool depth of 5” and a maximum jump height of 3” to the next upstream pool.

The channel reconstruction on the inlet side will extend 25’ upstream, at approximately 10% slope. The channel bed width will transition from 8’ wide at the culvert inlet to approximately 6’ wide at the match point. Simulated streambed material, 24” nominal thickness, with a V shaped bottom, will be used for reconstructed portions of the bed. Channel bank slopes will vary from 2:1 to 3:1. Existing stone bank protection will be reset along the banks in the area of the wing walls, up to 5’ above the channel bottom. Areas more than 5’ above the channel bottom will be stabilized with humus, seed, mulch, and erosion control blanket and will be allowed to re-vegetate naturally.

The channel reconstruction on the outlet side will extend 48’ downstream, at approximately 26% slope. The channel bed width will transition from 8’ wide at the culvert inlet to approximately 9.5’ wide at the match point. Simulated streambed material, 24” nominal thickness, will be used for reconstructed portions of the bed, with the same V shaped bottom described above. The perched area at the outlet and scour holes in the existing bed will be repaired to subgrade elevations prior to placing simulated streambed material. Boulders will be placed randomly in the bed to dissipate energy and encourage a meandering thalweg.

Channel bank slopes on the west side will vary from 2:1 near the wings to 3:1 farther downstream. Stone armor will be placed up to 5’ above the channel bottom to prevent erosion. Areas more than 5’ above the channel bottom will be stabilized with humus, seed, mulch, and

erosion control blanket and will be allowed to re-vegetate naturally. On the east side, the dry laid stone retaining wall will be removed and partially replaced by the culvert wing wall. The eroded area will be repaired. Channel bank slope on the east side will 1.5:1, stabilized with a 2' thick layer of Class B Stone Fill.

Stream Simulation

FHWA's HY-8 Culvert Analysis Program was used for stream simulation design. The program evaluates water depths, velocities, and channel stability at upstream and downstream of the crossing and compares the results to depths, velocities, and bed stability within the culvert. Stream cross sections used were at 25', 100', and 197' upstream and 10', 50', and 200' downstream of the proposed culvert ends. Pebble counts from the stream assessment were used to determine existing streambed substrate gradation and a representative design gradation for the simulated streambed material. The Program uses "Low, High, and Peak" flows to evaluate the design. Streamstats 2 year 7 day low flow prediction (for a 0.49 sq mile area) was about 0.03 cfs. Low flow was set to the minimum 1 cfs allowed by the Program. High flow was estimated at 10 cfs. Peak flow was set at the 50 year design flow of 225 cfs.

Note that in the HY-8 results provided, the minimum acceptable embedment depth is over 3 feet, which is not practical. Changing to 12" embedment within the culvert does not change the hydraulic calculations for depth, velocity, or erosive force used by the Program to evaluate stability, velocity, and depth.

Natural Resource Agency Coordination Meeting Minutes

53 Regional Drive
Concord, NH 03313

Tel: (603) 225-2978
Fax: (603) 225-0095

McFARLAND JOHNSON
Established 1946

MEETING NOTES

PROJECT: Shelburne 42426
(MJ Project No: 18340.06)

DATE OF MEETING: June 19, 2019

LOCATION: NHDOT Bureau of Environment Conference Room

SUBJECT: NHDOT Natural Resource Agency Coordination Meeting – DRAFT minutes

PROJECT REPRESENTATIVES:

NHDOT: Chris Carucci

MJ: Christine Perron

NOTES ON MEETING:

Chris Carucci introduced the project. This is a culvert replacement project funded under the Federal Culvert Rehabilitation Program. The proposed advertising date is 2/11/2020, with construction anticipated in summer of 2020.

The culvert location is about 1.05 miles east of the Gorham Town Line and carries Kidder Brook under US Route 2. Kidder Brook is a Tier 2 perennial stream. The culvert outlet is about 1,800' upstream of the Androscoggin River. There is a railroad culvert about 400' downstream of the culvert outlet. The size of this culvert is unknown.

The existing culvert is 50' long consisting of 10 LF of 72" cmp at the inlet, 6 LF of 5' x 5' stone box, 16 LF of 60" cmp, and 18 LF of variable dimension concrete box (max size 6' wide x 6.5' high at the outlet). The average slope through the structure is 4.5%.

The concrete box portion of the structure was constructed in 1931. The existing cmp and stone segments are in poor condition, with severe deterioration and voids that have caused sinkholes in the roadway. The concrete outlet segment is severely undermined and perched about 5 feet. The downstream channel has experienced significant erosion. A dry laid stone retaining wall (35' long) along the east bank is failing.

The StreamStats watershed area is 0.32 sq mi (204.8 ac). However, LIDAR (2017) gives a drainage area of 286 ac (0.45 sq mi). The FHWA Regression Method predicts a Q50 between 191 and 238 cfs and Q100 between 221 and 276 cfs. The SCS Method (Hydrocadd) predicts a Q50 between 214 and 235 cfs and Q100 between 277 and 346 cfs. Based on these results, the design flow has been set at 225 cfs for Q50 and 300 cfs for Q100. Existing hydraulic capacity is about 200 cfs, just prior to overtopping US2. Excess flow will overtop US 2 in a localized area and would not return to the downstream channel until reaching the railroad embankment. The NHDOT Maintenance District does not have any knowledge of flooding at this location, except for an October 2017 event that overtopped US2. The adjacent property

owner (White Birches Campground) confirmed that the culvert has overtopped only once, in October 2017 due to debris blockage.

Christine Perron provided an overview of resources. Resources in the project area are limited to Kidder Brook, a Tier 2 stream crossing with an average bankfull width of 13.8 feet. This is a 1st order stream that outlets into Pea Brook just before the Androscoggin River. The stream is designated as Essential Fish Habitat for Atlantic salmon, so coordination with the National Marine Fisheries Service will be required. The White Mountain National Forest is shown adjacent to the US 2 in this area; however, the official National Forest boundary is located well south of the project. Since the headwaters of Kidder Brook are located within the National Forest, the Forest will be contacted for input on the proposed project.

C. Carucci reviewed the proposed design. The project intent is to pass the 100 year storm without encroachment onto US 2 or the adjacent campground driveway. The proposed culvert length is set at 60 feet to allow for future improvements to US 2 such as 4' shoulders and some raise in grade.

The cost for a structure that fully meets the Stream Crossing Guidelines based on bankfull width (18' span bridge) is estimated at $1.4 million, not including PE & ROW. A structure of this size would likely be transferred to the Bureau of Bridge Design, resulting in at least a one year delay. The duration of construction of a bridge would be at least 3 months. Road closure is not an option in this location since US 2 is a major regional route with no practical detour options. Operation as one lane with temporary signals may be possible but it would be more likely that a temporary widening would be proposed, resulting in additional impacts.

Due to the cost, schedule, and construction constraints, the preferred alternative is a 5' high x 8' wide box culvert, embedded or with baffles. This structure will pass the Q50 with headwater just below the top of box and the Q100 with headwater about 1 foot below the adjacent campground driveway. Construction cost is estimated at $650,000, just under half the cost of an 18' bridge. Construction duration is estimated at 3 to 4 weeks with one lane, temporary signals, and minimal temporary widening.

Incidental work will include repair of the perched area at the outlet, and replacement of the dry stone retaining wall with the culvert wing wall and a stone lined slope.

Culvert bottom options consist of embedment with simulated streambed material or baffles. Baffles would be V-shaped with a maximum height of 12", so using baffles would allow for a smaller culvert, which means lower cost, less excavation depth, faster construction. Consideration needs to be given to preventing sub-surface flow, maintaining grade control, energy dissipation at high flows, and maintaining consistent depth at low flows.

Embedment would require at least 2.6' embedment depth, which would include a Class B stone armor layer below gravel/cobble bed material. This additional depth requires a larger box, more excavation, and significant extra time to place bed material. This option may require a removable top on culvert to place the material. Also, this is a very steep, 'flashy' watershed and bed material may tend to wash out frequently.

The downstream channel section was reviewed and would consist of an 8' wide bed, with 25% match over approximately 50 feet. The channel would be V-shaped to maintain low flow. Simulated streambed material would be designed to match existing channel material based on the pebble count, and larger embedded boulders would be randomly placed for energy dissipation. Slope work will cover eroded area at end of existing stone retaining wall.

Proposed impacts to the stream were reviewed.

Upstream – Extend structure 7', re-grade 25' of streambed, reset existing stone along banks. Work would result in approximately 300 sq ft (32 LF) of permanent channel impact.

Downstream – Extend structure 3', reconstruct 60' of channel and bank. Work would result in approximately 800 sq ft (60 LF) of permanent channel impact and 350 sq ft (50 LF) of permanent bank impact.

Overall, the project would result in 1,450 sq ft (142 LF) of permanent impacts to channel and bank. Minimal temporary impacts will be required.

C. Perron noted that permanent stream impacts will require mitigation since the proposed design would be considered an Alternative Design. Impacts are below the threshold of 500 LF of impact that DOT requires to consider culvert improvements as mitigation through the Stream Passage Improvement Program. Input was requested from the town on potential local mitigation projects to consider; however, no response has been received. Therefore, an in-lieu fee is proposed for mitigation. This will be confirmed with Lori Sommer.

C. Carucci asked if NH Fish & Game could provide target flow velocities for fish passage that could help inform the baffle design. Carol Henderson replied that baffles may not be the best option since no one could find a design that works well in all situations. She recommended coordinating with John Magee. Baffles can be a concern for turtle passage, although that may not be an issue at this site.

Karl Benedict commented that baffles need to balance sediment accumulation in the culvert with sediment loss from the culvert. Baffles are not prohibited under the Stream Crossing Rules but baffle design is very site specific and needs to consider sedimentation and maintaining a low flow channel. He suggested considering staggered baffles or v-notch baffles.

C. Carucci suggested reviewing a culvert constructed with baffles to assess if the baffles are working properly. This information could be provided in the permit application. A similar stream that has a culvert with baffles is located on Carpenter Brook in Littleton. It was agreed that this may help, but it was also reiterated that baffles need to be site specific.

Sarah Large asked if it was necessary to try to keep sediment in the culvert. K. Benedict was concerned that a crossing without sediment may not meet the Stream Crossing Rules.

C. Henderson asked if the larger, embedded box could be considered further. C. Carucci replied that there was still a concern with material washing out of a larger structure because of the steep slope.

The possibility of a precast textured bottom was discussed. Although this has not been tried before, it may be possible to design a precast concrete culvert bottom that somewhat mimics the roughness of a natural streambed. C. Henderson thought that this may be a better option at this site. K. Benedict commented that such a design would need to provide a low flow channel. C. Carucci would explore this option further.

It was agreed that the project did not need to be discussed at a future meeting, as long as the options discussed today are vetted and described in the permit application.

Submitted by:

Christine Perron
McFarland Johnson, Inc.

Note: Finalized minutes and the complete list of attendees will be available in the Conference Report for the June 19, 2019, Natural Resource Agency Coordination Meeting.

Mitigation Correspondence

Christine J. Perron

From: Sommer, Lori <Lori.Sommer@des.nh.gov>
Sent: Monday, August 26, 2019 2:45 PM
To: Christine J. Perron
Cc: Crickard, Ronald
Subject: RE: Shelburne 42426

Hi Christine,
Sorry I missed the meeting in June. Your description and the pictures help a lot. I think it could meet Env-Wt 904.07(c) so no mitigation would be required. Let me know if that makes sense. Thanks,

Lori

From: Christine J. Perron <CPerron@mjinc.com>
Sent: Tuesday, August 20, 2019 1:40 PM
To: Sommer, Lori <Lori.Sommer@des.nh.gov>
Cc: Crickard, Ronald <Ronald.Crickard@dot.nh.gov>
Subject: RE: Shelburne 42426

EXTERNAL: Do not open attachments or click on links unless you recognize and trust the sender.

Hi Lori,

After reviewing this project again with the DOT project engineer, a question about getting credit for the proposed improvements came up. The existing crossing is completely impassable given the 5-foot perch at the outlet, and is hydraulically undersized. The proposed structure will eliminate the perch, which will restore more than 1,000 feet of stream channel to upstream aquatic organism passage. The proposed structure will also provide a simulated streambed through the crossing and will pass the 100-year storm. The proposed regrading of the outlet channel will restore what is now a degraded streambed that has experienced a lot erosion and scour.

In the newly adopted rules, examples of self-mitigating measures include eliminating a barrier to aquatic organism passage, improving the hydraulic capacity of an under-sized crossing, and improving geomorphic compatibility, all of which will be accomplished with the proposed structure.

What are your thoughts?

Christine

From: Christine J. Perron
Sent: Monday, August 19, 2019 3:31 PM
To: Lori Sommer - DES Wetlands Bureau (lori.sommer@des.nh.gov) <lori.sommer@des.nh.gov>
Cc: Ron Crickard <Ronald.Crickard@dot.nh.gov>
Subject: Shelburne 42426

Hi Lori,

We presented the subject project at the June resource agency meeting and we're now working on the permit application. The project consists of replacing a culvert that carries Kidder Brook under US Route 2. This is a Tier 2 stream crossing based on a watershed of 286 acres. The stream has an average bankfull width of 13.8 feet.

The existing culvert is 50' long consisting of 10 LF of 72" cmp at the inlet, 6 LF of 5' x 5' stone box, 16 LF of 60" cmp, and 18 LF of variable dimension concrete box (max size 6' wide x 6.5' high at the outlet). The average slope through the structure is 4.5%. The concrete outlet segment is severely undermined and perched about 5 feet. The downstream channel has experienced significant erosion and a dry laid stone retaining wall (35' long) along the east bank is failing. Photos are attached.

After reviewing alternatives and coordinating with John Magee at NHFG, the preferred alternative is the structure that was presented at the resource agency meeting – a 5' high x 8' wide x 60' long precast concrete box culvert with internal concrete grade control structures to hold simulated streambed material. The outlet channel will be regraded approximately 50' to address scour and tie into the culvert. The dry stone retaining wall will be replaced with the culvert wing wall and a stone lined slope.

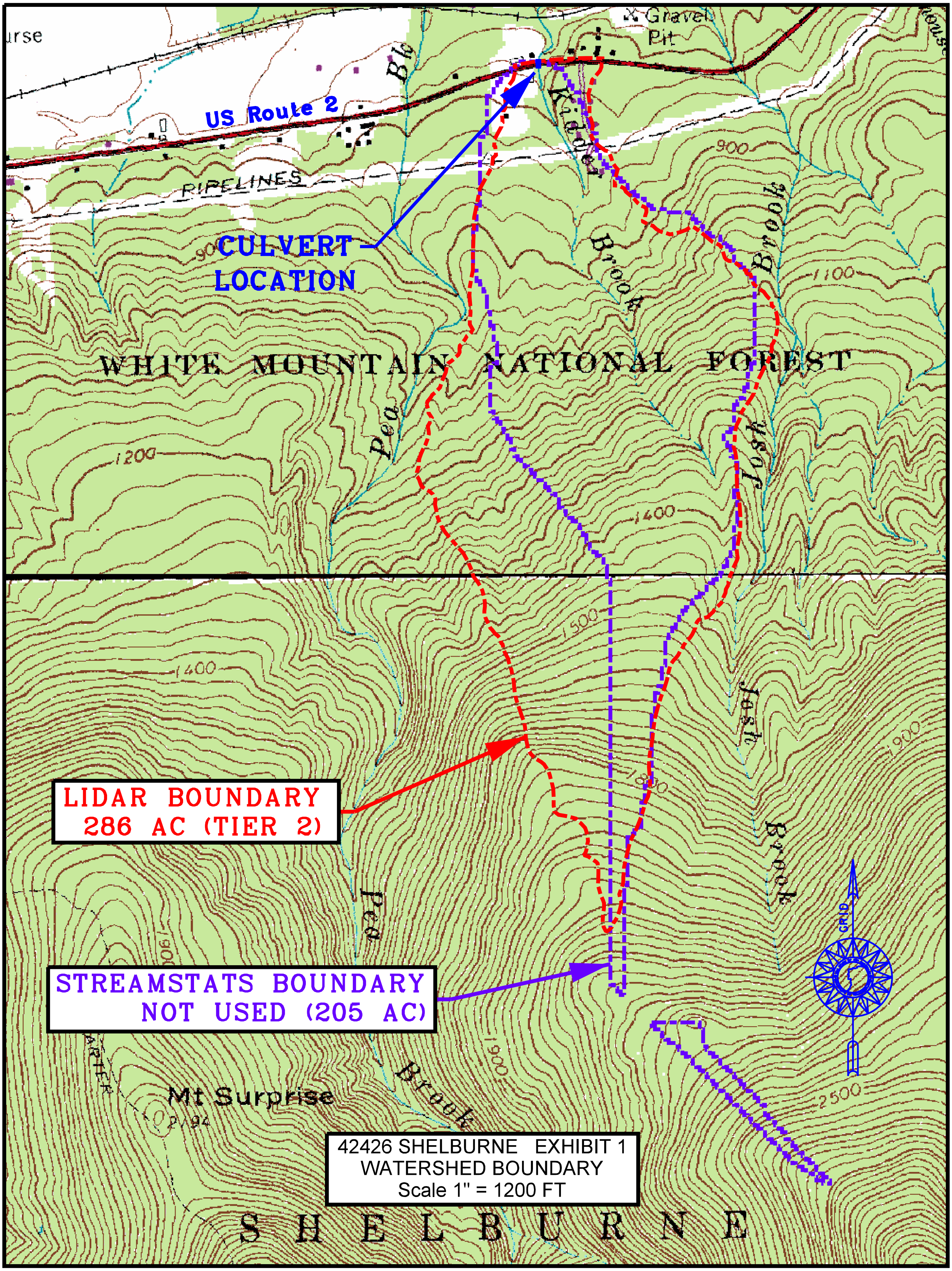
Along much of the stream, the TOB and OHW occur at the same elevation – when linear impacts were presented at the June meeting, impacts had not been calculated for bank in these areas. At the time linear impacts were approximately 142 LF. Since the meeting, we learned that the BOE does generally calculate linear feet of bank impact where TOB and OHW co-occur. With that in mind, the current linear feet of permanent bank and channel impact totals 219 LF. There are no wetland impacts.

We did send a letter (example attached) to the Selectboard, Conservation Commission, and Planning Board to inquire about local mitigation projects. No responses have been received. Since impacts are below the 500 LF threshold for considering mitigation through the SPIP, we have not looked at potential culvert improvements elsewhere. For these reasons, the NHDOT is planning to propose an in-lieu fee. Based on the proposed 219 LF of stream impacts, the ARM fund payment would be $57,760.81.

Since you were not able to attend the June resource agency meeting, I wanted to confirm all of this with you before the application is submitted. Let me know if you need any additional information.
Thanks Lori.
Christine

Christine Perron, CWS
Project Manager • Senior Environmental Analyst
McFarland Johnson
53 Regional Drive • Concord, NH 03301
OFFICE: 603-225-2978 ext. 1280
www.mjinc.com

Watershed Boundary Map



Gravel Pit
US Route 2
PIPELINES
CULVERT LOCATION
Kidder Brook
Josh Brook
Peg Brook
WHITE MOUNTAIN NATIONAL FOREST
LIDAR BOUNDARY 286 AC (TIER 2)
STREAMSTATS BOUNDARY NOT USED (205 AC)
Mt Surprise
GRID
42426 SHELBURNE EXHIBIT 1
WATERSHED BOUNDARY
Scale 1" = 1200 FT
SHELBURNE

Stream Crossing Rules

NH Department of Transportation
Bureau of Highway Design
Shelburne, 42426

Env-Wt 904.07 In-Kind Replacement of Tier 1 or Tier 2 Existing Legal Crossings

In order to qualify under this section, the crossing cannot have a history of causing or contributing to flooding that damages the crossing or other infrastructure. Does the crossing have a history of flooding?

The NHDOT Maintenance District indicated no history of flooding at this location, except for an October 2017 event that overtopped US2. The adjacent property owner (White Birches Campground) confirmed that the culvert overtopped only once, in October 2017 due to debris blockage. No other flooding has been documented at this location since the original installation of the culvert in the 1930s.

The replacement stream crossing shall be the same size and type as the existing OR an upgrade. Please describe how this applies to the subject project.

The proposed project will upgrade the stream crossing. The existing culvert is 50' long consisting of 10 LF of 72" cmp at the inlet, 6 LF of 5' x 5' stone box, 16 LF of 60" cmp, and 18 LF of variable dimension concrete box (max size 6' wide x 6.5' high at the outlet). The concrete outlet segment is severely undermined and perched about 5'. The proposed replacement structure is a 5' high x 8' wide (clear opening) x 60' long precast concrete box culvert, embedded 12" with stream simulation, and precast headwalls and wing walls. The perched area at the outlet and scour holes in the existing bed will be repaired to subgrade elevations prior to placing simulated streambed material.

The project may qualify as a **minimum** impact project if:

The crossing does not diminish the hydraulic capacity of the crossing.
The proposed structure will increase hydraulic capacity, passing the 100-year storm without encroachment onto US 2 or the adjacent campground driveway.

The crossing does not diminish the capacity of the crossing to accommodate aquatic life passage.
The current structure has a 5' perch at the outlet end, creating a complete barrier to upstream aquatic life passage. The project will eliminate this perch and repair the stream channel at the downstream end of the crossing.

The crossing meets the general design criteria specified in Env-Wt 904.01, as follows:

Env-Wt 904.01

(a) Not be a barrier to sediment transport;
There are no features within the proposed culvert that would be a barrier to sediment transport. The spaces between the concrete grade controls will be filled with simulated streambed material so that the bed has a relatively uniform surface through the culvert. The inlet and outlet will match the streambed.

Stream Simulation analysis indicates that water depths and velocities within the crossing structure at a variety of flows will be comparable to those found in the natural channel upstream and downstream of the stream crossing, therefore sediment transport characteristics will be similar to those in the upstream and downstream channels.

(b) Prevent the restriction of high flows and maintain existing low flows;
Stream Simulation analysis indicates that water depths and velocities within the crossing structure at a variety of flows will be comparable to those found in the natural channel upstream and downstream of the stream crossing. The culvert will not restrict high flows, and will maintain low flow depth and velocity.

(c) Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction;
The proposed culvert has no features that would substantially disrupt the movement of aquatic life indigenous to the waterbody.

(d) Not cause an increase in the frequency of flooding or overtopping of banks;
The proposed culvert will increase the crossing capacity significantly, reducing the depth of high flows.

(e) Preserve watercourse connectivity where it currently exists;
The existing culvert is perched approximately 5' at the outlet, resulting in a significant barrier to connectivity. The downstream channel is also blocked with large stones and woody debris in at least two locations.

(f) 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;
The proposed project will restore connectivity by eliminating the existing outlet perch and two downstream blockages (within the work area) and by providing a natural streambed through the structure.

(g) Not cause erosion, aggradation, or scouring upstream or downstream of the crossing; and
Stream Simulation analysis indicates that water depths and velocities within the crossing structure at a variety of flows will be comparable to those found in the natural channel upstream and downstream of the stream crossing, therefore sediment transport characteristics will be similar to those in the upstream and downstream channels.

(h) Not cause water quality degradation.
The proposed culvert will have no effect on water quality.

NH Natural Heritage Bureau Review Memo

CONFIDENTIAL – NH Dept. of Environmental Services review

Memo

NH Natural Heritage Bureau
NHB Datacheck Results Letter

To: Jordan Tate, McFarland Johnson
5 Depot Street
Suite 25
Freeport, ME 04032

From: Amy Lamb, NH Natural Heritage Bureau
Date: 5/1/2019 (valid for one year from this date)
Re: Review by NH Natural Heritage Bureau
NHB File ID: NHB19-1230 Town: Shelburne Location: US-2
Description: The project consists of a culvert replacement carrying Kidder Brook under US-2

As requested, I have searched our database for records of rare species and exemplary natural communities, with the following results.

Comments: The following record was included for your information. Contact NHB if there will be substantive hydrological changes at this location.

Natural Community	State[1]	Federal	Notes
Sugar maple - silver maple - white ash floodplain forest*	--	--	Threats are primarily changes to the hydrology of the river, land conversion and fragmentation, introduction of invasive species, and increased input of nutrients and pollutants.

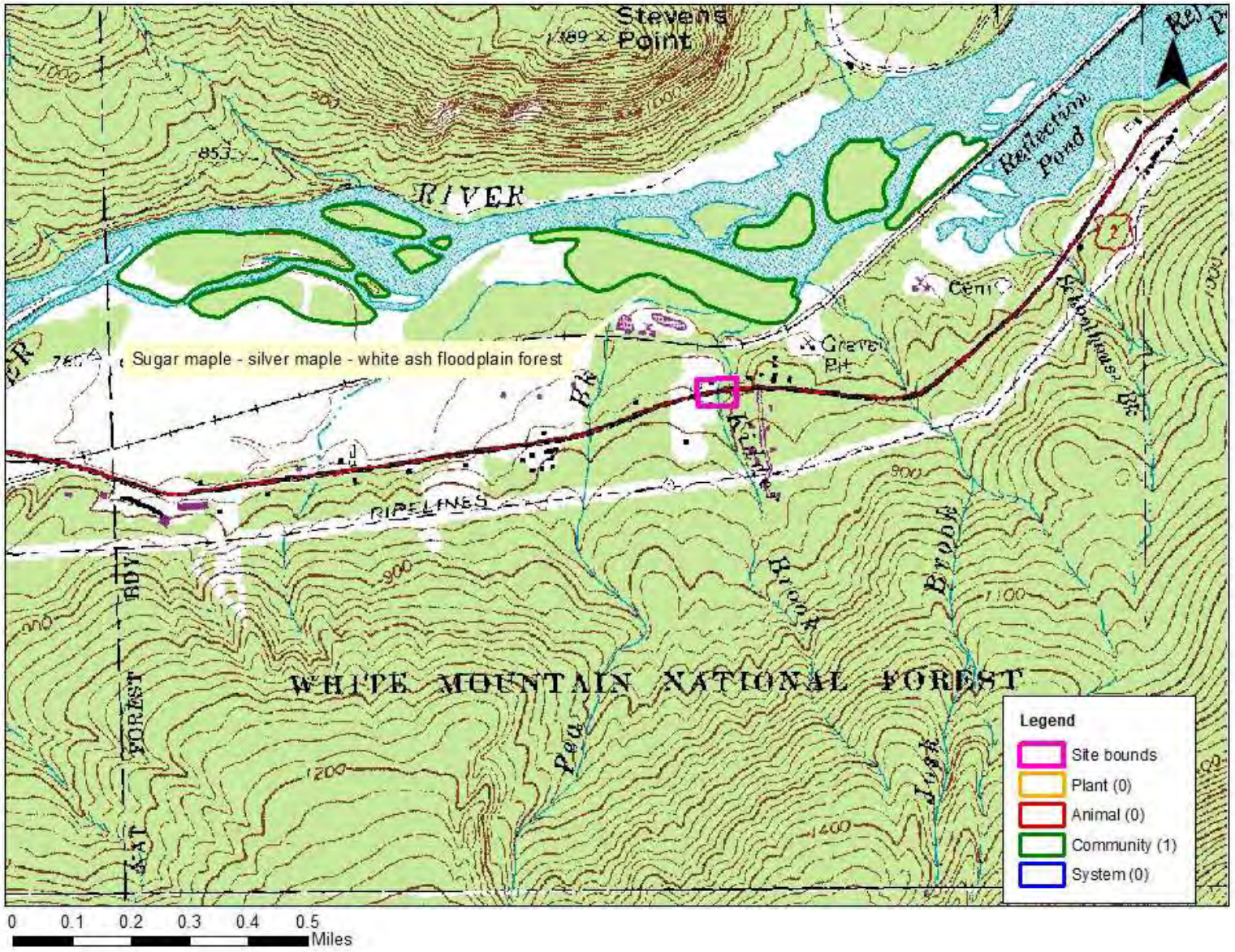
[1]Codes: "E" = Endangered, "T" = Threatened, "SC" = Special Concern, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

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.

Department of Natural and Cultural Resources
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DNCR/NHB
172 Pembroke Rd.
Concord, NH 03301

NHB19-1230


Stevens Point
RIVER
Reflection Pond
Gravel Pit
Sugar maple - silver maple - white ash floodplain forest
PIPELINES
WHITE MOUNTAIN NATIONAL FOREST
FOREST
Legend
Site bounds
Plant (0)
Animal (0)
Community (1)
System (0)
0 0.1 0.2 0.3 0.4 0.5
Miles

New Hampshire Natural Heritage Bureau - Community Record

Sugar maple - silver maple - white ash floodplain forest

Legal Status	Conservation Status
Federal: Not listed	Global: Not ranked (need more information)
State: Not listed	State: Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Historical records only - current condition unknown.
Comments on Rank:

Detailed Description: 1997: Two floodplain forest complexes were observed, one at the east edge of the golf course and one further west. The western complex was a stretch of scrappy broken canopy of *Acer saccharinum, Populus balsamifera, Fraxinus americana,* and *Acer rubrum*. A thick, species rich shrub and subcanopy layer included *Berberis thunbergii, Polygonum cuspidatum, Solanum dulcamara, Lonicera morrowii, Parthenocissus quinquefolius,* and *Toxicodendron radicans*. A sparse herb layer included *Onoclea sensibilis, Glyceria melicaria, Carex gracillima, Solidago gigantea, S. rugosa, Cacalia atriplicifiolia, Oxalis stricta,* and *Galeopsis tetrahit*. This area is characterized by edgy, patchy distribution of invasive, shrubs and vines, patches of bare sandy soils in the high terraces, occasional patches of pole size trees (especially near islands and low slough channels). The eastern complex was a typical, non-disturbed patch of high terrace floodplain forest. Other edgy, disturbed patches of this type of floodplain occurred t hroughout. Forest trees were variable in age and size, with an occasional super-canopy silver maple and red oak; 30"dbh individual cored; largest individual = 34" dbh. Dominant trees included *Acer saccharinum, Prunus serotina, Fraxinus nigra, Quercus rubra,* and *Tilia americana*. Shrubs and sub-canopy tree species included *Ostrya virginiana, Prunus virginiana, Acer saccharum,* and *Parthenocissus quinquefolius*. Herb species richness was low , with a mix of low and high floodplain species, including *Onoclea sensibilis, Matteuccia struthiopteris, Glyceria melicaria, Rubus hispidus,* and *Solidago rugosa*.

General Area: 1997: Wildlife sign was abundant, and wood-duck boxes were scattered on trees near the river bank. The islands in this area appeared to have silver maples in the canopy, especially overhanging the river's edge. Trees were large and overhanging along the golf course, and in various stages of recovery (pole size, blowdowns) along the river. Topography along riverside observation points was a maze of cobbly, sandy slough channels with organic debris piles from recent flooding. Higher terrace soils varied from sandy soils that harbored sandy species, to fine sandy loams, with little to no mottling, in lower landscape positions. The entire western complex is edgy and highly disturbed, either by the golf course or by flood action along the river. Edge and invasive woody, vine species are common. The eastern portion, framed by the railroad, and high gradient Pea and Kidder Brook, had more of a forest buffer, however a gravel pit for the railroad lies upslope, and along Pea Brook. The upland forest s appeared slightly disturbed from a logging history(?) and high gradient, flash flooding from Pea Brook seemed to have devastating effects on trees along the stream bank. The dry stream-bed cuts a wide swath, with a floor of large, rounded cobbles.

General Comments: 1997: These broken, edgey floodplain forest patches appear common on islands in this stretch of the Androscoggin. As much as possible of the forest should be protected, despite the edgy character of the patches.

Management Comments:

Location

Survey Site Name: PSNH / Golf Course
Managed By:

County: Coos
Town(s): Shelburne

CONFIDENTIAL – NH Dept. of Environmental Services review

Size: 84.6 acres Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: Route 2 West from Gorham. Look for Gorham / Androscoggin River Golf Course on left (north). Park in golf course parking lot, check with golf course staff. Hike along river. Also, access to releve at Observation Point 4 (to the east) is from railroad tracks that cut through golf course.

Dates documented

First reported: 1997-09-17 Last reported: 1997-09-17

CONFIDENTIAL – NH Dept. of Environmental Services review

NH Fish and Game Correspondence

Christine J. Perron

From: Magee, John <john.magee@wildlife.nh.gov>
Sent: Thursday, August 08, 2019 12:14 PM
To: Christine J. Perron
Cc: Carucci, Christopher
Subject: RE: NHDOT Project-Shelburne 42426

Thanks. I have been in the field every day since early July and this is my first full day in the office since then. Something that I just thought of is that the recreated streambed inside the culvert should have a well defined thalweg and plenty of fines mixed in so that there is surface flow during low flow.

Thanks,

John
John Magee
President, Northeastern Division of the American Fisheries Society Fish Habitat Biologist New Hamphsire Fish and Game Department
11 Hazen Drive, Concord, NH 03301
603-271-2744
603-271-5829

-----Original Message-----
From: Christine J. Perron <CPerron@mjinc.com>
Sent: Tuesday, July 16, 2019 2:07 PM
To: Magee, John <john.magee@wildlife.nh.gov>
Cc: Carucci, Christopher <Christopher.Carucci@dot.nh.gov>
Subject: FW: NHDOT Project-Shelburne 42426

EXTERNAL: Do not open attachments or click on links unless you recognize and trust the sender.

Hi John,

Additional information from Chris Carucci is below. I'm also copying Chris on this email. Let us know if you have any other questions

Thanks,
Christine

-----Original Message-----
From: Carucci, Christopher <Christopher.Carucci@dot.nh.gov>
Sent: Tuesday, July 16, 2019 2:02 PM
To: Christine J. Perron <CPerron@mjinc.com>
Subject: RE: NHDOT Project-Shelburne 42426

HY-8 calculates embedment depth for the specific site, based on the bed gradations developed from pebble counts.

It's trying to model a gradation inside the culvert that matches the existing streambed. Slope and velocity are used to determine if a lower armor layer is required, which it would be in this case. Total embedment is the lower layer plus the streambed layer which must be at least as thick as the largest particle, at this site it's around 24".

The example in John's previous e-mail (2.5' boulders in the culvert) would result in design embedment depth of 3'. Either way, it would be a significant cost and effort to install such a thick embedment.

I think the proposed 12" embedment with concrete grade controls would result in a similarly stable bed and would ensure some amount of surface water in the culvert at low flows. The channel shows evidence of sediment transport and HY-8 calc's show movement of sediment at relatively low flows, so any material carried out should be replaced frequently.
In the event most of the material is carried out, the grade controls (8' apart) would provide a minimum pool depth of 5" and a max jump height of 3" to the next pool.

Regarding the dry bed photo (Sept 2018), this was a very dry period and there was no flow downstream either.
I believe the current streambed condition is the result of the October 2017 flood event that scoured out the fines, leaving only cobbles that didn't move.
I have a few photos from 2010 and 2012 that show a normal looking bed with fines and base flow upstream and downstream.

We can salvage some of the upstream cobbles for use in restoring the downstream channel.

-----Original Message-----
From: Christine J. Perron [mailto:CPerron@mjinc.com]
Sent: Monday, July 15, 2019 6:47 AM
To: Carucci, Christopher
Subject: FW: NHDOT Project-Shelburne 42426

EXTERNAL: Do not open attachments or click on links unless you recognize and trust the sender.

Another comment from John...

-----Original Message-----
From: Magee, John <john.magee@wildlife.nh.gov>
Sent: Friday, July 12, 2019 2:52 PM
To: Christine J. Perron <CPerron@mjinc.com>
Subject: RE: NHDOT Project-Shelburne 42426

Another thought: the FHWA's HY-8 culvert program recommendation of 4.8 feet deep of substrate seems much deeper than many culverts I have seen with streambed simulation in them. Is that a blanket recommendation regardless of slopes, etc, or is that recommendation specific to this proposed design and its slopes, predicted velocities, etc?

John

John Magee
M.S., Certified Fisheries Professional
President, Northeastern Division of the American Fisheries Society Fish Habitat Biologist New Hampshire Fish and Game Department

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-----Original Message-----
From: Christine J. Perron [mailto:CPerron@mjinc.com]
Sent: Thursday, July 11, 2019 10:03 AM
To: Magee, John
Subject: RE: NHDOT Project-Shelburne 42426

EXTERNAL: Do not open attachments or click on links unless you recognize and trust the sender.

Hi John,

We presented the subject culvert replacement project at the June Natural Resource Agency Meeting and Carol suggested that we get your input on the proposed design.

As you know from previous emails with you, the culvert carries Kidder Brook under US Route 2. The crossing is a Tier 2 stream crossing. The existing culvert is 50' long consisting of 10 LF of 72" cmp at the inlet, 6 LF of 5' x 5' stone box, 16 LF of 60" cmp, and 18 LF of variable dimension concrete box (max size 6' wide x 6.5' high at the outlet). The average slope through the structure is 4.5%. The concrete outlet segment is severely undermined and perched about 5 feet. The downstream channel has experienced significant erosion. The stream has an average bankfull width of 13.8 feet. A few photos of the stream are attached.

The attached plans show the Department's preferred alternative at this time, with the culvert at a 4% slope, and simulated streambed with concrete grade controls. Chris Carucci is the project engineer and he indicated that he doesn't have any way of predicting AOP or fish passage design flow rates. Drainage area is too small for StreamStats Low Flow Regression equations. According to HEC-26, one of Vermont's low flow guidelines is 0.139 cfs / sq mi of drainage area, which gives 0.06 cfs for this drainage area (too low for any meaningful calc's). Minimum depth in the culvert at Q=1 cfs would be about 3". Max velocity in the culvert at Q=20 cfs would be about 4.2 ft/s.

A structure without grade controls was studied. FHWA's HY-8 culvert program recommends a 4.8' thick simulated streambed without grade controls. If used, this design would consist of a 2' thick armor layer of large stone and 2' thick simulated streambed, which would require a larger culvert. The additional culvert size, excavation depth, and installation time and cost makes this design impractical.

The cost for a structure that fully meets the Stream Crossing Guidelines based on bankfull width (18' span bridge) is estimated at $1.4 million, not including PE & ROW. A structure of this size would likely be transferred to the Bureau of Bridge Design, resulting in at least a one year delay. The duration of construction of a bridge would be at least 3 months. Road closure is not an option in this location since US 2 is a major regional route with no practical detour options. Operation as one lane with temporary signals may be possible but it would be more likely that a temporary widening

would be proposed, resulting in additional impacts. Due to cost, schedule, and construction constraints, a bridge at this location is not considered practical.

Another option that could be considered is a pre-cast roughened concrete culvert bottom. An example from Vermont is attached. This option would likely be significantly less cost and take less time to install.
It should be possible to provide a V shaped bottom to maintain a low flow channel. Velocity for this option would be slightly higher. For reference, manning's n for smooth concrete is 0.012, for the gravel bottom option 0.05, and probably about 0.04 for the textured bottom. Before we explore this option further, we wanted your input.

Thanks John. If it's easier to discuss all of this in person, we would be happy to meet with you.
Christine

Christine Perron, CWS
Project Manager . Senior Environmental Analyst McFarland Johnson
53 Regional Drive . Concord, NH 03301
OFFICE: 603-225-2978 ext. 1280
https://urldefense.proofpoint.com/v2/url?u=http-3A__www.mjinc.com&d=DwIFAw&c=vYl7KJMDeuM7F-Nqf_hfailBifPmyspo7hrJGlNN7nU&r=2JKuBDC18cOB00y5h9BymIEiPAeDJwflfeuwSsMHzvs&m=JODncp1vygL2MW07o5jyfnNMVjFoLoH5dcfkeimwLec&s=75UGtt6zeu_nSDqOWXOOtQnCDqQYE701gSqt4AABw00&e=

-----Original Message-----
From: Magee, John <john.magee@wildlife.nh.gov>
Sent: Thursday, May 16, 2019 9:52 AM
To: Jordan Tate <jtate@mjinc.com>
Cc: Henderson, Carol <Carol.Henderson@wildlife.nh.gov>; Christine J. Perron <CPerron@mjinc.com>; Timmins, Dianne <Dianne.Timmins@wildlife.nh.gov>
Subject: RE: NHDOT Project-Shelburne-42426 (NHB Review NHB19-1230)

Hello. I spoke with Dianne Timmins, our Coldwater Biologist in Lancaster and cc'd here. F&G conducted a number of standardized fish surveys and about 1,000 stream crossing surveys in the NH portion of the Androscoggin River watershed in 2018 as part of the overall Androscoggin (Watershed) Stream Crossing Assessment Project. The crossing survey data and assessments are in SADES. I see that the crossing in question was assessed by NHDOT staff in 2014 and is SADES ID 187.

We have fish data from 2018 in the stream a few hundred feet to the west, Pea (could be Peak?) Brook, and we caught blacknose dace, creek chub, slimy sculpin and wild brook trout. The same fish species were caught in other streams nearby. I see the photos in SADES show a dry streambed (photos taken in September 2015), but I don't know if there are standing pools of water upstream and/or downstream of the crossing in most years. Standing pools of water, even if there is no surface flow between them, can be the only refuge habitat for fish and other aquatic organisms during periods of low flow. I have seen these in a number of perennial streams during low flow years and the pools had quite a lot of fish in them.

I hope this information is helpful. Please let me know if you have more questions.

Thank you for reaching out.

John

John Magee
M.S., Certified Fisheries Professional

President, Northeastern Division of the American Fisheries Society Fish Habitat Biologist New Hampshire Fish and Game Department
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P 603-271-2744
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-----Original Message-----
From: Jordan Tate [mailto:jtate@mjinc.com]
Sent: Wednesday, May 15, 2019 4:25 PM
To: Magee, John
Cc: Henderson, Carol; Christine J. Perron
Subject: RE: NHDOT Project-Shelburne-42426 (NHB Review NHB19-1230)

Hi John,

We have completed an NHB review, which identified a sugar maple-silver maple-white ash floodplain downstream of the project area along the Androscoggin. No RTE species were identified by NHB within the project area. I've gone ahead and attached the response for you.

Jordan

-----Original Message-----
From: Magee, John <john.magee@wildlife.nh.gov>
Sent: Wednesday, May 15, 2019 4:20 PM
To: Jordan Tate <jtate@mjinc.com>
Cc: Henderson, Carol <Carol.Henderson@wildlife.nh.gov>; Christine J. Perron <CPerron@mjinc.com>
Subject: Re: NHDOT Project-Shelburne-42426 (NHB Review NHB19-1230)

Hi Jordan. I will check our fish survey database on Thursday. Have you completed an NHB datacheck?

John

John Magee, M.S., Certified Fisheries Professional President, Northeastern Division of the American Fisheries Society Fish Habitat Biologist New Hampshire Fish and Game Department
11 Hazen Drive
Concord, NH 03301
p 603-271-2744
f 603-271-5829

_____
From: Jordan Tate <jtate@mjinc.com>
Sent: Monday, May 13, 2019 1:52:58 PM

To: Magee, John
Cc: Henderson, Carol; Christine J. Perron
Subject: NHDOT Project-Shelburne-42426 (NHB Review NHB19-1230)

Hello Mr. Magee,

The NH Department of Transportation is planning a culvert replacement in Shelburne on US-2 (see location maps and shapefile). The crossing carries Kidder Brook under US-2 and consists of several segments including a 72" cmp at the inlet, 60" cmp, masonry transitions, and 6' wide x 6.5' high concrete box. The project is proposing a full replacement of the crossing. There is a stone retaining wall on the downstream end that will also be replaced. As part of our effort to identify all resources of concern, I am asking for your initial input on fisheries in this area.

Thank you,
Jordan

Jordan N. Tate * Environmental Analyst [cid:image001.jpg@01CFD0F2.5AAA7FA0]
5 Depot Street * Freeport, ME 04032
Office: (207) 417-4036 x 1850

Jordan Tate

From: Magee, John <john.magee@wildlife.nh.gov>
Sent: Thursday, May 16, 2019 9:52 AM
To: Jordan Tate
Cc: Henderson, Carol; Christine J. Perron; Timmins, Dianne
Subject: RE: NHDOT Project-Shelburne-42426 (NHB Review NHB19-1230)
Attachments: 42426 Location Map.pdf

Hello. I spoke with Dianne Timmins, our Coldwater Biologist in Lancaster and cc'd here. F&G conducted a number of standardized fish surveys and about 1,000 stream crossing surveys in the NH portion of the Androscoggin River watershed in 2018 as part of the overall Androscoggin (Watershed) Stream Crossing Assessment Project. The crossing survey data and assessments are in SADES. I see that the crossing in question was assessed by NHDOT staff in 2014 and is SADES ID 187.

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Sent: Wednesday, May 15, 2019 4:25 PM
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Cc: Henderson, Carol; Christine J. Perron

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Fish Habitat Biologist New Hampshire Fish and Game Department
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Cc: Henderson, Carol; Christine J. Perron
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Thank you,
Jordan

Jordan N. Tate * Environmental Analyst [cid:image001.jpg@01CFD0F2.5AAA7FA0]
5 Depot Street * Freeport, ME 04032
Office: (207) 417-4036 x 1850

USFWS Correspondence

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
http://www.fws.gov/newengland

July 31, 2019

Ronald Crickard
Bureau of Environment
NH Department of Transportation
7 Hazen Drive, P.O. Box 483
Concord, New Hampshire 03302-0483

Re: NH DOT Project 42426, Shelburne, NH
TAILS: 05E1NE00-2019-F-1482

Dear Mr. Crickard:

The U.S. Fish and Wildlife Service (Service) is responding to your request, dated July 17, 2019, to verify that the New Hampshire Department of Transportation (NHDOT) Project 42426 (Project), the proposed replacement of a culvert on U.S. Route 2 in Shelburne, New Hampshire, may rely on the December 15, 2016, Programmatic Biological Opinion (BO) for federally funded or approved transportation projects that may affect the northern long-eared bat (*Myotis septentrionalis*) (NLEB). We received your request and the associated LAA Consistency Letter on July 19, 2019. This letter provides the Service's response as to whether the Federal Highway Administration may rely on the BO to comply with section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; U.S.C. 1531 *et seq.*) for the Project's effects to the NLEB.

The NHDOT, as the non-Federal agency representative for the Federal Transportation Agency, has determined that the Project may affect, and is likely to adversely affect the NLEB. The Project consists of the replacement of an existing culvert carrying Kidder Brook under Route 2. Approximately 0.07 acre of tree clearing will occur which may be implemented during the bat active season.

NHDOT also determined the Project may rely on the programmatic BO to comply with section 7(a)(2) of the ESA, because the Project meets the conditions outlined in the BO and all tree clearing related to the proposed work will occur farther than 0.25 mile from documented roosts and farther than 0.5 mile from any known hibernacula. The Service reviewed the LAA Consistency Letter and concurs with NHDOT's determination. This concurrence concludes your ESA section 7 responsibilities relative to this species for this Project, subject to the Reinitiation Notice below.

Conclusion

The Service has reviewed the effects of the proposed Project, which include the NHDOT's commitment to implement the impact avoidance, minimization, and compensation measures as indicated on the LAA Consistency Letter. We confirm that the proposed Project's effects are consistent with those analyzed in the BO. The Service has determined that the Project is consistent with the BO's conservation measures, and the scope of the program analyzed in the BO is not likely to jeopardize the continued existence of the NLEB. In coordination with your agency, the Federal Highway Administration, and the other sponsoring Federal Transportation Agencies, the Service will reevaluate this conclusion annually in light of any new pertinent information under the adaptive management provisions of the BO.

Incidental Take of the Northern Long-eared Bat

The Service anticipates that tree removal associated with the proposed Project will cause incidental take of the NLEB. However, the Project is consistent with the BO, and such projects will not cause take of NLEBs that is prohibited under the final 4(d) rule for this species (50 CFR §17.40(o)). Therefore, this taking does not require exemption from the Service.

Reporting Dead or Injured Bats

The NHDOT, the Federal Highway Administration, its State/local cooperators, and any contractors must take care when handling dead or injured NLEBs that are found at the project site, in order to preserve biological material in the best possible condition and to protect the handler from exposure to diseases, such as rabies. Project personnel are responsible for ensuring that any evidence about determining the cause of death or injury is not unnecessarily disturbed. Reporting the discovery of dead or injured listed species is required in all cases to enable the Service to determine whether the level of incidental take exempted by this BO is exceeded, and to ensure that the terms and conditions are appropriate and effective. Parties finding a dead, injured, or sick specimen of any endangered or threatened species must promptly notify the Service's New England Field Office.

Reinitiation Notice

This letter concludes consultation for the proposed Project, which qualifies for inclusion in the BO issued to the Federal Transportation Agencies. To maintain this inclusion, a reinitiation of this project-level consultation is required where the Federal Highway Administration's discretionary involvement or control over the Project has been retained (or is authorized by law) and if:

1. new information reveals that the Project may affect listed species or critical habitat in a manner or to an extent not considered in the BO;
2. the Project is subsequently modified in a manner that causes an effect to listed species or designated critical habitat not considered in the BO; or
3. a new species is listed or critical habitat designated that the Project may affect.

In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease, pending reinitiation.

We appreciate your continued efforts to ensure that this Project is fully consistent with all applicable provisions of the BO. If you have any questions regarding our response, or if you need additional information, please contact Susi von Oettingen of this office at 603-227-6418.

Sincerely yours,

Thomas R. Chapman
Supervisor
New England Field Office

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
http://www.fws.gov/newengland

January 31, 2019

To Whom It May Concern:

This project was reviewed for the presence of federally listed or proposed, threatened or endangered species or critical habitat per instructions provided on the U.S. Fish and Wildlife Service's New England Field Office website:

http://www.fws.gov/newengland/EndangeredSpec-Consultation.htm (accessed January 2019)

Based on information currently available to us, no federally listed or proposed, threatened or endangered species or critical habitat under the jurisdiction of the U.S. Fish and Wildlife Service are known to occur in the project area(s). Preparation of a Biological Assessment or further consultation with us under section 7 of the Endangered Species Act is not required. No further Endangered Species Act coordination is necessary for a period of one year from the date of this letter, unless additional information on listed or proposed species becomes available.

Thank you for your cooperation. Please contact David Simmons of this office at 603-227-6425 if we can be of further assistance.

Sincerely yours,

Thomas R. Chapman
Supervisor
New England Field Office

Section 106 Effect memo

New Hampshire DOT
Department of Transportation

Victoria F. Sheehan
Commissioner

THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

RECEIVED
JUL 30 2019

William Cass, P.E.
Assistant Commissioner

SHELBURNE
X-A004(842)
42426

No Historic Properties Affected Memo

In order to assist the Federal Highway Administration (FHWA) in complying with Section 106 of the National Historic Preservation Act of 1966 and its amendments, The New Hampshire Department of Transportation (NHDOT), in consultation with the New Hampshire Division of Historical Resources (SHPO), has reviewed this undertaking according to the standards and procedures detailed in the 2018 Programmatic Agreement regarding the Federal-Aid Highway Program in New Hampshire.

Project Description:

The undertaking proposes to replace the culvert that carries US Route 2 over Kidder Brook in the Town of Shelburne, New Hampshire. The existing culvert is 50' long and consists of 10 LF of 72" cmp at the inlet, 6 LF of 5' x 5' stone box, 16 LF of 60" cmp, and 18 LF of variable dimension concrete box (max size 6' wide x 6.5' high at the outlet). The culvert outlet is approximately 1,800' upstream of the Androscoggin River. The structure was originally constructed in 1931. The existing cmp and stone segments are in poor condition, with severe deterioration and voids that have caused sinkholes in the roadway. The concrete outlet segment is severely undermined and perched about 5 feet. The downstream channel has experienced significant erosion. A dry laid stone retaining wall (35' long) along the east bank is failing.

The proposed project entails replacing the existing structure with a 5' high x 8' wide box culvert. Incidental work will include reconstruction of the streambed at the outlet, and replacement of the dry stone retaining wall with the culvert wing wall and a stone lined slope. The project will require permanent easements at the inlet and outlet of the culvert.

Identification and Analysis:

Based on a review pursuant to 36 CFR 800.4, we agree that the culvert is not eligible for the National Register of Historic Places. The multi-section culvert appears to retain some of its original construction and materials from the early twentieth century but has been altered extensively over time. Likely the earliest sections of the culvert, under the center of the roadway, include an early box culvert, constructed of stone and mortar walls with a steel plate/lintel supporting the roof, and a section with a round concrete or metal pipe. The latter section extends to a larger poured concrete box section and headwall that was constructed at some point after 1931. A large corrugated metal pipe, another later addition, extends out of the southern end of the culvert. The culvert lacks overall integrity and is not associated with any persons or events of historic significance.

We also agree that survey of adjacent properties is not warranted given the project's minimal impacts outside existing right-of-way and the deterioration of original structures on these properties, including the former Kidder Farm.

A Phase IA/IB Archaeological Survey was completed in 2019. No Native American or historic Euroamerican archaeological deposits were identified within the Area of Potential Effect. The combined results of the Phase IA Assessment and Phase IB Investigation indicate that it is considered unlikely that significant, i.e. State or National Register of Historic Places eligible, or other, archaeological sites will be adversely affected by the project as planned, and no additional archaeological survey is recommended prior to project construction.

Public Consultation:

Letters have been sent to town officials and the Shelburne Historical Society to seek input on potential concerns. No concerns have been raised to date and the project has no Consulting Parties.

Determination of Effect:

Applying the criteria of effect at 36 CFR 800.5, we mutually agreed that the above actions will result in no historic properties affected. No additional survey is required for the project as proposed.

Section 4(f) *(to be completed by FHWA)*	*There Will Be:*	☒ **No 4(f);**	☐ **Programmatic 4(f);**	☐ **Full 4 (f);** or
	☐ **A finding of *de minimis* 4(f) impact as stated:** In addition, with NHDHR concurrence of no adverse effect for the above undertaking, and in accordance with 23 CFR 774.3, FHWA intends to, and by signature below, does make a finding of *de minimis* impact. NHDHR's signature represents concurrence with both the no adverse effect determination and the *de minimis* findings. Parties to the Section 106 process have been consulted and their concerns have been taken into account. Therefore, the requirements of Section 4(f) have been satisfied.			

In accordance with the Advisory Council's regulations, we will continue to consult, as appropriate, as this project proceeds.

Jill Edelmann — 7/29/2019

Jill Edelmann
Cultural Resources Manager
NH Department of Transportation

Concurred with by the NH State Historic Preservation Officer:

Mal Mack DS HPO for — 7/30/19

Elizabeth H. Muzzey
State Historic Preservation Officer
NH Division of Historical Resources

c.c. Marika Labash, NHDHR; Jamie Sikora, FHWA; Ron Crickard, DOT; Christine Perron, MJ; Kirk Mudgett, DOT

Army Corps Secondary Impacts Checklist (Appendix B)

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?	X	
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.)		
2.5 The overall project site is more than 40 acres?		X
2.6 What is the area of the previously filled wetlands?	450 SF	
2.7 What is the area of the proposed fill in wetlands?	1,413 SF	
2.8 What is the % of previously and proposed fill in wetlands to the overall project site?	0.05%	
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?	x	
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	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.
`

US ROUTE 2 OVER KIDDER BROOK
CULVERT REPLACEMENT
TOWN OF SHELBURNE, NH

ACOE Appendix B Supplemental Narrative

1.1 Impaired Waters

The proposed project is located on US Route 2 where is crosses over Kidder Brook in Shelburne. According to the NHDES Draft 2018 303(d) list (most recent available), fish consumption for the assessment unit containing Kidder Brook (NHRIV400020103-01) is listed as impaired due to mercury.

Approximately 4,030 feet downstream of the project area, the Androscoggin River/Reflection Pond (NHIMP400020103-01) is an impaired waterbody. The river is listed as impaired for aquatic life integrity due to pH and impaired for fish consumption due to mercury. The project will not contribute to existing impairments and will not result in any increase in stormwater runoff.

2.3 If wetland crossings are proposed are they adequately designed to maintain hydrology, sediment transport and wildlife passage?

The proposed project will replace the existing culvert under US Route 2. The existing crossing carries Kidder Brook and is 50 feet long, consisting of several segments that include a 72" corrugated metal pipe (cmp) at the inlet, 60" cmp, masonry transitions, and 6' wide x 6.5' high concrete box. The concrete box outlet portion of the crossing was constructed in 1931 and is perched approximately 5 ft at the outlet.

The proposed structure is a precast 5’ high x 8’ wide concrete box culvert, 60’ long and embedded 12 inches with stream simulation. The average bankfull width at this location was measured in the field and determined to be 13.8 ft. The proposed structure will pass the 100-year storm without encroachment onto US 2 or the adjacent campground driveway, and will also improve fish passage and sediment transport by restoring stream continuity.

3.1 Has the NHB and 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?

The NH Natural Heritage Bureau reviewed the proposed project area and identified a natural community downstream of the project area. The NH Natural Heritage Bureau identified a sugar maple-silver maple-white ash floodplain forest south of the project area along the Androscoggin River. The proposed project will not result in changes in hydrology in the vicinity of the Androscoggin and is not expected to impact the natural community.

The USFWS Information, Planning, and Conservation System (IPaC) web tool was utilized to determine if Federally listed species have the potential to occur in the project area. According to the Official Species List (08/19/2019), the proposed project is within the range of the Federally-threatened and state-endangered northern long-eared (*Myotis septentrionalis*) and the Federally threatened Canada lynx (*Lynx canadensis*).

Northern long-eared bat has the potential to occur throughout New Hampshire. According to the US Fish & Wildlife Service, suitable summer habitat for northern long-eared bat consists of a variety of forested habitats. This species generally prefers closed canopy forest with an open understory. Potential roost trees include live trees or snags, at least 3" in diameter, with exfoliating bark, cracks, crevices, or cavities. Bridges and other structures can also provide suitable roosting habitat. This species overwinters in hibernacula such as caves. Neither the Natural Heritage Bureau nor NH Fish and Game reported any known winter hibernacula or maternity roost trees in the vicinity of the project.

A bridge assessment was completed on May 16, 2019 and found no evidence that bats have used the bridge for roosting. The project adheres to the criteria and conditions of the Range-wide Programmatic Consultation for Indiana Bat and Northern Long-eared Bat (Version 5, February 2018), as outlined in the Programmatic Biological Opinion for Transportation Projects in the Range of the Indiana Bat and Northern Long-eared Bat (December 2016). Using the USFWS determination key, it was determined that the project was likely to adversely affect northern long-eared bat due to active season tree clearing. The proposed project's effects are consistent with those analyzed in the Programmatic BO. The USFWS concurs that the project is not likely to jeopardize the continued existence of the northern long-eared bat.

Canada lynx (Lynx canadensis) requires large blocks of dense forested habitat and is only known to occur in northernmost areas of New Hampshire. The habitat in the project area is open hardwood forest. No suitable habitat for lynx exists in the project area and it is assumed that this species is not present.

3.2 Would work occur in any area identified as either "Highest Ranked Habitat in NH" or "Highest Ranked Habitat in Ecological Region"?

The majority of the project area is located in habitat classified as "Highest Ranking" which extends downstream to the north of the Androscoggin River. Immediately upstream the crossing, habitat is unranked until just south of the gas line corridor. Impacts in these areas will occur within and just beyond the existing right-of-way. These roadway shoulders and embankments have been previously disturbed and do not provide high-quality habitat.

3.5 Are stream crossings designed in accordance with the GC 21?

The cost for a structure that fully meets the Stream Crossing Guidelines based on bankfull width (18' span bridge) is estimated at $1.4 million, not including PE & ROW. A structure of this size would likely be transferred to the Bureau of Bridge Design, resulting in at least a one-year delay. The duration of construction of a bridge would be at least 3 months. Road closure is not an option in this location since US 2 is a major regional route with no practical detour options. Operation as one lane with temporary signals may be possible but it would be more likely that a temporary widening would be proposed, resulting in additional stream impacts.

Due to the cost, schedule, and construction constraints, the preferred alternative is a 5' high x 8' wide box culvert, embedded or with baffles. This structure will pass the Q50 with headwater just below the top of box and the Q100 with headwater about 1 foot below the adjacent campground driveway. Construction cost is estimated at $650,000, just under half the cost of an 18' bridge. Construction duration is estimated at 3 to 4 weeks with one lane, temporary signals, and minimal temporary widening. The proposed crossing will restore stream connectivity by eliminating the 5' perch and providing a simulated streambed through the structure.

5. Historic/Archaeological Resources
Has a copy of the Request for Project Review (RPR) Form been sent to the NH Division of Historical Resources as required on Page 11 GC 8(d) of the GP document?

The project has been coordinated with the NH State Historic Preservation Officer (SHPO), NHDOT Cultural Resource Program, and Federal Highway Administration based on the Section 106 review process established by the National Historic Preservation Act of 1966 (NHPA) and outlined at 36 CFR 800.9. On July 30, 2019 a determination of No Historic Properties Affected was made.

Photographs

Photo 1: Culvert inlet facing downstream

Photo 2: Culvert inlet facing upstream

Photo 3: Southern end of study area facing downstream towards crossing

Photo 4: Southern end of study area facing upstream (outside of study area)

Photo 5: Culvert outlet facing upstream

Photo 6: Culvert outlet facing downstream

Photo 7: Inside box culvert portion of the crossing

Photo 8: Rock wall along east of the culvert outlet

Photo 9: Northern end of the study area looking upstream towards the culvert outlet

Photo 10: Northern end of the study area looking downstream

Photo 11: Eastern end of the project area facing west on US-2

Photo 12: Western end of the project area facing east on US-2

Photo 13: Adjoining property to the southwest of the crossing. White Birches Campground.

Photo 14: Adjoining property to the northwest of the crossing. White Birches Campground.

Photo 13: Adjoining property to the southeast of the crossing

Photo 14: Adjoining land to the northeast of the crossing.

Photo 15: Scour pool at the outlet. Approximately 18' long and 15' wide.

Photo 16: Knotweed patch along the far side slope.

Construction Sequence

Shelburne 42426

CONSTRUCTION SEQUENCE

Typical Construction Sequence

1. Perform necessary clearing operations for access and staging.
2. Install perimeter sediment control and install necessary temporary erosion controls as specified on the strategies. Include all staging areas. Set up dewatering basin.
3. Install Water Diversion (clean water bypass).
4. Set up Phase 1 traffic control barrier (maintain 1 lane of traffic through work area, shifted toward outlet side of culvert).
5. Install Cofferdam (Inlet side of culvert).
6. Installation of approximately half of the box culvert, embedment material, inlet side headwall and wingwalls, reconstruct inlet channel and banks.
7. Stabilize inlet channel banks and over bank areas.
8. Set up phase 2 of traffic control (shift traffic toward inlet side of culvert).
9. Modify / Install Cofferdam (to support outlet side of culvert).
10. Install remaining portion of the box culvert, embedment material, outlet side headwall and wingwalls, reconstruct outlet channel and banks.
11. Stabilize outlet channel banks and over bank areas.
12. Remove traffic control barrier (maintain 1 lane of traffic using drums/cones, shift traffic as needed to accomplish remaining operations)
13. Remove diversion pipe, repair and stabilize areas disturbed by removal
14. Install guardrail and replace pavement.
15. Stabilize remaining disturbed areas
16. Remove all perimeter controls.

Env-Wt 404 Shoreline Stabilization

PART Env-Wt 404 CRITERIA FOR SHORELINE STABILIZATION

This project involves the replacement of a 72" cmp / box culvert carrying Kidder Brook under US Route 2. Incidental work will include repair of scoured/eroded areas downstream of the culvert outlet, replacement of a dry laid stone retaining wall at the outlet with a stone lined slope, and installation of guardrail on the outlet side. The need for stream bank stabilization / erosion protection and slope stabilization will result in placement of stone fill within areas under the jurisdiction of the NH Wetlands Bureau and the US Army Corps of Engineers. The stone fill will be located along the disturbed channel and on the steep slope above the east bank of the outlet channel as shown on the plans.

Pursuant to PART Wt 404 Criteria for Shoreline Stabilization, the following addresses each codified section of the Administrative Rules:

Env-Wt 404.01 Least Intrusive Method

The stream bank and slope stabilization treatment proposed is the least intrusive construction method necessary to ensure bank and slope stability while minimizing disruption to the surrounding environment. The proposed stone lining can be reasonably constructed utilizing general highway construction methods, typically requires little to no regular maintenance, and will re-vegetate naturally over time.

Env-Wt 404.02 Diversion of Water

Permanent diversion of stormwater runoff is not a practical method of reducing or eliminating the use of stone for erosion protection along stream banks. Diversion of existing sheet flow runoff would not eliminate the need for stone slope stabilization of the steep north east roadway embankment.

Env-Wt 404.03 Vegetative Stabilization

(a) Natural vegetation will be left intact to the maximum extent possible. Where practical, slopes will be graded at 2:1 or flatter and stabilized with humus, seed, and erosion control blanket. Further flattening of slopes is not practical due to the confined channel, steep existing topography, and presence of adjacent forest and development.

(b) The project is not in a tidal area.

Env-Wt 404.04 Rip-rap

(a) Stone fill is only proposed where slopes are steeper than 2:1. Stone fill is the minimum treatment necessary to protect the stream banks and slopes in these areas. At high flows, stream banks in the vicinity of the culvert inlet and outlet wing walls and along the steep downstream channel may experience turbulence and velocities beyond the limits of vegetative stabilization. Q100 velocity in the downstream channel will be over 10 ft/s. Erosion of the lower banks has the potential to destabilize the culvert wing walls and the roadway embankment above. The existing slope above the outlet side east bank is steeper than 1.5:1 and is partially supported by a dry laid stone retaining wall which is failing. The proposed slope will be graded to 1.5:1. A flatter slope would require relocation of the stream channel or relocation of US 2. Guardrail and an extended wing wall are proposed on the outlet side to fit the proposed design to site conditions.

(b) (1-5) The minimum and maximum stone size and gradation are contained in the attached NHDOT Standard Specification. Proposed grading, stone fill locations, and cross sections are shown on the attached plans. Bedding for the stone fill will consist of natural ground excavated to the proposed underside of the stone fill with geotextile fabric.

(6) The attached plans indicate the relationship of the project to fixed points of reference, abutting properties, and features of the natural shoreline.

(7) Stone fill is proposed for the limits shown on the attached plans to protect the banks from erosion during high flows, from long term scour, and for embankment slopes steeper than 2:1, which have difficulty establishing and supporting vegetation.

(c) This project is not located adjacent to a great pond or water body where the state holds fee simple ownership.

(d) As noted above, stone fill is only proposed where slopes are steeper than 2:1 and flatter slopes are physically impractical due to restricted site conditions. Stone fill is also necessary in the areas of the culvert wing walls and along the steep downstream channel where turbulence and velocity during high flows have the potential to cause erosion.

(e) The enclosed plan has been stamped by a professional engineer.

SECTION 585 -- STONE FILL

Description

1.1 This work shall consist of furnishing and placing a dense stone fill at the locations shown on the plans or ordered. Stone Fill is typically required for stability of embankment fill and soil cut slopes steeper than 2 horizontal to 1 vertical, although slopes at a flatter grade with water seepage or subject to submergence, such as in water quality treatment basins, could require stone fill. Stone fill is also used for erosion protection at pipe outlets, in drainage channels and for other drainage structures where expected water flows and velocities may require it.

Materials

2.1 Stone for stone fill shall be approved quarry stone, or broken rock of a hard, sound, and durable quality. The stones and spalls shall be so graded as to produce a dense fill with a minimum of voids.

2.1.1 Class A stone shall be irregular in shape with approximately 50 percent of the mass having a minimum volume of 12 ft^3, approximately 30 percent of the mass ranging between 3 and 12 ft^3, approximately 10 percent of the mass ranging between 1 and 3 ft^3, and the remainder of the mass composed of spalls.

2.1.2 Class B stone shall be irregular in shape with approximately 50 percent of the mass having a minimum volume of 3 ft^3, approximately 40 percent of the mass ranging between 1 and 3 ft^3, and the remainder of the mass composed of spalls.

2.1.3 Class C stone shall consist of clean, durable fragments of ledge rock of uniform quality, reasonably free from thin or elongated pieces. The stone shall be made from rock which is free from topsoil and other organic material. The stone shall be graded as follows:

Sieve Size	Percentage by Weight Passing
12 in	100
4 in	50 - 90
1-1/2 in	0 - 30
3/4 in	0 - 10

2.1.4 Class D stone shall conform to Table 520-3 - Coarse Aggregate, Standard Stone Size No. 467.

2.1.5 Spalls for filling voids shall be stones or broken rock ranging downward from a maximum size of 1 ft^3.

2.2 Gravel blanket material shall conform to 209.2.1.2.

2.3 Geotextile shall conform to Section 593.

Construction Requirements

3.1 Stones and spalls for stone fill shall be deposited and graded to eliminate voids and obtain a dense mass throughout the course. The spalls shall be tamped into place using an equipment bucket or other approved method.

3.1.1 When stone fill is placed on a slope, the stones shall be deposited in such a manner as not to dislodge the underlying material unnecessarily.

3.1.2 When stone fill is placed on a geotextile, it shall be deposited in a manner to maintain the integrity of the geotextile.

3.2 When gravel blanket is shown or ordered, the gravel shall be placed in layers not exceeding 12” in depth unless otherwise ordered.

3.3 The completed surface shall approximate the lines and grades shown or ordered. When ordered, stone placed over 1 ft. outside or above such lines and grades shall be removed.

3.4 Stone fill (Bridge) shall be placed within the limits shown on the plans.

Method of Measurement

4.1 Stone fill will be measured by the cubic yard and in accordance with 109.01.

Basis of Payment

5.1 The accepted quantity of stone fill of the class specified will be paid for at the Contract unit price per cubic yard complete in place.

5.2 Gravel blanket material specified or ordered will be paid for under Section 209.

5.3 Geotextile specified or ordered will be paid for under Section 593.

5.4 The accepted quantity of excavation required for placing stone fill and for placing any underlying gravel blanket will be paid for under the item of excavation being performed. Excavation herein refers only to excavation of original ground or to material ordered removed not shown on the plans.

5.5 Free borrow will not be required to replace the accepted quantity of stone obtained from the excavation. However, when the plans do not call for borrow, but the quantity of material removed from excavation for use under this item requires the Contractor to furnish borrow to complete the work, such borrow will be subsidiary.

Pay items and units:

585.1	Stone Fill, Class A	Cubic Yard
585.2	Stone Fill, Class B	Cubic Yard
585.21	Stone Fill, Class B (Bridge)	Cubic Yard
585.3	Stone Fill, Class C	Cubic Yard
585.4	Stone Fill, Class D	Cubic Yard

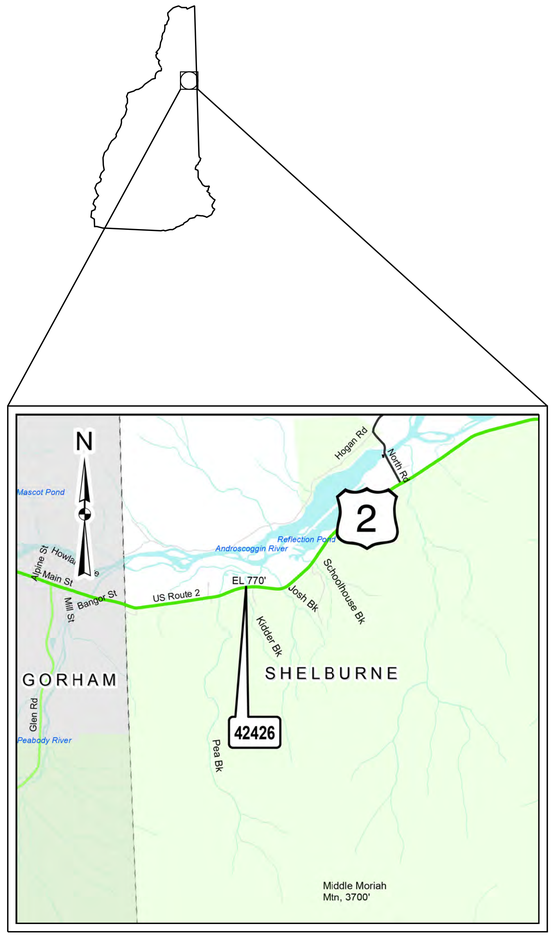
Wetland Impact & Erosion Control Plans

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

WETLANDS PLANS
FEDERAL AID PROJECT

X-A004(842)
N.H. PROJECT NO. 42426
US ROUTE 2

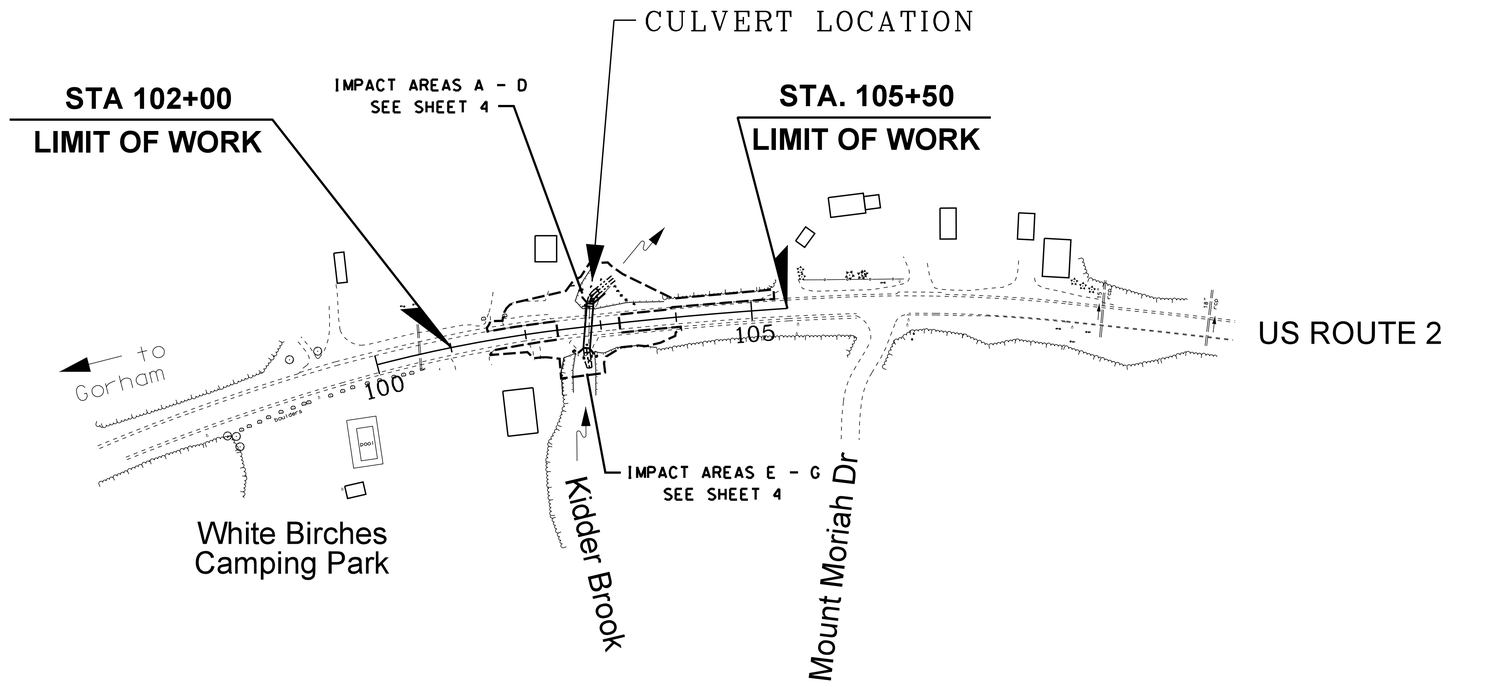
DESIGN DATA	
AVERAGE DAILY TRAFFIC 20 18	3,281
AVERAGE DAILY TRAFFIC 20 XX	XX
PERCENT OF TRUCKS	XX
DESIGN SPEED	50 MPH
LENGTH OF PROJECT	350 FT



LOCATION MAP

1 1/2 0 1 2 mi.

GRAPHIC SCALE



INDEX OF SHEETS

TOWN OF SHELBURNE

COUNTY OF COOS

SCALE: 1" = 100'

9/10/2019

Wetland Delineation by:

McFarland Johnson, Inc.

May 16, 2019

STATE OF NEW HAMPSHIRE
CHRISTINE J. PERRON
Shelburne 42426
No. 294
CERTIFIED WETLAND SCIENTIST

NHDOT THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

RECOMMENDED FOR APPROVAL:

DIRECTOR OF PROJECT DEVELOPMENT — DATE

APPROVED:

ASSISTANT COMMISSIONER AND CHIEF ENGINEER — DATE

DRAWING NAME	FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
42426FSW	X-A004(842)	42426	1	10

DRAWN BY CAC DATE 8/2019
CHECKED BY JJN DATE 8/23/19

FOR CONSTRUCTION AND ALIGNMENT DETAILS - SEE CONSTRUCTION PLANS

GENERAL

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

DRIVEWAYS — (label surface type)

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

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)

TREE OR STUMP (CROSS-SECTIONS) — (show station, circumference in feet & type)

HEDGE — (label type)

MONITORING WELL — mon W

WELL — W

FLAG POLE — fp

ORIGINAL GROUND (TYPICALS)

ROCK OUTCROP

ROCK LINE (TYPICALS & SECTIONS ONLY)

GUARDRAIL (label type) — existing — PROPOSED — 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

SLOPE LINE (FILL)

SLOPE LINE (CUT)

PROFILES AND CROSS SECTIONS:
ORIGINAL GROUND ELEVATION (LEFT) — 72.5
FINISHED GRADE ELEVATION (RIGHT) — 79.14

STATE OF NEW HAMPSHIRE
SHELBURNE
DEPARTMENT OF TRANSPORTATION ∘ BUREAU OF HIGHWAY DESIGN

STANDARD SYMBOLS

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
11-21-2014	std symb	42426	2	10

DRAINAGE

MANHOLE

CATCH BASIN — cb

DROP INLET — di

(existing) (PROPOSED)

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

PROPERTY LINE (COMMON OWNER)

TOWN LINE — BOW / CONCORD

COUNTY LINE — COOS / GRAFTON

STATE LINE — MAINE / NEW HAMPSHIRE

NATIONAL FOREST

CONSERVATION LAND — 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

MISCELLANEOUS/UNKNOWN POLE

GUY POLE OR PUSH BRACE

(plot point at face not center of symbol)

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 — (label type)

UNDERGROUND UTILITIES

WATER (on existing lines label size, type and note if abandoned) — W — PW

SEWER — S — PS

TELEPHONE — T — PT

ELECTRIC — E — PE

GAS — G — PG

LIGHTING — L — PL

INTELLIGENT TRANSPORTATION SYSTEM — ITS — PITS

FIBER OPTIC — FO — PFO

WATER SHUT OFF

GAS SHUT OFF

HYDRANT

MANHOLES

SEWER — MHS

TELEPHONE — MHT

ELECTRICAL — MHE

GAS — 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 — 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 — 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
SHELBURNE
DEPARTMENT OF TRANSPORTATION ∘ BUREAU OF HIGHWAY DESIGN

STANDARD SYMBOLS

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
9-1-2016	std symb	42426	3	10

WETLAND IMPACT SUMMARY

WETLAND NUMBER	WETLAND CLASSIFICATION	LOCATION	AREA IMPACTS						LINEAR STREAM IMPACTS FOR MITIGATION		
			PERMANENT				TEMPORARY		PERMANENT		
			N.H.W.B (NON-WETLAND)		N.H.W.B & A.C.O.E. (WETLAND)				BANK LEFT	BANK RIGHT	CHANNEL
			SF	LF	SF	LF	SF	LF	LF	LF	LF
2	R3UB1	A		21	780	53					
2	R3UB1	B					169	22			
B2	BANK	C					6	6			
B2	BANK	D	352	48							
1	R3UB1	E		65	281	32					
1	R3UB1	F					68	24			
B1	BANK	G					15	8			
SUB-TOTALS			352	134	1,061	85	258	60	0	0	

PERMANENT IMPACTS: 1,413 SF
TEMPORARY IMPACTS: 258 SF
TOTAL IMPACTS: 1,671 SF

N/F
LANGLANDS, ROBERT JR. & JANET

N/F
SCOTT, MICHAEL & JOYCE E.

Kidder Brook

PERMANENT DRAINAGE EASEMENT

LIMIT OF DISTURBANCE (TYP.) AND TEMPORARY EASEMENT WHERE OUTSIDE EXISTING ROW OR PROPOSED EASEMENTS

PERMANENT SLOPE EASEMENT

PROPOSED GUARDRAIL
STA 102+00 LT – 105+15 LT
16' OFFSET
50' EAGRT'S ON BOTH ENDS

LRS STOCKPILE AREA

Approx Existing ROW

US Route 2

Mt Moriah Dr

White Birches Camping Park

to Gorham

N/F
LANGLANDS, ROBERT JR. & JANET

N/F
SJOSTROM, KRIS S. & LINDA L.

STA 102+81 REPLACE EXISTING
72" CMP/STONE/CONCRTE BOX (50' LONG)
WITH 5' HIGH X 8' WIDE X 60' LONG
PRECAST CONCRETE BOX CULVERT
SEE ATTACHED CULVERT DETAILS

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	
R3UB1	RIVERINE, UPPER PERENIAL, UNCONSOLIDATED BOTTOM, COBBLE-GRAVEL
BANK	BANK

CONTOUR INTERVAL = 1 FOOT
SEE DETAILS FOR PROPOSED CONTOURS

20 0 20 40
SCALE IN FEET

REVISIONS AFTER PROPOSAL

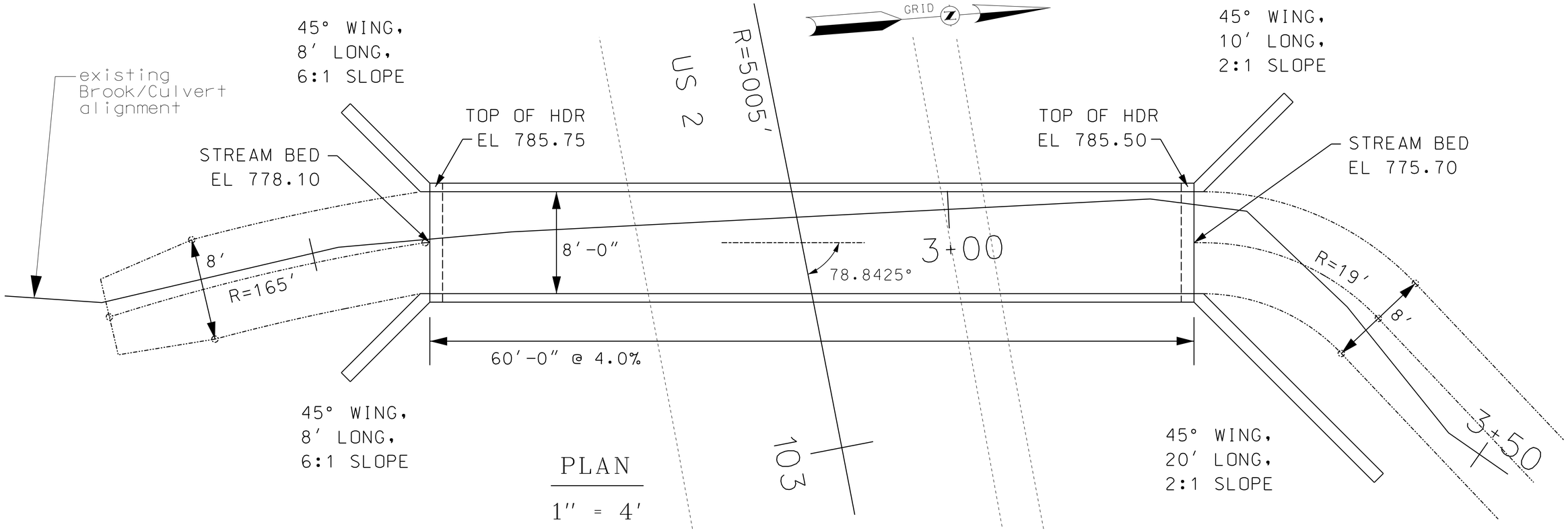
NUMBER	DESCRIPTION	DATE	STATION

		DATE
SDR PROCESSED		
NEW DESIGN	CAC	8/2019
SHEET CHECKED	JJN	8/23/19
AS BUILT DETAILS		

STATE OF NEW HAMPSHIRE
Town of Shelburne
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

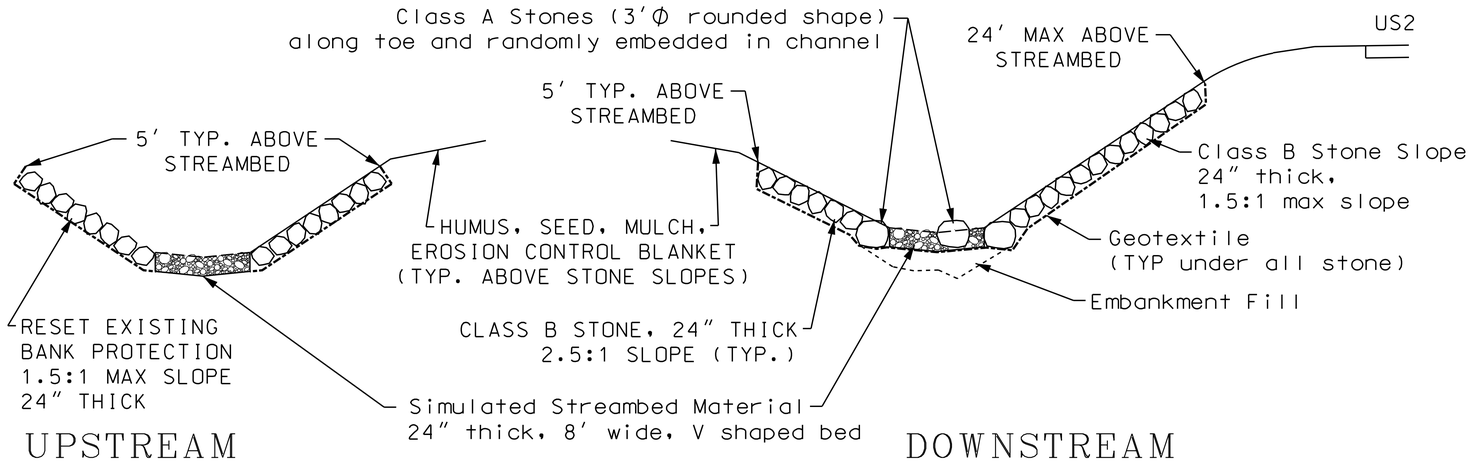
WETLAND IMPACT PLANS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
42426w01	42426	4	10



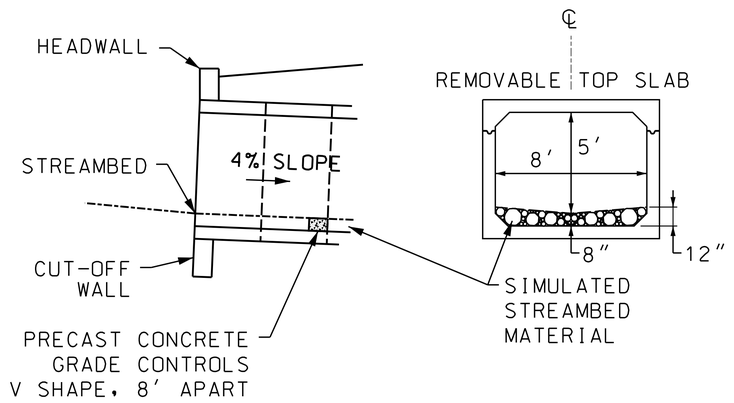
PLAN

1″ = 4′



Channel Sections

NOT TO SCALE



Culvert Sections

1″ = 4′

REVISIONS AFTER PROPOSAL

NUMBER	DESCRIPTION	STATION	DATE

SDR PROCESSED		DATE	
NEW DESIGN	CAC	DATE	7/2019
SHEET CHECKED	JJN	DATE	8/23/19
AS BUILT DETAILS		DATE	

STATE OF NEW HAMPSHIRE
SHELBURNE
DEPARTMENT OF TRANSPORTATION ∘ BUREAU OF HIGHWAY DESIGN

DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
42426 Details	42426	5	10

STONE SLOPE PROTECTION (TYP.)

APPROX LIMIT OF DISTURBANCE

(PERMANENT) SLOPE LINE

MATCH EXISTING STA 3+68± EL 764.0±

CLEARING LINE

CLEARING LINE

WING TIP EL 780.25

WING TIP EL 775.25

TOB

TOBOHW

OHW

8'

26%

5' @4%

775.50

PROPOSED GUARDRAIL

16'

R=5005'

US ROUTE 2

existing culvert

103

3' c ash

GRID

CONTOUR INTERVAL 1 FOOT

5 0 5 10

SCALE IN FEET

OUTLET GRADING PLAN

STATE OF NEW HAMPSHIRE
Town of Shelburne
DEPARTMENT OF TRANSPORTATION ∘ BUREAU OF HIGHWAY DESIGN

DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
42426gra1	42426	6	10

REVISIONS AFTER PROPOSAL

NUMBER	DESCRIPTION	DATE	STATION

SDR PROCESSED	DATE	
NEW DESIGN	CAC	DATE 8/2019
SHEET CHECKED	JJN	DATE 8/23/19
AS BUILT DETAILS		DATE

INLET GRADING PLAN

CONTOUR INTERVAL 1 FOOT

5 0 5 10 SCALE IN FEET

REVISIONS AFTER PROPOSAL				
NUMBER	DATE	STATION	STATION	DESCRIPTION

SDR PROCESSED DATE
NEW DESIGN CAC DATE 8/2019
SHEET CHECKED JJN DATE 8/23/19
AS BUILT DETAILS DATE

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

DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
42426gra2	42426	7	10

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	DESCRIPTION

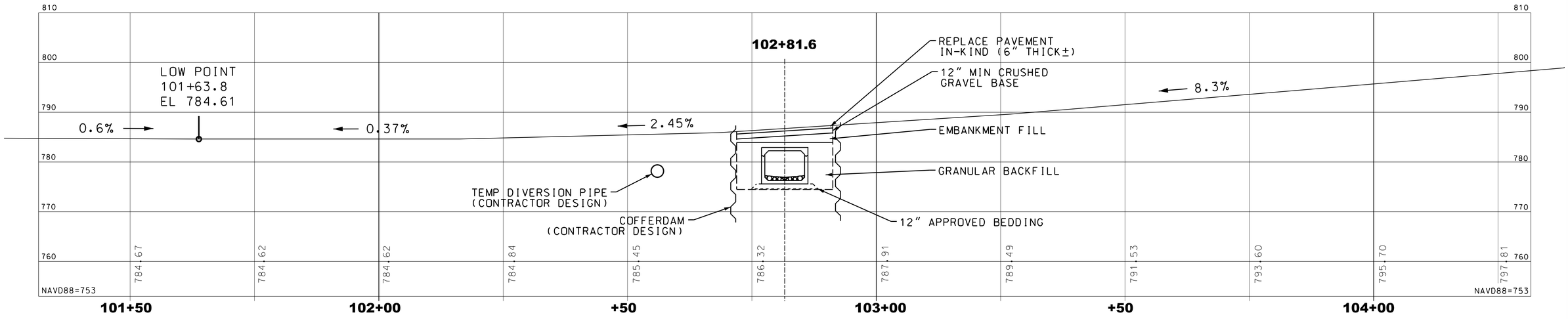
SDR PROCESSED DATE

NEW DESIGN CAC DATE 8/2019

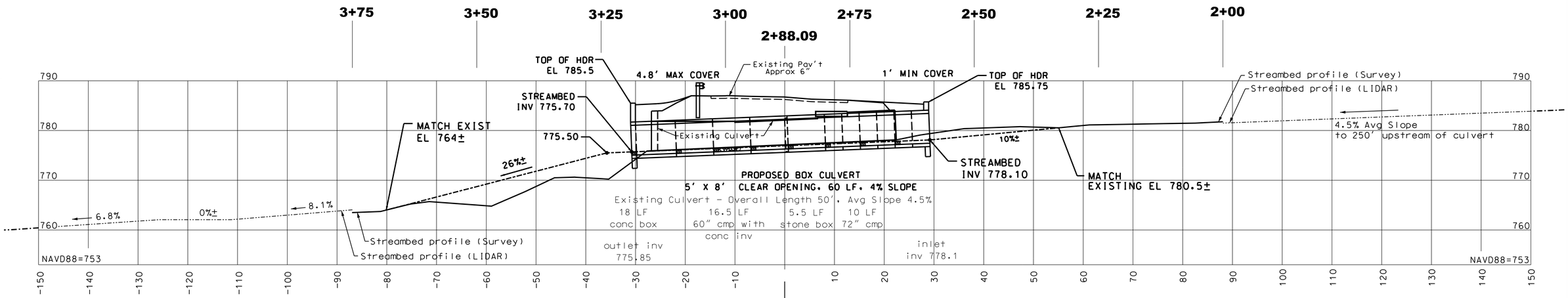
SHEET CHECKED JJN DATE 8/23/19

AS BUILT DETAILS DATE

US ROUTE 2 PROFILE



PROFILE ALONG BROOK CL



Note - LIDAR elevations are within ±0.5' of Survey elevations

US2 102+81.6
Culvert Centerline

10 0 10 20
SCALE IN FEET

STATE OF NEW HAMPSHIRE
Town of Shelburne
DEPARTMENT OF TRANSPORTATION ∘ BUREAU OF HIGHWAY DESIGN

PROFILES

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
42426 Profiles	42426	8	10

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 30" AND MAY 1" 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 15", OR WHICH ARE DISTURBED AFTER OCTOBER 15", 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 15", OR WHICH ARE DISTURBED AFTER OCTOBER 15", SHALL BE STABILIZED TEMPORARILY WITH STONE OR IN ACCORDANCE WITH TABLE 1.
      (C) AFTER NOVEMBER 30" 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 30".

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 1" THROUGH NOVEMBER 30", 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'	YES'	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.

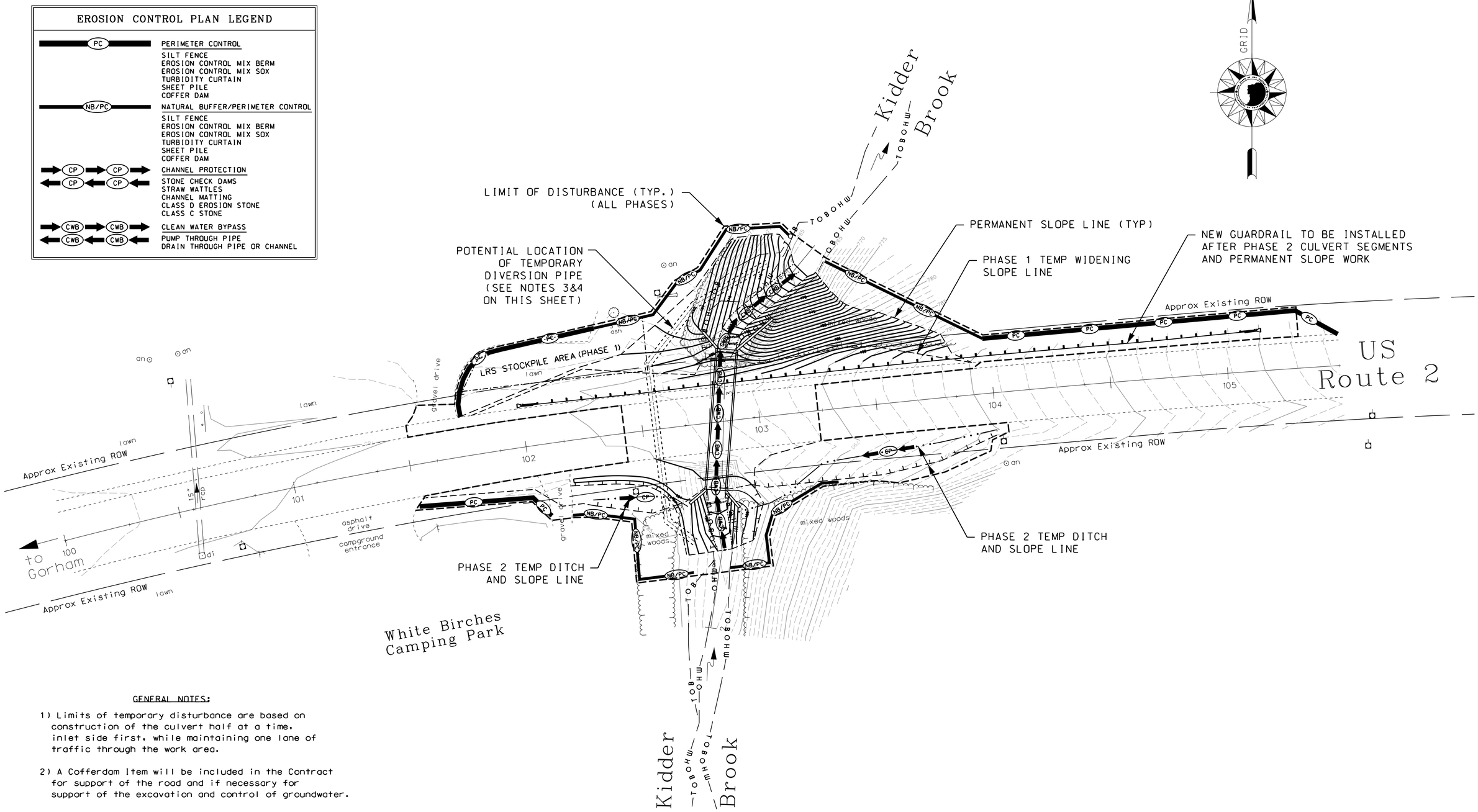
STATE OF NEW HAMPSHIRE
SHELBURNE
DEPARTMENT OF TRANSPORTATION ∘ BUREAU OF HIGHWAY DESIGN

EROSION CONTROL STRATEGIES

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
12-21-2015	erosstrat	42426	9	10

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 CP / CP CP	CHANNEL PROTECTION STONE CHECK DAMS STRAW WATTLES CHANNEL MATTING CLASS D EROSION STONE CLASS C STONE
CWB CWB / CWB 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, inlet side first, while maintaining one lane of traffic through the work area.

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.

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 pass the 2 year storm.

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

RESTORE TEMPORARY DISTURBANCE AREAS TO EXISTING GRADE

CONTOUR INTERVAL = 1 FOOT

20 0 20 40

SCALE IN FEET

NUMBER	DATE	STATION	DESCRIPTION
			REVISIONS AFTER PROPOSAL

SDR PROCESSED		DATE
NEW DESIGN	CAC	DATE 8/2019
SHEET CHECKED	JJN	DATE 8/23/19
AS BUILT DETAILS		DATE

STATE OF NEW HAMPSHIRE
Town of Shelburne
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

EROSION CONTROL PLAN

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
42426erc01	42426	10	10