STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

JAMES H. TROGDON, III
SECRETARY

October 10, 2017

U.S. Army Corps of Engineers
151 Patton Avenue, Room 208
Asheville, NC 28801-5006

ATTN: Ms. Lori Beckwith
NCDOT Coordinator

Subject: **Application for Section 404 Nationwide Permits 13, 23 and 33 and Section 401 Water Quality Certification** for the Proposed Replacement of Bridge 12 on SR 1538 (Becky Mountain Road) over Hogsed Creek in Transylvania County, Division 14, TIP No. B-4823, Federal Aid Project No. BRZ-1538(9), Debit $240 from WBS 38593.1.2.

Dear Madam:

The North Carolina Department of Transportation (NCDOT) proposes to replace bridge number 12 on SR 1538 (Becky Mountain Road) with a triple-barrel 11'x6' reinforced concrete box culvert (RCBC) slightly west of the existing alignment. Traffic will be maintained on-site during construction.

As a result of replacing the existing bridge with a culvert, there will be 42 linear feet of permanent stream impacts. There will also be 65 linear feet of stream bank stabilization due to the creation of floodplain benches at the inlet and outlet of the RCBC and 0.02 acre (58 linear feet) of temporary impacts due to dewatering with impervious dikes.

Please see enclosed copies of the Pre-Construction Notification (PCN), Division of Mitigation Services (DMS) acceptance letter, Stormwater Management Plan, Permit Drawings, Roadway Plan Sheets, and Biological Opinion. (Formal Section 7 consultation was required for the Appalachian elktoe, due to known occurrences of this species in the French Broad River near its confluence with Hogsed Creek as well as further downstream in the French Broad River.) A Programmatic Categorical Exclusion (PCE) was completed in April 2016 and distributed shortly thereafter. Additional copies are available upon request.

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
NATURAL ENVIRONMENT SECTION
1598 MAIL SERVICE CENTER
RALEIGH NC 27699-1598

Telephone: (919) 707-6000
Fax: (919) 212-5785
Customer Service: 1-877-368-4968
Website: www.ncdot.gov

Location:
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

This project is located in a trout watershed, therefore comments from the NCWRC will be required prior to authorization by the Corps of Engineers. By copy of this letter and attachment, NCDOT hereby requests NCWRC Review. NCDOT requests that NCWRC forward their comments to the Corps of Engineers and the NCDOT within 30 calendar days of receipt of this application.

This project calls for a letting date of February 20, 2018 and a review date of January 2, 2018; however, the let date may advance as additional funding becomes available.

A copy of this permit application and its distribution list will be posted on the NCDOT Website at: http://connect.ncdot.gov/resources/Environmental. If you have any questions or need additional information, please call Erin Cheely at (919) 707-6108.

Sincerely,

for Philip S. Harris III, P.E., C.P.M.
Natural Environment Section Head

Cc:
NCDOT Permit Application Standard Distribution List

Pre-Construction Notification (PCN) Form

For Nationwide Permits and Regional General Permits

(along with corresponding Water Quality Certifications)

June 28, 2017 Ver 1.8

*Please note: fields marked with a red asterisk * below are required. You will not be able to submit the form until all mandatory questions are answered.*

Below is a link to the DRAFT online help file.

http://edocs.deq.nc.gov/WaterResources/0/doc/549884/Page1.aspx

A. Processing Information

County (or Counties) where the project is located:*

Transylvania

Is this project a public transportation project?*

(•) Yes ( ) No

Is this a NCDOT Project?*

(•) Yes ( ) No

(NCDOT only) T.I.P. or state project number:

B-4823

WBS #

38593.1.2

(for NCDOT use only)

1a. Type(s) of approval sought from the Corps:*

☑ Section 404 Permit (wetlands, streams and waters, Clean Water Act)

☐ Section 10 Permit (navigable waters, tidal waters, Rivers and Harbors Act)

1b. What type(s) of permit(s) do you wish to seek authorization?*

☑ Nationwide Permit (NWP)

☐ Regional General Permit (RGP)

Nationwide Permit (NWP) Number: **13 - Bank Stabilization**

Nationwide Permit (NWP) Number: **23 - Categorical Exclusions**

Nationwide Permit (NWP) Number: **33 - Temporary Construction**

NWP Number Other:

List all NW numbers you are applying for not on the drop down list.

1c. Type(s) of approval sought from the DWR:*

check all that apply

- [x] 401 Water Quality Certification - Regular
- [ ] 401 Water Quality Certification - Express
- [ ] Non-404 Jurisdictional General Permit
- [ ] Riparian Buffer Authorization

1d. Is this notification solely for the record because written approval is not required? *

For the record only for DWR 401 Certification: ○ Yes ◉ No

For the record only for Corps Permit: ○ Yes ◉ No

1e. Is payment into a mitigation bank or in-lieu fee program proposed for mitigation of impacts?

If so, attach the acceptance letter from mitigation bank or in-lieu fee program.

◉ Yes ○ No

Acceptance Letter Attachment

Click the upload button or drag and drop files here to attach document

B-4823 DMS Acceptance.pdf 61.75KB

FILE TYPE MUST BE PDF

1f. Is the project located in any of NC's twenty coastal counties? *

○ Yes ◉ No

B. Applicant Information

1a. Who is the Primary Contact? *

NCDOT

1b. Primary Contact Email: *

ekcheely@ncdot.gov

1c. Primary Contact Phone: *

(xxx)xxx-xxxx

(919)707-6108

1d. Who is applying for the permit?

- [ ] Owner
- [ ] Applicant (other than owner)
- [ ] Agent/Consultant

(Check all that apply)

2. Owner Information

2a. Name(s) on recorded deed:

2b. Deed book and page no.:

2c. Responsible party:

(for Corporations)

2d. Address

Street Address

Address Line 2

City State / Province / Region

Postal / Zip Code Country

2e. Telephone Number:

(xxx)xxx-xxxx

2f. Fax Number:

(xxx)xxx-xxxx

2g. Email Address: *

pharris@ncdot.gov

C. Project Information and Prior Project History

1. Project Information

1a. Name of project: *

Replacement of Bridge 12 over Hogsed Creek on SR 1538

1b. Subdivision name:

(if appropriate)

1c. Nearest municipality / town: *

Brevard

1d. Driving directions *

If it is a new project and can not easily be found in a GPS mapping system. Please provide directions.

35.204695, -82.715079

2. Project Identification

2a. Property Identification Number:

(tax PIN or parcel ID)

2b. Property size:

(in acres)

2c. Project Address

Street Address

Address Line 2

City

State / Province / Region

Postal / Zip Code

Country

2d. Site coordinates in decimal degrees

Please collect site coordinates in decimal degrees. Use between 4-6 digits (unless you are using a survey-grade GPS device) after the decimal place as appropriate, based on how the location was determined. (For example, most mobile phones with GPS provide locational precision in decimal degrees to map coordinates to 5 or 6 digits after the decimal place.)

Latitude: *

35.204695

ex: 34.208504

Longitude: *

-82.715079

-77.796371

3. Surface Waters

3a. Name of the nearest body of water to proposed project: *

Hogsed Creek

3b. Water Resources Classification of nearest receiving water: *

C; Tr

Surface Water Lookup

3c. What river basin(s) is your project located in? *

French Broad

River Basin Lookup

4. Project Description

4a. Describe the existing conditions on the site and the general land use in the vicinity of the project at the time of this application: *

Land use within the vicinity of this project consists of about 50% forest land, 35% cultivated land (agricultural fields and pastures), and 15% developed or disturbed lands.

4b. Attach an 8 1/2 X 11 excerpt from the most recent version of the USGS topographic map indicating the location of the project site. (for DWR)

Click the upload button or drag and drop files here to attach document

File type must be pdf

4c. Attach an 8 1/2 X 11 excerpt from the most recent version of the published County NRCS Soil Survey map depicting the project site. (for DWR)

Click the upload button or drag and drop files here to attach document

File type must be pdf

4d. List the total estimated acreage of all existing wetlands on the property:

0

4e. List the total estimated linear feet of all existing streams on the property:

(intermittent and perennial)

335

4f. Explain the purpose of the proposed project:

The purpose of this project is to replace a functionally obsolete bridge (deck geometry rating 2 of 9).

4g. Describe the overall project in detail, including the type of equipment to be used:

The proposed project involves replacing a 26-foot, single-span bridge with a triple-barrel 11'x6' reinforced concrete box culvert slightly west of the existing alignment. Traffic will be detoured on-site during construction. Standard road building equipment, such as trucks, dozers, and cranes will be used.

4h. Please upload project drawings for the proposed project.

Click the upload button or drag and drop files here to attach document

B-4823 Final Permit Drawings.pdf	1.83MB
B-4823 Roadway Plans.pdf	1.88MB

File type must be pdf

5. Jurisdictional Determinations

5a. Have the wetlands or streams been delineated on the property or proposed impact areas? *

(•) Yes ( ) No ( ) Unknown

Comments:

Only two perennial streams identified in the study area - Hogsed Creek and a UT. No JD site visit was held.

5b. If the Corps made a jurisdictional determination, what type of determination was made? *

( ) Preliminary ( ) Approved (•) Unknown

Corps AID Number:

Example: SAW-2017-99999

5c. If 5a is yes, who delineated the jurisdictional areas?

Name (if known): Erin Cheely

Agency/Consultant Company: NCDOT

Other:

5d. If yes, list the dates of the Corps jurisdictional determinations or State determinations and attach documentation.

5d1. Jurisdictional determination upload

Click the upload button or drag and drop files here to attach document

File type must be PDF

6. Project History

6a. Have permits or certifications been requested or obtained for this project (including all prior phases) in the past? *

○ Yes ◉ No ○ Unknown

7. Future Project Plans

7a. Is this a phased project? *

○ Yes ◉ No

Are any other NWP(s), regional general permit(s), or individual permits(s) used, or intended to be used, to authorize any part of the proposed project or related activity? This includes other separate and distant crossing for linear projects that require Department of the Army authorization but don't require pre-construction notification.

D. Proposed Impacts Inventory

1. Impacts Summary

1a. Where are the impacts associated with your project? (check all that apply):

☐ Wetlands ☑ Streams-tributaries ☐ Buffers

☐ Open Waters ☐ Pond Construction

2. Wetland Impacts

If there are wetland impacts proposed on the site, then complete this question for each wetland area impacted.

3. Stream Impacts

If there are perennial or intermittent stream impacts (including temporary impacts) proposed on the site, then complete this question for all stream sites impacted.

3a. Site # - Reason for impact	3b.Impact type	3c. Type of impact	3d. Stream name	3e. Stream Type	3f. Jurisdiction type	3g. Stream width	3h. Impact length
1 - 3@ 11'x6' RCBC Map label (e.g. Road Crossing 1)	**P** Permanent (P) or Temporary (T)	**Fill**	**Hogsed Creek**	**Perennial** Perennial (PER) or intermittent (INT)	**Both**	Average **12** (feet)	**42** (linear feet)
1- Bank Stabilization Map label (e.g. Road Crossing 1)	**P** Permanent (P) or Temporary (T)	**Stabilization**	**Hogsed Creek**	**Perennial** Perennial (PER) or intermittent (INT)	**Both**	Average **12** (feet)	**65** (linear feet)

3a. Site # - Reason for impact	3b.Impact type	3c. Type of impact	3d. Stream name	3e. Stream Type	3f. Jurisdiction type	3g. Stream width	3h. Impact length
1- Impervious dike Map label (e.g. Road Crossing 1)	**T** Permanent (P) or Temporary (T)	**Dewatering**	**Hogsed Creek**	**Perennial** Perennial (PER) or intermittent (INT)	**Both**	Average **12** (feet)	**58** (linear feet)

** All Perennial or Intermittent streams must be verified by DWR or delegated local government.

3i. Total jurisdictional ditch impact in square feet:

0

3i. Total permanent stream impacts:

107

3i. Total temporary stream impacts:

58

3i. Total stream and tributary impacts:

165

3j. Comments:

4. Open Water Impacts

If there are proposed impacts to lakes, ponds, estuaries, tributaries, sounds, the Atlantic Ocean, or any other open water of the U.S. then individually list all open water impacts below.

5. Pond or Lake Construction

If pond or lake construction is proposed, then complete the chart below.

6. Buffer Impacts (for DWR)

If project will impact a protected riparian buffer, then complete the chart below. Individually list all buffer impacts below.

E. Impact Justification and Mitigation

1. Avoidance and Minimization

1a. Specifically describe measures taken to avoid or minimize the proposed impacts in designing the project: *

The proposed replacement triple-barrel, 11'x6' reinforced concrete box culvert (RCBC) will be constructed just west of the alignment of the existing bridge. The center low-flow barrel will closely mimic the exiting stream characteristics in both width and slope. The outer, high-flow barrels will have floodplain benches at the inlet and outlet ends, which will be covered with coir fiber matting and side slopes lined with Class I rip-rap for bank stabilization. The proposed RCBC will be buried 1.0 ft and have 1.0 ft sills at the inlet and outlet of the low flow barrel with 2.0 ft sills at the inlet and outlet of the outer high flow barrels.

An existing ditch at the beginning of the project (SW quadrant) will be relocated to accommodate the new roadway alignment. Temporary matting will be used until permanent vegetation is established in this ditch. Coir fiber matting will be utilized to protect the ditch along the NE quadrant of the project from Mill Cove Road to the end of the project. An undersized 15" CMP under Mill Cove Road will be replaced with an 18" drainage pipe. The existing ditch from Mill Cove Road to Hogsed Creek will be regraded to accommodate the wider roadway and lined with class I rip-rap. All ditch outlets will have class I rip-rap at embankments.
See attached Biological Opinion (BO) for additional measures to protect Appalachian elktoe populations.

1b. Specifically describe measures taken to avoid or minimize the proposed impacts through construction techniques: *

Impervious dikes will be constructed to dewater the work area and a temporary stilling basin will be utilized during dewatering. Design Standards in Sensitive Watersheds will be utilized during construction to reduce the stormwater impacts to the receiving streams due to erosion and runoff. A trout moratorium from October 15 – April 15 will be adhered to in order to protect reproducing trout.

2. Compensatory Mitigation for Impacts to Waters of the U.S. or Waters of the State

2a. Does the project require Compensatory Mitigation for impacts to Waters of the U.S. or Waters of the State?

(•) Yes ( ) No

2c. If yes, mitigation is required by (check all that apply):

[ ] DWR [x] Corps

2d. If yes, which mitigation option(s) will be used for this project?

[ ] Mitigation bank [x] Payment to in-lieu fee program [ ] Permittee Responsible Mitigation

4. Complete if Making a Payment to In-lieu Fee Program

4a. Approval letter from in-lieu fee program is attached.

[x] Yes

4b. Stream mitigation requested:

(linear feet)

42

4c. If using stream mitigation, stream temperature:

cold

4d. Buffer mitigation requested (DWR only):

(square feet)

0

4e. Riparian wetland mitigation requested:

(acres)

0

4f. Non-riparian wetland mitigation requested:

(acres)

0

4g. Coastal (tidal) wetland mitigation requested:

(acres)

0

4h. Comments

The NCDOT does not propose mitigation for the 65 linear feet of bank stabilization or the 0.02 ac (58 linear feet) of temporary impacts from dewatering. These impacts do not require permanent fill in the stream bed and, therefore, under Section 404 of the Clean Water Act, do not constitute Loss of Waters of the U.S. and are not subject to compensatory mitigation.

F. Stormwater Management and Diffuse Flow Plan (required by DWR)

1a. Does this project require a Stormwater Management Plan?

(•) Yes ( ) No

1b. If this project DOES require a Stormwater Management Plan, then provide a brief, narrative description of the plan:

See attached Permit Drawings

1c. What is the overall percent imperviousness of this project?

%

1d. Who will be responsible for the review of the Stormwater Management Plan? *

- [ ] Certified Local Government
- [ ] DEMLR Stormwater Review
- [ ] DWR 401 & Buffer Permitting Branch
- [x] DWR Transportation Permitting Branch

2. Diffuse Flow Plan

2a. Does the project include or is it adjacent to protected riparian buffers identified within one of the NC Riparian Buffer Protection Rules?

- ○ Yes
- ◉ No

If no, explain why:

5. DWR 401 Stormwater Review

5a. Is the Stormwater Management Plan (including BMP Supplemental Forms and Operation and Maintenance Agreements) attached?

- ◉ Yes
- ○ No

Stormwater Management Plan Upload

Click the upload button or drag and drop files here to attach document

file type must be pdf

G. Supplementary Information

1. Environmental Documentation

1a. Does the project involve an expenditure of public (federal/state/local) funds or the use of public (federal/state) land? *

- ◉ Yes
- ○ No

1b. If you answered "yes" to the above, does the project require preparation of an environmental document pursuant to the requirements of the National or State (North Carolina) Environmental Policy Act (NEPA/SEPA)? *

- ◉ Yes
- ○ No

1c. If you answered "yes" to the above, has the document review been finalized by the State Clearing House? (If so, attach a copy of the NEPA or SEPA final approval letter.) *

- ◉ Yes
- ○ No

NEPA or SEPA Final Approval Letter

Click the upload button or drag and drop files here to attach document

FILE TYPE MUST BE PDF

2. Violations (DWR Requirement)

2a. Is the site in violation of DWR Water Quality Certification Rules (15A NCAC 2H .0500), Isolated Wetland Rules (15A NCAC 2H .1300), or DWR Surface Water or Wetland Standards or Riparian Buffer Rules (15A NCAC 2B .0200)? *

- ○ Yes
- ◉ No

2b. Is this an after-the-fact permit application? *

- ○ Yes
- ◉ No

2c. If you answered "yes" to one or both of the above questions, provide an explanation of the violation(s):

3. Cumulative Impacts (DWR Requirement)

3a. Will this project (based on past and reasonably anticipated future impacts) result in additional development, which could impact nearby downstream water quality? *

○ Yes ◉ No

3b. If you answered "no," provide a short narrative description.

Due to the minimal transportation impact resulting from this bridge replacement, this project will neither influence nearby land uses nor stimulate growth. Therefore, a detailed indirect or cumulative effects study will not be necessary.

4. Sewage Disposal (DWR Requirement)

4a. Describe, in detail, the treatment methods and dispositions (non-discharge or discharge) of wastewater generated from the proposed project. If the wastewater will be treated at a treatment plant, list the capacity available at that plant.

5. Endangered Species and Designated Critical Habitat (Corps Requirement)

5a. Will this project occur in or near an area with federally protected species or habitat? *

◉ Yes ○ No

5b. Have you checked with the USFWS concerning Endangered Species Act impacts? *

◉ Yes ○ No

5c. If yes, indicate the USFWS Field Office you have contacted.

Asheville

5d. Is this a DOT project located within Division's 1-8? *

○ Yes
◉ No

5e. Will you cut any trees in order to conduct the work in waters of the U.S.? *

○ Yes ◉ No

5f. Does this project involve bridge maintenance or removal? *

◉ Yes ○ No

5f(1). If yes, have you inspected the bridge for signs of bat use such as staining, guano, bats, etc.? Representative photos of signs of bat use can be found in the NLEB SLOPES, Appendix F, pages 3-7.

○ Yes ○ No

Link to the NLEB SLOPES document: http://saw-reg.usace.army.mil/NLEB/1-30-17-signed_NLEB-SLOPES&apps.pdf

If you answered "Yes" to 5f(1), did you discover any signs of bat use? *

○ Yes ◉ No ○ Unknown

If yes, please show the location of the bridge on the permit drawings/project plans.

Click the upload button or drag and drop files here to attach document

File must be PDF

5g. Does this project involve the construction/installation of a wind turbine(s)?* *

○ Yes ◉ No

If yes, please show the location of the wind turbine(s) on the permit drawings/project plans.

Click the upload button or drag and drop files here to attach document

File must be PDF

5h. Does this project involve (1) blasting, and/or (2) other percussive activities that will be conducted by machines, such as jackhammers, mechanized pile drivers, etc.? *

○ Yes ◉ No

If yes to either, please provide details to include type of percussive activity, purpose, duration, and specific location of this activity on the property.

Click the upload button or drag and drop files here to attach document

File must be PDF

5i. What data sources did you use to determine whether your site would impact Endangered Species or Designated Critical Habitat? *

As of June 1, 2017 the USFWS lists twelve federally listed species for Transylvania County. There is no habitat present for seven of these species. Habitat is present for small whorled pogonia, Virginia spiraea, gray bat, northern long-eared bat, and Appalachian elktoe. Surveys were conducted for small whorled pogonia in 2012, and Virginia spiraea in 2012, 2014, and 2015. Neither plant was identified in any of these surveys. The project area was assessed for bats in 2015 and it was determined that this project would have no effect on either bat species. Formal Section 7 consultation with the USFWS was required for the remaining species, the Appalachian elktoe, due to known occurrences of this species in the French Broad River near its confluence with Hogsed Creek as well as further downstream in the French Broad River. See the attached Biological Opinion issued by the USFWS on September 14, 2017.

6. Essential Fish Habitat (Corps Requirement)

6a. Will this project occur in or near an area designated as an Essential Fish Habitat? *

○ Yes ◉ No

6b. What data sources did you use to determine whether your site would impact an Essential Fish Habitat? *

NMFS County Index

7. Historic or Prehistoric Cultural Resources (Corps Requirement)

Link to the State Historic Preservation Office Historic Properties Map (does not include archaeological data: http://gis.ncdcr.gov/hpoweb/

7a. Will this project occur in or near an area that the state, federal or tribal governments have designated as having historic or cultural preservation status (e.g., National Historic Trust designation or properties significant in North Carolina history and archaeology)? *

○ Yes ◉ No

7b. What data sources did you use to determine whether your site would impact historic or archeological resources? *

NEPA Documentation

7c. Historic or Prehistoric Information Upload

Click the upload button or drag and drop files here to attach document

File must be PDF

8. Flood Zone Designation (Corps Requirement)

Link to the FEMA Floodplain Maps: https://msc.fema.gov/portal/search

8a. Will this project occur in a FEMA-designated 100-year floodplain? *

○ Yes ◉ No

8b. If yes, explain how project meets FEMA requirements:

NCDOT Hydraulics Unit coordination with FEMA

8c. What source(s) did you use to make the floodplain determination? *

FEMA Maps

Miscellaneous attachments not previously requested.

Click the upload button or drag and drop files here to attach document

B-4823 Biological Opinion.pdf	2.37MB
B-4823 Cover Letter signed.pdf	462.93KB

File must be PDF

Signature

*

☑ By checking the box and signing below, I certify that:

- I have given true, accurate, and complete information on this form;
- I agree that submission of this PCN form is a “transaction” subject to Chapter 66, Article 40 of the NC General Statutes (the “Uniform Electronic Transactions Act”);
- I agree to conduct this transaction by electronic means pursuant to Chapter 66, Article 40 of the NC General Statutes (the “Uniform Electronic Transactions Act”);
- I understand that an electronic signature has the same legal effect and can be enforced in the same way as a written signature; AND
- I intend to electronically sign and submit the PCN form.

Full Name: *

Colin Mellor

Signature

Environmental Quality

ROY COOPER
Governor

October 6, 2017

Mr. Philip S. Harris, III, P.E., CPM
Project Development and Environmental Analysis Unit
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina 27699-1598

Dear Mr. Harris:

Subject: Mitigation Acceptance Letter:

B-4823, Replace Bridge Number 12 over Hogsed Creek on SR 1538, Transylvania County

The purpose of this letter is to notify you that the Division of Mitigation Services (DMS) will provide the compensatory stream mitigation for the subject project. Based on the information supplied by you on September 29, 2017, the impacts are located in CU 06010105 of the French Broad River basin in the Southern Mountains (SM) Eco-Region, and are as follows:

French Broad 06010105 SM	Stream			Wetlands			Buffer (Sq. Ft.)	
	Cold	Cool	Warm	Riparian	Non-Riparian	Coastal Marsh	Zone 1	Zone 2
Impacts (feet/acres)	42.0	0	0	0	0	0	0	0

*Some of the stream impacts may be proposed to be mitigated at a 1:1 mitigation ratio. See permit application for details.

The impacts and associated mitigation needs were under projected by the NCDOT in the 2017 impact data. DMS will commit to implement sufficient compensatory stream mitigation credits to offset the impacts associated with this project as determined by the regulatory agencies using the delivery timeline listed in Section F.3.c.iii of the In-Lieu Fee Instrument dated July 28, 2010. If the above referenced impact amounts are revised, then this mitigation acceptance letter will no longer be valid and a new mitigation acceptance letter will be required from DMS.

If you have any questions or need additional information, please contact Beth Harmon at 919-707-8420.

Sincerely,

James B. Stanfill
Credit Management Supervisor

cc: Mr. Lori Beckwith, USACE – Asheville Regulatory Field Office
Ms. Amy Chapman, NCDWR
File: B-4823

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Asheville Field Office
160 Zillicoa Street, Suite B
Asheville, North Carolina 28801

September 14, 2017

Mr. John F. Sullivan, III, P.E.
Division Administrator
Federal Highway Administration
310 New Bern Avenue, Suite 410
Raleigh, North Carolina 27601

Dear Mr. Sullivan:

Subject: Proposed Replacement of Bridge No. 12 over Hogsed Creek on State Route 1538 (TIP B-4823), Transylvania County, North Carolina

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (Opinion), based on our review of the proposed replacement of Bridge 12 over Hogsed Creek on State Route (SR) 1538 in Transylvania County, North Carolina, and its effects on the federally endangered Appalachian elktoe (*Alasmidonta raveneliana*), and is in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act).

This Opinion is based on information provided in a Biological Assessment (BA) submitted to the Service, received on July 28, 2017; field investigations; personal communications with experts on the affected species; and other sources of information. This document repeats much of the information provided in the BA, altered as needed to match style and preserve consistency, so that the Opinion can serve as a stand-alone document. A complete administrative record of this consultation is on file at this office.

In the BA, the North Carolina Department of Transportation (NCDOT), in association with the Federal Highway Administration (FHWA), determined that the following federally listed species would not be affected by the proposed bridge replacement project: bog turtle (*Glyptemys muhlenbergii*), Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*), gray bat (*Myotis grisescens*), Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), rusty patched bumblebee (*Bombus affinis*), mountain sweet pitcherplant (*Sarracenia rubra* ssp. *jonesii*), small whorled pogonia (*Isotria medeoloides*), spreading avens (*Geum rediatum*), swamp pink (*Helonias bullata*), Virginia spiraea (*Spiraea virginiana*), and

rock gnome lichen (*Gymnoderma lineare*). In view of this information, we concur with your determination that the bridge replacement project will have no effect on these species. Therefore, we believe the requirements under section 7 of the Act are fulfilled for these species. However, obligations under section 7 of the Act must be reconsidered if: (1) new information reveals effects of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner that was not considered in this review, or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

CONSULTATION HISTORY

May 30, 2012 - Site visit was made by NCDOT personnel Karen Kendig, Logan Williams, and Mike Sanderson and Service personnel Jason Mays and John Fridell. In this area, Hogsed Creek flows through a sod farm with very little riparian buffer before it joins the French Broad River.

August 23, 2012 – Qualitative timed searches for mussels were conducted at four sites on the main stem of the French Broad River by NCDOT personnel Logan Williams, Karen Kendig, Mary Frazer, and Mike Sanderson and Service personnel John Fridell and Jason Mays. All sites were located downstream of the mouth of Hogsed Creek. The creeper mussel (*Strophitus undulatus*) was collected at every site, indicating suitable mussel habitat. Additionally, live Appalachian elktoe mussels were collected 12 river miles (RM) (19.31 kilometers [km]) upstream from the mouth of the Davidson River, the previous known upstream extent of the species in the French Broad, indicating that the Appalachian elktoe is expanding its range upstream in the French Broad River and is frequently detected at locations where the creeper mussel is already known to occur.

October 25, 2013 – Email from Mike Sanderson (NCDOT) to Neil Medlin (NCDOT) stating that the proposed bridge site is less than 0.2 RM (0.32 km) from the confluence with the French Broad River in an area that is known to be habitat that is occupied by the Appalachian elktoe.

March 28, 2014 – Email from Mike Sanderson (NCDOT) to John Williams (NCDOT) stating that Jason Mays (Service) indicated that he was not opposed to a reinforced concrete box culvert (RCBC) (personal communication, March 28, 2014) as long as it was larger than the existing structure. His biggest concern would be any structure that is likely to cause bank destabilization.

April 12, 2014 – Email from John Williams (NCDOT) to Jason Mays (Service), which summarized their conversation from the previous day. It stated that Mays' field investigation indicated that the condition upstream from the bridge was surprisingly good given the open fields that flank it. The condition of the banks between Bridge 12 and Culvert 20 downstream was poor, which potentially resulted from constricted flow with the two structures. If so, the constricted flow may have created accelerated water coming out of Bridge 12, resulting in scour just downstream and ponding water behind Culvert 20, causing the banks to get soft and slough off.

May 15, 2014 – John Williams (NCDOT) coordinated a meeting with NCDOT design staff and Service personnel to discuss structure type, stream restoration opportunities to offset potential effects to the Appalachian elktoe, and alternatives. The NCDOT indicated they would move forward with an RCBC and pursue coordination with the landowner.

March 17, 2015 – Email from Mike Sanderson (NCDOT) to NCDOT personnel indicating that Jason Mays (Service) stated verbally that a determination of "may affect, not likely to adversely affect" is what he is likely to concur with. He did mention that it would be necessary to visit the French Broad River for a survey at the mouth of the creek.

May 13, 2015 – NCDOT Preliminary Plan Review Meeting. Hydrologic analyses determined that a two-barrel RCBC would not function adequately. The existing grade would be matched as much as possible.

April 13, 2016 – Final Programmatic Categorical Exclusion (PCE) distributed by the NCDOT.

October 26, 2016 – Mussel survey by Mike Sanderson (NCDOT) and Jason Mays (Service) found the Appalachian elktoe in the French Broad River, directly downstream of its confluence with Hogsed Creek. Project moved to formal consultation.

November 1, 2016 – The NCDOT (Mike Sanderson and Erin Cheely) consulted with the Service (Jason Mays and Andrew Henderson) via phone and discussed the time frame of the BA/BO with regard to permitting. Both agencies decided that the most beneficial way to proceed forward was to secure conservation measures in the form of funding for mussel programs and retain the current final design of the project. Propagation efforts are underway for the wavy-rayed lampmussel (*Lampsilis fasciola*) and the creeper mussel, both of which are also native to the French Broad River system and commonly co-occur with the Appalachian elktoe. These species are good indicators of mussel persistence and habitat quality in the French Broad River. They could be used as test animals in mussel propagation and population augmentation efforts and to build partnerships, as well as facilitate outreach and educational opportunities between the University of North Carolina at Asheville (UNCA), North Carolina Wildlife Resources Commission (NCWRC), and the Service.

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

As defined in the Service's section 7 regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas." The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The direct and indirect effects of the actions and activities must be considered in conjunction with the effects of other past and present Federal, state, or private activities, as well as the cumulative effects of reasonably certain future state or private activities within the action area. This Opinion addresses

only those actions for which we believe adverse effects may result. In their BA, the FHWA outlined those activities involved in the replacement of Bridge No. 12 on SR 1538 over Hogsed Creek (B-4823) that would affect the Appalachian elktoe. This Opinion addresses whether replacing the existing bridge is likely to jeopardize the continued existence of the Appalachian elktoe.

The NCDOT has determined that the existing bridge is deficient because of its deteriorating structural integrity. NCDOT Bridge Management Unit records indicate Transylvania County Bridge No. 12 has a sufficiency rating of 43 out of a possible 100 for a new structure. With a deck geometry rating of 2, the bridge is considered functionally obsolete according to FHWA standards. The bridge had temporary shoring put in place in 2014 to keep it sound until replacement. The posted weight limit on the bridge is 14 tons for single vehicles and 19 tons for truck-tractor semi-trailers. Bridge No. 12 currently carries 600 vehicles per day, with 700 vehicles per day projected for 2040. In addition, the superstructure and substructure of Bridge No. 12 have timber elements that are 55 years old. Timber components have a typical life expectancy between 40 and 50 years due to the natural deterioration rate of wood. The bridge is approaching the end of its useful life, and replacement will result in safer traffic operations.

The proposed action, as defined in the BA, involves replacement of the existing one-lane bridge in place with a three-barrel RCBC, 11 feet (ft) (3.35 meters [m]) by 6 ft (1.83 m). The project is scheduled to be completed within 1 year. An off-site detour on State Highway 276 will be used for traffic during project construction activities. The RCBC will be installed on the existing channel alignment at the stream crossing. The proposed RCBC design will maintain the same stream slope (1.25 percent) as the existing stream slope; therefore, the proposed low-flow velocities through the RCBC are intended to be consistent with the existing low-flow velocities in the stream. The proposed RCBC would provide a slightly larger hydraulic opening than the existing bridge structure. Streamside slopes would be 2:1.

Hogsed Creek is about 13 ft (3.96 m) wide upstream and 11 ft (3.35 m) wide downstream of the existing bridge proposed for replacement with the RCBC. The new RCBC will maintain this channel width in the center low-flow barrel of the RCBC. Floodplain benches will be shaped for both outside high-flow barrels, and bank stabilization will be used to maintain channel structure near the crossing. The RCBC will be buried 1.0 ft (0.31 m) deep, and 1.0-ft (0.31-m) sills will be used at the inlet and outlet ends of the low-flow (center) barrel. The high-flow barrels will have 2.0-ft (0.61-m) sills. The RCBC will be backfilled with native stream material to sill height. Only material that is excavated from the streambed will be used in the low-flow barrel, and the high-flow barrels may be supplemented with riprap if needed. If riprap is used in the high-flow barrels, native material will be placed on top.

A. Action Area

The project action area is defined as all areas to be affected, directly or indirectly, by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02).

For this bridge replacement with an RCBC, the limits of effects are considered to include the limits of construction of the approach and any area receiving runoff from the construction activity, including the receiving river, extending 1,314 ft (400.51 m) downstream and 328 ft (99.97 m) upstream of the structure. The proposed project intersects Hogsed Creek, less than 0.2 RM (0.32 km) from the French Broad River, and the Appalachian elktoe has been collected immediately downstream of the confluence of Hogsed Creek and the French Broad River.

B. Conservation Measures

Conservation measures represent actions, pledged in the project description, that the action agency will implement in order to minimize the effects of the proposed action and further the recovery of the species under review. Such measures should be closely related to the action and should be achievable within the authority of the action agency. We consider the beneficial effects of conservation measures in making our determination of whether the project will jeopardize the species and in the analysis of incidental take.

The following "Design Standards in Sensitive Watersheds" are incorporated into FHWA/NCDOT projects that occur within or upstream of water bodies that contain federally protected aquatic species:

- Erosion- and sedimentation-control measures, structures, and devices within a sensitive watershed shall be so planned, designed, and constructed in a manner that provides protection from the runoff of the 25-year storm, which produces the maximum peak rate of runoff as calculated according to procedures in the "Erosion and Sediment Control Planning and Design Manual" or according to procedures adopted by the NCDOT.

- Sediment basins within sensitive watersheds shall be designed and constructed such that the basin will have a settling efficiency of at least 70 percent for the 40-micron- (0.04-mm-) size soil particles transported into the basin by the runoff of the 2-year storm, which produces the maximum peak rate of runoff as calculated according to procedures in the "Erosion and Sediment Control Planning and Design Manual" or according to procedures adopted by the NCDOT.

- Erosion- and sedimentation-control measures will include the use of flocculants in appropriate areas to improve the settling of sediment particles and reduce turbidity levels in construction runoff. The use of flocculants will

conform to the approved product list of the North Carolina Division of Water Resources (NCDWR). No flocculants will be used at the perimeter of the site, and erosion-control measures will be designed to prevent the release of treated soil into the stream.

- Newly constructed open channels in sensitive watersheds shall be designed and constructed with side slopes no steeper than two horizontal to one vertical if a vegetative cover is used for stabilization, unless soil conditions permit a steeper slope or where the slopes are stabilized by using mechanical devices, structural devices, or other acceptable ditch liners. In any event, the angle for side slopes shall be sufficient to restrain accelerated erosion.

- Ground cover sufficient to restrain erosion must be provided for any portion of a land-disturbing activity in a sensitive watershed within 14 calendar days following completion of construction or development.

Because the project is located in an environmentally sensitive area, special procedures will also be used for clearing and grubbing, temporary stream crossings, and grading operations. This also requires that special procedures be used for seeding and mulching and staged seeding within the project.

The environmentally sensitive area shall be defined as a 50-foot (ft) buffer zone on both sides of the stream or depression measured from the top of the streambank or center of the depression.

- Clearing and Grubbing - In areas identified as environmentally sensitive, the contractor may perform clearing operations, but not grubbing operations, until immediately prior to beginning grading operations as described in Article 200-1 of the *Standard Specifications*. Only clearing operations (not grubbing) shall be allowed in this buffer zone until immediately prior to beginning grading operations. Erosion-control devices shall be installed immediately following the clearing operation.

- Grading - Once grading operations begin in identified environmentally sensitive areas, work shall progress in a continuous manner until complete. All construction within these areas shall progress in a continuous manner so that each phase is complete and areas are permanently stabilized prior to beginning the next phase. Failure on the part of the contractor to complete any phase of construction in a continuous manner in environmentally sensitive areas will be just cause for the engineer to direct the suspension of work in accordance with Article 108-7 of the *Standard Specifications*.

- Temporary Stream Crossings - Any crossing of streams within the limits of this project shall be accomplished in accordance with the requirements of Subarticle 107-12(B) of the *Standard Specifications*.

- Native Vegetation Seeding and Mulching - Seeding and mulching shall be performed in accordance with Section 1660 of the *Standard Specifications*, and vegetative cover sufficient to restrain erosion shall be installed immediately following grade establishment. Seeding and mulching shall be performed on the areas disturbed by construction immediately following final grade establishment. No appreciable time shall lapse into the contract time without stabilization of slopes, ditches, and other areas within the environmentally sensitive areas. Penalties to the contractor may apply if this condition is not met.

- Stage Seeding - The work covered by this section shall consist of the establishment of a vegetative cover on cut-and-fill slopes as grading progresses. Seeding and mulching shall be done in stages on cut-and-fill slopes that are greater than 20 ft (6.10 m) in height, measured along the slope, or greater than 2 acres in area. No stage shall exceed the limits stated above.

The following are additional measures intended to further reduce deleterious construction-related effects to the waterway:

- Machines will be refueled outside of the environmentally sensitive area and inside a specific containment area designed to contain any spills and facilitate easy cleanup.

- Machines will be inspected daily to catch and repair leaks of hydraulic fluid.

- A stormwater management plan will be submitted for review and approval with the permit package.

- As part of the FHWA's section 7.a.1 regulatory requirement under the Act and to offset the long-term effects to freshwater mussel habitat in the vicinity of this proposed project (B-4823), the NCDOT and FHWA (in consultation with the Service) have agreed to provide $15,000 to the NCWRC mussel propagation program at UNCA. Propagation and population augmentation through these efforts is intended to assist in the recovery of species in the French Broad River and to have a positive effect on the environmental baseline, which is greater than the perceived negative impact of the loss of habitat due to this bridge project.

II. STATUS OF THE SPECIES AND ITS CRITICAL HABITAT

A. Appalachian elktoe (Alasmidonta raveneliana)

Status: Endangered
Family: Unionidae
Listed: September 3, 1993

1. Characteristics

Isaac Lea (1834) described the Appalachian elktoe from the French Broad River system in North Carolina. Its shell is thin, but not fragile, oblong and somewhat kidney-shaped, with a sharply rounded anterior margin and a broadly rounded posterior margin. Parmelee and Bogan (1998) site a maximum length of 3.1 inches (78.74 millimeters [mm]). However, recently observed individuals from the Little River (French Broad River basin) in Transylvania County and the West Fork Pigeon River (French Broad River basin) in Haywood County measured in excess of 3.9 inches (99.06 mm) in length (Service 2009). The periostracum (outer shell) of the adult Appalachian elktoe varies in color from dark brown to yellowish-brown. Rays may be prominent in some individuals, usually on the posterior slope, and nearly obscure in other specimens. The nacre (inside shell surface) is a shiny bluish-white, changing to a salmon color in the beak cavity portion of the shell. A detailed description of the shell characteristics is contained in Clarke (1981). Ortmann (1921) provides descriptions of the soft anatomy.

The reproductive cycle of the Appalachian elktoe is similar to that of other native freshwater mussels. Males release sperm into the water column, and the sperm are then taken in by the female through their siphons during feeding and respiration. The females retain the fertilized eggs in their gills until the larvae (glochidia) fully develop. The mussel glochidia are released into the water, and within a few days they must attach to the appropriate species of fish, which they parasitize for a short time while they develop into juvenile mussels. They then detach from their fish host and sink to the stream bottom where they continue to develop, provided they land in a suitable substrate with the correct water conditions (Service 2002). The Appalachian elktoe is a bradytictic (long-term) breeder, with the females retaining glochidia in their gills from late August to mid-June (Service 2009). Glochidia are released in mid-June, attaching to either the gills or fins of a suitable fish host species. Transformation time for the Appalachian elktoe occurs within 18 to 22 days at a mean temperature of 18°C. The Appalachian elktoe can use a variety of common fish hosts but appears to specialize on infesting darters and sculpins, which are common in the action area.

2. Distribution and Habitat Requirements

The Appalachian elktoe is known only from the mountain streams of western North Carolina and eastern Tennessee. Historically, the species has also been recorded from Tulula Creek (Tennessee River drainage), the main stem of the French Broad River, and the Swannanoa River (French Broad River system) (Clarke 1981), but it was reported to have been eliminated from these streams (Service 1994, 1996). Currently, it is known to occur in low numbers in a reach of the main stem of the French Broad River in Transylvania County (see discussion below). It is unclear whether this represents a recolonization or an

erroneous conclusion of extirpation. There is also a historical record of the Appalachian elktoe from the North Fork Holston River in Tennessee (S.S. Haldeman collection); however, this record is believed to represent a mislabeled locality (Gordon 1991). If the historical record for the species in the North Fork Holston River is a valid record, the species has apparently been eliminated from this river as well.

Although the complete historic range of the Appalachian elktoe is unknown, available information suggests that the species once lived in the majority of the rivers and larger creeks of the upper Tennessee River system in North Carolina, with the possible exception of the Hiwassee and Watauga River systems (the species has not been recorded from either of these river systems). In Tennessee, the species is known only from its present range in the main stem of the Nolichucky River. At the time of listing, two known populations of the Appalachian elktoe existed--the Nolichucky River, including its tributaries (the Cane River and the North Toe River), and the Little Tennessee River and its tributaries. The record in the Cane River was represented by one specimen found just above its confluence with the North Toe River (Service 1996). Since listing, the Appalachian elktoe has been found in additional areas. These occurrences include extensions of the known ranges in the Nolichucky River (North Toe River, South Toe River, and Cane River) and the Little Tennessee River (Tuckasegee River and Cheoah River) as well as a rediscovery in the French Broad River basin (Pigeon River, Little River, Mills River, and the main stem of the French Broad River). Many of these newly discovered populations are relatively small in size and range.

In the Little Tennessee River system in North Carolina, subpopulations survive in three rivers--the Little Tennessee, Tuckasegee, and Cheoah. These subpopulations are likely functionally isolated from each other by Fontana Reservoir. The main stem of the Little Tennessee River subpopulation occurs from the City of Franklin downstream to the backwaters of Fontana Reservoir in Swain and Macon Counties, covering an area of about 600 acres. Much of the area of the Little Tennessee River occupied by the Appalachian elktoe is part of the Nantahala National Forest. The Appalachian elktoe has been reported from relatively shallow, medium-sized creeks and rivers with cool, clean, well-oxygenated, moderate- to fast-flowing water. The species is most often found in riffles, runs, and shallow flowing pools with stable, relatively silt-free, coarse sand and gravel substrate associated with cobble, boulders, and/or bedrock (Gordon 1991; Service 1994, 1996, 2009). Stability of the substrate appears to be critical to the Appalachian elktoe, and the species is seldom found in stream reaches dominated by silt or shifting sand.

With the exception of the Nolichucky River basin and the Tuckasegee populations, all of the other populations were generally considered small in number and/or restricted to short reaches of isolated streams. The Little Tennessee River population was once considered the stronghold for the species;

however, densities have declined by over 90 percent in the river since 2004, and the species is now very rare throughout most of the occupied reach. The cause of this decline remains uncertain (NCWRC, unpublished data, Aquatics Database, 2014). The other populations of the Appalachian elktoe currently appear to be comprised of scattered individuals restricted to very short stream reaches, and their viability is questionable (Service 2009). The Cheoah River, Pigeon River, Little River, Mills River and French Broad River populations are restricted to scattered areas of suitable habitat in stream reaches of about 3.60 RM (5.79 km), 14.04 RM (22.60 km), 11.1 RM (17.86 km), 2.0 RM (3.22 km), and 17.4 RM (28.00 km), respectively, making them vulnerable to extirpation from a single catastrophic event, such as a major chemical spill (Service 2009).

3. Threats to the Species

The decline of the Appalachian elktoe throughout its historic range has been attributed to a variety of factors, including sedimentation, point and nonpoint-source pollution, and habitat modification (impoundments, channelization etc.). The low numbers of individuals and the restricted range of most of the surviving populations make them extremely vulnerable to extirpation from a single catastrophic event or activity. Catastrophic events may consist of natural events, such as flooding or drought, as well as human influenced events, such as toxic spills associated with highways or railroads.

Portions of the French Broad River basin and most of western North Carolina experienced catastrophic flooding in late summer 2004 as a result of Tropical Storms Francis, Ivan, and Jeanne. Numerous dead mussels, including the Appalachian elktoe, were observed in over-wash areas along the Little Tennessee River after the flood events. Additionally, surveys conducted in the Little Tennessee River after the flooding yielded noticeably lower catch per unit effort of live mussels, including the Appalachian elktoe, compared to past survey efforts in this section of the river (Service 2009).

Siltation resulting from improper erosion control of various types of land usage, including agriculture, forestry, road construction, and development, has been recognized as a major contributing factor to the degradation of mussel populations (Service 1996). Siltation has been documented to be extremely detrimental to mussel populations by degrading substrate and water quality, increasing potential exposure to other pollutants, and direct smothering of mussels (Ellis 1936, Marking and Bills 1979). Sediment accumulations of less than an inch have been shown to cause high mortality in most mussel species (Ellis 1936). In Massachusetts, a bridge construction project decimated a population of the endangered dwarf wedgemussel (*Alasmidonta heterodon*) because of accelerated sedimentation and erosion (Smith 1981). The abrasive action of sediment on mussel shells has been shown to cause erosion of the outer shell, which allows acids to reach and corrode underlying layers (Harman 1974).

Sewage treatment effluent has been documented to significantly affect the diversity and abundance of mussel fauna (Goudreau et al. 1988). Goudreau et al. (1988) found that recovery of mussel populations might not occur for up to 2 RM (3.22 km) below points of chlorinated sewage effluent. Most of the water bodies where Appalachian elktoe still exist have relatively few point source discharges within the watershed and are rated as having "good" to "excellent" water quality (NCDWR 2012, Service 1996).

The introduction of exotic species, such as the Asian clam and zebra mussel (*Dreissena polymorpha*), has also been shown to pose significant threats to native freshwater mussels. The Asian clam is now established in most of the major river systems in the United States (Fuller and Powell 1973). At the time the Appalachian elktoe was listed, the Asian clam was not known from the stretch of the Little Tennessee River that it occupies; however, it has been observed in the Little Tennessee River in recent years and, as mentioned earlier, may be a contributing factor to the decline of that population. Concern has been raised over competitive interactions for space, food, and oxygen between this species and native mussels, possibly at the juvenile stages (Neves and Widlak 1987; Alderman 1997). When the Appalachian elktoe was listed, it was speculated that, due to its restricted distribution, it "may not be able to withstand vigorous competition" (Service 1996).

Another exotic species that has the potential to adversely impact aquatic species, including Appalachian elktoe, is the Japanese knotweed (*Fallopia japonica*). The plant is considered to be an invasive species that can reproduce from its seed or from its long, stout rhizomes. It can tolerate a variety of conditions, such as full shade, high temperatures, high salinity, and drought. It can be spread by wind, water, and soil movement to an area where it quickly forms dense thickets that exclude native vegetation and greatly alter the natural ecosystem. This species has become established in riparian habitats throughout western North Carolina. The species has a very shallow root system; because of this shallow root system and its preclusion of other vegetation, areas where this species has been established may be susceptible to erosion during flood events.

Prior residential development and agricultural practices have had serious impacts on riparian and aquatic habitat in the project area. Much of the riparian habitat within the project area has been severely degraded by agricultural activities, including sod farming. Because riparian areas have been cleared of trees and other woody vegetation by landowners, high-water events have resulted in bank erosion and scour along and within Hogsed Creek and along much of the French Broad River upstream and downstream of the project area. The poor condition of the riparian habitat along Hogsed Creek also likely leads to excessive runoff from adjacent agriculture fields that contain not only silt but also fertilizers and pesticides that are used in those fields.

4. Designated Critical Habitat

a. In accordance with section 4 of the Act, critical habitat for listed species consists of:

(1) The specific areas within the geographical area occupied by the species at the time it is listed in which are found those physical or biological features (constituent elements) that are essential to the conservation of the species and which may require special management considerations or protection.

(2) The specific areas outside the geographical area occupied by the species at the time it is listed upon a determination by the Secretary that such areas are "essential for the conservation of the species."

b. Critical habitat for Appalachian elktoe has been designated in 144.3 total RM (232.23 km) in six distinct units. Those units are as follows:

(1) Encompasses about 24 RM (38.62 km) of the main stem of the Little Tennessee River from the Lake Emory Dam in Franklin, Macon County, North Carolina, downstream to the backwaters of Fontana Reservoir in Swain County, North Carolina

(2) Encompasses about 26 RM (41.84 km) of the main stem of the Tuckasegee River from the SR 1002 bridge in Cullowhee, Jackson County, North Carolina, downstream to the NC 19 bridge north of Bryson City, Swain County, North Carolina.

(3) Encompasses about 9.1 RM (14.65 km) of the main stem of the Cheoah River from the Santeelah Dam, downstream to its confluence with the Little Tennessee River, in Graham County, North Carolina.

(4) Encompasses about 4.7 RM (7.56 km) of the main stem of the Little River (French Broad River basin) from the Cascade Lake Power Plant, downstream to its confluence with the French Broad River in Transylvania County, North Carolina.

(5) Encompasses about 11.1 RM (17.86 km) of the main stem of the West Fork Pigeon River (French Broad River basin) from the confluence with the Little East Fork Pigeon River, downstream to the confluence with the East Fork Pigeon River; and the main stem of the Pigeon River from the confluence of the East Fork Pigeon River and West Fork Pigeon River, downstream to the NC 215 crossing, south of Canton, Haywood County, North Carolina.

(6) Encompasses about 3.7 RM (5.96 km) of the main stem of the North Toe River, Yancey and Mitchell Counties, North Carolina, from the confluence with Big Crabtree Creek, downstream to the confluence of the South Toe River; about 14.1 RM (22.69 km) of the main stem of the South Toe River, Yancey County, North Carolina, from the SR 1152 crossing, downstream to its confluence with the North Toe River; about 21.6 RM (34.76 km) of the main stem of the Toe River, Yancey and Mitchell Counties, North Carolina, from the confluence of the North Toe River and South Toe River, downstream to the confluence of the Cane River; about 16.5 RM (26.55 km) of the main stem of the Cane River, Yancey County, North Carolina, from the SR 1381 crossing, downstream to its confluence with the Toe river; and about 13.5 RM (21.73 km) of the main stem of the Nolichucky River from the confluence of the Toe River and the Cane River in Yancey and Mitchell Counties, North Carolina, downstream to the US 23/19W crossing, southwest of Erwin, in Unicoi County, Tennessee.

c. When designating critical habitat, the Service identifies physical and biological features (primary constituent elements) that are essential to the conservation of the species and that may require special management considerations or protection. The primary constituent elements essential for the conservation of Appalachian elktoe are:

(1) Permanent, flowing, cool, clean water.

(2) Geomorphically stable stream channels and banks.

(3) Pool, riffle, and run sequences within the channel.

(4) Stable sand, gravel, cobble, and boulder or bedrock substrates with no more than low amounts of fine sediment.

(5) Moderate to high stream gradient.

(6) Periodic natural flooding.

(7) Fish hosts, with adequate living, foraging, and spawning areas for them.

Although there are specific sites within the six units that do not contain all of the primary constituent elements, these elements are found consistently throughout the designated river reaches and are present at the sites containing the "healthiest" of the occurrences (Service 2002).

III. ENVIRONMENTAL BASELINE

Under section 7(a)(2) of the Act, when considering the effects of an action on federally listed species, we are required to take into consideration the environmental baseline. The environmental baseline includes past and ongoing natural factors and past and present impacts from all Federal, state, or private actions and other activities in the action area (50 CFR 402.02), including Federal actions in the area that have already undergone section 7 consultation and the impacts from state or private actions that are contemporaneous with the consultation in progress. The environmental baseline for this Opinion considers all projects approved prior to the initiation of formal consultation.

A. Hogsed Creek

1. Water Quality

Hogsed Creek is located in the French Broad River basin (U.S. Geological Survey, Hydrologic Unit 06010105]. Hogsed Creek has been identified by the North Carolina Department of Environmental Quality (NCDEQ) as trout waters. There are no designated outstanding resource waters, high quality waters, or water supply watersheds (WS-I or WS-II) within 1.0 RM (1.61 km) downstream of the study area. The NCDEQ's 2014 Final 303(d) list of impaired waters does not identify Hogsed Creek or any other streams within 1.0 RM (1.61 km) of the study area as impaired.

2. Survey Information

Collection records available from the NCWRC's database indicate that the Appalachian elktoe was collected from the main stem of the French Broad River at the Crab Creek Road crossing, near the town of Penrose, in 2005, during surveys conducted to assess damage from flooding that occurred late in 2004. This location is about 12 RM (19.31 km) downstream of the proposed project on Hogsed Creek. Prior to this record, the Appalachian elktoe was known to have been present in the French Broad River; however, decades of pollution and development degraded the habitat, and there were no contemporary records of this species from the river.

3. Status of the Species Within the Action Area

Since 2005, the Appalachian elktoe has experienced an expansion in the French Broad River and is currently known to occupy a portion of the upper French Broad River between the towns of Mills River and Rosman. Aquatic surveys conducted in anticipation of the Hogsed Creek bridge replacement in the summer of 2012 noted suitable habitat at the mouth of Hogsed Creek, downstream of the proposed construction project. The creeper mussel, a closely related species often found with the Appalachian elktoe in the French Broad, was collected live at the mouth of Hogsed Creek and downstream in the French Broad River, hinting that

the Appalachian elktoe was likely also present, but undetected, during the surveys conducted at that time.

An additional survey conducted in the fall 2016 at the same site detected live Appalachian elktoes at the mouth of Hogsed Creek and demonstrated that the Appalachian elktoe is present within the action area and is likely to be affected by the proposed project. Hogsed Creek discharges within the area sparsely populated by Appalachian elktoe in the French Broad River. Because the extent of this colonization by the species appears to be relatively small, it is likely particularly vulnerable to changes in population numbers.

IV. EFFECTS OF THE ACTION

Under section 7(a)(2) of the Act, "effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action. The Federal agency is responsible for analyzing these effects. The effects of the proposed action are added to the environmental baseline to determine the future baseline, which serves as the basis for the determination in this Opinion. Should the effects of the Federal action result in a situation that would jeopardize the continued existence of the species, we may propose reasonable and prudent alternatives that the Federal agency can take to avoid a violation of section 7(a)(2).

The discussion that follows is our evaluation of the anticipated direct, indirect, and cumulative effects of implementing the proposed action. Direct effects are actions that may result in immediate effects to the species, including the construction of temporary causeways, land-clearing, potential toxic spills, and erosion. All of these activities have the potential to kill or injure the species under consideration, by either injuring them, poisoning them, or causing habitat alteration. Indirect effects are those caused by the proposed action that occur later in time but that are still reasonably certain to occur. Cumulative effects are those effects of future state or private activities, not involving Federal activities, which are reasonably certain to occur within the action area of the proposed Federal action (50 CFR 402.02).

A. Factors to be Considered

1. Proximity of the Action – Based on recent surveys within the action area conducted by the NCDOT and the Service, the Appalachian elktoe is within the project impact area and could be directly and indirectly affected. The Appalachian elktoe recently was found downstream of the proposed project.

2. Nature of the Effect – In-stream habitat will be affected permanently by the installation of an RCBC within the stream channel. Both in-stream habitat and habitat within the floodplain will be affected for the duration of the construction and RCBC installation activities and likely for some period after completion of

the project. Portions of the stream channel will be impacted permanently by installation of the RCBC and shaping of the floodplain benches. Also, stream discharge velocities and patterns will be altered, resulting in changes to physical habitat within Hogsed Creek. Although the clearing of riparian vegetation will be minimal due to the lack of established vegetative cover at the existing bridge crossing, riparian areas further from the stream used for equipment access could result in minor changes in water chemistry, including temporary increases in water temperature. An increase in access for large construction vehicles to cross the creek may have cumulative effects that include increased development of the watershed in an area that was previously not accessible for some types of construction.

3. Disturbance Duration, Frequency, and Intensity – Direct and indirect disturbances to the streambed will occur during removal of the existing bridge and installation of the RCBC, including backfilling sills with native material within the RCBC. Effects to the streambed from installation within the RCBC footprint are a significant impact to stream habitat. The installation of an RCBC at this site is considered a permanent 130-ft (~40-m) impact to Hogsed Creek and will result in the functional loss of streambed in the footprint of the installed RCBC at least until particle sorting within the RCBC achieves a stable equilibrium. Mechanical bridge removal and RCBC installation will likely result in high-intensity compaction and disturbance of the streambanks and stream substrate for a short duration. Although the total surface-water impacts for the entire project are relatively small (~0.05 acre), the true extent of these impacts is unknown because rivers and streams are linear features, and cumulative impacts of activities throughout watersheds are not easily quantified. The RCBC will result in disturbance to stream-flow patterns and substrate throughout the life of the structure and may cause the conversion of stable stream habitat to scoured habitat, which is considered a permanent effect. The project is scheduled to be completed within 1 year.

   Once construction is completed, stream riparian areas will be stabilized through erosion-control measures and a combination of hardened slope protection or immediate seeding and mulching. However, minor temporary increases in siltation and sedimentation associated with stormwater runoff are anticipated to occur during project implementation, even with the incorporation of preformed scour holes (PSHs) in the project design. Temporary impacts will likely include increased erosion and bank instability. Stabilization with nonnative rock within the floodplain may lead to permanent alteration of local air and water temperatures due to a combination of the loss of any existing riparian shading and the heating of impervious surfaces. Effects of streambed loss will likely include benthic habitat loss in Hogsed Creek, potential fragmentation of habitat for mussels and host fishes at extremely low flows, and overall decreased benthic productivity within the stream.

To minimize the potential for sedimentation, the NCDOT has developed specific erosion-control measures for this project designed to protect environmentally sensitive areas. Although there are no practical erosion-control measures that can totally eliminate the chance for sedimentation from a project site, if the erosion-control plans are properly incorporated into project construction and strictly adhered to, adverse effects to the aquatic habitat of Hogsed Creek and the French Broad River from erosion and sedimentation should be minimal.

Stormwater coming off the new structure will not directly enter the river; rather it will be directed into inlets placed just off the end of the bridge into PSHs in the floodplain, where it will be treated via a vegetated buffer before flowing into the river. This conservation measure should allow some road-derived pollutants to be sequestered within the PSHs, thereby reducing to the pollutant load within the river.

B. Analyses of the Effects of the Action

1. Appalachian elktoe

a. Potential Beneficial Effects

The NCDOT and FHWA have committed to participating in a partnership with the Service, NCWRC, and UNCA to propagate and restore the Appalachian elktoe and other native mussels in the French Broad River. Propagation efforts to reintroduce native freshwater mussels in this river should have population-level benefits.

b. Direct Effects

Potential direct effects to mussel species associated with transportation projects include substrate disturbance/loss, siltation, and alteration of flows and the introduction of toxic compounds. Under normal conditions, the removal of a bridge over a stream is a relatively minor disturbance to the stream habitat; however, construction activities invariably have some adverse effects on the aquatic habitat by increasing the amount of erosion, siltation, and chemical pollution to the impacted waters. Additionally, the purpose of the proposed project is to install a three-barrel RCBC at the site of the existing bridge, which will result in a direct effect and a permanent impact to Hogsed Creek. All of these activities have the potential to kill or injure mussels by poisoning them with the release of some toxic substance or causing siltation that may suffocate them. These actions may result in direct harm to individuals or negative changes in suitable habitat downstream of the project site.

The above-mentioned conservation measures will be incorporated by the FHWA and NCDOT to avoid/minimize effects to Hogsed Creek and the

French Broad River. Strict implementation of these measures will reduce the chance that the effects will be detrimental to the Appalachian elktoe in the impact area downstream of the proposed bridge replacement. It should be assumed that the Appalachian elktoe is continually present downstream of the project site. Due to the close proximity of known occurrences, losses of the species in the French Broad River could occur downstream of the site of the RCBC installation on Hogsed Creek. The potential loss of individual Appalachian elktoes would normally not be expected to adversely affect the overall population within the French Broad River; however, given the known limited extent of this population, each individual mussel has increased importance. Installation of the RCBC will result in the placement of permanent and temporary fill into Hogsed Creek. The following direct effects to the creek are anticipated as a result of construction activities, though these numbers may change slightly in the final design.

- Permanent (RCBC and fill) – 130 ft^2 (12.08 m^2)
- Temporary (stream stabilization) – 18 ft^2 (1.67 m^2)

The detrimental effects of siltation on aquatic species have already been listed in this document. Suspended solids, sedimentation, and turbidity result in reduced biodiversity as well as a decline in productivity at all trophic levels (Gilbert 1989). Because of the topography and the erodible nature of the soils in the project area, project construction has the potential to result in sedimentation in Hogsed Creek and the French Broad River.

Geomorphically stable stream channels and banks are a primary constituent element essential for the survival and conservation of the Appalachian elktoe. Stream channel instability, caused by excavation and construction activities associated with bridge removal and installation of the proposed RCBC on Hogsed Creek, could lead to reduced numbers of Appalachian elktoes. Natural stream stability is achieved when the stream exhibits a stable dimension, pattern, and profile such that, over time, the channel features are maintained and the channel neither aggrades nor degrades. Channel instability occurs when scour results in degradation or when sediment deposition leads to aggradation (Rosgen 1996). The placement of fill materials and RCBCs into streams can alter the normal flow pattern of a water body by reducing flow velocities upstream, thus increasing sedimentation and flow velocities downstream, resulting in scour and erosion. Lack of native riparian vegetation at the project site has the potential to contribute to sedimentation downstream in Hogsed Creek and the French Broad River.

Numerous pollutants have been identified in highway runoff, including various metals (lead, zinc, iron, etc.), sediment, pesticides, deicing salts, nutrients (nitrogen, phosphorus), and petroleum hydrocarbons (Yousef et al. 1985, Gupta et al. 1981). The sources of these runoff constituents range from

construction and maintenance activities to daily vehicular use. Hoffman et al. (1984) concluded that highway runoff can contribute up to 80 percent of the total pollutant loadings to receiving water bodies. Petroleum hydrocarbons, polycyclic aromatic hydrocarbons, lead, and zinc were some of the pollutants identified. The potential for the introduction of these pollutants into Hogsed Creek and the French Broad River is increased with the short-term associated increases in construction equipment and long-term two-lane capacity of vehicular traffic over Hogsed Creek on SR 1538.

c. Indirect Effects

Indirect effects are those effects that are caused by or will result from the proposed action and are later in time but are still reasonably certain to occur (50 CFR 402.02). These types of effects can include natural responses to the proposed action's direct effects or human-induced effects associated with the proposed action. The indirect effects of replacing a bridge with an RCBC are not well known. The initial installation of an RCBC is known to cause changes in the flow of the stream and corresponding erosive processes that can alter the adjacent habitat, regardless of efforts to "backfill" the RCBC with native stream material. Adding instream structures will likely cause minor local scour below the RCBC until a state of equilibrium is reached.

The existing bridge structure has not resulted in the temporary trapping of logs and woody debris on the upstream side of the crossing, but there is potential for those conditions to increase with the addition of an RCBC with three barrels. In addition to the direct effects of RCBC installation that were discussed above, another concern with RCBC installation is the potential for the RCBC to act as a barrier to fish migration. Disruption of fish migrations can indirectly affect freshwater mussels if the fish that are disturbed serve as fish hosts for the mussel species and are infested with glochidia (juvenile mussels) at the time when their migration patterns are disrupted. The permanence of the RCBC is not expected to interfere with normal seasonal migration of any fish species in Hogsed Creek due to backfill of the RCBC with native stream material. Temporary disruptions to the normal migration of individuals of some fish species may occur while the RCBC is installed. Individual fish, particularly benthic species, may be restricted, or deterred from swimming upstream of the RCBC; however, these temporary disruptions to fish behavior are not expected to significantly affect the survival of transforming Appalachian elktoes as there is ample habitat downstream in the French Broad River for transformed mussels. Additionally, the temporary restriction of individual fish from habitat upstream of the RCBC is not anticipated to affect the distribution of the Appalachian elktoe upstream of the RCBC as the identified potential fish host species that occur in Hogsed Creek and the French Broad River are widely distributed throughout the river.

Project-induced changes in land use are also considered indirect effects. These types of land use changes are not direct consequences of the road construction but result from modifications in access to parcels of land and from modifications in travel time between various areas (Mulligan and Horowitz 1986). This project involves the installation of a structure in essentially the same location on existing alignment; however, the new structure will permit the crossing of much larger and heavier vehicles that may be used to more effectively bring large construction equipment and prefabricated construction elements across the creek. There are other routes available to transport these types of cargo; and, presently, development pressure in the area across Hogsed Creek is low to moderate, so it is unknown if the increase in access will indirectly affect development within the watershed.

One other indirect effect that roadway crossings of water bodies can have on the aquatic environment is the potential for toxic spills once the roadway alterations and bridge replacement with an RCBC are completed and the roadway is operational again. However, when, where, and how these events may occur is unpredictable. Stormwater coming off the new structure will not directly enter Hogsed Creek; rather, it will be directed into inlets placed just off the end of the bridge into PSHs in the floodplain, where it will be treated via vegetated buffer before flowing into the river. This conservation measure should allow for some road-derived pollutants to be sequestered within the PSHs, thereby reducing the pollutant load within the creek.

d. Interrelated and Interdependent Actions

An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. There are no known interrelated or interdependent actions that should be considered in this Opinion.

e. Cumulative Effects

Cumulative effects are those effects of future state or private activities, not involving Federal activities, which are reasonably certain to occur within the action area of the proposed Federal action. As discussed earlier, the Appalachian elktoe population in the upper main stem French Broad River has expanded in the past decade, for reasons not understood. The French Broad River basin has experienced water-quality degradation from past mining, development, and agricultural practices. This degradation undoubtedly adversely affected the aquatic fauna of the watershed, including the Appalachian elktoe. Given the dynamic nature of riverine habitats and the large amount of land area encompassed in a watershed, it is virtually

impossible to eliminate all potential effects to the aquatic species in these habitats.

In addition to the effects associated with the bridge construction addressed in the BA, other effects to the Appalachian elktoe population in Hogsed Creek and the French Broad River basin have occurred and will continue to occur. These types of effects are difficult to identify or quantify but may include: (1) sedimentation/erosion effects from agricultural and residential land use; (2) water-quality effects (fertilizers, pesticides, etc.) from agricultural and residential sources; (3) small-scale littering into the creek and the river; (4) effects from recreational uses of the river (fishermen stepping on individual mussels, using mussels as bait, etc.); and (5) others, all of which could adversely impact individual mussels or their habitat. These potential effects are expected to be localized and small, and their cumulative effect is not likely to be large enough to cause serious declines in the overall population.

The NCDOT's analysis of future land use did not identify any other major projects planned in the action area that would threaten the viability of the Appalachian elktoe population in Hogsed Creek and the French Broad River; however, localized land-use effects, such as agricultural practices or illegal pollution (dumping into the river, etc.), may occur in the watershed that could result in small-scale adverse effects to the species.

f. Conclusion

After reviewing (1) the current status of the Appalachian elktoe, (2) the environmental baseline for the action area, (3) the effects of implementation of the proposed action, (4) the measures identified in the BA to help minimize the potential effects of the proposed project and the proposal to assist in the management and recovery of the species, and (5) any potential cumulative effects, it is the Service's biological opinion that implementing this project is not likely to jeopardize the continued existence of the Appalachian elktoe.

2. Appalachian Elktoe Critical Habitat

There is no critical habitat for the Appalachian elktoe in Hogsed Creek or the main stem of the French Broad River, but critical habitat has been designated in the Little River, a tributary to the French Broad River. Critical habitat unit 4 for the Appalachian elktoe encompasses 4.7 RM (7.56 km) of the main stem of the Little River. The Little River enters the French Broad River about 12.5 RM (20.12 km) downstream of the mouth of Hogsed Creek. Critical habitat for the Appalachian elktoe in the Little River is not within the project action area nor is any other critical habitat. Therefore, no critical habitat would be affected by the proposed project.

V. INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the taking of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, such as breeding, feeding, or sheltering. Harass is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not for the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered to be prohibited under the Act, provided that such taking is in compliance with the terms and conditions of this incidental take statement.

A. Amount of Take Anticipated

We anticipate that incidental take of the Appalachian elktoe may occur as a result of the removal of the existing bridge structure and installation of the proposed three-barrel RCBC. During construction, individual mussels may be harmed by siltation or other water-quality degradation or dislocated because of physical changes in their habitat.

The project will involve the disturbance of ~0.05 acre of land adjacent to the river; 18 ft^2 (1.67 m^2) of the streambed will be temporarily affected by stream stabilization measures; and 135 ft^2 (12.08 m^2) of the streambed will be permanently affected by the placement of RCBCs. An area of nonlethal disturbance is expected to extend up to 1,312 ft (399.90 m) downstream from the causeways, where mussels or fish will be harmed by disturbance. We anticipate this take to be a short-term disruption of their normal life history. Cumulative effects may have harmful effects throughout the watershed, but we expect these effects to be below a measureable threshold. These assumptions are made (1) based on the project being constructed as planned; (2) with careful adherence to conservation measures, other environmental regulations, and best management practices (BMPs); and (3) without unforeseen circumstances or accidents that may have a greater effect than that which is considered in this document. If project effects extend beyond the expected disturbance distances considered or if incidental take is exceeded, all work should stop, and the Service should be contacted immediately.

B. Effect of the Take

In this Opinion, we have determined that the level of take associated with this project is not likely to result in jeopardy to the Appalachian elktoe or to result in the

destruction or adverse modification of critical habitat. This Opinion is based on the expected small area of disturbance and the inclusion of conservation measures that minimize take to the degree that we expect population-level effects will not be measureable.

1. Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of the Appalachian elktoe. These nondiscretionary measures include, but are not limited to, the terms and conditions outlined in this Opinion.

a. The FHWA/NCDOT will ensure that the contractor understands and follows the measures listed in the "Conservation Measures," "Reasonable and Prudent Measures," and "Terms and Conditions" sections of this Opinion.

b. Construction activities shall be implemented consistent with measures developed to protect the Appalachian elktoe, including those measures intended to maintain, improve, or enhance its habitat.

c. All appropriate FHWA/NCDOT BMPs for bridge maintenance and construction will be followed or exceeded for this project, and any BMPs listed in the "Terms and Conditions" section of this Opinion will be followed.

2. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the FHWA/NCDOT must comply with the following terms and conditions, which implement the reasonable and prudent measures described previously and outline required reporting and/or monitoring requirements. These terms and conditions are nondiscretionary.

a. A Service biologist will be present at the on-site preconstruction meeting to cover permit conditions and discuss any questions the contractor has regarding implementation of this project. After the contractor submits plans for various stages of the project, a Service biologist will review and provide comments on the plans and will attend any meetings to discuss implementation of the plans.

b. Activities in the floodplain will be limited to those absolutely necessary to remove the existing bridge and install the RCBCs. Areas used for borrow or construction by-products will not be located in wetlands or the 100-year floodplain.

c. Where possible, the NCDOT will plant trees that provide shade to impervious surfaces in order to reduce heat pollution in the river.

VI. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. The following conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

A. Pursue funding and partnership opportunities to complete any additional research, inventory, and monitoring work in order to better understand the distribution and autecology of the rare species in the French Broad watershed.

B. Where opportunities exist, work with landowners, the general public, and other agencies to promote education and the dissemination of information about endangered species and their conservation.

C. Pursue additional buffers and conservation opportunities along the main stem of the French Broad River and its tributaries, either individually or in concert with other conservation organizations.

D. Explore opportunities to work with local and state water-quality officials in order to minimize or eliminate sources of pollution, including wastewater and stormwater discharges into the upper French Broad watershed.

E. Consult with the Service on projects that affect aquatic habitat in the French Broad drainage, regardless of the funding source, to ensure compliance with all provisions of the Act.

In order for the Service to be kept informed about actions that minimize or avoid adverse effects or that benefit listed species or their habitats, we request notification of the implementation of any conservation recommendations.

VII. REINITIATION/CLOSING STATEMENT

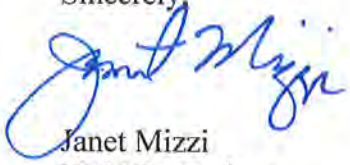
This concludes formal consultation on the actions outlined in your formal consultation letter and BA dated July 28, 2017, requesting formal consultation. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion, or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of

incidental take is exceeded, any operation causing such take must cease, pending reinitiation.

Consultation should also be reinitiated if new biological information becomes known that invalidates the assumptions made regarding the biology or distribution of the Appalachian elktoe in the French Broad River in North Carolina.

If you or your staff have any questions concerning this Opinion, please contact Mr. Andrew Henderson of our staff at 828/258-3939, Ext. 227, or me, Ext. 223. We have assigned our Log No. 4-2-12-065 to this project; please refer to it in any future correspondence concerning this project.

Sincerely,



Janet Mizzi
Field Supervisor

Electronic copy to:
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Mr. Colin Mellor, Natural Environment Unit Project Management Group Supervisor, North Carolina Department of Transportation, 1598 Mail Service Center, Raleigh, NC 27699-1598
Mr. J. Michael Sanderson, Natural Environment Unit Biological Surveys Group, North Carolina Department of Transportation, 1598 Mail Service Center, Raleigh, NC 27699-1598
Ms. Lori Beckwith, U.S. Army Corps of Engineers, Asheville Regulatory Field Office, 151 Patton Avenue, Room 208, Asheville, NC 28801-5006

Literature Cited:

Alderman, J.M. 1997. Monitoring the Swift Creek freshwater mussel community. Pp. 98-107 in K.S. Cummings, A.C. Buchanan, C.A. Mayer, and T.J. Naimo, eds., 1997. Conservation and Management of Freshwater Mussels II: Initiatives for the future. Proceedings of a UMRCC symposium, October 16-18, 1995, St. Louis, Missouri. Upper Mississippi River Conservation Committee, Rock Island, IL. 293 pp.

Clarke, A.H. 1981. The tribe Alasmidontini (Unionidae: Anodontinae), Part I: Pegias, Alasmidonta, and Arcidens. Smithsonian Contributions to Zoology (326), 101 pp.

Ellis, M.M. 1936. Erosion silt as a factor in aquatic environments. Ecology. 17:29-42.

Fuller, S.L.H., and C.E. Powell. 1973. Range extensions of *Corbicula manilensis* (Philippi) in the Atlantic drainage of the United States. The Nautilus. 87(2):59.

Gilbert, O.L. 1989. The ecology of urban habitats. Chapman and Hall, London, 369 pp.

Gordon, M.E. 1991. Species account for the Appalachian elktoe (*Alasmidonta ravaneliana*). Unpublished report to The Nature Conservancy. 5 pp.

Goudreau, S.E., R.J. Neves, and R.J. Sheehan. 1988. Effects of sewage treatment effluents on mollusks and fish of the Clinch River in Tazewell County, Virginia. Final Rep., U.S. Fish and Wildlife Service. 128 pp.

Gupta, M.K., R.W. Agnew, and T.L. Meinholz. 1981. Constituents of highway runoff Volume II, Procedural manual for monitoring of highway runoff. Report FHWA/81/043. FHWA, U.S. Dept. of Transportation, 121 pp.

Harman, W.N. 1974. The effects of reservoir construction and channelization on the mollusks of the upper Delaware watershed. Bull. Am. Malac. Union 1973:12-14.

Hoffman, E. J., J. S. Latimer, C. D. Hunt, G. L. Mills and J. G. Quinn. 1984. Stormwater runoff from highways. Water, Air and Soil Pollution 25:349-364.

Marking, L.L., and T.D. Bills. 1979. Acute effects of silt and sand sedimentation on freshwater mussels. Pp. 204-211 in J.L. Rasmussen, ed., Proc. of the UMRCC symposium on the Upper Mississippi River bivalve mollusks. UMRCC. Rock Island, IL. 270 pp.

Mulligan, P.M., and A.J. Horowitz. 1986. Expert panel method of forecasting land use impacts of highway projects. Pp. 9-15 in Transportation Research Record 1079 land development simulation and traffic mitigation, National Transportation Research Board, Washington, DC. 36 pp.

Neves, R.J., and J.C. Widlak. 1987. Habitat ecology of juvenile freshwater mussels (Bivalvia: Unionidae) in a headwater stream in Virginia. Amer. Malacol. Bull. 1(5):1-7.

North Carolina Division of Water Resources. 2012. A Guide to Surface Freshwater Classifications in North Carolina.

Ortmann, A.E. 1921. The anatomy of certain mussels from the Upper Tennessee. The Nautilus 34(3):81-91.

Parmalee, P.W., and A.E. Bogan. 1998. Freshwater Mussels of Tennessee. University of Tennessee Press, Knoxville, TN.

Rosgen, D. 1996. Applied River Morphology. Pagosa Springs, CO, Wildland Hydrology Books, Pagosa Springs, CO. 385 pp.

Smith, D. 1981. Selected freshwater invertebrates proposed for special concern status in Massachusetts (Mollusca, Annelida, Arthropoda). Massachusetts Dept. of Env. Qual. Engineering, Div. of Water Pollution Control. 26 pp.

U.S. Fish and Wildlife Service. 1994. Endangered and Threatened Wildlife and Plants; Appalachian Elktoe Determined To Be an Endangered Species. CFR, Vol. 59, No. 225.

U.S. Fish and Wildlife Service. 1996. Appalachian Elktoe (*Alasmidonta raveneliana*) Recovery Plan. Atlanta, GA. 30 pp.

U.S. Fish and Wildlife Service. 2002. Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the Appalachian Elktoe. CFR, Vol. 67, No. 188.

U.S. Fish and Wildlife Service. 2009. Appalachian Elktoe (*Alasmidonta raveneliana*) 5-Year Review: Summary and Evaluation. Asheville, NC.

Yousef, Y.A., H.H. Harper, L.P. Wiseman, and J.M. Bateman. 1985. Consequential species of heavy metals in highway runoff: Florida Department of Transportation Final Report FL-ER-29-85. 153 pp.

North Carolina Department of Transportation

Highway Stormwater Program

STORMWATER MANAGEMENT PLAN

FOR NCDOT PROJECTS

(Version 2.02; Released April 2015)

WBS Element: 38593.1.2 **TIP No.:** B-4823 **County(ies):** Transylvania

General Project Information

WBS Element:	38593.1.2	**TIP Number:**	B-4823	**Project Type:**	Bridge Replacement	**Date:**	9/19/2017
NCDOT Contact:	Andrew H. McDaniel, PE			**Contractor / Designer:**	Joshua G. Dalton, PE, CPESC		
Address:	NCDOT Hydraulics Unit 1590 MSC, Raleigh, NC 27699 1020 Birch Ridge Rd, Raleigh, NC 27610			**Address:**	Sungate Design Group, PA 915 Jones Franklin Rd. Raleigh, NC 27606		
Phone:	(919) 707-6737			**Phone:**	(919) 859-2243		
Email:	ahmcdaniel@ncdot.gov			**Email:**	jdalton@sungatedesign.com		
City/Town:	Brevard			**County(ies):**	Transylvania		
River Basin(s):	French Broad			**CAMA County?**	No		
Wetlands within Project Limits?	No						

Project Description

Project Length (lin. miles or feet):	0.13	**Surrounding Land Use:**	Rural, Residential

	Proposed Project	**Existing Site**
Project Built-Upon Area (ac.)	0.3 ac.	0.2 ac.
Typical Cross Section Description:	Two 10 ft. wide paved travel lanes with 3 ft wide unpaved shoulders (7 ft. with guard rail) and 2:1 to 4:1 fill slopes.	Two 9 ft. paved travel lanes with vaiable width unpaved shoulders and fill slopes.
Annual Avg Daily Traffic (veh/hr/day):	Design/Future: 700 Year: 2040	Existing: 617 Year: 2017

General Project Narrative: (Description of Minimization of Water Quality Impacts)

B-4823 consists roadway and shoulder improvements along with the replacement of an existing, single span, 24' long bridge with a 3 @ 11' x 6' concrete box culvert. An existing ditches at the beginning of the project (SW quadrants) will be relocated to accommodate the new roadway alignment. Temporary matting will be used until permanent vegetation is established in the ditch. Coir fiber matting will be utilized to protect the ditch along the NE quadrant of the project from Mill Cove Road to the end of the project. The proposed culvert will be buried a minimum of 1.0 ft. and have one low flow barrel and two high flow barrels. This configuration will closely mimic the existing stream characteristics. The high flow barrels will have floodplain benches at the inlet and outlet ends, which will be covered with coir fiber matting, and side slopes lined with class 'I' rip-rap for bank stabilization. All ditch outlets will have class 'I' rip-rap at embankments. Impervious dikes will be constructed to dewater the work area. A temporary stilling basin will be utilized during dewatering. Standard erosion and sediment control practices will be followed during construction and unitl the site is stabilized.

Waterbody Information

Surface Water Body (1):	Hogsed Creek		**NCDWR Stream Index No.:**	6-26	
NCDWR Surface Water Classification for Water Body		**Primary Classification:**	Class C		
		Supplemental Classification:	Trout Waters (Tr)		
Other Stream Classification:					
Impairments:	None				
Aquatic T&E Species?	No	Comments:			
NRTR Stream ID:	N/A			**Buffer Rules in Effect:**	N/A
Project Includes Bridge Spanning Water Body?	No	**Deck Drains Discharge Over Buffer?**	N/A	**Dissipator Pads Provided in Buffer?**	N/A
Deck Drains Discharge Over Water Body?	N/A	(If yes, provide justification in the General Project Narrative)		(If yes, describe in the General Project Narrative; if no, justify in the General Project Narrative)	
(If yes, provide justification in the General Project Narrative)					

North Carolina Department of Transportation

Highway Stormwater Program

STORMWATER MANAGEMENT PLAN

FOR NCDOT PROJECTS

(Version 2.02; Released April 2015)

WBS Element:	38593.1.2	TIP No.:	B-4823	County(ies):	Transylvania	Page	2	of	2

Bridge to Culvert Avoidance and Minimization

Proposed Structure Summary

Sheet No. & Station	Sheet No.:	4	Station:	17+23 -L-	
Drainage Area (ac or sq mi):		3.4	Sq. Miles		
Surface Water Body:		(1)Hogsed Creek			
Culvert Type:		Reinforced Concrete Box Culvert			
Avoidance and Minimization Efforts: (Bridge to Culvert)		Proposed culvert is consistent with existing stream slope. Proposed low flow dimensions through the culvert are consistent with the existing low flow channel dimensions in the stream. Prop. low flow velocities through the culvert are consistent with the existing low flow velocities in the stream. Prop. culvert is buried a minimum of 1.0 ft. to retain bed material. Proposed culvert length has been minimized by using minimum fill and 2:1 side slopes.			

Number of Culverts:	3		
Culvert Width/Diameter (ft):	11		
Culvert Height (ft):	6		
Culvert Length (ft)	42		

Stream Slope

Existing Average Stream Slope (%):	1.25 %
Proposed Culvert Slope (%):	1.25 %

Culvert Burial

Proposed Culvert Burial Depth (ft):	1
Existing Streambed Material:	Sand, silt, cobbles, and boulders.
Proposed Sills/Baffles:	1.0 ft tall sills proposed at entrance and exit of low flow barrel. 2.0 ft tall sills proposed and entrance and exit of high flow barrels. No baffles are proposed.

Fish and/or Aquatic Life Passage

Existing Low Flow Channel Dimensions in the Stream:	Avg. upstream width = 13 ft. Avg. downstream width = 11 ft.
Proposed Low Flow Dimensions Through the Culvert:	Single low flow barrel = 11 ft.
Existing Low Flow Velocities in the Stream (ft/s):	V(2yr) = 4.8 fps
Proposed Low Flow Velocities Through the Culvert (ft/s):	V(2yr) = 4.8 fps
Alternating Low Flow Sills/Baffles:	1.0 ft tall low flow sills proposed at entrance and exit of low flow barrel to retain bed material and maintain natural stream charateristics.

Culvert/Stream Alignment

Stream Patterns Upstream and Downstream of the Culvert that Could Affect Fish Passage and Bank Stability:	None observed.	
Bed Forms Impacted by Culvert (riffles, pools, glides, etc.):	No impacts to bed forms anticipated from the installation of the proposed culvert.	
Low Flow Floodplain Bench Required? (provide justification)	Yes	Floodplain benchs are specified for two of the three proposed culvert barrels. Specifying one barrel as a low flow barrel most closely mimics the existing channel dimensions.
Sharp Bends at Inlet/Outlet? (describe culvert alignment with stream)	No	The proposed culvert alignment matches the existing channel alignment at the crossing.
Stream Realignment Necessary? (provide justification)	No	
Bank Stabilization:	Class 'I' rip-rap bank stabilization is proposed for a distance of approximately 40 ft. both up and down stream of the culvert.	

Outlet Velocities

Natural Stream Channel 2-yr Velocity (ft/s):	4.8	Natural Stream Channel 10-yr Velocity (ft/s):	5.6
Proposed Culvert 2-yr Outlet Velocity (ft/s):	4.8	Proposed Culvert 10-yr Outlet Velocity (ft/s):	5.6

Roadway Geometric Considerations

Evaluate/Describe Roadway Geometric Constraints:

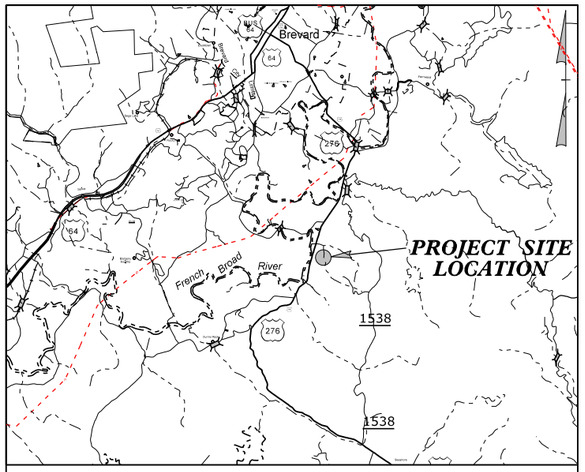
There are no roadway geometric constraints that prevent ideal culvert design and installation.

09/08/99

TIP PROJECT: B-4823

CONTRACT: Cxxxxx

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols



VICINITY MAP

N.T.S.

6/27/2017 Rev. Preliminary Plans

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

TRANSYLVANIA COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4823	1	

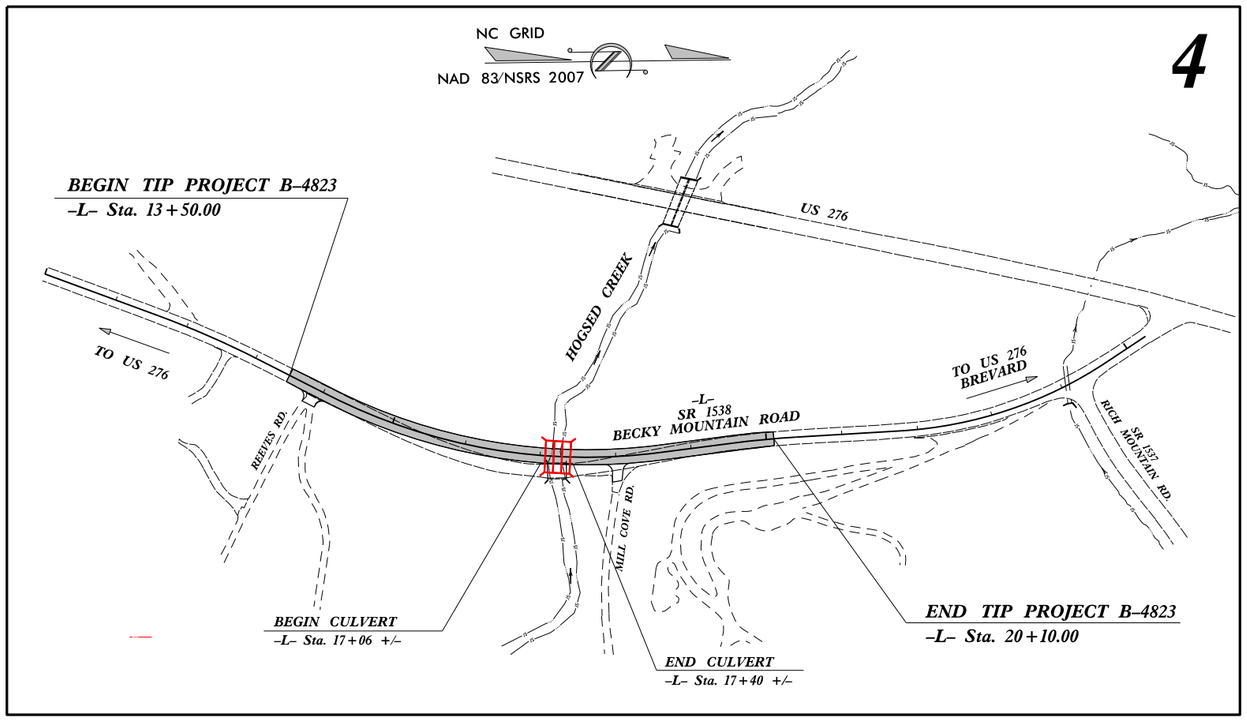
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
38593.1.2	BRZ-1538(9)	P.E.
38593.2.1	BRZ-1538(9)	R/W
38593.3.1	BRZ-1538(9)	CONST.

PERMIT DRAWING
SHEET 1 OF 7

LOCATION: BRIDGE NO. 12 OVER HOGSED CREEK ON SR 1538 (BECKY MOUNTAIN ROAD)

TYPE OF WORK: GRADING, PAVING, DRAINAGE AND CULVERT

WETLAND AND SURFACE WATER IMPACTS PERMIT



CLEARING ON THIS PROJECT SHALL BE PERFORMED TO LIMITS ESTABLISHED BY METHOD II.

THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA

ADT 2017 = 617
ADT 2040 = 700
K = 11 %
D = 65 %
T = 3 % *
V = 45 MPH
* TTST = 1% DUAL 2%
FUNC CLASS =
LOCAL
SUB-REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-4823	=	0.119 mi.
LENGTH STRUCTURE TIP PROJECT B-4823	=	0.006 mi.
TOTAL LENGTH TIP PROJECT B-4823	=	0.125 mi.

PLANS PREPARED BY:
CH ENGINEERING
3220 GLEN ROYAL RD, RALEIGH, NC 27617
TELE 919.788.0224 FAX 919.788.0232
NC LICENSE #P-0189

PLANS PREPARED FOR:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr.
Raleigh, NC 27610

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
JULY 15, 2016

LETTING DATE:
FEBRUARY 20, 2018

BRIAN A. WILES, PE
PROJECT ENGINEER

BRENDA MOORE, PE
NCDOT CONTACT

HYDRAULICS ENGINEER

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

9/13/2017
B4823_Hyd_prm_wet_psh_01.dgn
jharvey

PROJECT REFERENCE NO.	SHEET NO.
B-4823	4

R/W SHEET NO.

ROADWAY DESIGN ENGINEER — HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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PERMIT DRAWING SHEET 2 OF 7

CH ENGINEERING
3220 GLEN ROYAL RD. RALEIGH, NC 27617
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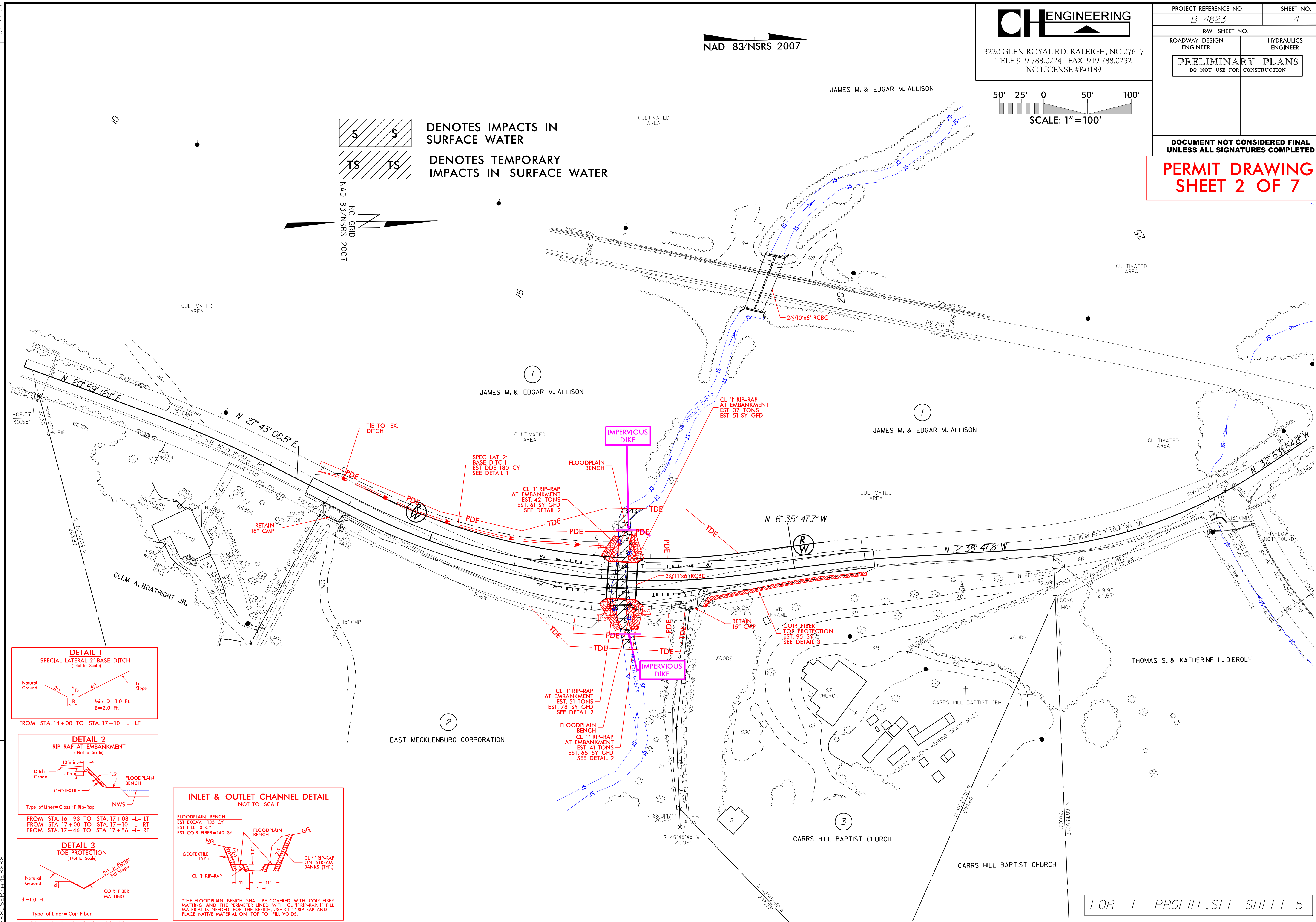
NC LICENSE #P-0189

REVISIONS
8/xx/2017 Right-of-Way Revision Roadway and Hydraulics redesigned to allow for onsite detour.


NAD 83/NSRS 2007
SCALE: 1"=100'
S S DENOTES IMPACTS IN SURFACE WATER
TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NC GRID NAD 83/NSRS 2007
JAMES M. & EDGAR M. ALLISON
EAST MECKLENBURG CORPORATION
CARRS HILL BAPTIST CHURCH
THOMAS S. & KATHERINE L. DIEROLF
CLEM A. BOATRIGHT JR.
IMPERVIOUS DIKE
FLOODPLAIN BENCH
3@11'x6' RCBC
2@10'x6' RCBC
TIE TO EX. DITCH
SPEC. LAT. 2' BASE DITCH EST DDE 180 CY SEE DETAIL 1
CL 'I' RIP-RAP AT EMBANKMENT EST. 42 TONS EST. 61 SY GFD SEE DETAIL 2
CL 'I' RIP-RAP AT EMBANKMENT EST. 32 TONS EST. 51 SY GFD
CL 'I' RIP-RAP AT EMBANKMENT EST. 51 TONS EST. 78 SY GFD SEE DETAIL 2
CL 'I' RIP-RAP AT EMBANKMENT EST. 41 TONS EST. 65 SY GFD SEE DETAIL 2
COIR FIBER TOE PROTECTION EST. 95 SY SEE DETAIL 3
RETAIN 18" CMP
RETAIN 15" CMP
N 20°59'12.1" E
N 27°43'08.5" E
N 6°35'47.7" W
N 2°38'47.8" W
N 32°53'54.8" W
DETAIL 1 SPECIAL LATERAL 2' BASE DITCH (Not to Scale)
Min. D=1.0 Ft. B=2.0 Ft.
FROM STA. 14+00 TO STA. 17+10 -L- LT
DETAIL 2 RIP RAP AT EMBANKMENT (Not to Scale)
Type of Liner=Class 'I' Rip-Rap
FROM STA. 16+93 TO STA. 17+03 -L- LT
FROM STA. 17+00 TO STA. 17+10 -L- RT
FROM STA. 17+46 TO STA. 17+56 -L- RT
DETAIL 3 TOE PROTECTION (Not to Scale)
d=1.0 Ft.
Type of Liner=Coir Fiber
FROM STA. 18+10 TO STA. 20+00 -L- Rt
INLET & OUTLET CHANNEL DETAIL NOT TO SCALE
FLOODPLAIN BENCH EST EXCAV.=135 CY EST FILL=0 CY EST COIR FIBER=140 SY
*THE FLOODPLAIN BENCH SHALL BE COVERED WITH COIR FIBER MATTING AND THE PERIMETER LINED WITH CL 'I' RIP-RAP. IF FILL MATERIAL IS NEEDED FOR THE BENCH, USE CL 'I' RIP-RAP AND PLACE NATIVE MATERIAL ON TOP TO FILL VOIDS.

FOR -L- PROFILE, SEE SHEET 5

CH ENGINEERING
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NC LICENSE #P-0189

PROJECT REFERENCE NO.	SHEET NO.
B-4823	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING SHEET 3 OF 7

50' 25' 0 50' 100'
SCALE: 1"=100'

NAD 83/NSRS 2007

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

NAD 83/NSRS 2007 NC GRID

JAMES M. & EDGAR M. ALLISON

CULTIVATED AREA

EXISTING R/W

US 276

2@10'x6' RCBC

CL 'I' RIP-RAP AT EMBANKMENT EST. 32 TONS EST. 51 SY GFD

IMPERVIOUS DIKE

FLOODPLAIN BENCH

SPEC. LAT. 2' BASE DITCH EST DDE 180 CY SEE DETAIL 1

CL 'I' RIP-RAP AT EMBANKMENT EST. 42 TONS EST. 61 SY GFD SEE DETAIL 2

TIE TO EX. DITCH

RETAIN 18" CMP

SR 1538 BECKY MOUNTAIN RD.

N 20°59'10.1" E

N 27°43'08.5" E

N 6°35'47.7" W

N 2°38'47.8" W

N 32°53'54.8" W

S 17°50'09" W 283.83'

CLEM A. BOATRIGHT JR.

3@11'x6' RCBC

RETAIN 15" CMP

COIR FIBER TOE PROTECTION EST. 95 SY SEE DETAIL 3

IMPERVIOUS DIKE

CL 'I' RIP-RAP AT EMBANKMENT EST. 51 TONS EST. 78 SY GFD SEE DETAIL 2

FLOODPLAIN BENCH CL 'I' RIP-RAP AT EMBANKMENT EST. 41 TONS EST. 65 SY GFD SEE DETAIL 3

EAST MECKLENBURG CORPORATION

N 88°31'17" E 20.92'

S 46°48'48" W 22.96'

S 46°48'48" W 229.53'

N 65°23'15" W 509.46'

N 88°19'52" E 430.03'

N 88°19'52" E 12.99'

CARRS HILL BAPTIST CHURCH

ISF CHURCH

CARRS HILL BAPTIST CEM

CONCRETE BLOCKS AROUND GRAVE SITES

THOMAS S. & KATHERINE L. DIEROLF

WOODS

SOIL

WELL HOUSE

CONC ROCK WALL

ROCK WALL

ARBOR

LANDSCAPE AREA

STEPS

CONC MON

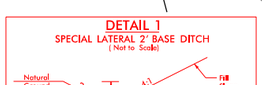
INFLOW NOT FOUND

OUTFALL NOT FOUND

EXISTING

FOR -L- PROFILE, SEE SHEET 5

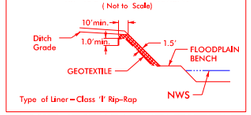
DETAIL 1
SPECIAL LATERAL 2' BASE DITCH
(Not to Scale)



Min. D=1.0 Ft.
B=2.0 Ft.

FROM STA. 14+00 TO STA. 17+10 -L- LT

DETAIL 2
RIP RAP AT EMBANKMENT
(Not to Scale)

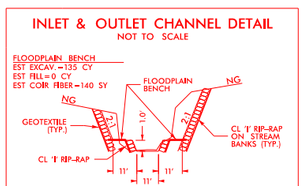


FROM STA. 16+93 TO STA. 17+03 -L- LT
FROM STA. 17+00 TO STA. 17+10 -L- RT
FROM STA. 17+46 TO STA. 17+56 -L- RT

DETAIL 3
TOE PROTECTION
(Not to Scale)

FROM STA. 18+10 TO STA. 20+00 -L- Rt

INLET & OUTLET CHANNEL DETAIL
NOT TO SCALE



*THE FLOODPLAIN BENCH SHALL BE COVERED WITH COIR FIBER MATTING AND THE PERIMETER LINED WITH CL 'I' RIP-RAP IF FILL MATERIAL IS NEEDED FOR THE BENCH. USE CL 'I' RIP-RAP AND PLACE NATIVE MATERIAL ON TOP TO FILL VOIDS.

REVISIONS
8/xx/2017 Right-of-Way Revision Roadway and Hydraulics redesigned to allow for onsite detour.

8/17/99

$$$$USERNAME$$$$ $$$$SYSTIME$$$$

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

10' 5' 0 10' 20'
SCALE: 1" = 20'

PROJECT REFERENCE NO.	SHEET NO.
B-4823	4c
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 4 OF 7

IMPERVIOUS DIKE

TDE

PDE

FLOODPLAIN BENCH

JS

TS

S

3@11'x6' RCBC

8:1

15" CMP

HOGSELD

WOODS

9' GR

IMPERVIOUS DIKE

REVISIONS 8/17/99

$$$$SYSTIME$$$$
$$$$SIMEDON$$$$
$$$$USERNAME$$$$

5/14/99

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NC LICENSE #P-0189

PROJECT REFERENCE NO.	SHEET NO.
B-4823	5

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING SHEET 5 OF 7

-L-

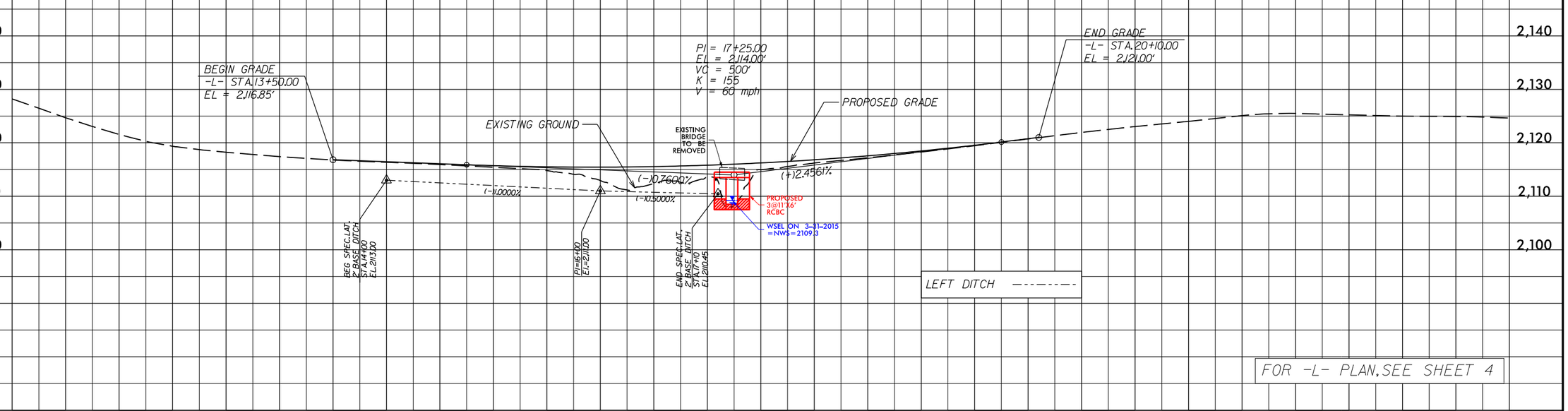
BM 1 ELEV = 2,140.75'
N 549,600 E 890,345
-L- STA 11+17 66' RIGHT
8 INCH SPIKE SET IN TOP
OF A 18" HOLLY STUMP

BM 2 ELEV = 2,124.15'
N 550,284 E 890,546
-L- STA 18+16 54' RIGHT
8 INCH SPIKE SET IN THE BASE
OF A 40 INCH WHITE OAK TREE

BM 3 ELEV = 2,125.03'
N 550,870 E 890,432
-L- STA 24+04 27' RIGHT
CHISELED "X" IN THE NORTHERN
END OF CONC. HEADWALL

CULVERT HYDRAULIC DATA

DESIGN DISCHARGE	= 1000	CFS
DESIGN FREQUENCY	= 25	YRS
DESIGN HW ELEVATION	= 2113.8	FT
BASE DISCHARGE	= 1400	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 2115.9	FT
OVERTOPPING DISCHARGE	= 1400	CFS
OVERTOPPING FREQUENCY	= 100	YRS
OVERTOPPING ELEVATION	= 2115.9 Sta.15+93	FT -L-



$$$$$$SYSTIME$$$$$
$$$$$$USERNAME$$$$
$$$$$$DESIGN$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

DETAIL
(NOT TO SCALE)

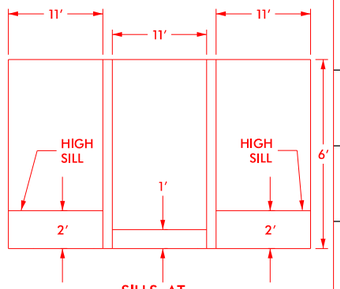
MULTI– BARREL CULVERT LOW FLOW CHANNEL,SILLS AND FLOOD PLAIN BENCH

*NOTES:

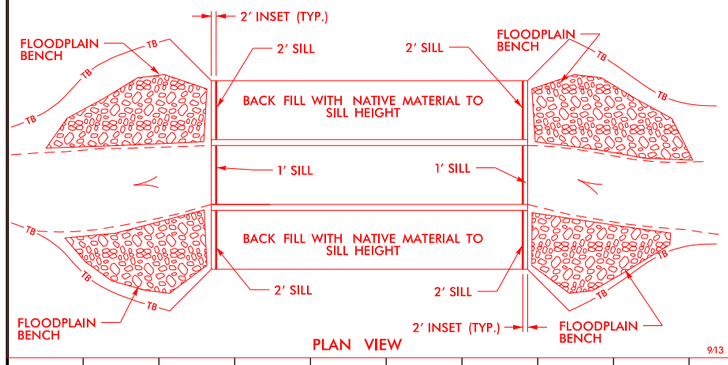
1) NATIVE MATERIAL BETWEEN SILLS IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE THE STREAM OR FLOODPLAIN AT THE PROJECT SITE DURING CONSTRUCTION. ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO LINE THE LOW FLOW CULVERT BARREL. RIP–RAP MAY BE USED TO SUPPLEMENT THE NATIVE BED MATERIAL IN THE HIGH FLOW CULVERT BARREL(S). IF RIP–RAP IS USED TO LINE THE HIGH FLOW CULVERT BARREL(S), NATIVE MATERIAL SHOULD BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

2) SILLS ARE TO BE 1.0 FT. WIDE, CAST SEPARATELY AND ATTACHED BY DOWELS.

3) DO NOT SET ELEVATION OF HIGH SILLS ABOVE BANK FULL.



SILLS AT INLET AND OUTLET

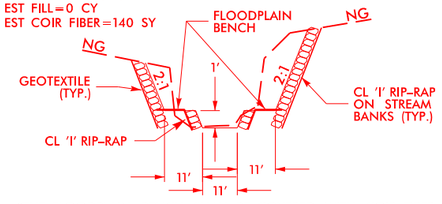


PLAN VIEW

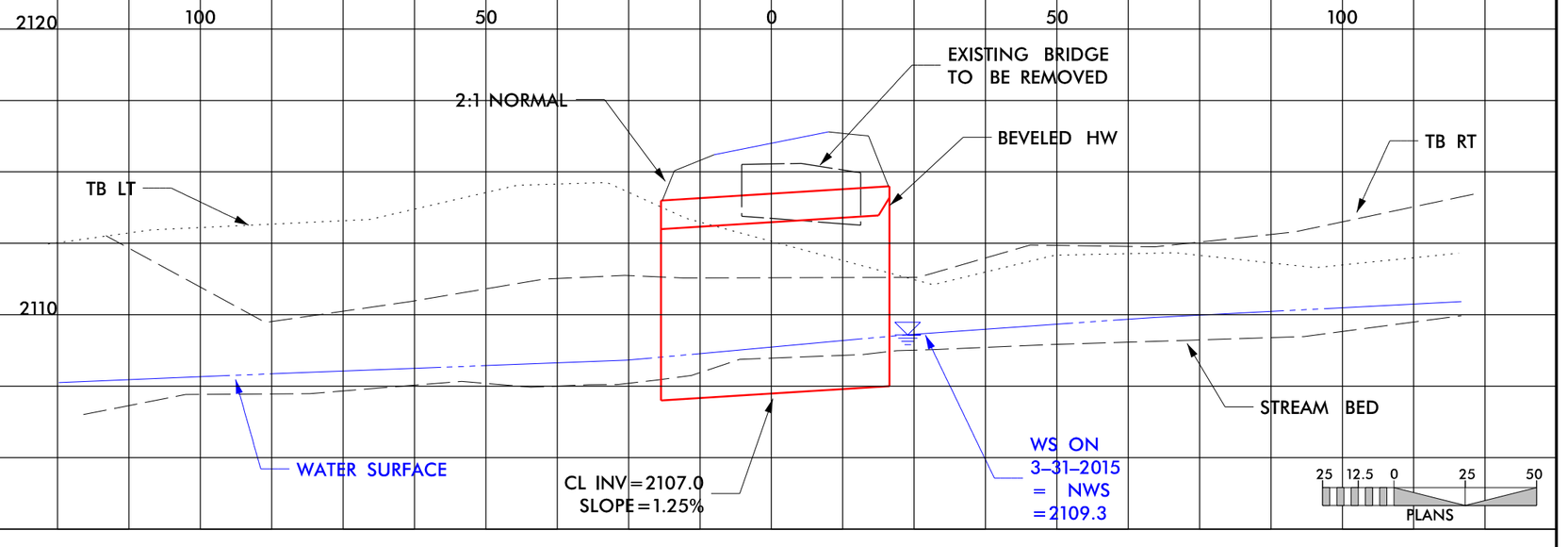
9/13

INLET & OUTLET CHANNEL DETAIL
NOT TO SCALE

FLOODPLAIN BENCH
EST EXCAV.=135 CY
EST FILL=0 CY
EST COIR FIBER=140 SY



*THE FLOODPLAIN BENCH SHALL BE COVERED WITH COIR FIBER MATTING AND THE PERIMETER LINED WITH CL 'I' RIP–RAP. IF FILL MATERIAL IS NEEDED FOR THE BENCH, USE CL 'I' RIP–RAP AND PLACE NATIVE MATERIAL ON TOP TO FILL VOIDS.



PROJECT REFERENCE NO.	SHEET NO.
B–4823	4d

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 6 OF 7

$$$$$SYSTIME$$$$
$$$$$USERNAME$$$$

WETLAND PERMIT IMPACT SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1	17+15/17+40 -L-	3 @ 11' x 6' RCBC						0.02		42		
		STREAM STABILIZATION						0.02		65		
		IMPERVIOUS DIKE							0.02		58	
TOTALS*:								0.04	0.02	107	58	0

*Rounded totals are sum of actual impacts

NOTES:

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
9-20-17
TRANSYLVANIA COUNTY
B-4823
38593.1.2

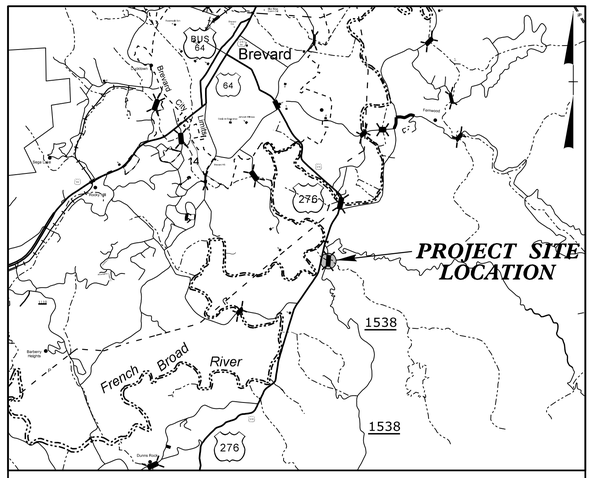
Revised 2013 10 24

09/08/99

TIP PROJECT: B-4823

CONTRACT: C203943

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols



VICINITY MAP

N.T.S.

10/03/2017 100% Review Plans

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

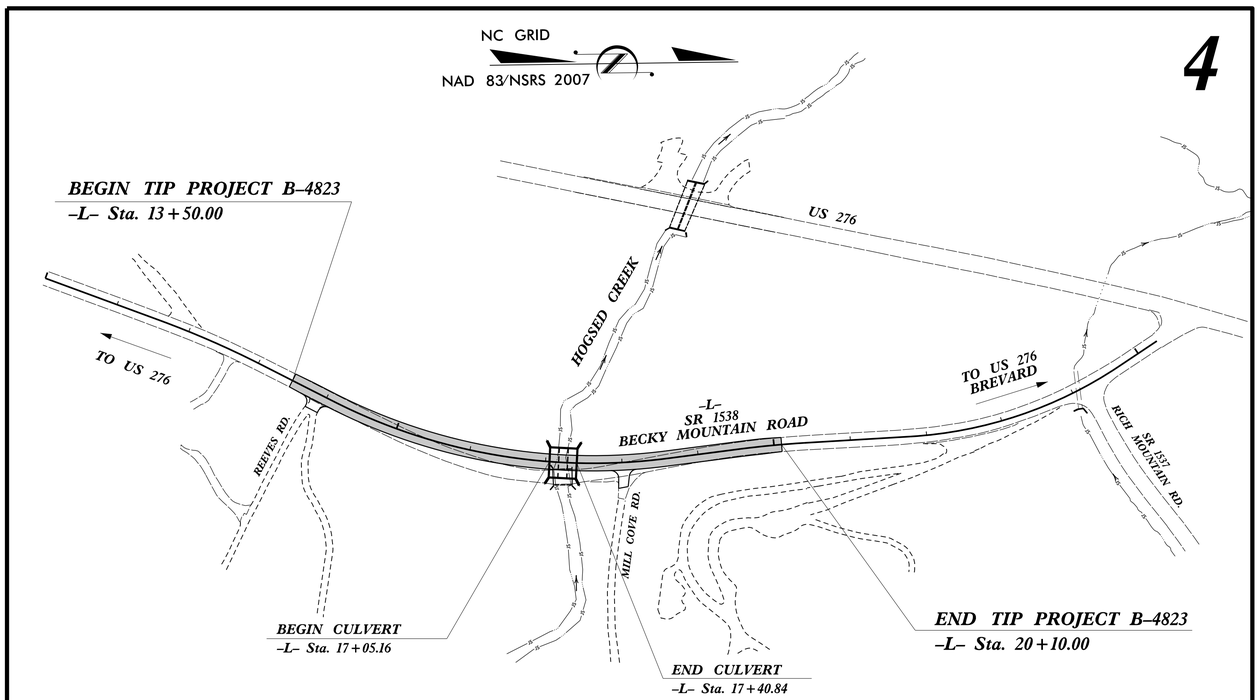
TRANSYLVANIA COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4823	1	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
38593.1.2	BRZ-1538(9)	P.E.
38593.2.1	BRZ-1538(9)	R/W
38593.3.1	BRZ-1538(9)	CONST.

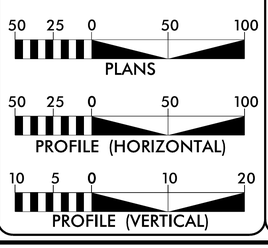
LOCATION: BRIDGE NO. 12 OVER HOGSED CREEK ON SR 1538 (BECKY MOUNTAIN ROAD)

TYPE OF WORK: GRADING, PAVING, DRAINAGE AND CULVERT



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES



DESIGN DATA

ADT 2017 = 617
ADT 2040 = 700
K = 11 %
D = 65 %
T = 3 % *
V = 45 MPH
* TTST = 1% DUAL 2%
FUNC CLASS = LOCAL
SUB-REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-4823	=	0.118 mi.
LENGTH STRUCTURE TIP PROJECT B-4823	=	0.007 mi.
TOTAL LENGTH TIP PROJECT B-4823	=	0.125 mi.

PLANS PREPARED BY:
CH ENGINEERING
3220 GLEN ROYAL RD, RALEIGH, NC 27617
TELE 919.788.0224 FAX 919.788.0232
NC LICENSE #P-0189

PLANS PREPARED FOR:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr.
Raleigh, NC 27610

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JULY 15, 2016

LETTING DATE: FEBRUARY 20, 2018

BRIAN A. WILES, PE
PROJECT ENGINEER

DAVID STUTTS, PE
NCDOT CONTACT
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HYDRAULICS ENGINEER
SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
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TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

9/28/2017
R:\Roadway\Proj\B4823_Rdy_tsh.dgn
USERNAME

12/2/2016

PROJECT REFERENCE NO.	SHEET NO.
B-4823	1B

STATE OF NORTH CAROLINA, DIVISION OF HIGHWAYS

CONVENTIONAL PLAN SHEET SYMBOLS

Note: Not to Scale **S.U.E. = Subsurface Utility Engineering*

BOUNDARIES AND PROPERTY:

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin — EIP
- Computed Property Corner
- Property Monument — ECM
- Parcel/Sequence Number — 123
- Existing Fence Line
- Proposed Woven Wire Fence
- Proposed Chain Link Fence
- Proposed Barbed Wire Fence
- Existing Wetland Boundary — WLB
- Proposed Wetland Boundary — WLB
- Existing Endangered Animal Boundary — EAB
- Existing Endangered Plant Boundary — EPB
- Existing Historic Property Boundary — HPB
- Known Contamination Area: Soil — S
- Potential Contamination Area: Soil — S
- Known Contamination Area: Water — W
- Potential Contamination Area: Water — W
- Contaminated Site: Known or Potential

BUILDINGS AND OTHER CULTURE:

- Gas Pump Vent or U/G Tank Cap
- Sign — S
- Well — W
- Small Mine
- Foundation
- Area Outline
- Cemetery
- Building
- School
- Church
- Dam

HYDROLOGY:

- Stream or Body of Water
- Hydro, Pool or Reservoir
- Jurisdictional Stream — JS
- Buffer Zone 1 — BZ 1
- Buffer Zone 2 — BZ 2
- Flow Arrow
- Disappearing Stream
- Spring
- Wetland
- Proposed Lateral, Tail, Head Ditch — FLOW
- False Sump

RAILROADS:

- Standard Gauge — CSX TRANSPORTATION
- RR Signal Milepost — MILEPOST 35
- Switch — SWITCH
- RR Abandoned
- RR Dismantled

RIGHT OF WAY & PROJECT CONTROL:

- Secondary Horiz and Vert Control Point
- Primary Horiz Control Point
- Primary Horiz and Vert Control Point
- Exist Permanent Easment Pin and Cap
- New Permanent Easement Pin and Cap
- Vertical Benchmark
- Existing Right of Way Marker
- Existing Right of Way Line
- New Right of Way Line — RW
- New Right of Way Line with Pin and Cap — RW
- New Right of Way Line with Concrete or Granite R/W Marker — RW
- New Control of Access Line with Concrete C/A Marker — CA
- Existing Control of Access — CA
- New Control of Access — CA
- Existing Easement Line — E
- New Temporary Construction Easement — E
- New Temporary Drainage Easement — TDE
- New Permanent Drainage Easement — PDE
- New Permanent Drainage / Utility Easement — DUE
- New Permanent Utility Easement — PUE
- New Temporary Utility Easement — TUE
- New Aerial Utility Easement — AUE

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement
- Existing Curb
- Proposed Slope Stakes Cut — C
- Proposed Slope Stakes Fill — F
- Proposed Curb Ramp — CR
- Existing Metal Guardrail
- Proposed Guardrail
- Existing Cable Guiderail
- Proposed Cable Guiderail
- Equality Symbol
- Pavement Removal

VEGETATION:

- Single Tree
- Single Shrub
- Hedge
- Woods Line
- Orchard
- Vineyard — Vineyard

EXISTING STRUCTURES:

MAJOR:

- Bridge, Tunnel or Box Culvert — CONC
- Bridge Wing Wall, Head Wall and End Wall — CONC WW

MINOR:

- Head and End Wall — CONC HW
- Pipe Culvert
- Footbridge
- Drainage Box: Catch Basin, DI or JB — CB
- Paved Ditch Gutter
- Storm Sewer Manhole — S
- Storm Sewer — S

UTILITIES:

POWER:

- Existing Power Pole
- Proposed Power Pole
- Existing Joint Use Pole
- Proposed Joint Use Pole
- Power Manhole — P
- Power Line Tower
- Power Transformer
- U/G Power Cable Hand Hole
- H–Frame Pole
- U/G Power Line LOS B (S.U.E.*) — P
- U/G Power Line LOS C (S.U.E.*) — P
- U/G Power Line LOS D (S.U.E.*) — P

TELEPHONE:

- Existing Telephone Pole
- Proposed Telephone Pole
- Telephone Manhole — T
- Telephone Pedestal — T
- Telephone Cell Tower
- U/G Telephone Cable Hand Hole — HH
- U/G Telephone Cable LOS B (S.U.E.*) — T
- U/G Telephone Cable LOS C (S.U.E.*) — T
- U/G Telephone Cable LOS D (S.U.E.*) — T
- U/G Telephone Conduit LOS B (S.U.E.*) — TC
- U/G Telephone Conduit LOS C (S.U.E.*) — TC
- U/G Telephone Conduit LOS D (S.U.E.*) — TC
- U/G Fiber Optics Cable LOS B (S.U.E.*) — T FO
- U/G Fiber Optics Cable LOS C (S.U.E.*) — T FO
- U/G Fiber Optics Cable LOS D (S.U.E.*) — T FO

WATER:

- Water Manhole — W
- Water Meter
- Water Valve
- Water Hydrant
- U/G Water Line LOS B (S.U.E*) — W
- U/G Water Line LOS C (S.U.E*) — W
- U/G Water Line LOS D (S.U.E*) — W
- Above Ground Water Line — A/G Water

TV:

- TV Pedestal — C
- TV Tower
- U/G TV Cable Hand Hole — HH
- U/G TV Cable LOS B (S.U.E.*) — TV
- U/G TV Cable LOS C (S.U.E.*) — TV
- U/G TV Cable LOS D (S.U.E.*) — TV
- U/G Fiber Optic Cable LOS B (S.U.E.*) — TV FO
- U/G Fiber Optic Cable LOS C (S.U.E.*) — TV FO
- U/G Fiber Optic Cable LOS D (S.U.E.*) — TV FO

GAS:

- Gas Valve
- Gas Meter
- U/G Gas Line LOS B (S.U.E.*) — G
- U/G Gas Line LOS C (S.U.E.*) — G
- U/G Gas Line LOS D (S.U.E.*) — G
- Above Ground Gas Line — A/G Gas

SANITARY SEWER:

- Sanitary Sewer Manhole
- Sanitary Sewer Cleanout
- U/G Sanitary Sewer Line — SS
- Above Ground Sanitary Sewer — A/G Sanitary Sewer
- SS Forced Main Line LOS B (S.U.E.*) — FSS
- SS Forced Main Line LOS C (S.U.E.*) — FSS
- SS Forced Main Line LOS D (S.U.E.*) — FSS

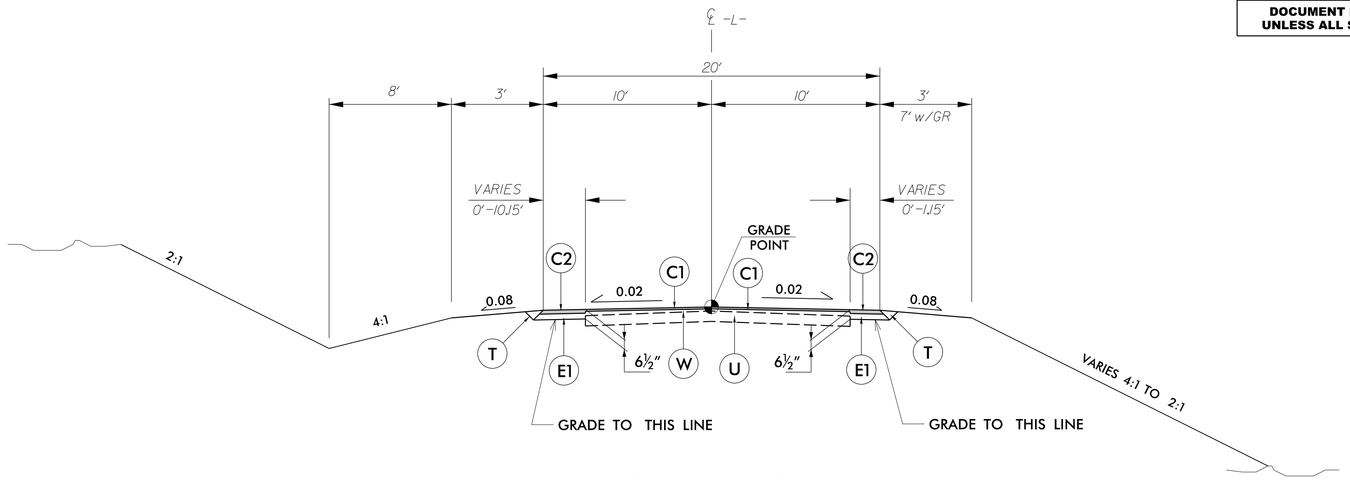
MISCELLANEOUS:

- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box — S
- Utility Unknown U/G Line LOS B (S.U.E.*) — ?UTL
- U/G Tank; Water, Gas, Oil
- Underground Storage Tank, Approx. Loc. — UST
- A/G Tank; Water, Gas, Oil
- Geoenvironmental Boring
- U/G Test Hole LOS A (S.U.E.*)
- Abandoned According to Utility Records — AATUR
- End of Information — E.O.I.

6/2/99

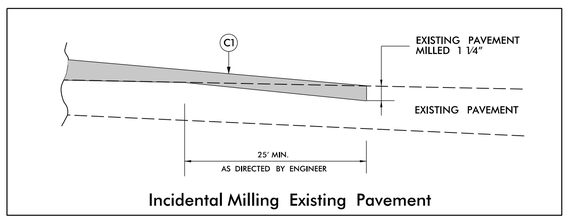
PAVEMENT SCHEDULE	
C1	PROP. APPROX. 1¼" ASPHALT CONCRETE SURFACE COURSE, TYPE SF9.5A, AT AN AVERAGE RATE OF 137.5 LBS. PER SQ. YD.
C2	PROP. APPROX. 2½" ASPHALT CONCRETE SURFACE COURSE, TYPE SF9.5A, AT AN AVERAGE RATE OF 137.5 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.
C3	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE SF9.5A, AT AN AVERAGE RATE OF 110 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT TO EXCEED 1½" IN DEPTH.
E1	PROP. APPROX. 4" ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD.
E2	PROP. VAR. DEPTH ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT LESS THAN 3" IN DEPTH OR GREATER THAN 5½" IN DEPTH.
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
W	VARIABLE DEPTH ASPHALT PAVEMENT (SEE STANDARD WEDGING DETAIL SHEET No. 2A-1)

NOTE: PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.

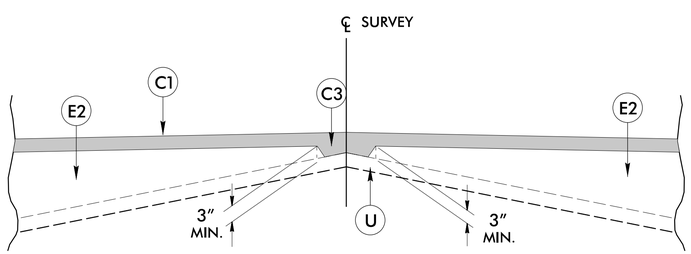


TYPICAL SECTION NO. 1

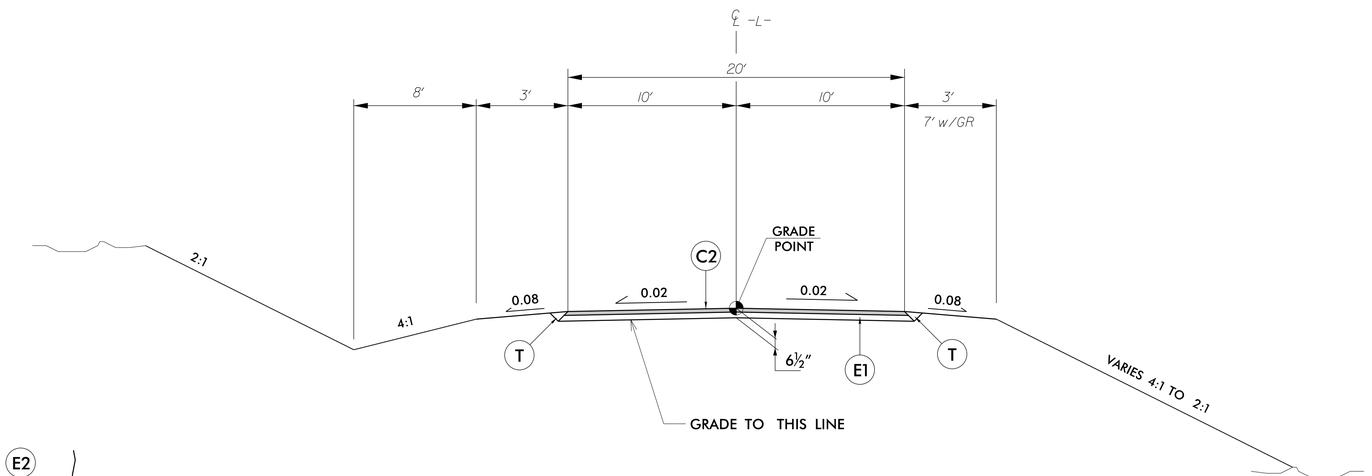
–L– STA. 13+50.00 TO –L– STA. 15+25.00
–L– STA. 18+00.00 TO –L– STA. 20+10.00



Incidental Milling Existing Pavement



Detail Showing Method of Wedging



TYPICAL SECTION NO. 2

–L– STA. 15+25.00 TO –L– STA. 18+00.00

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PROJECT REFERENCE NO.	SHEET NO.
B-4823	2A-1
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

9/28/2017
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LEFEWARE

REVISIONS	
8/17/99	
8/18/2017	Right-of-Way Revision Roadway and Hydraulics redesigned to allow for onsite detour.
9/25/2017	Added Right-of-Way Markers on right side of road along existing R/W.

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TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

PROJECT REFERENCE NO.	SHEET NO.
B-4823	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NAD 83/NSRS 2007

-L-

PI Sta 12+30.92	PI Sta 16+40.78	PI Sta 19+97.97	PI Sta 23+27.32
△ = 6° 43' 56.4" (RT)	△ = 34° 18' 56.2" (LT)	△ = 3° 56' 59.9" (RT)	△ = 30° 15' 07.0" (LT)
D = 4° 46' 28.7"	D = 7° 38' 22.0"	D = 4° 46' 28.7"	D = 10° 25' 02.7"
L = 141.00'	L = 449.19'	L = 82.73'	L = 290.40'
T = 70.58'	T = 231.56'	T = 41.38'	T = 148.67'
R = 1,200.00'	R = 750.00'	R = 1,200.00'	R = 550.00'
	SE = .04		

BEGIN TIP PROJECT B-4823
-L- POT Sta. 13+50.00

POT Sta. 10+00.00

BL-1

N 20° 59' 12.1" E

N 27° 43' 08.5" E

PC Sta. 14+09.22

BM #1
-BL- STA 5+00.00
S 26° 50' 57.9" E DIST. 119.67
ELEV. 2140.75'

PC Sta. 11+60.34

PT Sta. 13+40.34

CLEM A. BOATRIGHT JR.
DB 259 PG 504

JAMES M. & EDGAR M. ALLISON
DB 121 PG 13

BY2-7

BY2-8

BM #4
-BY2- STA 6+70.94
19.37 LEFT
ELEV. 2111.85'

2@10'x6' RCBC

BRIDGE DESCRIPTION #12
WOOD DECK / BST SURFACE
WOOD RAILS & WOOD WHEEL GUARDS
8 STEEL I BEAMS
WOOD HEADWALLS
3 WOOD WINGWALLS

3@11'x6' RCBC

BEGIN CULVERT
-L- POC 17+05.16

END CULVERT
-L- POC 17+40.84

PT Sta. 18+58.41

PC Sta. 21+78.65

PT Sta. 21+46.05

POT Sta. 25+29.29

END TIP PROJECT B-4823
-L- POC Sta. 20+10.00

N 6° 35' 47.7" W

N 2° 38' 47.8" W

N 32° 53' 54.8" W

PT Sta. 19+56.59

PC Sta. 20+39.39

BL-2

BL-3

BL-4

BYI-6

BM #2
-BL- STA 11+25.09
45.93 RIGHT
ELEV. 2124.15'

BM #3
-BL- STA 17+18.93
15.85 RIGHT
ELEV. 2125.03'

THOMAS S. & KATHERINE L. DIEROLF
DB 275 PG 689

EAST MECKLENBURG CORPORATION
DB 620 PG 722
DB 251 PG 119
DB 127 PG 620
PB 15 PG 193

CARRS HILL BAPTIST CHURCH
DB 260 PG 190
DB 18 PG 526
DB 123 PG 32
DB 46 PG 98
PB 10 PG 940

CARRS HILL BAPTIST CHURCH
DB 260 PG 190
DB 18 PG 526
DB 123 PG 32
DB 46 PG 98
PB 10 PG 940

RETAIN 18" CMP
RETAIN 15" CMP

SPEC. LAT. 2' BASE DITCH EST DDE 180 CY SEE DETAIL 1

CL 'I' RIP-RAP AT EMBANKMENT EST. 42 TONS EST. 61 SY GFD SEE DETAIL 2

CL 'I' RIP-RAP AT EMBANKMENT EST. 51 TONS EST. 78 SY GFD SEE DETAIL 2

CL 'I' RIP-RAP AT EMBANKMENT EST. 41 TONS EST. 65 SY GFD SEE DETAIL 2

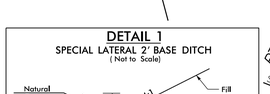
CL 'I' RIP-RAP AT EMBANKMENT EST. 32 TONS EST. 51 SY GFD

FLOODPLAIN BENCH

COIR FIBER TOE PROTECTION EST. 95 SY SEE DETAIL 3

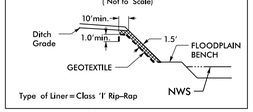
TIE TO EX DITCH

DETAIL 1
SPECIAL LATERAL 2' BASE DITCH
(Not to Scale)



FROM STA. 14+00 TO STA. 17+10 -L- LT

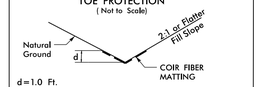
DETAIL 2
RIP RAP AT EMBANKMENT
(Not to Scale)



Type of Liner = Class 'I' Rip-Rap

FROM STA. 16+93 TO STA. 17+03 -L- LT
FROM STA. 17+00 TO STA. 17+10 -L- RT
FROM STA. 17+46 TO STA. 17+56 -L- RT

DETAIL 3
TOE PROTECTION
(Not to Scale)

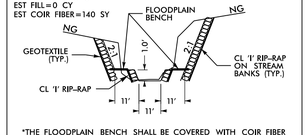


d = 1.0 Ft.

Type of Liner = Coir Fiber

FROM STA. 18+10 TO STA. 20+00 -L- Rt

INLET & OUTLET CHANNEL DETAIL
NOT TO SCALE



*THE FLOODPLAIN BENCH SHALL BE COVERED WITH COIR FIBER MATTING AND THE PERIMETER LINED WITH CL 'I' RIP-RAP. IF FILL MATERIAL IS NEEDED FOR THE BENCH, USE CL 'I' RIP-RAP AND PLACE NATIVE MATERIAL ON TOP TO 'FILL VOIDS.

FOR -L- PROFILE, SEE SHEET 5

9/28/2017
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PROJECT REFERENCE NO.	SHEET NO.
B-4823	5

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

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-L-

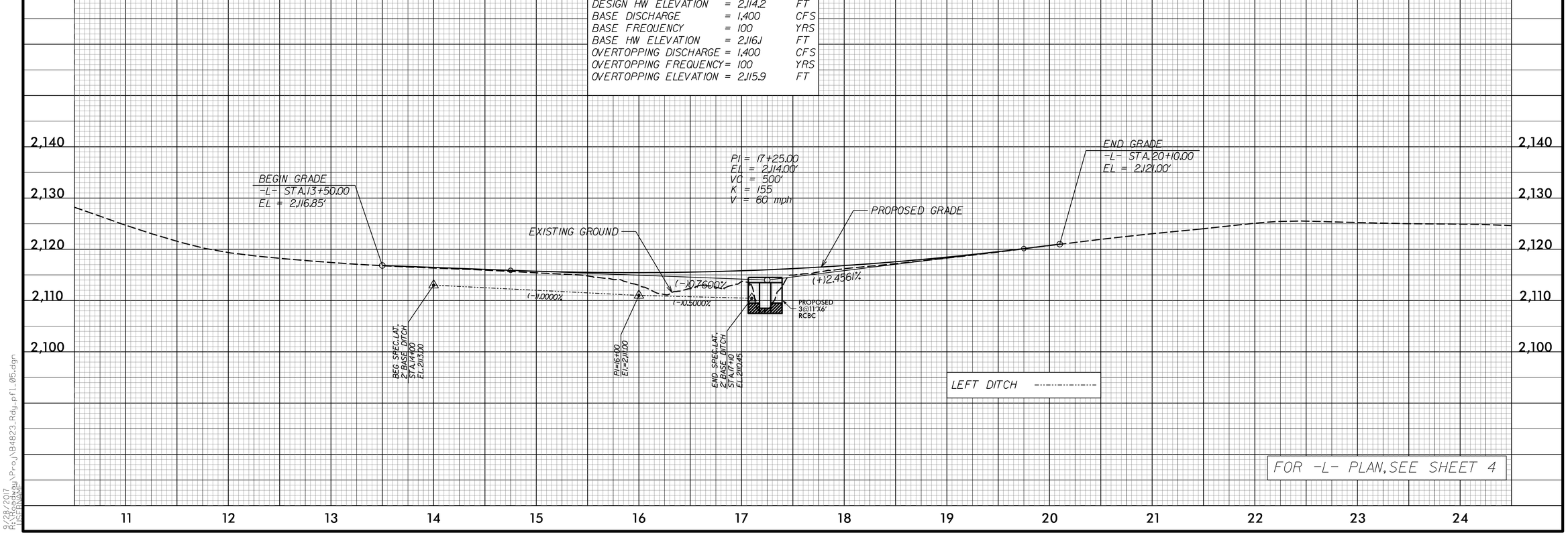
BM 1 ELEV = 2,140.75'
N 549,600 E 890,345
-L- STA 11+17 66' RIGHT
8 INCH SPIKE SET IN TOP
OF A 18" HOLLY STUMP

BM 2 ELEV = 2,124.15'
N 550,284 E 890,546
-L- STA 18+16 54' RIGHT
8 INCH SPIKE SET IN THE BASE
OF A 40 INCH WHITE OAK TREE

BM 3 ELEV = 2,125.03'
N 550,870 E 890,432
-L- STA 24+04 27' RIGHT
CHISELED "X" IN THE NORTHERN
END OF CONC. HEADWALL

CULVERT HYDRAULIC DATA

DESIGN DISCHARGE	= 1,000	CFS
DESIGN FREQUENCY	= 25	YRS
DESIGN HW ELEVATION	= 2,114.2	FT
BASE DISCHARGE	= 1,400	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 2,116.1	FT
OVERTOPPING DISCHARGE	= 1,400	CFS
OVERTOPPING FREQUENCY	= 100	YRS
OVERTOPPING ELEVATION	= 2,115.9	FT



FOR -L- PLAN, SEE SHEET 4

9/28/2017
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