United States Department of the Interior

FISH AND WILDLIFE SERVICE
Asheville Field Office
160 Zillicoa Street Suite #B
Asheville, North Carolina 28801

February 22, 2019

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

Subject: Proposed Widening of I-26 From US 25 Near Hendersonville to I-40/I-240 South of Asheville, Henderson and Buncombe Counties, North Carolina. Federal Aid Project No. NHF-26-1(62)23/IMNHF-026-1(86)9/WBS No. 34232.1.1/36030.1.1/S.T.I.P. No. I-4400/I-4700

Dear Mr. Sullivan:

This document transmits the U.S. Fish and Wildlife Service's (USFWS) biological opinion (Opinion), based on our review of the proposed widening of I-26, and its effects on the federally endangered Appalachian elktoe (*Alasmidonta raveneliana*) and gray bat (*Myotis grisescens*), 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 and received on August 20, 2018, field investigations, personal communications with experts on the affected species, and other sources of information. 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 were Not Likely to be Adversely Affected by the proposed action: Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*). The USFWS concurs with this determination. Additionally, the NCDOT and FHWY's concluded that the following species would not be affected by the proposed bridge replacement project: bog turtle (*Glyptemys muhlenbergii*), Blue Ridge Goldenrod (*Solidago spithamaea*), Bunched Arrowhead (*Sagittaria fasciculata*), Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*), mountain sweet pitcherplant (*Sarracenia rubra ssp. jonesii*), rock gnome lichen (*Gymnoderma lineare*), rusty patched bumblebee (*Bombus affinis*), small whorled pogonia (*Isotria medeoloides*), spotfin chub

(*Erimonax monachus*), spreading avens (*Geum radiatum*), Spruce-fir moss spider (*Microhexura monitvaga*), swamp pink (*Helonias bullata*), tan riffleshell (*Epioblasma florentina walkeri*), Virginia spiraea (*Spiraea virginiana*), white fringeless orchid (*Platanthera integrilabia*), and white irisette (*Sisyrinchium dichotomum*). After review of the information provided, we concur with your effects determinations for the above species.

This fulfills the requirements under section 7 of the Act have been fulfilled for these species. Requirements 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.

Sincerely,

Janet Mizzi
Field Supervisor

Biological Opinion
I-26 Widening from US 25 Near Hendersonville to I-40/I-240 South of Asheville
Henderson and Buncombe Counties, North Carolina

FWS Log # 01-206

Prepared by:
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Janet Mizzi, Field Supervisor

2-22-19
Date

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CONSULTATION HISTORY

- May 3, 2001 – United States Fish and Wildlife Services (USFWS) concurred with a "No Effect" determination for all listed species associated with project I-4400.
- May 18, 2006 – USFWS provided scoping comments for the newly combined I-4400/4700 project. USFWS recommended a reevaluation for all listed species since more than five years had passed since surveys were conducted and the project scope had changed.
- July 19, 2016 – Gray bat discovered by NCWRC and USFWS in a bridge roost near Action Area.
- October 5, 2016 – Letter from USFWS to NCDOT providing comments on the Draft Environmental Impact Statement (DEIS, NCDOT, 2016). USFWS recommended additional surveys for bats.
- October 20, 2016 – Letter from United States National Park Service (NPS) to NCDOT providing comments on the DEIS. NPS stated they did not agree with the "No Effect" finding for gray bat since the species had recently been discovered near the project. The letter also mentioned that results of recent acoustic surveys along the Blue Ridge Parkway recorded calls consistent with those of Indiana bat. The letter recommended additional surveys for gray bat and Indiana bat, as well as protection of known, occupied habitat for bog turtle, which occurs adjacent to the existing interstate.
- November 30, 2016 – Coordination meeting with NCDOT, USFWS, NPS, NCWRC, FHWA to discuss needed surveys for gray bat.
- December 20, 2016 – On-site coordination meeting with NCDOT, USFWS, NPS, NCWRC, and FHWA to visit areas of concern and discuss needed bat surveys.
- January 30, 2017 – Meeting in Asheville with NCDOT, USFWS, NCWRC, and NPS to discuss bat survey specifics.
- March 23, 2017 – USFWS and NCWRC provide comments on proposed scope of work for gray bat surveys.
- May -August 2017 – Updates on progress of ongoing gray bat surveys.
- September 12, 2017 – Draft acoustic survey report submitted to USFWS, NCWRC, and NCDOT for review.
- September 29, 2017 – Surveys conducted downstream of the I-26 crossing over the French Broad River found a previously undocumented occurrence of Appalachian elktoe.
- October 11, 2017 – Merger Team Concurrence Point 4A Meeting. Potential stormwater and sediment and erosion control measures specific to minimizing impacts to gray bat and Appalachian elktoe were discussed. USFWS suggested additional conservation measures including a revegetation plan, minimization of impacts to surface waters, and minimization of tree clearing, particularly around the bridge over the French Broad River.
- October - December 2017 – A series of conference calls regarding information and structure of the BA including Action Area, conservation measures for federally listed species - including gray bat research project and conservation for Appalachian elktoe - in the French Broad River basin, the use of Design Standards for Sensitive Watersheds

(DSSW), the use of (and commitment to, where feasible and practical) post-construction stormwater controls for any streams draining directly to the French Broad River.

- February 1, 2018 – Coordination call/meeting with USFWS, FHWA, and NCDOT to discuss USFWS and FHWA comments on draft version of BA.
- February 7, 2018 – Call/meeting between USFWS, FHWA, NCDOT, North Carolina Division of Water Resources (NCDWR), and USACE to discuss bridge replacement over the French Broad River. USFWS, NCDWR, and USACE expressed concern over safety of river users, size of causeways, length of time causeways will be in place, and size of river channel opening while causeways are in place.
- March 5, 2018 – Revised plan for replacement of bridges over the French Broad River.
- June-July 2018 – NCDOT submitted draft BA to USFWS, USACE, NPS, FHWA, and NCDWR for review and comment. A series of calls to discuss aspects of the BA and revisions.
- August 20, 2018 – Final BA submitted to USFWS
- August 29, 2018 – Initiation of Formal Consultation.
- November 20, 2018 – Section 404/NEPA Merger Meeting Concurrence Point 4C
- November 27, 2018 – USFWS notified FHWA and NCDOT of outstanding information requested for the BO.
- December 17, 2018 – USFWS received all information requested from FHWA and NCDOT.
- December 22, 2018 – January 25, 2019 - federal government shutdown, USFWS employees on furlough
- February 1, 2019 - Phone conversation between USFWS and Marissa Cox, NCDOT Biological Surveys Group Supervisor, where NCDOT committed to three years of post construction monitoring for gray bats.
- February 8, 2019 – Phone conversation with Division 13 Construction Engineer concerning lighted night operations on the I-26 bridge (BO Section 2.3.2.1). The Engineer agreed to include a two week period with no lighting to facilitate migration during a critical period.
- February 11, 2019 - USFWS submitted a Draft Biological Opinion to FHWA and NCDOT for review.

BIOLOGICAL OPINION

1. INTRODUCTION

The Federal Highway Administration (FHWA) and the North Carolina Department of Transportation (NCDOT) are proposing highway improvements to a 22.2-mile (mi.) segment of Interstate 26 (I-26) in Henderson and Buncombe Counties, NC. The current interstate is a four-lane median divided highway. The highway will be widened to six lanes for about 13.6 miles from US 25 (Exit 54) in Henderson County northward to the US 25 (Asheville Highway; Exit 44) interchange and to eight lanes for about 8.6 miles to the I-40/I-240 interchange in Buncombe County just west of Asheville. In addition to widening the roadway, the bridges that carry the Blue Ridge Parkway over I-26 and the existing bridge that crosses the French Broad River (FBR) will be replaced and the pair of existing rest areas in Henderson County, south of Fanning Bridge Road (SR 3539) will be reconstructed. Project construction is anticipated to begin approximately 2 months after the contract is let (finalized), and will continue for approximately 60 months (5 years). This Biological Opinion considers the effects of the Action on the Appalachian elktoe and the gray bat.

2. DESCRIPTION OF THE PROPOSED ACTION

2.1 Action Area

For purposes of consultation under Section 7 of the Act, the Action Area is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (50 CFR §402.02). The I-4400/I-4700 Action Area (Figure 1) includes the I-4400/I-4700 study area (as defined in the DEIS; NCDOT 2016), which extends 22.2 mi. and consists generally of a 1,400 ft.-wide corridor that follows I-26 from US 25 in Henderson County north to I-40/I-240 in Buncombe County, with expanded areas at interchanges, rest areas, and the Blue Ridge Parkway bridge. In addition, the Action Area incorporates some tributaries and portions of the FBR including:

- Sections of the FBR within 0.5 mi. (downstream) of tributary impacts,
- FBR tributaries impacted within 0.5 mi. of occupied Appalachian elktoe habitat, and
- The FBR from the I-26 crossing downstream (north) to I-40, specifically to the I-26 Connector (I-2513) study area (Appendix I).

2.2 Proposed Action

The following describes the major activities involved in the proposed project that will have an impact on gray bats and Appalachian elktoe. Replacement of the existing bridges over the FBR, widening existing I-26 and ongoing operations of I-26 after the construction is completed are described in detail. In addition, NCDOT through project design and up-front implementation

planning, has committed to a number of conservation measures to avoid and minimize impacts to gray bats and Appalachian elktoe and these specific measures also are detailed.

2.2.1 Bridge Replacement over the French Broad River

The existing pair of two-lane bridges that carry I-26 over the FBR will be replaced with one new structure that will provide a total of eight travel lanes. Demolition of the existing bridges and construction of the new bridge is anticipated to take approximately three to four years.

The proposed new bridge structure will have three spans with lengths of approximately 151 ft., 170 ft., and 143 ft. from east to west, and will require two bents (foundation supports) in the river. Each bent will require ten drilled shafts. Assuming ten, 5-foot diameter shafts for each bent, the drilled shaft area is approximately 200 square feet (sq. ft.), per bent, for a total of 400 sq. ft. for both bents. Currently, drainage from the deck of the existing structure flows directly into the river. The new structures include shoulders sufficient to convey runoff into adjacent stormwater control devices and eliminate direct discharge into the river.

Bridge construction and demolition will require temporary access roads adjacent to existing I-26 to reach the river and temporary stone construction causeways in the FBR to construct the bridge. The access roads will be built parallel to I-26 in all four quadrants of the existing bridge. Vegetation clearing at the FBR will be minimized as much as practicable to build the access roads. Access roads will require approximately 3.75 ac. beyond the current slope stake limits for the project. However, these areas would need to be cleared as part of the typical construction process for this project.

Some work would likely need to be completed at night. The amount and type of lighting for all activities will be minimized to the maximum extent possible. Because the FBR is regularly used for recreation, it cannot be closed to navigation for the duration of construction. As part of providing a safe passage lane for river users, NCDOT will install steady-state, solar-powered red lighting on the construction causeways.

2.2.2 Highway Widening

Existing I-26 will be widened from four lanes to eight lanes for about 8.6 miles and to six lanes for about 13.6 miles. The highway will be widened primarily within the existing right-of-way and to the middle of the current roadway. Construction activities associated with the proposed widening project include clearing and grubbing vegetation, grading, paving, culvert extensions and replacements, bridge replacements, striping, signs, and lighting.

The project includes limited clearing of woody vegetation to accommodate additional travel lanes and interchange expansions. Clearing will likely begin almost immediately after the project is let for construction, and may continue for a period of up to two years. Clearing may occur at different locations along the length of the project, depending on construction timing/phasing. Clearing activities will take place during daylight hours, but may occur during any time of year, with the exception of the area on Blue Ridge Parkway property where tree clearing will occur between August 15 and May 15.

The 3.3-mi. long section of the project that extends from just north of the Blue Ridge Parkway to NC 191 (Brevard Road) is heavily wooded. For this reason, because of its proximity to the FBR, and because it is the largest contiguously forested area within the Action Area, clearing in this section will be minimized. Clearing will not extend beyond areas that will become part of the permanent project footprint. NCDOT developed a preliminary design that utilizes retaining walls whenever practicable for this section of the project. Based on the slope stake limits associated with preliminary design and the tree line presented in the final survey, approximately 3.8 ac. of trees will be cleared along this section of the project.

2.2.3 Highway Operation

Once the highway is widened and in operation, the additional capacity will increase the number of vehicles that travel the roadway in the Action Area. Increases in traffic will increase noise and nighttime lighting from headlights. The majority of the corridor will remain unlit except at existing interchanges. Two locations will require additional permanent lighting: the I-26 and US 25 (Asheville Highway) interchange and the reconstructed rest areas. The additional pavement will increase the amount of impervious surface and post-construction stormwater.

2.3 Conservation Measures

Conservation measures represent actions, pledged in the project description, that the action agency will implement 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. The beneficial effects of conservation measures are taken into consideration in the USFWS's determination of a jeopardy versus a non-jeopardy opinion and in the analysis of incidental take.

The NCDOT proposes to offset project related impacts by implementing a number of conservation measures. Included in the overall proposal are measures that will help aid recovery by conserving or restoring habitat and measures intended to minimize direct impacts through project design, construction practices, and monitoring and remediation. Some of these measures directly benefit gray bats or Appalachian elktoe, but many are beneficial to both species. Where appropriate, the measures are further categorized by the species that may derive the most benefit.

2.3.1 Highway Widening

Indiana, Northern long-eared and gray bats

2.3.1.1 Time of Year Restriction for Tree Clearing on the Blue Ridge Parkway:

- No tree clearing will occur on NPS land between May 15 and August 15.
- Emergence and/or acoustic surveys are required prior to any tree clearing that must occur between April 1 and May 1 or August 15 and November 15.
- No significant tree removal within 5 mi. of known hibernacula can occur between April 1 and November 15.

- In the event that any roost trees are documented within 0.25 mi. of the project area, regardless of the time of year, the NPS will seek consultation with the USFWS before work proceeds.

Gray bats

2.3.1.2 Minimization of Tree Clearing:

- In the area between the Blue Ridge Parkway and NC 191 (Brevard Road), trees will only be cleared to establish the permanent project footprint, temporary piping of streams SEE and SFG (as identified in Table 15 of the BA), establish associated SEC devices, and to create temporary construction access roads at the Blue Ridge Parkway.

2.3.1.3 Roadway Construction Lighting:

- Due to gray bat activity on the landscape between April 15 and October 15, NCDOT will limit all construction-related lighting to whatever is necessary to maintain safety in active work areas closest to the FBR during this time. Therefore, construction-related lighting will not project into adjacent wooded areas or over the water surface of the river. This restriction will apply to locations between Brevard Road (NC 191) and Glenn Bridge Road (SR 3495) with the exceptions of the construction area associated with the access roads at the Blue Ridge Parkway and the existing brightly lit area associated with the Long Shoals Road (NC 146) interchange.

- During construction, lighting will only be used in areas where active construction is occurring. Otherwise, no additional lighting is needed. For paving operations, specifically, which will more than likely be at night, the area typically lit is directly adjacent to the paving machine.

Gray Bats and Appalachian Elktoe

2.3.1.4 Erosion Control Measures:

When projects occur in watersheds that contain protected aquatic species, NCDOT implements erosion control measures that exceed the standard BMPs. For this project a combination of Design Standards in Sensitive Watersheds (DSSW, 15A NCAC 04B .0124), Environmentally Sensitive Areas and the NC Division of Water Quality (NCDWQ) Construction General Permit (NCG01) terms and conditions that allow for stormwater discharge under the National Pollutant Discharge Elimination System (NPDES) apply and NCDOT will default to the most-restrictive SEC measure requirement. A table comparing these methods can be found in Appendix II.

The sedimentation and erosion control plan (SECP) will be in place prior to any ground disturbance for all bridge replacements and construction. When needed, combinations of erosion control measures (such as silt bags in conjunction with a stilling basin) will be used to ensure that the most protective measures are being implemented.

- The sedimentation and erosion control plans shall adhere to the DSSW, where practicable, within the existing and proposed right of way for the following areas:
    - From the Blue Ridge Parkway bridge to the northern project terminus.
    - For portions of the project within 1 mi. and draining directly to streams that are identified as NCDEQ and/or NCWRC designated trout streams.
    - For portions of the project within 1 mi. and draining directly to streams where aquatic threatened or endangered species are present.

- Environmentally Sensitive Areas will be demarcated within the Action Area and will be defined by a 50-foot buffer zone on both sides of jurisdictional streams measured from top of streambank, in which the following shall apply:
    - The Contractor may perform clearing operations, but not grubbing operations until immediately prior to beginning grading operations.
    - Once grading operations begin, work shall progress in a continuous manner until complete.
    - Erosion control devices shall be installed immediately following the clearing operation.
    - Seeding and mulching shall be performed on the areas disturbed by construction immediately following final grade establishment.
    - Seeding and mulching shall be done in stages on cut and fill slopes that are greater than 20 ft. in height measured along the slope, or greater than 2 ac. in area, whichever is less.
    - All SEC measures, throughout the project limits, must be cleaned out when half full of sediment, when applicable, to ensure proper function of the measures.

2.3.1.4.1 Streams Designated as Environmentally Sensitive Areas

Stream Name	NRTR Map ID	Distance to French Broad River (mi.)	Stream Effects (ft.) (2:1 SS+25 ft.)*	Stream Effects (ft.) (2:1 SS)**
UT to Dellwood Lake^	SFG	0.00	2010.0	662.3
Powell Creek (Lake Julian)***	SDN	0.03	111.1	53.0
UT to French Broad***	SDU	0.05	86.9	34.4
UT to French Broad***	SDK	0.05	75.1	48.9
UT to French Broad ***	SDF	0.06	91.0	61.9
UT to French Broad***	SFX	0.06	72.6	47.3
UT to French Broad***	SEQ	0.07	74.5	24.2
UT to French Broad***	SDG	0.07	68.9	43.0
UT to French Broad***	SDX	0.08	1043.2	399.6
UT to French Broad***	SDW	0.09	60.0	25.3
UT to French Broad***	SFO	0.10	56.7	55.0
UT to French Broad***	SDE	0.10	99.1	47.6
UT to French Broad^	SEE	0.15	383.0	106.3
UT to French Broad***	SEF	0.15	505.3	368.1
UT to Dellwood Lake***	SFI	0.19	7.3	0.0

UT to French Broad***	SDY	0.41	22.5	2.3
UT to French Broad***	SED	0.43	66.7	9.4
UT to French Broad***	SEV	0.47	43.7	16.8
UT to French Broad***	SDC	0.50	102.5	44.2
UT to French Broad***	SEW	0.55	37.9	12.8
UT to French Broad***	SEU	0.55	18.3	10.6
UT to Dellwood Lake***	SFR	0.67	46.0	27.8
UT to Dellwood Lake***	SFQ	1.09	96.8	43.7
UT to Long Valley Branch***	SFM	1.86	382.0	29.0
UT to Long Valley Branch***	SFP	1.90	50.0	22.7
Long Valley Branch***	SFN	2.19	43.8	24.9

*Effects calculated based on current design proposed 2:1 slope stake (SS) limits plus 25 ft. (SS+25).
**Effects calculated based on current design proposed 2:1 slope stake (SS) limits. Effects for Streams SFG, SFO, and SEE calculated based on access road footprint.
***Streams subject to DSSW and designated as Environmentally Sensitive Areas.
^Stream to be temporarily piped for construction of access road (access road is too close to allow for 50-ft buffer).

- Contract language regarding erosion control will include the following, or similar language as appropriate:

    - "The Contractor will be required to prosecute the work in a continuous and uninterrupted manner from the time work begins until completion of each phase of structure construction, demolition, and completion. The Contractor will not be permitted to suspend operations except for reasons beyond their control or except where the Engineer has authorized a suspension of the Contractor's operations in writing."
    - "In the event that the Contractor's operations are suspended in violation of the above provisions or it is determined the Contractor is not deemed to be pursuing the work in a continuous manner in accordance with his submitted and approved schedule, the sum of $1000.00 per day will be charged to the Contractor for each and every calendar day that such suspension takes place. The said amount is hereby agreed upon as liquidated damages due to extra engineering and maintenance costs and due to increased public hazard resulting from a suspension of the work. Liquidated damages chargeable due to suspension of the work will be additional to any liquidated damages that may become chargeable due to failure to complete the work on time."

2.3.1.4.2 Monitoring of Effectiveness of SEC Devices:

- Two Construction Project Inspectors, one for I-4400 and one for I-4700, will monitor SEC devices for the life of the project.

- Inspections of erosion control devices will be done daily for construction associated with the FBR bridge replacement. For the remainder of the project, the standard inspection schedule (weekly, or after a rainfall event of one-half inch or greater) will apply.
- NCDOT will install a rainfall data logger at the river to continuously monitor and record rainfall events.
- NCDOT will self-report to USFWS any SEC device failures that result from excessive rainfall events (exceeding a 25-year storm event). The NCDOT inspector will report any failures to the Division Environmental Officer, who will contact the agency within 24 hours. If there are any failures in SEC measures, NCDOT will meet with resource agencies and work to adaptively manage SEC devices for further storm events while construction continues.

2.3.1.4.3 Agency Coordination:

- NCDOT will invite representatives from USFWS, USACE, and the NCWRC to the pre-construction meeting for the proposed project, as well as to all subsequent field inspections prior to construction, to insure compliance with all special project commitments.
- NCDOT shall provide USFWS with the SECP and allow 15 days for review.
- NCDOT shall provide USFWS with the FBR bridge demolition plan and allow 15 days for review.
- All resource agencies will be invited to review the demolition plan and will be notified prior to start of demolition so they may have a representative on site.
- NCDOT will invite USFWS and USACE to review the design of the SEC measures for streams SEE and SFG, as well as the revegetation and monitoring plan.
- NCDOT will contact USFWS if new information about gray bats is discovered, as it relates to the project.
- NCDOT will report any injured or dead bats found on the construction sites to USFWS.

2.3.2 Bridge Construction

Gray Bats

2.3.2.1 Night Time Construction Activities at FBR:

At the FBR bridge, the use of lights after sunset may be necessary to improve safety for work crews during construction. These are not operations that occur on a regular schedule.

- To minimize potential impacts to lactating females and their pups, between June 1 and June 14, NCDOT shall commit to restrict the construction contractor to no night work. During June 15 through August 1, NCDOT will also commit to restrict the construction contractor to no more than 28 total nights of work, with no more than four consecutive nights. Lighting used for construction will be limited to what is necessary to maintain safety standards, and will only be directed toward active work areas.

2.3.2.2 Red Safety Lighting:

- NCDOT shall place solar-powered, steady-state, red, safety lights on the causeways for river user safety. Generators will not be used to provide power, so as to avoid additional noise that may disturb bats flying through the work zone.

Gray Bats and Appalachian Elktoe

2.3.2.3 FBR Bridge Replacement:

- NCDOT may install temporary retaining walls on the outer edges of the access roads to reduce impacts to adjacent forested land and jurisdictional features.
- The footprint for the access roads will not extend beyond the permanent project footprint.
- Activities in the floodplain will be limited to those needed to construct the proposed bridge and remove the existing bridges.
- Streams SEE and SFG will be temporarily piped during bridge construction and demolition. A revegetation and stream monitoring plan shall be developed for Streams SEE and SFG. The revegetation and stream monitoring plan shall be approved by the USACE and USFWS and will commence once the bridge construction and demolition are complete and the pipe is removed. Monitoring, to observe vegetation success and stream stability and detect and control invasive exotic plants, will take place for a minimum of three years after construction.
- Causeways will be used instead of multiple work bridges which would require drilled piles and take longer to install. The use of causeways also means that work bridge support piers will not be present, thereby eliminating obstacles in the flight path of bats foraging and commuting through the work zone.
- Causeways will have 1:1 slopes to minimize their size.
- NCDOT will require the contractor to use clean rock (free of debris and pollutants) for the construction of the causeways to minimize unnecessary sediment input into the river.
- Causeway material will be removed to the extent practicable and either disposed of off-site or used in areas that require permanent stone protection after project completion. NCDOT will also require that concrete barriers (barrier rail) be placed along the downstream edge of each causeway to limit the downstream movement of causeway material during high flow events.
- Causeway material will be added/removed as needed for each stage to minimize the causeway footprint over the length of the project.
- The Stage 4 causeway extension will be sloped to allow water to flow over the top, reducing overall impact to channel flow (See NCDOT I-26 Bridge over the French Broad River Proposed Construction and Demolition document for details).
- To minimize disturbance to the riverbed, all readily detectable causeway material will be removed to the extent practicable, while removing as little of the original riverbed as possible.
- Construction fabric will not be used under the causeway material, as it has a tendency to tear into tiny pieces and float downstream during removal.
- Any equipment that is placed on the causeways will be removed any time throughout a work day when the water level rises, or is expected to rise overnight, to a point where the equipment could be flooded, or during periods of inactivity (two or more consecutive

days). The only exception to this measure is that the drill rig and crane may be left in place for periods of inactivity; however, they must also be removed if the water rises, or is expected to rise, to a point where the drill rig and crane could be flooded.

- NCDOT will require the contractor to use new or steam-cleaned equipment to access causeways that are under water if these causeways are utilized for removal of existing bents in underwater conditions.
- NCDOT will require the contractor to have clean, non-leaking equipment, diapers on-site for each causeway, and spill kits located at each causeway.
- With the exceptions noted below for the drill rig and crane, all construction equipment shall be refueled outside the 100-year floodplain or at least 200 ft. from all water bodies (whichever distance is greater) and be protected with secondary containment. During crucial periods of construction and demolition, when the drill rig and crane cannot be moved, the drill rig and crane can be refueled while inside the 100-year floodplain provided that spill response materials (such as spill blankets and fueling diapers) are used during the refueling. Hazardous materials, fuel, lubricating oils, or other chemicals will be stored outside the 100-year floodplain or at least 200 ft. from all water bodies (whichever distance is greater), and not in a Water of the U.S. Areas used for borrow or construction by-products will not be located within wetlands or the 100-year floodplain.
- When constructing drilled piers for the FBR bridge, a containment system will be developed so that material does not enter the river. Material by-product will be pumped out of the shaft to an upland disposal area to the extent practicable and treated through a proper stilling basin or silt bag.
- The erosion-control plan will be in place prior to any ground disturbance for the FBR bridge replacement. When needed, combinations of erosion-control measures (such as silt bags in conjunction with a stilling basin) will be used to ensure that the most protective measures are being implemented.
- Construction of the new bridge will be accomplished in a manner that prevents uncured concrete from coming into contact with water entering or flowing in the river.
- The causeway design has been refined to allow for a maximum free flow area of the FBR. The original design provided for only a 28 percent free flow area of the river at the causeway's largest size. The design was refined and now allows a 51 percent minimum free flow area when the causeway is at its greatest extent.
- Removal of the existing bridge shall be performed so as not to allow debris to fall into the water. If debris is dropped in the river, it will be immediately removed.
- The current barrier on the bridge is a one bar metal rail on concrete parapet with retrofitted guardrail. It will be replaced with concrete barrier rail, a 42-in. solid, concrete "Jersey barrier" style guard wall.

2.3.3 Roadway Operation

Gray Bat

2.3.3.1 Minimal Additional Roadway Lighting:

- NCDOT will add minimal additional permanent lighting. Lighting at interchanges may be relocated, to allow for reconfiguration or expansion of the interchanges, but new

lighting will only be required at the US 25 (Asheville Highway) interchange and the rest areas.

Gray Bat and Appalachian Elktoe

2.3.3.2 Stormwater Control Measures:

- NCDOT has developed stormwater commitment guidance, which will apply at crossings of the FBR and any portion of the NCDOT stormwater conveyance system draining to an outfall discharging to the river within the NCDOT right of way.
- NCDOT will prepare a stormwater management plan (SMP) that implements structural and non-structural post-construction stormwater best management practices (BMPs) to the maximum extent practical, which is consistent with the Department's National Pollutant Discharge Elimination System (NPDES) Post-Construction Stormwater Program.
- When preparing the SMP, NCDOT commits to using a hierarchical BMP selection process, which is optimized to treat silt, nutrients, and heavy metals.
- NCDOT will commit to evaluating the use of emerging BMP technologies that the Department has not yet published in its BMP Toolbox. These emerging BMP technologies are as follows:
    - Bioswales
    - Bioembankments
    - Biofiltration conveyances
    - Soil improvement to maximize infiltration

2.3.3.3 Reforestation and Monitoring Plan:

- Eastern Federal Lands Highway Division (EFLHD) of FHWA will develop a re-vegetation/landscaping plan to re-establish native vegetation and provide for a continuous visual experience for Blue Ridge Parkway and Mountains to Sea Trail users.
- For the portion of the project from the Blue Ridge Parkway overpass to the northern terminus of the project, NCDOT will develop a revegetation plan that incorporates native woody and/or shrubby vegetation, as appropriate, for areas outside of the final slope stake limits disturbed during construction. The monitoring shall be conducted annually for a minimum of three years after final planting. Photo documentation shall be utilized to document the success of the vegetation and a report shall be submitted to the USFWS within sixty (60 days) post monitoring.
- NCDOT will develop a revegetation and monitoring plan for Streams SEE and SFG to commence once the bridge construction and demolition are complete and the temporary pipes are removed, which will likely be similar to the revegetation plan presented above for the area between the Blue Ridge Parkway overpass and the northern project terminus.

2.3.4 Habitat Conservation Measures

2.3.4.1 Conservation Measures to Benefit Gray Bats

NCDOT-Sponsored gray bat Research Project:

- NCDOT, with the cooperation of the USFWS and NCWRC, committed to a three year study on gray bats within the FBR Basin. This study will serve as a conservation measure for NCDOT projects within the Divisions 13 and 14 for a limited time. NCDOT will provide $900,000 in funding to Indiana State University to conduct the research project, which will aid in the recovery and conservation of the gray bat. The end goal is to gather the information needed to allow NCDOT and USFWS to enter into a programmatic consultation to cover the gray bat for NCDOT Divisions 13 and 14, as well as help to develop species-specific avoidance and minimization measures.

2.3.4.2 Conservation Measures to Benefit Appalachian Elktoe

FBR Conservation Funding:

- NCDOT will provide $500,000 in funding to the North Carolina Nongame Aquatic Projects Fund for the FBR Conservation Plan (FBRCP) proposed by USFWS, which will aid in the recovery and conservation of Appalachian elktoe. The funding will be held by the NCWRC. A multi-agency/organization group of mussel species experts, including USFWS and NCDOT, will determine how to expend the funds, which may include the following: species reintroduction, early warning and emergency production capacity, genetic management program, and other appropriate activities as described in the FBRCP.

2.3.5. Monitoring

2.3.5.1 Erosion and Sediment Control Performance Monitoring

- NCDOT will implement a video surveillance system that will target critical areas identified along the project corridor for the purposes of monitoring the performance of erosion and sediment control practices. The surveillance equipment will be comprised of video equipment capable of monitoring target areas. The intent of the active surveillance will be to provide assurance that the necessary erosion and sediment control practices are being implemented and maintained as practical to protect the identified resource.

- NCDOT will document the performance through images extracted from the video surveillance system. Due to the complexity of utilizing sensitive video equipment in a construction area, the Department may experience technical difficulties which will have to be resolved or a supplemental monitoring system will need to be deployed.

- NCDOT will provide the monitoring images to USFWS at their request, and/or when there has been an event that resulted in a failed erosion and sediment control measure, and will also identify the actions taken to correct the situation.

- NCDOT will identify target areas that have significant risk to the resource due to failed erosion and sediment control devices while land disturbance would be occurring. Once the area is stabilized then the surveillance equipment can move to the next target area. Special attention will be given to those streams identified by the USFWS.

2.3.5.2 Monitoring for Gray Bat Return and Activity:

- NCDOT will conduct acoustic monitoring for gray bats immediately prior to and during construction at the FBR bridge. Acoustic data may provide valuable information on bat activity in general, and gray bat activity, in particular, as it relates to project construction.
- To determine whether gray bats avoid the active construction zone, NCDOT will investigate the use of night-vision video recordings, or other methods, in an attempt to monitor bat activity at the bridge while active night time construction is underway.

2.3.5.3 FBR Geomorphology Monitoring:

- To ensure bridge construction at the FBR crossing will not result in substantial changes to channel stability (scour, erosion, etc.), NCDOT will conduct river channel monitoring at the I-26 bridge construction site to document the morphological condition at the FBR bridge site and to evaluate the impacts of construction and temporary causeways on river habitat. Monitoring activities will consist of the following:

    - Surveying the FBR channel bathymetry and riverbanks before and during the construction of the I-26 crossing (approximately 3.5 years). Mapping will occur before construction and then every quarter during construction, with one final survey after the causeways are all removed, and will cover at least 100 ft. upstream and 250 ft. downstream of the causeway locations.
    - A complete digital terrain model (DTM) of the stream bed and banks from each survey conducted will be prepared. NCDOT will retain an experienced firm or staff members to analyze the DTM and compile a final report to be submitted to USFWS.
    - If monitoring at the FBR reveals excessive bank erosion, bank instability, or sedimentation associated with the bridge replacement, NCDOT will work to identify the cause and will make improvements to address the problems in a timely manner.

3. STATUS OF THE SPECIES

3.1 GRAY BAT

This section summarizes best available data about the biology and current condition of the gray bat (*Myotis grisescens* - gray bat) throughout its range that are relevant to formulating an opinion about the Action. The USFWS published its decision to list the gray bat as endangered on April 28, 1976. There is no designated critical habitat for this species.

3.1.1 Species Description and Life History

The gray bat is one of the largest species in the genus *Myotis* in eastern North America, with a forearm length of 40 to 46 millimeters, a weight of 7 to 16 grams (usually 8 to 11 grams), and a wingspan of 27.4 to 30 centimeters (Barbour and Davis 1969). Gray bats can most readily be distinguished from other *Myotis* by their wooly, unicolored dorsal fur, which may seem paler on

the bats' belly. The fur appears gray after the mid-summer molt, becoming chestnut brown or bright russet leading to the next molt (Gore 1992). Another important characteristic is the wing membrane, which is also gray, connects to the foot at the ankle rather than the base of the toes (Barbour and Davis 1969, Gore 1992). The nails on the feet are notched and the calcar is unkeeled (Harvey *et al.* 1981, Sealander 1979).

The primary range of the gray bat is concentrated in the cave regions of Alabama, Arkansas, Kentucky, Missouri and Tennessee, with smaller populations found in adjacent states, including a growing population in a quarry in Clark County, Indiana (Harvey *et al*. 1981, Brack *et al*. 1984, Harvey 1992, Harvey 1994, Mitchell 1998). Gray bats are one of the few species of bats in North America inhabiting caves year-round. The species occupies cold caves or mines in winter and warmer caves during summer (Tuttle 1976a, Harvey *et al*. 1981, Harvey 1994, Martin 2007). In winter, gray bats hibernate in deep vertical caves that trap large volumes of cold air and the species typically forms large clusters with some aggregations numbering in the hundreds of thousands of individuals (Harvey 1994, Tuttle and Kennedy 2005). The species chooses hibernation sites where there are often multiple entrances, good air flow (Martin 2007) and where temperatures are approximately 5°-9° C, though 1°-4° C appears to be preferred (Tuttle and Kennedy 2005). Tuttle (1979) noted that an estimated 95% of the range-wide population was confined to only nine caves.

There are a few exceptions to this cave-specific roosting strategy. Many bat species use bridges as roost sites (Keeley and Tuttle 1999) and the gray bat is no exception. Bridges provide a warm thermal refuge for individuals foraging far from their primary daytime roosts and have been documented as night roosts for gray bats in northwest Georgia (Johnson *et al*. 2002). Gray bat maternity colonies have been found in storm drains (i.e., culverts) in Arkansas (Harvey and McDaniel 1988, Timmerman and McDaniel 1992), Kentucky (Hays and Bingham 1964), and Kansas (Decher and Choate 1988). Culvert conditions can mimic those found in natural caves in terms of high levels of humidity and clear running water. Maternity colonies have also turned up in more unusual places, such as a barn in Missouri (Gunier and Elder 1971) and the gate room of a large dam in Tennessee (Lamb 2000).

Gray bats show strong philopatry to both summering and wintering sites (Tuttle 1976a, Tuttle 1979, Tuttle and Kennedy 2005, Martin 2007). Because of their highly specific roost and habitat requirements, only about 5% of available caves are suitable for occupancy by gray bats (Tuttle 1979, Harvey 1994). At all seasons, males and yearling females seem less restricted to specific cave and roost types (Tuttle 1976b). Bachelor males segregate in separate aggregations within a colony home range that usually includes several caves that may extend up to 70 kilometers along a particular river valley (Tuttle and Kennedy 2005).

Gray bat hibernacula are often comprised of individuals from large areas of summer range. Based on band recovery data, Hall and Wilson (1966) calculated that a gray bat hibernaculum in Edmonson, County Kentucky attracted individuals from an area encompassing 27,195 square kilometers in Kentucky, southern Illinois, and northern Tennessee (Hall and Wilson 1966). Gray bats are documented to regularly migrate from 17 to 437 kilometers between summer maternity sites and winter hibernacula (Tuttle 1976b, Hall and Wilson 1966), with some individuals moving as much as 689 to 775 kilometers (Tuttle 1976b, Tuttle and Kennedy 2005).

Gray bats are reproductively mature at two years of age (Miller 1939, Tuttle 1976a) and mate between September and October. Copulation occurs upon arrival at hibernating caves, whereupon females immediately enter hibernation. Mating males may take a few weeks to replenish fat stores, but are typically in hibernation by early November (Tuttle 1976b, Tuttle and Stevenson 1978). Adult females store sperm throughout hibernation, a strategy known as delayed fertilization, and pregnancy begins following their spring emergence (Krulin and Sealander 1972). After a gestation period of 60 to 70 days (Saugey 1978), females give birth to one pup between late May and early June. Newborn young weigh approximately one-third of their mother's weight and are volant within 21-33 days (Tuttle 1976b, Harvey 1994, Tuttle and Kennedy 2005).

In summer, female gray bats form maternity colonies of a few hundred to many thousands of individuals. Nursery colonies typically form on domed ceilings of caves that are capable of trapping the combined body heat from clustered individuals and where the temperature ranges between 14° and 25° C (Harvey 1992, Harvey 1994, Tuttle and Kennedy 2005, Martin 2007). All other individuals not actively mating, both male and female, occupy caves on the outlying edge of the home range (Tuttle 1976b).

Gray bats feed exclusively on insects, with flies (Diptera), beetles (Coleoptera), caddisflies (Trichoptera), moths (Lepidoptera), wasps (Hymenoptera), stoneflies (Plecoptera), leafhoppers (Homoptera), and mayflies (Ephemeroptera) being the most important orders of insect prey (Rabinowitz and Turtle 1982, Clawson 1984, Brack 1985, Lacki *et al*. 1995, Best *et al*. 1997). Diet has been found to coincide most directly with the predominantly available prey species in the foraging area (Clawson 1984, Barclay and Bingham 1994), including both terrestrial and aquatic species (Clawson 1984). A study examining fecal remains conducted by Brack and LaVal (2006) indicates that gray bat diets fluctuate to a minor degree depending upon varying factors such as age, sex, and location.

Gray bat summer foraging is strongly correlated with open water of rivers, streams, lakes or reservoirs, where insects are abundant (Tuttle 1976b, LeVal *et al*. 1977). Results of surveys conducted in Tennessee indicate that wetland depressions are also important foraging sites for gray bats (Lamb 2000). Although the species may travel up to 35 kilometers between prime feeding areas over lakes and rivers and occupied caves, (LaVal *et al*. 1977, Tuttle and Kennedy 2005, Moore *et al*. 2017), most maternity colonies are usually located between 1-4 kilometers from foraging locations (Tuttle 1976b). Newly volant gray bats travel 0.0 – 6.6 kilometers between roost caves and foraging areas (Tuttle 1976a, Tuttle 1976b). At foraging sites, Tuttle (1976b) estimated that gray bats forage within roughly three meters of the water's surface. Abbreviated instances of bad weather in early spring and late fall are generally the only times gray bats deviate from primarily feeding along local bodies of water, and then they are found foraging in forest canopies (LaVal *et al*. 1977, Stevenson and Tuttle 1981).

Gray bats are known to establish foraging territories as insect numbers drop after dusk. Territories are controlled by reproductive females, which annually return to preferred territories (Brady *et al*. 1982, Goebel 1996). Gray bats tend to have large home ranges. Thomas and Best (2000) reported non-reproductive gray bats (males and females) from one northern Alabama cave foraged over areas of approximately 97 square kilometers. Moore *et al.* (2017) found reproductive female gray bats in Arkansas had a larger home range than previously thought, with

an average of 159 square kilometers, and they depend on water for foraging and traveling. The home range for reproductive females may change depending on reproductive status, but could also change based on colony size, insect abundance, habitat continuity, land use, or a combination of these factors (Moore *et al.* 2017). During times of limited food resources, males and pre-reproductive females may be excluded from foraging territories (Stevenson and Tuttle 1981).

Forested areas along the banks of streams and lakes serve as corridors for travel and as protective feeding cover for newly volant young (Tuttle 1979, Brady *et al*. 1982, Moore *et al.* 2017). Whenever possible, gray bats of all ages fly in the protection of forest canopy between roosts and feeding areas (USFWS 1982). In addition, young often feed and take shelter in forest areas near the entrance to cave roosts (Tuttle 1979). Individuals may also fly overland from relatively land-locked roost sites to reach the main river channel or tributary systems that lead to open-water foraging sites (Thomas 1994, Best and Hudson 1996). Gray bats do not feed in areas along rivers or reservoirs where the forest has been cleared (LaVal *et al.* 1977).

Young, non-volant gray bats experience healthy growth rates because their energy expenditure for thermoregulation is reduced by the roosting colony (Herreid 1963, 1967). In undisturbed colonies, young may take flight within 20 to 25 days after birth. However, young may not become volant for 30 to 35 days if disturbed (Tuttle 1975). Hunting is primarily learned by young on their own after learning to fly (Stevenson and Tuttle 1981), though lactating females will continue to nurse their offspring for a short time after they become volant. Survival and growth of volant young is inversely proportional to the distance travelled for shelter and food (Tuttle 1976a). Roosts are cool during this period of lactation and females are often required to feed continuously to sustain the high body temperatures required to nurse (Tuttle and Stevenson 1977). Distance traveled to feeding areas may also be correlated with adult mortality (Martin 2007).

Gray bats have been recorded as living up to 17 years (Harvey 1992, Tuttle and Kennedy 2005), with a mean annual survival rate of 70 percent in males and 73 percent in females (Gunier and Elder 1971). While survivorship among juveniles is relatively high (Saugey 1978), only 50 percent of gray bats reach maturity (USFWS 1980). Therefore, approximately five years are required for a female gray bat to produce two surviving offspring. Mortality rates are higher during the spring migration when fat stores have been expended and food resources can be scarce (Tuttle and Stevenson 1977).

3.1.2. Status and Distribution

The gray bat largely occupies a limited geographic range in karst areas of the southeastern United States. They are mainly found in Alabama, northern Arkansas, Kentucky, Missouri, and Tennessee. A few can be found in northwestern Florida, western Georgia, southeastern Kansas, southern Indiana, southern and southwestern Illinois, northeastern Oklahoma, northeastern Mississippi, western Virginia, and western North Carolina.

In the late 1970s, Tuttle (1979) estimated the total population to be approximately 2.25 million. The population was estimated at only 1.6 million in the early 1980s (Brady *et al*. 1982) and fell to 1.5 million within the next 10 years (Harvey 1992). By 2001, the population increased to 2.3

million (Mitchell and Martin 2002), and again to 2.5 million in 2003 (Harvey *et al.* 2004). This is a net increase in population size of approximately 10 percent between the 1970's and 2003, and an increase of 40 percent from the smallest population estimate. The status of hibernating populations of gray bats was further reviewed in 2006 (Harvey and Currie 2007). At that time, the population was estimated at 3,377,100 – an estimated increase of 104 percent from 1982 (Harvey and Currie 2007).

As defined in the Gray Bat Recovery Plan, Priority 1(P1) hibernacula include caves occupied now or in the past by more than 50,000 gray bats in northern Alabama and Tennessee, and 25,000 elsewhere (USFWS 1982). Most of the 17 current P1 caves were designated in the recovery plan, but several additional caves have been identified as having significant winter populations in more recent times. From 2013 -2015 many of the 17 P1 hibernacula were surveyed, however not all caves were surveyed in the same winter. In 2017, winter surveys of all P1s were conducted, including the largest hibernaculum, Fern Cave in Alabama. This coordinated, rangewide effort provided the best opportunity in decades to estimate the gray bat population, now estimated at approximately 4,358,263 (Shauna Marquardt pers. comm.).

3.1.3 Threats

The primary cause of gray bat population decline is human disturbance of their natural habitat (Barbour and Davis 1969, Mohr 1972, Harvey 1975, Tuttle 1979, USFWS 1982, USFWS 2009b), with wintering sites and maternity roosts being especially susceptible to disruption. Commercialization of caves that allows for public access, spelunking, and looting for archaeological artifacts are activities that most commonly result in disturbance to roosting bats (USFWS 1982, USFWS 2009b). Disturbance in the hibernacula occurs when a human enters the cave and bats wake from hibernation, using vital energy stores that cannot be recovered before emerging in the spring (Tuttle 1976b). Approximately 20 to 30 days of stored energy is depleted with each arousal (Daan 1973). Losing these fat stores can cause bats to leave the roost prematurely in search of food during unsuitable circumstances, which may result in high mortality rates. During the first hour of arousal, individuals may lose up to 0.48 g of body weight; a significant amount when contrasted with the typical hibernation losses of 0.01 g per day (Brady *et al*. 1982). When this human interference occurs in maternity caves it is typically most devastating in late spring and early summer (May to July), as non-volant offspring are in the roost. Thousands of bats may die from a single disruption (USFWS 1982). In addition, Stevenson and Tuttle (1981) found that banded gray bats tended to avoid roosts where they had been handled by researchers.

Humans are also impacting the environment in other ways that can negatively impact bats. Deforestation close to cave entrances, at foraging sites, and along commuting routes is likely to have negative effects due to the removal of prey abundance and reduced cover from natural predators (Tuttle 1979). Recently-volant young are especially susceptible to the effects of deforestation, as they require the protection of forest cover while becoming proficient fliers.

Insecticide use historically had a detrimental impact on gray bat populations (Clark *et al.* 1978, Clark *et al.* 1988), though many of the toxic substances are now banned from the market. The longevity, high metabolic rate, and insectivorous diet of bats increases their likelihood of exposure to bioaccumulating chemicals in the environment. While modern pesticides (e.g.,

organophosphates, neonicotinoids, pyrethroids, carbonates) aren't expected to bioaccumulate in tissues, they are still a concern, are highly toxic, and may kill bats from direct exposure (Shapiro and Hohmann 2005). The presence of other contaminants of concern that can bioaccumulate (e.g., pharmaceuticals, flame retardants) has been documented in bats (Secord *et al.* 2015), though additional research is needed to understand impacts. Additionally, pesticides and other pollutants could indirectly impact bats by reducing insect populations.

Siltation and nutrient loading of waterways where bats forage and drink may negatively affect the species. As previously stated, a large portion of the gray bat diet is comprised of adult aquatic insects such as mayflies, stoneflies, and caddisflies. These groups of aquatic insects are especially susceptible to degraded water quality. Any substantial declines in the populations of these insects may have a detrimental effect on gray bat populations as well (USFWS 1982). Tuttle (1979) presented a correlation between a decline in gray bat numbers and an increase in sedimentation in several Alabama and Tennessee waterways.

Tied to increased waterway siltation is impoundment of streams and rivers to create reservoirs. While it was originally suspected that this practice would increase suitable foraging habitat for gray bats, it was ultimately found that the opposite is true (USFWS 1982). Disturbance to roosting bats using caves adjacent to these impoundments has also been observed. Noise from passing watercraft increased, as did access to cave roosts previously far from population centers and roads (USFWS 1982).

Gray bat populations could also be impacted by temperature and precipitation changes due to climate change. Climate change will likely affect the distribution of suitable hibernacula for bats (Humphries *et al.* 2002). Since gray bats are a cave-obligate species, requiring highly specific hibernacula and maternity caves, they are acutely at risk from fluctuating climate conditions. As temperatures rise, conditions within gray bat hibernacula and maternity caves could change, making them less suitable. In addition, the increase in overall temperatures may lead to earlier arousal from hibernation, resulting in higher energy expenditure and potentially premature parturition (Sherwin *et al.* 2013). Changes in precipitation is also of concern. Under drought conditions, bats have to travel further distances for food and more rainfall could inhibit insect flight and decrease prey availability. These changes could have particularly adverse effects on nursing females, as the energy costs associated with traveling longer distances for food and water result in longer lactation times, slowing overall juvenile development (Tuttle 1976b, Adams 2010). Furthermore, increased frequency of severe storms could lead to flooding of important roost sites.

Another potential threat to gray bat populations is the fungal disease white-nose syndrome (WNS). The disease is caused by the fungus *Pseudogymnoascus destructans*, which grows on the wings, ears, and muzzle of hibernating bats (Cryan *et al.* 2013). Since its discovery in New York in 2006, WNS has had an overwhelmingly negative effect on North American hibernating bats, eradicating millions of individuals. Mortality rates in afflicted bats often exceed 90 percent (Thogmartin *et al.* 2013). Bats that have been infected with WNS display erratic changes in behavior including day-time flying and increased frequency of arousal during hibernation (Cryan *et al.* 2013).

In 2012, USFWS confirmed the first instance of WNS in gray bats (USFWS 2012b). The full impact of WNS on overall gray bat populations is still being determined. It seems plausible that WNS would pose a serious threat to a species like the gray bat, where individuals overwinter in few high-density hibernacula, should it infect those colonies. However, some studies have found that *P. destructans* may not spread through gray bat colonies as quickly as once expected, nor be as substantial a threat to the species as initially suspected (Flock 2014, USFWS 2014b). As of spring 2017, the species has yet to experience any WNS-related declines and their populations appear to have remained stable within Tennessee (Bernard *et al.* 2017) and Virginia (Powers *et al.* 2016). Several behavioral traits, such as preferred microclimates within hibernacula and sustained activity and foraging throughout winter (Bernard and McCracken 2017) may enable this species to prevent or minimize the colonization of *P. destructans* during torpor.

3.2 APPALACHIAN ELKTOE

This section summarizes best available data about the biology and current condition of Appalachian elktoe (*Alasmidonta raveneliana*) throughout its range that are relevant to formulating an opinion about the Action. The USFWS published its decision to list Appalachian elktoe as endangered on September 3, 1993. There is no designated critical habitat for this species in the Action Area.

3.2.1 Species Description and Life History

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. Parmalee and Bogan (1998) cite a maximum length of 8 cm. However, individuals from the Little River (French Broad River basin) in Transylvania County and West Fork Pigeon River (French Broad River Basin) in Haywood County measured more than 9.9 cm in length (USFWS 2009b). The periostracum (outer shell) of the Appalachian elktoe varies in color from dark brown to yellowish-brown in color. 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 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 (USFWS 2002). The Appalachian elktoe is a bradytictic (long-term) breeder, with the females retaining glochidia in their gills from late August to mid-June (USFWS 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 l 8°C. The Appalachian elktoe can use a variety of

common fish hosts but appears to specialize on darters and sculpins, which are common in the action area

3.2.2 Status and Distribution

The Appalachian elktoe is known only from the mountain streams of western North Carolina and eastern Tennessee. It is found in gravelly substrates often mixed with cobble and boulders, in cracks of bedrock, and in relatively silt-free, coarse sandy substrates (USFWS 1996).

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 (USFWS 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.

The Appalachian elktoe has experienced declines in two populations across its range. A sudden die-off in the Little Tennessee River, once considered the largest and most secure population, began in 2005 and continued through 2015, when periodic monitoring efforts failed to find any live individuals. In 2017 and 2018, several individual Appalachian elktoe were found in the Little Tennessee River, indicating a remnant population, but the population is limited and only a tiny fraction of its previous size. Appalachian elktoe also have declined in the lower portion of the South Toe River, a tributary of the Nolichucky River. Appalachian elktoe are still present in the South Toe River, but at reduced densities. The other populations of Appalachian elktoe appear to be stable (Tuckasegee, Cheoah, and Pigeon Rivers) or expanding (French Broad River). A remnant population known in the Cheoah River since the early 2000's is presently being augmented by the NCWRC with hatchery-propagated individuals sourced from the Tuckasegee River. This effort appears to be successful in bringing this population back to a viable state. Prior to 2004, the French Broad River population appeared to be confined to two tributary streams (Little River, Mills River), but over the last few years the known range of Appalachian elktoe in the main stem of the French Broad River has expanded and now appears to be well established, albeit at low density, over a broad area.

3.2.3 Threats

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.

Natural flooding events combined with alteration of watersheds can lead to large fluctuations in abundance observed in Appalachian elktoe populations. 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 (USFWS 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 (USFWS 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). 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**,** USFWS 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). When the Appalachian elktoe was listed, it was speculated that, due to its restricted distribution, it "may not be able to withstand vigorous competition" (USFWS 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.

4. 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.

4.1 GRAY BAT

4.1.1 Species Status and Distribution in the Action Area

Acoustic data and bridge checks indicate gray bats are present in the Action Area between mid-March and late-October. Gray bats were also present in lower numbers into early November. Although no roosts were found in the Action Area, maternity, bachelor, and transient roosts were identified near the Action Area on or directly adjacent to the FBR. Gray bat calls detected in the Action Area and bats equipped with transmitters and tracked in and through the Action Area are from these nearby roost sites. The acoustic data indicate gray bats are primarily foraging and commuting along the FBR. Fewer gray bat calls were identified at the six detectors located in non-riparian areas and along smaller streams. Emergence count data from known roosts in 2018 suggest at least 1,300 gray bats in the area. Of the 488 gray bats captured in 2018 as part of the Indiana State University research project, approximately 82% were adult males, 13% were adult females, 4% were juveniles and 1% unknown age. The sex ratio of the juveniles was roughly 27% female and 73% male.

In order to determine the presence and distribution of gray bats in the Action Area, 13 acoustic detectors were located along the length of the project (Appendix I). Since gray bats are known to use large rivers for foraging and commuting, the detectors were deployed primarily along the FBR or its larger tributaries in the I-26 corridor. On the southern end of the project, Detectors 1-4 were located on larger tributaries to the FBR and adjacent to existing I-26. Detectors 5-13 were located at sites adjacent to the project and the FBR.

4.1.1.1 Acoustic Surveys

Acoustic detectors 1- 4 were located on large tributaries to the FBR that are crossed by I-26. These detectors recorded low numbers of gray bat calls, indicating gray bats are present to the

southern terminus of the project. Detector site 5, the southernmost detector site adjacent to the river, produced a substantial number of gray bat calls.

Detector site 8 at the Blue Ridge Parkway overpass recorded 11 calls attributable to gray bats during three weeks of deployment. The acoustic detector located between the French Broad River and the Blue Ridge Parkway (Site 9), recorded very few bat calls, and no *Myotis* calls. Although these sites are located in one of the most heavily wooded portions of the Action Area, no sizable water features are present here which is the likely explanation for low gray bat activity.

Detector site 11, the I-26 crossing of the French Broad River, had a particularly high level of gray bat activity throughout the survey season, and consistently recorded more gray bat calls than any other detectors deployed during the same time frame. Furthermore, gray bats were active throughout the night, with pulses of activity just after dusk and just before dawn, especially after pups became volant.

Gray bats are very active at the I-26 crossing relative to other detector locations along the FBR. Bats were observed flying under the bridges, rather than over them, likely to avoid the light from passing cars, avoid the possibility of predation by crossing open areas over the highway, and/or because bats were foraging on emerging aquatic insects associated with the highly oxygenated water created by the rocky riverbed in this area. The two detectors that bracket Site 11 upstream and downstream did not exhibit the high numbers of gray bat calls observed at detector site 11. Given the concentration of calls at Site 11, gray bats aren't just passing through but appear to be choosing to spend time there and making multiple passes in front of the detector.

The NPS conducted separate acoustic surveys for bats during 2016 and recorded what they believe to be Indiana bats on Blue Ridge Parkway property near I-26. In a letter to NCDOT dated November 2, 2017 USFWS states their position that acoustic surveys conducted by NPS in 2016 were not conclusive for Indiana bats. During the process of vetting matching *Myotis* calls for the acoustic survey report associated with this project, none of the high-quality calls examined had call characteristics consistent with Indiana bats.

4.1.1.2 Structure Surveys

Twenty-four (24) bridges and 18 culverts in the Action Area were inspected between April 26, 2017 and July 27, 2017 for the presence of bats or evidence of bat use (guano, staining, and/or urine). Minimal bat use was noted on the Long Shoals Road bridge over the FBR. It is likely that the structure is used infrequently for night roosting bats and while it is located in the Action Area, is not scheduled for any work as part of the subject project.

4.1.1.3 Telemetry Surveys

Limited telemetry data indicate gray bats are flying through and foraging in the Action Area. NCWRC staff attached transmitters to two gray bats from the nearby maternity roost during 2016 and 2017. In 2016, two bats were tracked for 12 days and the bats returned to the roost each night. Bat A foraged along Hominy Creek in the area near Pond Road. Bat B foraged along the French Broad River just north of the I-40 crossing.

In 2017, three individuals were captured at the maternity roost and tracked for 13 days. On most nights, the bats returned to the maternity roost, however, one bat traveled over 20 mi. to a roost in Madison County on three nights. On seven nights, bat roost locations could not be found. Unlike the bats tracked in 2016, bats tracked in 2017 did not consistently return to the same foraging areas. One bat travelled south to forage along the French Broad River just north of Long Shoals Road. The other bats flew north from the roost and foraged along Hominy Creek, Bent Creek, Long Valley Lake, and various locations on the French Broad River.

In 2018, transmitters were placed on 90 bats as part of the Indiana State University Research Project, in part to collect information on foraging and commuting areas. Six bats were tracked via car from two roosts near the project area and were found foraging in areas south and north of the primary roost. Three of these bats foraged south of the primary roost, mostly along the FBR, but also in the Sandy Bottom area. Three bats foraged north of the primary roost and the project area around Hominy Creek and along the river south of Amboy Rd. Bats appear to forage mainly over water, usually the French Broad River and associated tributaries. Towers were also set up throughout the French Broad watershed to collect additional data on transmittered bats. Three of these towers were located within or very close to the project area and tagged bats were detected at all three.

4.1.2 Factors Affecting the Species' Environment in the Action Area

Development directly adjacent to the FBR has fragmented gray bat habitat by removing vegetation and creating more artificially lighted areas that the bats must avoid as they commute from roost areas to forage areas. In contrast, improvements in water quality in the FBR have likely increased the prey base and improved the overall ability of bats to feed over the river.

4.2 APPALACHIAN ELKTOE

4.2.1 Species Status and Distribution in the Action Area

In 2017, mussel surveys were conducted at 20 sites in the mainstem FBR. The sites were selected by the consultants, Three Oaks Engineering, based on habitat characteristics and were surveyed by methods suited to water depth, including using view buckets, snorkel and scuba gear. Appalachian elktoe were located at four sites in the FBR in the Action Area. Given the size and variability of habitats in the FBR, Appalachian elktoe could occur in low numbers throughout the Action Area. Any adults or juveniles present will occur in the riverbed, while glochidia may be attached to host fish that reside in or move through the Action Area in the FBR.

4.2.2 Factors Affecting the Species' Environment in the Action Area

French Broad River water quality in the Action Area historically suffered from industrial and agricultural pollution. Beginning in the 1970's, efforts were begun to reduce pollution and sediment entering the River. While the FBR is much cleaner today than in the past century, there are still threats from ongoing development. Portions of the FBR and several of the larger

tributaries are on the 303d list of impaired waters. There have been no previous formal sec.7 consultations for Appalachian elktoe in the FBR in the Action Area.

5. 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. Direct effects are actions that may result in immediate effects to the species, including lighting construction areas, increased noise, the placement of temporary causeways in the FBR, land-clearing, and changes in water quality. Indirect effects are those caused by the proposed action that occur later in time but that are still reasonably certain to occur.

5.1 GRAY BAT

5.1.1 Factors to Be Considered

5.1.1.1 Proximity of the Action

Based on acoustic and telemetry surveys within the Action Area, the gray bat occurs throughout the Action Area from mid-March through October. Although measures to avoid and minimize impacts to gray bats are included in the project plans, implementation of the project will result in unavoidable impacts to habitat and individual bats.

5.1.1.2 Nature of the Effect

Commuting and foraging habitat along the FBR in the Action Area will be affected for the duration of the construction project. At the bridge replacement on the FBR, additional lighting and noise from construction equipment located on causeways at the river level will repel some bats from the river, causing them to find other areas to forage or forcing them to fly over the highway making them more susceptible to being hit by cars or predation. Riparian vegetation at the FBR that is removed during construction will allow more light and noise from traffic to reach the river, potentially repelling foraging bats. Pregnant or lactating females repelled from their forage areas may experience lower fitness and be more likely to lose pups due to longer flight distances to forage. In-stream habitat for aquatic insects in the footprint of the bridge construction will be impacted by the construction, and for some time after the construction is completed. Additionally, water quality impacts from construction and increased impervious surface runoff may decrease the FBR food and drinking water source quality, potentially impacting gray bat fitness.

5.1.1.3 Disturbance Duration, Frequency and Intensity

Gray bats will be affected by the construction from mid-March through October when they are present in the action area. Disturbance from increases in nighttime lighting and noise will exist until construction is complete. After the construction causeways are removed from the FBR, the

substrate and its invertebrate population will continue to recover for some period of time as the river has bankfull flows that resort the riverbed and reestablish the riffle section. The widened highway is likely to result in more permanent impacts from increased noise and lighting from an increase in vehicles, which may impact foraging and commuting bats. The clearing will further fragment habitat and may act as a barrier in certain locations since *Myotis* are reluctant to cross wide, open areas and some species of bats avoid large roads (Berthinussen and Altringham 2012a).

5.1.2 Analysis of Effects of the Action

5.1.2.1 Potential Beneficial Effects

Reduction of direct stormwater runoff at bridge locations.

Storm water from the existing bridge over the FBR and at Cane and Clear Creeks currently enters the streams directly from the bridge decks. The new bridges will collect and direct storm water to the ends of the bridges and discharge the deck drainage into vegetated buffers before entering the river. Stormwater coming off the approaching roadways at the bridge locations will be managed in a similar manner. The elimination of direct roadway discharge should result in localized improvement of water quality and potentially a beneficial effect on gray bat forage.

Reduction in Permanent Fill at French Broad River Crossing

Permanent fill in the form of bridge bents will be reduced upon completion of the new bridge. The existing bridges have five interior bents each, arranged on spread footings, with only one of these bents situated on land. The proposed bridge will have two bents, both in the water. This means more of the river bed will be available for colonization of aquatic fauna, including aquatic insects, which are the main food source for gray bats. Furthermore, gray bats will have fewer vertical impediments to navigate as they fly near the water surface while foraging and commuting.

5.1.3.2 Direct and Indirect Effects

5.1.3.2.1 Bridge Construction at the French Broad River

The FBR in the location where I-26 crosses is relatively narrow and the riparian corridor is densely wooded. The bridge serves as an underpass for bats, funneling them under the existing roadway as they commute and forage along the surface of the river (uses of underpasses by bats is discussed by Berthinussen and Altringham 2012b). Night construction activities in this area will affect gray bat foraging and commuting along the FBR. In addition, this river reach is a long riffle section, providings high quality habitat for aquatic insects and an excellent forage area for the gray bats. The effects to gray bats are described in detail below.

5.1.3.2.1.1 Light and Noise

The use of lighting after sunset will be necessary to complete some aspects of construction. Bats currently use this area and are accustomed to traffic noise and some night lighting from car

headlights as cars pass over the bridge but there is little traffic noise or light that reaches the surface of the river.

In order to prepare the construction site, and for the duration of construction of the new bridges, the night work that must be done at the river level and from the causeways that are located roughly at river level will increase lighting and noise that will likely repel bats from this area while at the same time drawing insects from the adjacent areas to the light. Activities that may require night lighting during the active season include access road construction, causeway construction and phasing, drilling new shafts, concrete pours, and setting new bridge beams.

Myotis sp. are light averse (Voigt 2018) and the addition of night lighting and construction noise at the water level and in the riparian corridor will repel some bats from the river in this location. If gray bats avoid areas that are brighter and noisier than they are accustomed to, this could lead to increased travel time/distance between their roosts and foraging areas and result in diminished fitness of adults and/or reduced survivorship of pups at nearby maternity roosts. Furthermore, some bats could be lost to predation and/or vehicle strike if they attempt to cross over the highway rather than using the underpass.

5.1.3.2.1.2 Construction Causeways

Fill associated with the temporary causeways placed in the FBR will affect both the area available for forage and the quality of the river corridor for commuting bats. Construction activities in the river are expected to take at least three years, and causeways will be in place for the duration of the bridge construction. The fill material used for the causeways may temporarily reduce habitat for aquatic insects, narrow the river through this reach, and create changes in river flows at normal and flood flows. Although the causeways have been designed to cover as little of the river as possible and remain in place as short a duration as possible, they will alter flows for the duration of the construction. Bats may be deterred from commuting under the bridge while causeways are in place and construction is ongoing.

5.1.3.2.1.3 Removal of Vegetation

Limited tree clearing will be necessary for construction at the FBR. Four temporary access roads will be constructed to reach the construction area of the bridge. Although retaining walls will be used to minimize the amount of necessary clearing, the access roads will require about 3.75 acres of clearing. On the northwest bank of the river, there is currently a gap in the canopy that spans roughly 134 ft. Clearing necessary to widen the roadway will result in an additional 175 ft. of open space. On the southeast side of the river, the riparian vegetation is somewhat fragmented by the one-lane Old River Road. The current break in the canopy is 195 ft. and an additional 45 ft. of clearing will be necessary. Gray bats often avoid large open spaces and could be deterred from commuting and foraging in this area until the planted trees mature.

5.1.3.2.2 Highway Widening Construction

The project closely parallels the FBR for about 2.5 miles. Gray bat calls were recorded at all the detector sites adjacent to the river. Therefore, we assume gray bats are using the entire length of the river within the Action Area for foraging and commuting at night and may be affected by construction activities occurring after dark and temporary habitat changes occurring during construction. Construction activities associated with the proposed widening project include

clearing, grubbing, grading, installation of pavement, culvert extensions and replacements, bridge replacements, striping, signs, and lighting. The effects to gray bats are described in detail below.

5.1.3.2.2.1 Light and Noise

For construction work that must take place at night, the lighting likely will be brighter than ambient light generated by headlights or nearby overhead lighting around interchanges or near developed areas. Night construction could take place at any time throughout the life of the project. The portion of the roadway roughly located between the Long Shoals Road (NC 146) interchange and the Brevard Road (NC 191) interchange currently has no overhead lighting, so all ambient light is generated by automobile headlights. Additional construction lighting will elevate the amount of ambient light.

Within the Action Area, gray bat activity is highest along the French Broad River which may limit their exposure to construction lighting and noise for the highway widening, particularly in the sections south of the airport where the river shifts to the west away from the interstate. At the Blue Ridge Parkway, more nighttime construction activities may occur, but based on the results of acoustic surveys, as well as NCWRC telemetry studies, gray bats do not appear to be very active here. Construction lighting and noise may exacerbate the barrier effect of roads, causing gray bats to modify their preferred foraging and commuting areas due to increased light and noise associated with construction activities.

5.1.3.2.2.2 Removal of Woody Vegetation

Removal of trees and clearing will likely have the most impact in the project section from the northern terminus to about Long Shoals Road. From that point south, most of the project will widen to the already-cleared area between the existing lanes of I-26. Clearing will begin almost immediately after the project is let for construction and may continue for a period of up to two years. Clearing may occur at different locations and at different times along the length of the project, depending on construction timing/phasing. Clearing activities will take place during daylight hours, but may occur during any time of year, with the exception of Blue Ridge Parkway property where tree clearing will occur between August 15 and May 15.

To avoid flying through active construction areas, gray bats with foraging areas or travel corridors within the Action Area will have to expend an increased amount of energy to establish new foraging areas or travel corridors. Additionally, they may be subject to increased inter- and intra-specific competition. These impacts could extend beyond the widening project if some individuals continue to alter foraging and commuting routes because of permanent increased fragmentation from the project. Bats remaining loyal to certain foraging areas may continue crossing newly-cleared areas, potentially increasing their risk of mortality from predation and vehicle strikes. It is unclear whether gray bats that regularly forage in the Action Area will experience difficulty in establishing new foraging areas due to the availability of suitable foraging habitat in the surrounding landscape.

5.1.3.2.2.3 Changes in Water Quality

NCDOT has implemented design changes to minimize impacts to surface waters and wetlands. However, not all impacts could be eliminated, NCDOT activities may negatively affect water

quality within the Action Area. These effects are anticipated to be short term in nature, and may include:

- Temporary sedimentation from land-clearing and earth moving activities such as preparation, installation of drainage features, utility installation, culvert installation/extension, and grading activities;
- Temporary sedimentation from in-water work associated with bridge demolition and construction activities such as investigative drilling for bridge footings, installation and removal of temporary causeways, removal of existing bents, and shaft drilling.

Eighty-six streams, in addition to the French Broad River, will be impacted in some way by the project. Most of them are small streams, which gray bats do not typically use for foraging and commuting, but activities associated with these streams may contribute to diminished water quality within the Action Area. Insects associated with aquatic habitats make up a large portion of the diet of gray bats (Rabinowitz and Turtle 1982, Clawson 1984, Brack 1985, Lacki *et al.* 1995, Best *et al.* 1997), and many species of aquatic insects can be negatively affected by a decrease in water quality (Hilsenhoff 1982, Lenat 1993, and Ramezani *et al.* 2014). Therefore, a decrease in water quality may adversely affect a portion of the prey base of the species.

Although water quality impacts may result in a reduction in specific portions of the prey base and drinking water quality for gray bats, adverse effects are likely to be undetectable due to other inputs into the FBR watershed. Therefore, we do not anticipate any measurable effect on gray bats due to potentially diminished water quality.

5.1.3.2.3 Highway Operation

Traffic is projected to increase along I-26 because of the capacity expansion (NCDOT 2014b). With this increase in traffic will come associated increases in light and noise from more cars and the greater potential for bat-vehicle collisions, predation and for bats to abandon formerly used foraging and commuting areas. The removal of vegetation will further fragment habitat and the widened road could act as a travel barrier since *Myotis* are reluctant to cross wide, open areas. Gray bats may avoid flying over a road of this size, and have to fly longer distances along foraging or migration routes, thus resulting in lowered fitness.

5.1.3.2.3.1 Lighting

Once the proposed roadway is in operation and traffic volume increases, the amount of light generated by headlights will increase. Gray bats travelling across or adjacent to the roadway, particularly in areas near the river, would be most susceptible to increased light, and may avoid these areas in the future, potentially altering their migration routes and lowering their fitness. At the I-26 crossing of the FBR, the current guardrail is concrete parapet with a retrofitted metal rail on top, and a metal guardrail addition on the side facing traffic. These features allow automobile headlights to shine through the railing and over adjacent airspace above the French Broad River. The replacement bridge will have a solid concrete “Jersey barrier” guard wall. This guardrail/wall type will be more effective in controlling the amount of light generated by passing vehicles that reaches the surrounding airspace.

5.1.3.2.3.2 Noise

Noise will increase with increased traffic volume. Volume between Long Shoals Road and Brevard Road is projected to increase the peak hour bidirectional traffic from 4,952 vehicles to 9,904 vehicles after construction is completed. Per the 2016 NCDOT Traffic Noise Manual, a 3 dB(A) increase in traffic noise is expected whenever the traffic volume is doubled.

Given the amount of gray bat activity at the French Broad River crossing, noise levels were further analyzed at this location. Using FHWA's Traffic Noise Model (TNM), version 2.5, 2011 base year noise levels on I-26 at the French Broad River are estimated to be 78 decibels (dB(A)). The 2040 design year noise levels with the project in place are predicted to be 76 db(A), a decrease of 2 dB(A). The reasons for the decrease in noise levels of 2 dB(A) are: 1) the existing dual bridges are being replaced with a single bridge, eliminating the potential for noise to pass through the gap (and under) the two existing bridges; and 2) the new bridge will feature concrete Jersey barriers in the median and as guardrails on the bridge shoulders, which, based on the TNM model, reduce traffic noise levels at nearby human receptors.

Given that gray bat activity is high at the I-26 crossing over the French Broad River, bats are not noticeably deterred by the noise from the current traffic volume at this location. There are no studies focused specifically on gray bats and noise effects. However, some studies suggest that Indiana bats (a congener) may be able to tolerate disturbance from vehicular traffic noise at a roost near a large airport (Sparks *et al.* 2009). Therefore, at this time we do not anticipate noise levels will adversely affect bats.

5.1.3.2.3.3 Vehicle Collisions and Increased Predation

Bats attempting to cross the interstate in the heavily wooded area between the Blue Ridge Parkway and Brevard Road will encounter a wider opening in the forest. Gray bats that attempt to cross over the roadway could be struck and injured or killed by passing vehicles. Bat mortality caused by impacts with passing vehicles is widely documented (Kiefer *et al.* 1995, Lesiński 2007, Gaisler *et al.* 2009, Russell *et al.* 2009, Lesinski *et al.* 2010, Medinas *et al.* 2013). Bat injury and mortality from vehicle strikes may increase within the Action Area from increased traffic.

5.2 APPALACHIAN ELKTOE

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 jeopardizes the continued existence of the species, we may propose reasonable and prudent alternatives 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 placement of temporary causeways in the FBR, permanent impacts of new bridge bents in the FBR, land-clearing, and changes in water quality.

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).

5.2.1 Factors to Be Considered

5.2.1.1 Proximity of the Action

Based on surveys of the FBR in the Action Area, the Appalachian elktoe occurs in the very low numbers patchily distributed through the Action Area. Although measures to avoid and minimize impacts to Appalachian elktoe are included in the project plans, implementation of the project will result in unavoidable impacts to habitat and may result in impacts to individual mussels.

5.2.1.2 Nature of the Effect

In-stream habitat in the FBR will be permanently affected by new bents in the river. About 400 sq feet of riverbed will be permanently lost. Temporary construction causeways also will affect habitat in the immediate vicinity of the I-26 crossing of the FBR.

Highway widening will impact about 86 jurisdictional streams in the Action Area primarily through culvert extensions, including 26 FBR tributaries directly crossed by the project. Bridges over Clear Creek and Cane Creek will be replaced.

5.2.1.3 Disturbance Duration, Frequency, and Intensity

The highway widening will create disturbance to tributaries and downstream resources that will be ongoing in different segments of the project for years. With appropriate sediment and erosion control measures, large inputs of sediment should be avoided during construction. After the project is completed and the roadway opens to traffic, there will be increases in stormwater runoff volume and pollutants, some of which may reach areas occupied by the Appalachian elktoe.

Disturbance to the riverbed from bridge construction will occur over a relatively short period of time from the construction of the bridge piers at the FBR crossing. The causeways for construction and demolition will be in place for the length of time needed to construct and demolish the bridges. Although there will be direct impacts to the riverbed associated with the causeways, the construction of the causeways will be phased to limit the amount of causeway in the river at any one time, and only the causeways needed for an activity will be in place during that activity and will be removed when the action is completed. There will be temporary impacts to river hydrology both upstream and downstream of the causeways.

5.2.3 Analysis of Effects of the Action

5.2.3.1 Potential Beneficial Effects

Reduction of direct stormwater runoff at bridge locations. Storm water from the existing bridge over the FBR and at Cane and Clear Creeks enters the streams directly from the bridge decks. The new bridges will collect and direct storm water to the ends of the bridges and discharge the deck drainage into vegetated buffers before entering the river. Storm water coming off the approaching roadways at the bridge locations will be managed in a similar manner. The elimination of direct roadway discharge should result in localized improvement of water quality due to pollutant filtration and sequestration on the upland. Reduced pollutant load should have some beneficial effect on the Appalachian elktoe.

Elimination of bents in the main river channel. The existing crossing of the FBR has three sets of double piers in the river channel that will be eliminated with a new spanning structure. The elimination of these piers in the FBR is expected to reduce the bridge's effects on stream flow patterns at the bridge site and may result in less chance of catching woody debris which can cause bed instability.

5.2.3.2 Direct and Indirect Effects

5.2.3.2.1 Construction Effects

5.2.3.2.1.1 Investigative Drilling

Investigative drilling for the I-26 Bridge footings will be conducted from the existing bridge deck and will require three 4-in diameter borings within each of the two bent locations: one at each edge for a total of six. Each boring will reach a depth of 25 to 30 ft. This work will be completed before the causeways are put in the FBR. Investigative drilling will be conducted during nighttime hours, drilling four holes per day and take one week to complete the work. The borings will cover about 75 sq. in. in total.

5.2.3.2.1.2 Temporary Access Roads

Temporary access roads will be constructed to transport materials and construction equipment to the bridge worksite. The access roads will be built parallel to I-26, one in each quadrant. The access roads will require approximately 3.75 acres to be cleared of trees and other vegetation. The temporary access roads, if not maintained properly, could transport sediment into the river until disturbed slopes become stabilized with riprap, matting, or other measures. Since the roads slope down toward the river, they could channel sediment directly into Appalachian elktoe habitat. Special sediment and erosion control measures have been developed for the bridge construction site to minimize negative effects.

5.2.3.2.1.3 Causeway Construction and Use

To construct the new bridges that carry I-26 over the FBR and demolish the existing structures, it is necessary to build temporary stone causeways adjacent to and in the FBR. Causeway size will be minimized as much as possible during each stage of construction to maximize the free flow area of the river. Causeway area will vary with the stages of construction, but are projected to

temporarily affect a total area of 1.01-acres. The total time causeways will be in place is about 3.6 years (186 weeks). With the primary causeways in place, the river free flow will be constricted to a maximum 58 percent of the normal cross-sectional area.

The long duration of causeway operation needed to construct this project creates an opportunity for related effects to Appalachian elktoe and the habitat near the construction area. The BA acknowledges that it is possible the rock causeway material may be washed away during high flow events, where it could have a negative effect on the species by crushing individuals or fouling of habitat. Additionally, the disruption of approximately 1.0 acres of stream bottom affected by the installation and removal of the causeways may cause temporary negative effects to the habitat. The BA concludes that the probability of this causing direct mortality is low, due to the low density of Appalachian elktoe in the area downstream of the project crossing. Also, because the habitat is bedrock dominant, the USFWS believes this habitat will likely revert back to its present suitability within a few years post construction and the probability of direct mortality is low.

The operation of causeways can also increase stream bed and bank scour near the project area. The hydraulic effects of placing causeways in the river were modeled by NCDOT to determine the effect of high flows on the river. The causeways will restrict river flow and can result in upstream pooling with an increase in water level, depending on the size of the causeways in place at a given time and the magnitude of the increased flow. This is not expected to cause negative effects to the Appalachian elktoe. The area downstream of the causeway will experience higher velocities while causeways are in place, and may experience higher rates of scour as a result. Scouring could affect any mussels in the riverbed, washing them downstream and/or causing shell erosion. Most of the riverbed where the causeways will be placed and immediately downstream is bedrock, so adverse effects to mussels from channel instability or scour are not anticipated as a result of increased river velocity. NCDOT proposes to avoid disturbance to the area downstream of the causeways to the extent possible and to monitor the area for scour. Monitoring for channel stability during construction will extend 100 ft. upstream and 250 ft. downstream of the causeway locations (USGS Monitoring plan). Should significant scour be detected, NCDOT has committed to making improvements to the causeway to prevent scour. The USFWS believes that the area most likely to be affected, being largely dominated by bedrock, may be affected temporarily, but is likely to return to suitability within a few years post construction.

In addition to the potential changes in hydrology as a result of the causeways, there is the potential for the causeways to act as velocity barriers to fish movement. The disruption of fish movement could impact the Appalachian elktoe if fish hosts for the elktoe are unable to move freely in the river. These temporary disruptions to fish movement may cause some loss in recruitment to upstream or downstream areas for the period of time the causeways are in place. The USFWS believes the direction of disruption of fish host travel is primarily in the upstream direction. Downstream migration of fish is unlikely to be affected as strongly due to the nature of the causeways and associated flow disruptions. Since the distribution of the bulk of the Appalachian elktoe population is upstream of the project, and host fish directional movement downstream is the most important direction of movement in this case, the USFWS believes this effect will be minimal.

5.2.3.2.1.4 Spills and Pollutant Discharge

The inadvertent spill or discharge of toxic pollutants, such as diesel fuel and hydraulic oil, into the river could result in mortality of Appalachian elktoe. Spills of construction fluids are not uncommon, and the long duration of heavy equipment use adjacent to waterways increases the possibility that a spill or discharge could occur, adversely impacting the river water quality. However, NCDOT has committed to conservation measures to refuel the equipment away from the water and to have spill kits near the equipment on the causeways, reducing the likelihood of a spill or discharge reaching the river. Spills could also take place near any other waterway and subsequently have an effect further downstream, but we believe normal spill response is capable of avoiding effects from minor spills. Major spills resulting from negligent operation are still possible, but unlikely.

5.2.3.2.1.5 Bridge Demolition and Construction

The replacement of the existing I-26 bridge will be on similar alignment to the existing bridge. The new bridge will be slightly larger than the existing structure, but due to longer spans will only have two bents in the river where the existing bridge had three. Due to the near exact replacement of the existing structure we do not expect significant stream alteration due to the placement of the existing bridge itself. There will be minor changes in the permanent fill. The new bridge will require an additional 400 ft^2. of river bottom habitat that will be permanently affected by fill for bridge bents; however, removal of most of the existing bridge foundations will offset most of this change. The changes in bent number and construction of causeways will likely cause some localized scour during and after construction. Given the prevalence of bedrock at the bridge crossing, the degree of riverbed scouring due to presence of bridge bents is not expected to increase from the present conditions.

During demolition NCDOT will remove the existing bridge using methods that minimize the amount of construction debris in the river, and due to the unknown nature of the existing foundation construction and condition, many decisions about removal will have to be made on site. Small amounts of bridge debris may fall into the river. However, it will be removed and we do not believe that small amounts of construction debris temporarily in the river will have any effect on Appalachian elktoe.

The drilling of support shafts for the new bridge involves a drilling fluid of bentonite clay and water. This mixture is typically recycled. The loss of large amounts of clay into the river could have a negative effect to water quality; however, our understanding of this process is that leaks of drilling fluid, though possible, would be quickly detected and remedied. We do not believe that this activity will have a negative effect unless there is a negligent discharge of drilling fluid.

5.2.3.2.1.6 Erosion and Sedimentation from Construction

Highway construction projects require significant earth moving activity. This includes clearing and grubbing, cut and fill, grading operations, etc. This project will also require the replacement of a large number of culverts and two bridges over Clear and Cane creeks. All activities that expose soil create an opportunity for runoff from the project into the river. This type of runoff from construction can negatively impact aquatic species, including the Appalachain elktoe. With a duration of five years or more and effects to 86 streams draining to the FBR, this project has significant potential to cause long duration widespread negative effects to Appalachian

elktoe and its habitat. Two previous population declines in this species coincided with erosive events. In the Little Tennessee River, hurricanes Frances and Ivan in 2004 caused major flooding resulting in landslides and chronically unstable banks throughout the watershed. Over the next few years, the population of Appalachian elktoe declined precipitously and is now critically imperiled. On the South Toe River, starting in 2013 a major road widening project began affecting dozens of tributaries of the South Toe River. Subsequently, the Appalachian elktoe population immediately downstream of this disturbance declined. Investigations into the mechanism that caused the decline are ongoing, but the proximity to potential erosive sources begs caution that this species is particularly sensitive to elevated levels of fine sediment.

The distribution of Appalachian elktoe in the FBR is currently in the upper portions of the river. As previously described in the species baseline, the Appalachian elktoe appears to be currently expanding in the FBR and the known downstream extent of this species has expanded further every year since 2005. The known downstream range of the Appalachian elktoe is presently just upstream of the mouth of Hominy Creek, around 5 miles downstream of the I-26 crossing of the FBR. The presence of two other species of mussel downstream of this record and extending all the way into Tennessee gives us reason to believe that the downstream expansion of the Appalachian elktoe will continue unless external factors halt the population expansion. Due to the above mentioned losses in two other populations, the long term stability of the FBR population is a key factor in recovering this species.

The erosion control measures incorporated into the proposed action will reduce the levels of sedimentation into the FBR, but these measures have a design limit based on the amount of rainfall received at the project area. Rainfall events that are greater than the erosion control design limits will result in sediment loss into the river. The baseline levels of suspended sediment in the FBR are already elevated due to cumulative activity in the watershed. However, this baseline suspended sediment has allowed for recent population expansion. In 2018 the Asheville region experienced the highest level of rainfall on record. The previous record year was 2013. The five year duration of this project makes it possible that periods of significant rainfall will occur during the construction. In order to reduce the number and likelihood of sedimentation events from rainfall resulting in water quality impacts, the NCDOT has proposed several conservation measures to improve erosion control efficacy, monitor effectiveness and to fund resource agencies to plan for species recovery in case of unforeseen circumstances. However; if conditions are atypical or if effects to the species are greater than anticipated, NCDOT and USFWS have agreed to collaborate to seek solutions. Accordingly, we have included a Term and Condition that the USFWS can request an onsite meeting to discuss the project at any time. This will allow for adaptive improvements and ensure that problems are addressed early and impacts minimized.

5.2.3.2.2 Operation Effects

The construction of this project will lead to additional road surface drainage to the French Broad River indefinitely. The operation of roads is known to increase the rate of runoff into the river, causing potential destabilization of sensitive habitat within. Roadway runoff contains pollutants that may affect aquatic species at high concentration. Roadways are also a primary threat for toxic spills that could affect the river habitat.

5.2.3.2.2.1 *Impervious Surfaces*

Widening I-26 will increase impervious surface in the Action Area. There is an estimated increase of roadway pavement of 117.9 acres with additional increases associated with interchanges and rest areas. The increased impervious surfaces will cause an increase in stormwater runoff. NCDOT has committed to implementing stormwater control measures throughout the project where they are practical. We believe that proper stormwater controls will reduce the effects of stormwater on the receiving streams, but not entirely eliminate stormwater effects on the river, especially when rainfall rates are high. The increased stream velocities may have adverse erosive effects on tributary channels resulting in additional sedimentation in the river habitat. The NCDOT has committed to fixing erosion problems at culverts in tributary channels during construction. Proper outfall conditions should further reduce some erosion within the tributary channels. Therefore, based on the present conditions in the action area, as well as the conservation measures proposed we do not believe that the increase in impervious surface will significantly impact the suitability of the habitat in the future.

5.2.3.2.2.2 *Roadway Runoff*

NCDOT has committed to funneling runoff from the FBR bridge off the bridge to a vegetated buffer, thereby reducing runoff from the current baseline. However, there will be additional runoff due to the additional impervious surface. Numerous pollutants have been identified in highway runoff, including various metals (e.g., lead, zinc, iron), sediment, pesticides, de-icing salts, nutrients (nitrogen, phosphorus), and petroleum hydrocarbons and many of these.can be harmful to mussels. Mussels present in the Action Area may experience locally increased exposure to runoff from the I-4400/I-4700 widening project and the resulting increase in impervious surface from the highway. The effects from roadway runoff will be long-lasting, spanning the life of the highway but will likely be sporatic and site specific. The long term effects of chronic exposure to roadway pollutants to mussels are poorly understood. The conservation funding provided by the NCDOT for activities aiding in the conservation of Appalachian elktoe will be expended to further study the health of the watershed, as well as the elktoe to aid in recovery of the species.

5.2.3.2.2.3 *Toxic Spills*

Toxic spills on roadways are a concern for aquatic species. This will be true any time large quantities of material are transported near waterways. Due to the large amount of existing roadway and train transport in the FBR basin, the widening of I-26 will not appreciably increase the probability of a spill.

5.2.3.2.2.4 *Induced Land Development*

Qualitative analyses of the probable development patterns in the FLUSA suggested that Project I-4400/I-4700 would not have a notable indirect effect on land use in the FLUSA (NCDOT 2016), so land use effects within the smaller Action Area should not be notable either. Potential land use effects as a result of the I-26 widening are limited because the project does not provide any new access or opportunities for traffic exposure to properties and will generate marginal travel time savings (NCDOT 2016).

5.2.3.2.2.5 *Interrelated/Interdependent Effects*

Interrelated actions are those that are part of the larger action and depend on the larger action for their justification. Similarly, interdependent actions are those that have no independent utility apart from the action under consideration (50 CFR §402.02).

Highway projects can induce changes in surrounding land use when they shorten commuting times or provide access to areas previously poorly served. These changes can be interdependent if they would not occur without construction of the project. The NCDOT studied the potential for changes in land use surrounding the Action Area (NCDOT 2016) and found that the nature of this project, as an upgrade to an existing roadway, without additional access along its length, would not induce significant amounts of additional development.

Another source of interrelated effects common to roadway projects is the siting of waste and borrow areas necessary for the temporary holding of construction materials. On large projects, the area necessary for waste, borrow and staging operations can be large and under certain conditions could create additional negative effects for aquatic species. NCDOT allows the contractor to manage placement and operation of the waste and borrow sites after the contract is awarded and does not consider effects of the waste and borrow sites to be part of the authorized action, however, NCDOT does provide standard guidance for borrow/fill sites that are intended to regulate the environmental effects of these areas and requires consultation with the Division Engineer if their placement could affect a federally listed species. If not for the proposed action, the waste and borrow sites would not be necessary. Therefore, we consider them interdependent to the proposed action. However, if NCDOTs standard guidelines are followed, we believe they will effectively minimize additional effects associated with these sites.

6. CUMULATIVE EFFECTS

Gray bat and Appalachian elktoe

Cumulative effects are defined under the ESA as "those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the Action Area of the Federal action subject to consultation" (50 CFR 402.02). Future federal actions unrelated to the proposed action are not considered because they require separate consultation pursuant to Section 7 of the ESA.

The Indirect Screening Report (NCDOT 2013a), the associated update (NCDOT 2017a), and the Asheville Regional Cumulative Effects Study (NCDOT 2014c) indicate the I-26 widening project will result in few indirect impacts and minimal cumulative effects. The majority of activities identified in these reports will likely require federal authorization requiring their own ESA Section 7 consultation, and would not be considered a cumulative effect under the ESA. However, since publication of these reports, a large residential development within the action area has received approval from the Asheville City Council. The planned Riverwoods residential development, a mix of approximately 167 single family residences with additional commercial space, is planned for property adjacent to the French Broad River near the I-26 crossing of the river. We anticipate that this development will require Section 7 consultation due to impacts to waterways, but at this stage it is not certain.

Considering the existing level of development within the French Broad watershed, coupled with large areas of forested habitat nearby (Biltmore, Pisgah Forest, Bent Creek), these cumulative effects are unlikely to alter the species baselines in a manner easily distinguished from the background disturbance of other activities within the Action Area. We are not aware of additional state, local or private actions that are reasonably certain to occur within the Action Area that would not be subject to section 7 review. Therefore, cumulative effects to gray bat and Appalachian elktoe are not expected to reach a measurable level, and are not addressed further in the Opinion.

7. CONCLUSION

7.1 GRAY BAT

After reviewing the current status of the gray bat; the environmental baseline for the action area; the effects of bridge construction, demolition, and highway widening; conservation measures incorporated into the proposed action; any potential interrelated and interdependent actions associated with the proposed action; and any cumulative effects, it is the USFWS's opinion that implementing this project is not likely to jeopardize the continued existence of the gray bat. No critical habitat for gray bat exists within the Action Area, therefore, non will be affected.

7.2 APPALACHIAN ELKTOE

After reviewing the current status of the Appalachian elktoe; the environmental baseline for the action area; the effects of bridge construction, demolition, and highway widening; measures identified in the NCDOT's BA to help minimize the potential impacts of the proposed project and assist in the protection, management, and recovery of the species; any potential interrelated and interdependent actions associated with the proposed action; and any potential cumulative effects, it is the USFWS's opinion that implementing this project is not likely to jeopardize the continued existence of the Appalachian elktoe. No critical habitat for Appalachian elktoe exists within the Action Area, therefore, non will be affected.

8. 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 by the USFWS to include significant habitat modification or degradation resulting in death or injury to listed species by significantly impairing essential behavioral patterns, such as breeding, feeding, or sheltering. Harass is defined by the USFWS 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 that 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), incidental take is not prohibited under the Act, provided it is in compliance with the terms and conditions of this incidental take statement.

8.1 GRAY BAT

The USFWS anticipates incidental take of gray bats may occur as a result of the replacement of the I-26 bridge over the FBR and the widening of I-26. During construction, individual bats may be repelled from forage areas in the bridge footprint and along the river, reducing adult and juvenile fitness and affecting pup birth and health before they are able to fly and forage on their own. Additionally, more bats may be killed due to predation and car strikes if they are repelled from areas of active construction and forced to fly over the highway or more open areas.
No evidence of bat roosting was observed on any bridges or in any culverts to be included in project construction activities, therefore impacts to gray bats due to modification or elimination of summer roosts are not expected. The number of gray bats using the FBR within and near the action area is estimated at a minimum of 1300 individuals. An unknown number of these will be affected by the construction activities (including: temporary lighting, noise, causeways, decrease in water quality, and loss of woody vegetation). Most of the take associated with this project will be in the form of harm and harassment, but some mortality of adult bats, newly-volant juveniles, and non-volant pups is possible. Additionally, some loss of recruitment is expected due to stress on pregnant and lactating females and subsequent loss of pups. This harm is not expected to cause mortality of all individuals with in the Action Area, but could reduce fecundity and recruitment within the Action Area temporarily.

Data used to determine the number of gray bats in the Action Area is a conservative estimate, and gray bat populations are known to fluctuate seasonally and annually in a given area, therefore it is not possible to base the amount of incidental take on numbers of individual bats. Due to the difficulty of detecting take of gray bats resulting from the action, the amount of incidental take will be monitored using the duration of construction activities over and adjacent to the river, the most disruptive aspect of the project, as a surrogate measure of take. In order to limit the duration of this disruption, we believe that bridge construction activities extending beyond 5 years should be limited to work only during daylight hours so that the bats using the Action Area can resume normal behavior and return to the baseline condition. Therefore, the amount of incidental take will be exceeded if the night operations at the FBR bridge exceed five years.. If construction operations at the I-26 bridge cannot be completed in five years from the start of causeway construction without night operations, all work should stop, and the USFWS should be contacted immediately to reinitiate consultation.

In this Opinion, the USFWS has determined that this level of take is not likely to result in jeopardy to the gray bat. In addition to the subsequent measures listed in the Reasonable and Prudent Measures and Terms and Conditions sections of this Opinion, the measures listed in the Conservation Measures section of this opinion must be implemented for this determination to remain valid.

8.2 APPALACHIAN ELKTOE

The USFWS anticipates incidental take of the Appalachian elktoe may occur as a result of the construction of the bridge at the FBR. During construction, individual mussels may be crushed, harmed by siltation or other water quality degradation, or dislocated because of physical changes in their habitat. Appalachian elktoe were only found in the Action Area during 2017 surveys for this project.. Our knowledge of the density and distribution of Appalachian elktoe in the Action

Area is based on a small number of documented occurrences. Surveys for this project identified five individual Appalachian elktoe at four total sites.

The survey data is not sufficient to populate a robust population model, but in an effort to estimate potential take, the USFWS applied a simple model incorporating survey effort and catch rates to estimate a baseline density for Appalachian elktoe in the Action Area. We estimated an experienced surveyor could reasonably cover 400 square meters in an hour of surveying. The mussels are not always at the surface, and due to difficulty seeing the small aperatures in the substrate, surveyors are not likely to find every mussel. To compensate for this we estimated that a capture efficiency of 25% was reasonable based on previous experience with mussel survey techniques, i.e. the number of mussels found reflect 25% of the total mussels in a given area. Therefore, the model estimates an Appalachian elktoe density of of 0.0005 mussels per square meter in the Action Area.

This project proposes to directly affect around 1.04 acres of habitat that will be covered by rock causeways. Based on the estimated density, we expect around 2 Appalachian elktoe to be in the area buried by causeway installation. This area has been surveyed on at least two occasions and no Appalachian elktoe have been seen in the area to be affected by the causeway. Therefore we expect take from this activity to result in mortal take of two or fewer individuals.

Due to the large extent and duration of this project, it is possible Appalachian elktoe in the Action Area will be affected by indirect habitat degradation from sediment eroded from the project and from the degradation of channels receiving additional stormwater from the project. Applying the model density to the area of habitat in the Action Area returns an estimated population of 821 adult Appalachian elktoe in the Action Area. In order for the population to remain stable, recruitment in the action area needs to equal natural mortality in the population. Appalachian are estimated to live about 12 years with about 10 years of reproductive lifespan. That requires a recruitment rate of 0.10 annually, in this case 82 new recruits per year that could be affected by project related effects.

Conservation measures outlined in the BA are intended to minimize indirect effects due to sedimentation in the FBR. Even under standard construction conditions, we expect Appalachian elktoe within the Action Area may be harmed by the presence of turbidity or settling of sediment in depositional portions of its habitat. We expect this effect to be non-lethal harm to adults that could result in temporarily reduced recruitment throughout the duration of the project. The effects of sediment pollution within the Action Area should not reach a level prevents recolonization of the Action Area after construction. Prolonged increases in sediment transport in Appalachian elktoe habitat could cause habitat alteration that would prevent future population growth even after construction is finished. Due to the difficulty of measuring these effects directly, the NCDOT proposes monitoring project erosion control with a study conducted by the USGS. USGS proposes to use existing water quality data available from the NCDEQ and combine it with pre-construction data collected from USGS monitoring stations to measure a baseline turbidity. If the monitoring stations record an increase in turbidity greater than normal variation in the flow-corrected pre-construction monitoring data, the USFWS will reinitiate consultation with the FHWA to address the causes of the additional turbidity.

We believe the conservation measures and monitoring included in the BA are sufficient to reduce the effects of construction such that the population of Appalachian elktoe in the French Broad is likely to remain healthy and viable into the future. Therefore, in this Opinion, the USFWS has determined that this level of take is not likely to result in jeopardy to the Appalachian elktoe. In addition to the subsequent measures listed in the Reasonable and Prudent Measures and Terms and Conditions sections of this Opinion, the measures listed in the Conservation Measures section of this opinion must be implemented for this determination to remain valid.

9. REASONABLE AND PRUDENT MEASURES

The USFWS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of the gray bat and Appalachian elktoe. These non-discretionary measures include, but are not limited to, the commitments in the BA and the terms and conditions outlined in this Opinion.

1. The USFWS must be notified of any project modifications.

10. TERMS AND CONDITIONS

In order for the exemption from the take prohibitions of section 9(a)(1) of the ESA, the 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 non-discretionary. As necessary and appropriate to fulfill this responsibility, the NCDOT must require any permittee, contractor, or grantee implement these Terms and Conditions through enforceable terms that are added to the permit, contract, or grant document.

1. NCDOT will adhere to all measures listed in the Conservation Measures section of this Opinion and in the BA.

2. NCDOT will simultaneously notify USACE and USFWS of any permit modification requests.

3. A USFWS biologist will be invited (at least seven days prior) to the preconstruction meeting(s) to review permit conditions and discuss any questions the contractor has regarding implementation of the project. After the contractor submits plans for various stages of the project, a USFWS biologist will review and provide comments on the plans and will be invited to attend any meetings to discuss implementation of the plans.

4. During construction, culvert inlets and outlets will be evaluated by the resident engineer with regard to stream stability immediately following installation and quarterly for a period of 1 year at each location. Indicators of instability, such as head cutting, scour, aggradation, or degradation, will be used to determine the need for corrective actions.

5. A final field inspection will be held with the contractor to evaluate culvert placement and stream stability before the project is considered complete. If instability is detected during any of these reviews, corrective actions will be performed when deemed necessary by the engineer or

by the conditions of any federal and state permits required by Section 404/401 of the Clean Water Act.

6. USFWS can call for a site meeting with NCDOT at any time to evaluate and discuss erosion control effectiveness.

7. To minimize impacts to gray bat, NCDOT will not install the causeway material at night in the French Broad River between April 15th and October 1st.

8. Modern bat modular roost panels or comparable structures will be installed on three bridges over the French Broad River and/or tributaries within or close to the Action Area. Panels should be constructed of fiber reinforced concrete with additives to mimic thermal mass and should be mounted using metal. Bridge selection and panel placement/design should be informed by work currently being conducted by Indiana State University. Panels should be checked for bat use once in early summer and once in late fall for three years following placement. The details of bat box location and installation will be decided by a committee to include USFWS, NCWRC, and NCDOT.

9. NCDOT will monitor bat activity post construction for up to three years.

NCDOT has committed to conduct acoustic monitoring for gray bats at the FBR bridge after construction of the bridge and after work ceases in the area surrounding the bridge (see consultation history). Monitoring should occur for a minimum of one season and maximum of three seasons. Monitoring can cease when activity levels resume to pre-construction levels (see 2017 and 2018 acoustic data) or after three seasons. NCDOT will also conduct three years of emergence counts at the BRP bridge, Marshall bridge, and the culvert roost using the same methods as counts conducted by Indiana State University so data can be compared. Partners including NCWRC and USFWS can assist with these counts. The details of post construction monitoring will be decided by a committee of USFWS, NCWRC, and NCDOT staff. Information gathered will help assess impacts from the project and will inform future consultation and conservation efforts. Information will also help establish a baseline for the connector project.

10. A special area will be designated from project Station 1078+00 to Station 1230+67 (Brevard Road to the Blue Ridge Parkway) where the following requirements will apply:

- The contractor will submit a comprehensive grading plan before starting any cut or fill work in this section for the approval of the division construction engineer. The plan shall include:

    a. The number and makeup of the crews working in this area;

    b. A narrative outlining a systematic approach to removing cut and placing fill including a proposed time for each operation.

- No more than 10 acres of cut and or fill open in this area without prior approval by the engineer.
- All access roads will be covered with railroad ballast or larger stone to prevent the loss of material.

- The contractor shall submit an access road construction plan for the Blue Ridge Parkway access road for review and approval by the division construction engineer.
- All cut and fill slopes are to be matted in this section of the project.

11. Energy dissipators will be installed at the following 18 sites to reduce post construction stormwater.

Location of Concrete Energy Dissipators

Station Location	Permit Drawing Site Number	Outfall Stream or Wetland ID
EBL between 940 and 941	Site 11	WBV
EBL between 951 and 952	Site 11	WBV
EBL approximately 1030		Near WCH
EBL between 1037 and 1038		Near WCH
EBL between 1044 and 1045		Near WCH
EBL approximately 1047		Near WCH
WBL between 1090 and 1091	Site 23	SDK
WBL approximately 1105	Site 28	SDY
WBL between 1115 and 1116 (in median)	Site 30	SDX
WBL between 1117 and 1118 (in median)	Site 30	SDX
WBL between 1118 and 1119 (in median)	Site 30	SDX
WBL between 1131 and 1132	Site 32	SEQ
WBL approximately 1135		Near WCW
WBL approximately 1138		Near WCW
WBL between 1148 and 1149	Site 37	SEF
WBL between 1155 and 1156	Site 38	SEE
WBL between 1157 and 1158	Site 38	SEE
WBL approximately 1173	Site 41	SFG

11. MONITORING AND REPORTING REQUIREMENTS

In order to monitor the impacts of incidental take, the NCDOT must report the progress of the Action and its impacts on the species to the USFWS as specified in the Incidental Take Statement. This section provides the specific instructions for such monitoring and reporting. As necessary and appropriate to fulfill this responsibility, the NCDOT must require any permittee, contractor, or grantee implement these Terms and Conditions through enforceable terms that are added to the permit, contract, or grant document. Such enforceable terms must include a requirement to immediately notify the NCDOT and USFWS if the amount or extent of incidental take specified in this Incidental Take Statement is exceeded during action implementation.

USGS geomorphology and surface water condition Erosion Control Monitoring

A final project report will be produced to describe the methodology and results from monitoring streamflow, precipitation, continuous and discrete water-quality, and geomorphology in Focus Areas 1 and 2. The report will summarize conditions before, during, and after NCDOT construction activities and will be provided to the Service.

Bat Activity Monitoring

NCDOT will provide a final report and yearly monitoring summaries starting at the end of the first monitoring season.

12. REINITIATION NOTICE

Formal consultation for the I-26 Widening project is concluded. Reinitiation of consultation is required by law if:

a. the amount or extent of incidental take is exceeded;
b. new information reveals that the Action may affect listed species or designated critical habitat in a manner or to an extend not considered in this BO;
c. the Action is modified in a manner that causes effects to listed species or designated critical habitat not considered in this BO; or
d. a new species is listed or critical habitat designated that the action may affect.

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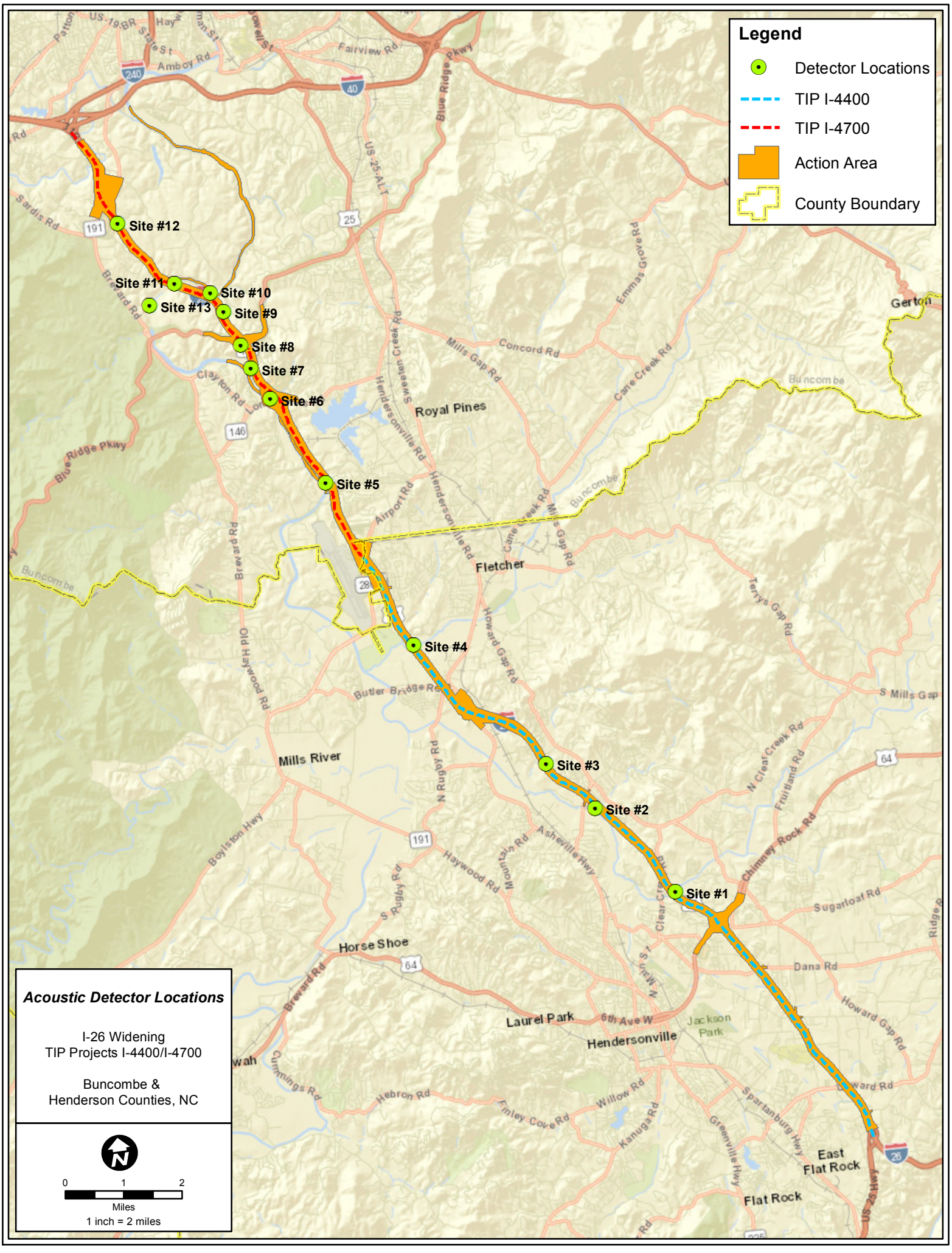
Appendix I – Action area and detector locations map


Legend
Detector Locations
TIP I-4400
TIP I-4700
Action Area
County Boundary
Site #12
Site #11
Site #10
Site #13
Site #9
Site #8
Site #7
Site #6
Site #5
Site #4
Site #3
Site #2
Site #1
Royal Pines
Fletcher
Mills River
Horse Shoe
Laurel Park
Hendersonville
East Flat Rock
Flat Rock
Gerton
Acoustic Detector Locations
I-26 Widening
TIP Projects I-4400/I-4700
Buncombe &
Henderson Counties, NC
0 1 2
Miles
1 inch = 2 miles

Appendix II – Erosion control standards comparison table

Guidelines & when they're applicable	**Environmentally Sensitive Areas** Effective area within 50' of T&E stream	**Design Standards in Sensitive Watersheds**	N**PDES - NCG01 (Must also follow DSSW in areas where project is w/in a mile of T&E aquatics)**	N**PDES - NCG01 II.B.2.b (for HQW)**	**I-4400/I-4700 CMs**
Limits on disturbance	No grubbing until just before grading. Grading work shall progress in continuous manner and permanently stabilized^ before starting next phase	20 ac limit for uncovered areas in HQW zones or w/in 1 mile of and draining to waters where T&E species are present (per NCG01)	20 ac limit for uncovered areas w/in a mile of T&E aquatic spp.		SEC plans shall adhere to the DSSW, where practicable, within the existing and proposed right of way for the following areas: For portions of the project within 1 mi. and draining directly to streams where aquatic threatened or endangered species are present.
S&EC design		S&EC designed for 25 yr. storm event within HQW zones or w/in 1 mile of and draining to waters where T&E species are present (per NCG01)	See DSSW		
S&EC structures	Sed & erosion control structures cleaned out when half full	Sed basins with 70% efficiency for 2 yr. storm within HQW zones or w/in 1 mile of and draining to waters where T&E species are present (per NCG01)	See DSSW (and bottom row, below)		Within ESA: Erosion control devices shall be installed immediately following the clearing operation. All SEC measures, throughout the project limits, must be cleaned out when half full of sediment, when applicable, to ensure proper function of the measures.
Slopes		2:1 max channel slope in HQW zones or w/in 1 mile of and draining to waters where T&E species are present (per NCG01)	See DSSW		

Guidelines & when they're applicable	**Environmentally Sensitive Areas** Effective area within 50' of T&E stream	**Design Standards in Sensitive Watersheds**	N**PDES - NCG01 (Must also follow DSSW in areas where project is w/in a mile of T&E aquatics)**	N**PDES - NCG01 II.B.2.b (for HQW)**	**I-4400/I-4700 CMs**
Ground stabilization	Seeding/mulching immediately after final grade Seeding/mulching done in stages on 20' high slopes or if >2 ac	Ground cover^^ sufficient to restrain erosion within 15 working days or 60 calendar days following completion of construction, whichever period is shorter in HQW zones or w/in 1 mile of and draining to waters where T&E species are present (per NCG01)	Permanent stabilization^ w/in 7 calendar days on >3:1 slope, ditches, swales, perimeter dikes & HQW. Stabilization w/in 14 calendar days on all other disturbed areas*	For portions of projects within the High Quality Water Zone**, stabilization shall be achieved as soon as practicable but in any event within 7 calendar days from last land-disturbing act.	Within ESA: Once grading operations begin, work shall progress in a continuous manner until complete. Seeding and mulching shall be performed on the areas disturbed by construction immediately following final grade establishment. Seeding and mulching shall be done in stages on cut and fill slopes that are greater than 20 ft. in height measured along the slope, or greater than 2 ac. in area, whichever is less.
Sediment reporting			The permittee shall report to DWQ any visible sediment being deposited in any stream or wetland w/in 24 hrs. Written submission w/in 5 days.		NCDOT will self-report to USFWS any SEC device failures that result from excessive rainfall events (exceeding a 25-year storm event). The NCDOT inspector will report any failures to the Division Environmental Officer, who will contact the agency within 24 hours. If there are any failures in SEC measures, NCDOT will meet with resource agencies and work to adaptively manage SEC devices for further storm events while construction continues.
S&EC inspections			All S&EC must be inspected at least once every 7 calendar days and must be inspected within 24 hours after storm event of > 0.50 inches of rain per 24-hour period.		Inspections of erosion control devices will be done daily for construction associated with the French Broad River bridge replacement. For the remainder of the project, the standard inspection schedule (weekly, or after a rainfall event of one-half in. or greater) will apply.

Guidelines & when they're applicable	**Environmentally Sensitive Areas** Effective area within 50' of T&E stream	**Design Standards in Sensitive Watersheds**	N**PDES - NCG01 (Must also follow DSSW in areas where project is w/in a mile of T&E aquatics)**	N**PDES - NCG01 II.B.2.b (for HQW)**	**I-4400/I-4700 CMs**
Piles of dirt			Earthen-material stockpiles must be located 50' from storm drains and streams		
Sediment basins			Sed. basin outlet structures must withdraw from surface unless drainage area < 1 acre. Discharges must meet the requirements of the Sediment Pollution Control Act and provisions of Section 6.74 of the Erosion and Sediment Control Planning and Design Manual to assure that buffers and vegetated areas will be used to reduce the potential for visible siltation outside of the 25% buffer zone nearest the land-disturbing activity.		

^ Permanent Stabilization - When all soil disturbing activity is completed, and exposed soils have been stabilized with a vegetative cover with a density of at least 80% or covered with a structural stabilization method. Permanent perennial vegetation may include the use of sod, shrubs and ground cover plants mixed with mulching, aggregate or other landscaping techniques. Structural methods include concrete, asphalt, retaining wall or other stabilization techniques.

^^ Ground cover is defined in15A NCAC 04A .0105 as "any natural vegetative growth or other material which renders the soil surface stable against accelerated erosion."

*conditions and exemptions apply
** areas that are within one mile of and drain to HQW's

ESAs are used for the following: streams, including HQWs and 303(d)s, wetlands, ORWs, critical areas, regulated riparian buffers, CAMA areas of environmental concern, T&E species habitat, and trout waters