Gray Bat Habitat Survey Report

for

TIP Project I-4400/I-4700

(WBS 34232.1.1)

Widening of I-26 from NC 225 (US 25 Connector) in Henderson County to NC 280/I-40 in Buncombe County

Buncombe County, North Carolina

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Project Development and Environmental Analysis Unit
Natural Environment Section

May 2013

Alderman Environmental Services, Inc.

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The North Carolina Department of Transportation (NCDOT) proposes to widen Interstate Highway 26 (I-26) from NC 225 (US 25 connector) in Henderson County to NC 280/I-40 in Buncombe County to six lanes. These projects are referred to as TIP project numbers I-4400 and I-4700, respectively. The existing roadway is a four-lane divided highway (two lanes in each direction), with a 44-foot median. The project area generally runs slightly northwest to southeast from the Interstate 40/240/26 junction to the North Carolina Highway 280 junction. The project study area consists of a 9.3-mile alignment, and an approximate 800-foot wide corridor, with expansions around interchanges (Figures 1-3).

The gray bat (*Myotis grisescens*) is a federally-listed endangered species which the US Fish and Wildlife Service (USFWS) identifies as potentially occurring in Buncombe County, North Carolina. Surveys are required by the US Endangered Species Act (ESA), National Environmental Policy Act (NEPA), the North Carolina State Environmental Policy Act (SEPA), and other regulations and policies to determine potential project effects on this species. The gray bat is not listed by USFWS as potentially occurring in Henderson County; therefore no surveys for this species were conducted in that county.

The gray bat was listed as endangered in 1976 under the ESA throughout its range in the United States and retains that listing as well as North Carolina listing as endangered (NCGS 113-333). The gray bat is a small (0.25 – 0.56 ounces) insectivorous species in the genus *Myotis* that occurs in the central and southeastern US in areas with karst (limestone bedrock) geology (USFWS, 1982). It is a communally roosting cave obligate species, meaning that individuals roost in assemblages of conspecifics in caves both during the winter hibernation period as well as in the active period of spring/summer/fall of the year. Winter caves used for hibernation by gray bats tend to be large, deep, and vertical limestone caves with temperature range of 33.8-48.2 degrees Fahrenheit. Summer caves that support maternity colonies tend to include warmer portions of large caves (57.2-77 degrees F), while males and non-reproductive females are more widely distributed in smaller groups at a variety of caves throughout their range. Summer roost caves are usually within 0.62 miles of a river or reservoir over which the species almost exclusively forages (USFWS, 1982). Foraging has been documented over large rivers and reservoirs, often in proximity to the daytime roost caves; however, they may travel up to 21.7 miles from their roost to particular foraging areas over reservoirs or rivers (USFWS, 2009). Their diet consists largely of aquatic insects, and numerous studies have documented foraging over open water of rivers and reservoirs bordered by forested habitat. Records of gray bats foraging over open water where the adjacent shoreline has been cleared of forest do not exist (USFWS, 1982).

There are no known caves occupied by gray bats in North Carolina, either in the hibernation period or the summer active period. There are records of gray bats occurring (assumed during foraging) in Haywood County, North Carolina over the Pigeon River (NCWRC, pers. comm.) and three documented records from Buncombe County, though specific locations for those records are unclear (Robert Currie, USFWS pers. comm.; NCNHP database updated 2013). There are numerous records of gray bats occurring, including both roosts (caves) and foraging locations in eastern Tennessee counties adjacent to North Carolina (e.g. Greene and Sullivan counties, USFWS, 1982).

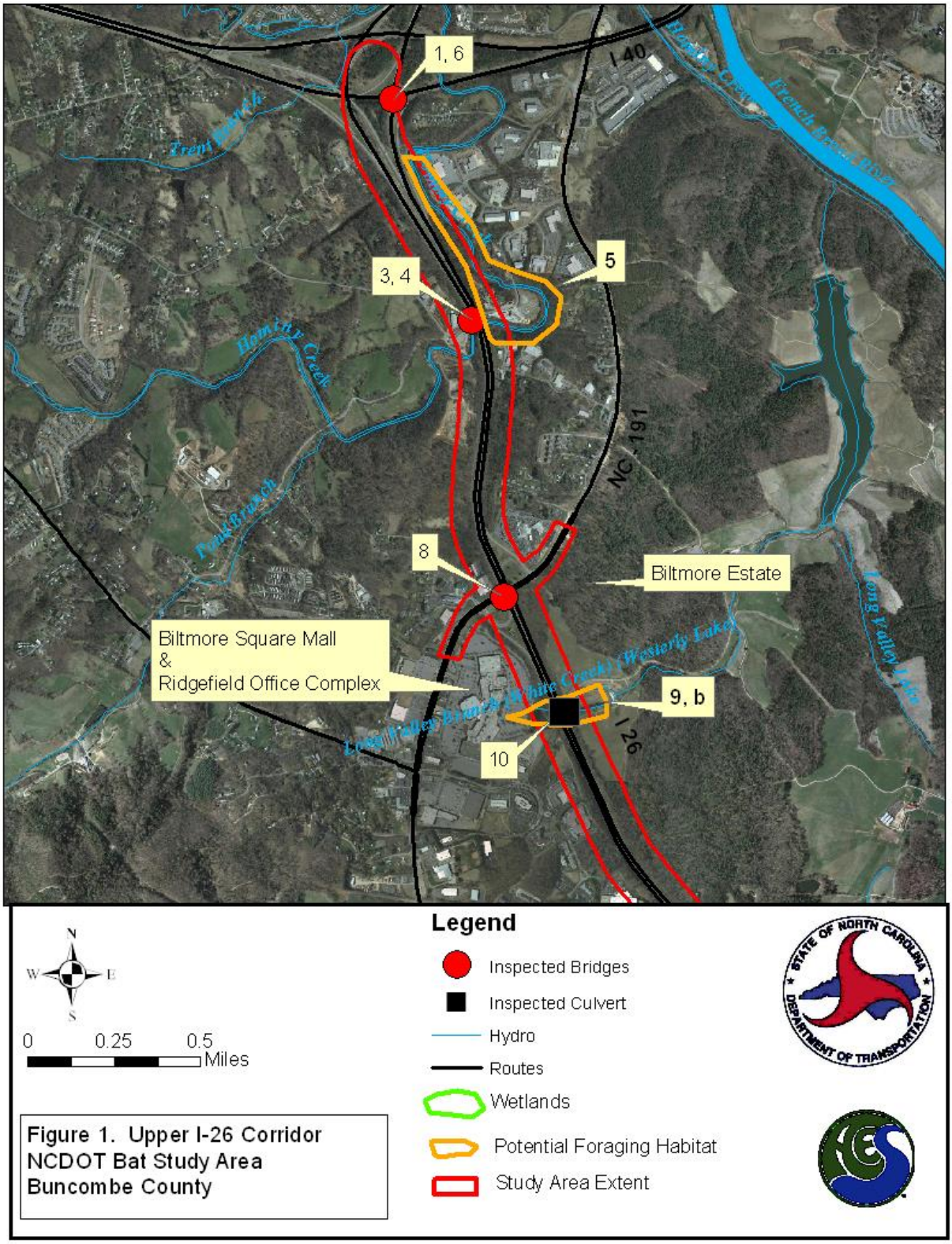

Figure 1. Upper I-26 Corridor
NCDOT Bat Study Area
Buncombe County

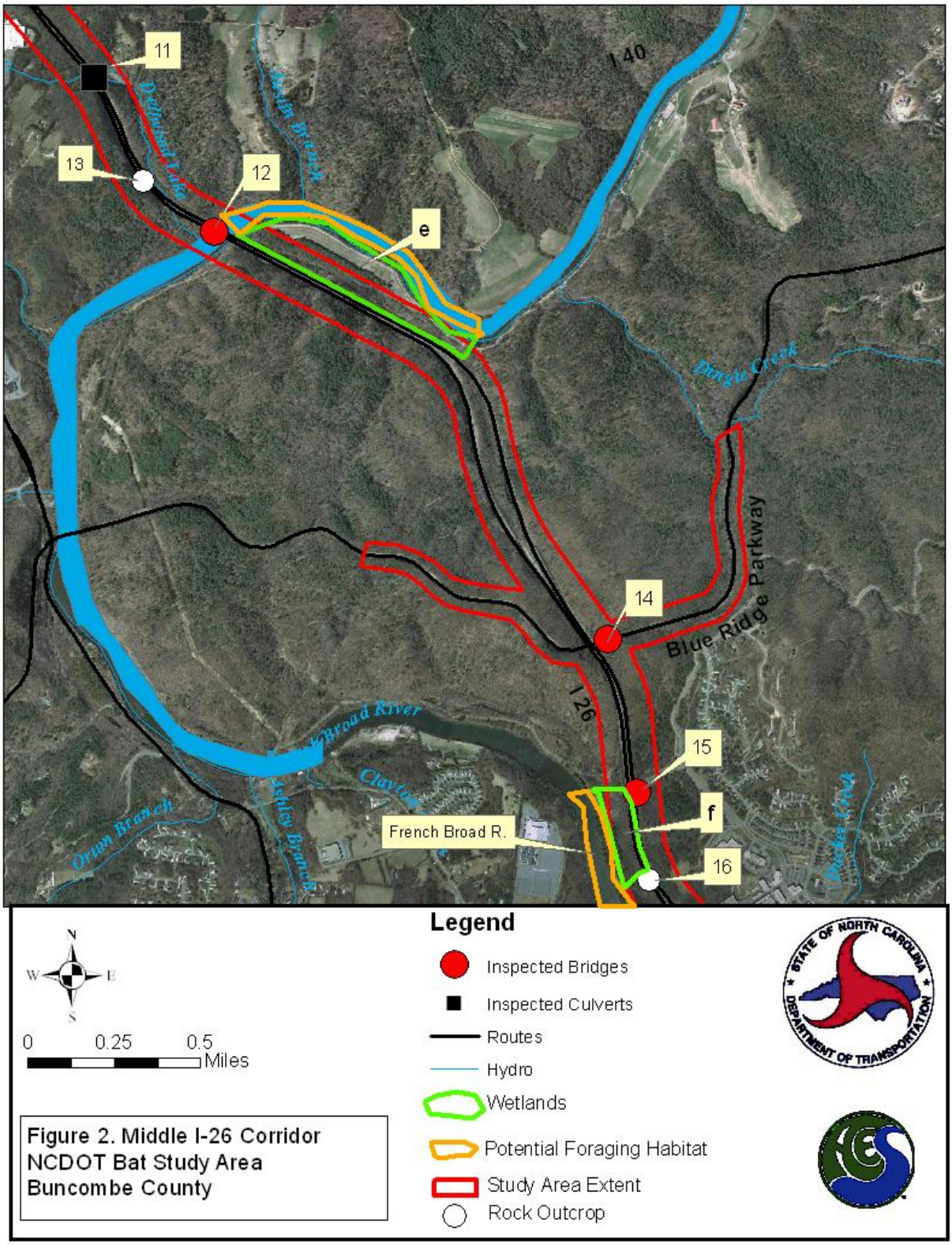

Figure 2. Middle I-26 Corridor
NCDOT Bat Study Area
Buncombe County

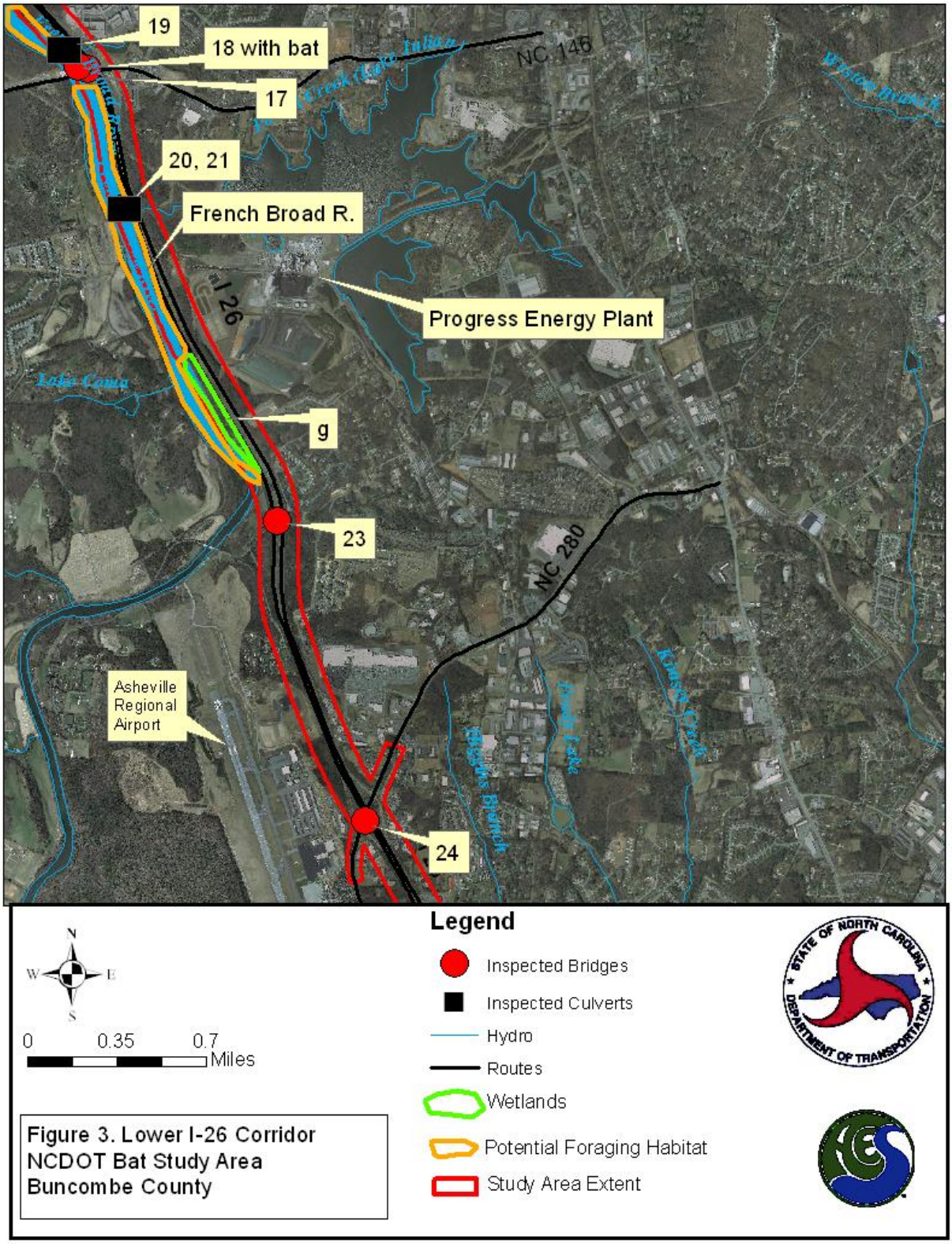

Figure 3. Lower I-26 Corridor
NCDOT Bat Study Area
Buncombe County

Within the project study area for NCDOT (TIP I-4400/I-4700), there are no known caves or abandoned subterranean mines that provide roosting habitat for gray bats. There are also no records of gray bats utilizing man-made structures (e.g. bridges or culverts) for roosting in NC (NCWRC, pers. comm.), although maternity colonies have been documented using bridges and culverts in other states (Keeley and Tuttle, 1999).

Specific objectives of the project were to find and investigate any potential roosting habitat and identify potential foraging habitat for gray bats. NCDOT provided a "Bat Habitat Assessment Form" to be completed for each potential roost as well as foraging habitat area.

Land use within the project area is dominated by the existing interstate corridor. Residential and commercial development occurs along segments of the corridor associated with road crossings, including NC 191, NC 146, and NC 280. There are several large and significant landholdings within the project area, including Biltmore Square Mall, and Ridgefield Commercial Development south of NC 191 and west of I-26, Progress Energy's Electric Utility Plant south of NC 146 and east of I-26, and the Asheville Regional Airport north of NC 280 and west of I-26. In addition, the Biltmore Estate is bisected by the I-26 corridor and includes several miles of forested land along the highway length and the only agricultural land (vineyard and small fields) within the study area. The US National Park Service's Blue Ridge Parkway crosses the project corridor approximately one mile north of NC 146. Hominy Creek, a medium sized (20-40 ft. wide) stream crosses the corridor and runs parallel to the interstate within the project area for approximately 3,000 feet. The French Broad River crosses the interstate corridor on the Biltmore Estate property and runs parallel to and within the project area for approximately 2.5 miles (Figures 1-3).

Survey Methods

We overlaid the project study area, including known bridges/box culverts, on satellite imagery in order to identify any areas of rock outcrops. We also used this approach to identify wooded areas that would need to be inspected on the ground for the presence of roosting and foraging habitat. Within the project study area we identified approximately twelve wooded miles that would require ground truthing for the presence of rock outcrops, caves, mines, culverts, or other roosting or foraging habitats. The remaining six miles were investigated from the roadside, since they were primarily open residential or commercial land that afforded quick verification of the presence of suitable habitat. In addition to walking the twelve identified miles, we also investigated end bents, rails, and deck expansion joints on each bridge and each box culvert within the project study area for potential roosting sties. Finally, habitats identified via satellite imagery as potential foraging habitat for gray bats were visited and assessed. For each rock outcrop, bridge, box culvert, and area of potential foraging habitat, we completed a NCDOT Bat Habitat Assessment Form, modified for this project to include GPS coordinates (see Appendix 2), and took pictures. Field Surveys were completed by Christopher McGrath (NCWRC Permit # 12-ES00358; USFWS Permit # TE82796A-0) and Joseph Alderman.

Results

A review of satellite imagery revealed no obvious rock outcroppings within the study area, or evidence of mines or caves. We used it to identify 12 miles within the project study area that we walked to visually search for and inspect roosting or foraging habitat. Table 1 (Appendix 1) is a compilation of the information contained in 26 separate Bat Habitat Assessment Forms completed at bridges, rock outcrops, box culverts, and potential foraging habitats for gray bats. Data forms for each site can be found in Appendix 3.

We investigated every bridge within the project area (see Table 1; Appendix 1 for details and references to photographs in Appendix 4, and Figures 1-3 for locations,). We examined crevices in each end wall, expansion joints, and bridge rails (when concrete). In addition to noting the width and depth of crevices that could potentially be used by roosting bats, we also looked for staining and the presence of guano which would indicate use by bats. Of all the bridges within the project area, we found evidence of bat use at only one bridge. Bridge # 100053 at site #18 (NC 146 over the French Broad River) had evidence of bat use (guano on south side of each end wall), and one *Myotis leibii* roosting on the southeast end wall crevice on the day we inspected it. The amount and size of guano suggest infrequent use by a few small sized bats like *Myotis leibii*. The rails of this same bridge also appeared to be suitable for bat use (the correct width and material) for potential bat use. The only other bridge which had suitable conditions for bat roosting in the rails of the bridge (a favorite roost spot of many bats) was bridge # 440240 at site #24 (NC 280 over I-26), though we found no evidence of bat use there. We did not find evidence of bat use at any other bridges, nor would we anticipate bat use, based upon evaluation of the crevices and other features of the bridges in the project area.

USFWS has requested that they be notified of the presence of any migratory bird nests. Three bridges in the project area showed evidence of use by birds (again, Figures 1-3 show locations). Bridge #100253, site #1 had an old eastern phoebe (*Sayornis phoebe*) on it. The Blue Ridge Parkway Bridge (#100205, site #14) has an active pair of northern ravens (*Corvus corax*) currently nesting on it. Bridge # 100053, site #18, in addition to being the only site with evidence of bat use, also has 18 cliff swallow (*Petrochelidon pyrrhonota*) nests on it. Cliff swallows are migrants and nest colonially and usually demonstrate nest site fidelity from year to year, so their return is likely imminent.

There were 7 concrete box culverts identified and investigated in the project (Sites 10, 11, 19, 20, and 21). Four of these were constructed for vehicle traffic under the interstate and the remainder carry streams. The box culverts range from approximately six foot square to 10' X 12'. Every one of them is very smooth with no wood or other surfaces potentially useful to roosting bats, and with very few (if any) cracks or crevices. We found no evidence (guano or staining) of use by any bats in any of the box culverts. Generally, they are too big, open, and smooth to offer sheltered roosts, perhaps have too much disturbance, or have unsuitable air flow and temperature regimes to be used by bats. The pictures below show examples.

Picture 10B. Site #10.

Picture 11B. Site #11.

Picture 19A. Site #19.

We found 2 small rock outcrops within the project area (site #13 and Site #16). Neither rock outcrop included roosting habitat for gray bats. They did not have significant overhangs or any evidence of caves associated with them. They both possessed significant fracturing of the rock faces such that some of the smaller myotid bats (e.g., *Myotis leibii* or *Myotis septentrionalis*) may potentially utilize them; however, we found no evidence of bat use at either site. Table 1 (Appendix 1) references the picture number for all photographs taken on the project, including all of the bridges, culverts, rock outcrops, and foraging habitats.

Picture 13A. Rock Outcrop at site #13.

Picture 16A. Rock Outcrop at site #16.

Gray bat foraging habitat consists of open water of larger rivers and lakes/reservoirs where adjacent shorelines are forested. We characterized the potential foraging habitat for gray bats in the project study area without regard to whether there are any gray bats in the area. In searching the project area for this habitat type, we found 5 areas of potential foraging habitat for gray bats (Figures 1-3). Hominy Creek (site #5, Figure 1) runs parallel to the interstate for approximately ½ mile. It is approximately 20-30 feet wide and partially bordered by woodlands. Its size and the amount of nearby development make it marginal foraging habitat for gray bats.

Picture 5A (upstream) and 5B (downstream) at site #5.

The next area of potential foraging habitat for gray bats is a complex of wetlands/ponds/lakes that includes the stormwater drainage pond for Biltmore Square Mall, immediately adjacent to the western side of I-26, connected by culvert to Westerly Lake of the Biltmore Estate, which is immediately adjacent to the eastern side of I-26 (site #9 and #b, Figure 1). These two ponds provide several acres of open water habitat and the drainage pond is somewhat surrounded by woodlands These waterbodies would provide marginal foraging habitat at best, because of the small area, surrounding land use (vineyard in the case of Westerly Lake) and the fact that they are bisected by I-26.

Picture 9A, site #9. Biltmore Mall drainage.

Picture bA, site b. Westerly Lake.

The remaining three potential foraging habitat sites for gray bats are similar in nature to each other in that they all are comprised of sizeable floodplain wetland complexes immediately adjacent to the French Broad River (see Figures 2 & 3, and site e, f, and g, in Table 1 in Appendix 1). In each case, the wetlands are fed by seepage from the toe of the hillslope as well as drainage from the highway, and run parallel to the river for several hundred yards. The French Broad River is good quality foraging habitat for gray bats due to its size (width, in particular), the substrate and water quality generally producing an abundance of aquatic insects, and its generally forested margins. Combining the river with these extensive wetland complexes only enhances the foraging habitat potential by adding to the insect foraging base and providing additional cover for predator avoidance while foraging over water. All three of these sites constitute good potential gray bat foraging habitat. In addition, site f is known to support bog turtles (*Glyptemys muhlenbergii*), a state Threatened species, further enhancing the ecological significance of these wetlands.

Picture eA. Site #e. Wetland adjacent to I-26 and French Broad River.

Conclusions

The project study area includes suitable foraging habitat for gray bats in at least three areas along the French Broad River, and perhaps marginal habitat in two other places. However, we found no evidence of roosting habitat for gray bats in any form (naturally occurring caves or man-made structures). While foraging habitat exists, there is no evidence that there are gray bats in the vicinity to make use of it. The 2009 Status Review for Gray Bat (USFWS) indicates that extensive study of gray bat populations has found travel distances up to 21.7 miles from roost sites to foraging areas, and that is even greater than the distances previous thought they would travel to forage (USFWS, 1982). In the case of this project, given that the closest known roost sites for gray bats occur in Tennessee (where karst geology occurs) and this project area is well over 25 miles to the closest point in Tennessee and even further from known roosts there, it is very unlikely that gray bats would be present and foraging in the project area. Therefore we conclude that TIP project I-4400/I-4700 will have no effect on gray bat populations.

References

Currie, Robert. US Fish and Wildlife Service (Retired). Personal communications.

Keeley, B. W. and M. D. Tuttle. 1999. Bats in American Bridges. Resource Publication No. 4. Bat Conservation International, Inc. Austin, TX. 41 pp.

North Carolina Natural Heritage Program. Heritage Data Search website. Accessed 5/3/2013. http:// http://portal.ncdenr.org/web/nhp/database-search.

North Carolina Wildlife Resources Commission historical files and personal experience.

US Fish and Wildlife Service. 1982. Gray Bat Recovery Plan. 143pp. http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A04J.

US Fish and Wildlife Service. 2009. Gray Bat 5 Year Review: Summary and Evaluation. Columbia Missouri Ecological Services Office. 34 pp.

Qualifications of Principal Investigator: Christopher McGrath

Education

Master of Environmental Management, Natural Resources Ecology. Duke University, Durham, North Carolina. 1991.
Bachelor of Arts. Biology, minor in Anthropology. Skidmore College, Saratoga Springs, New York. 1989.

Professional Experience

Wildlife Diversity Program Coordinator, 2005-2012. North Carolina Wildlife Resources Commission.
Mountain Region Wildlife Diversity Supervisor, 2004-2005. North Carolina Wildlife Resources Commission.
Mountain Nongame Project Leader, 1994-2004. North Carolina Wildlife Resources Commission.
Wildlife Biologist, 1992-1994. North Carolina Wildlife Resources Commission.
Contract Biologist, 1990-1992. North Carolina Wildlife Resources Commission.

Selected Professional Certifications

North Carolina Endangered Species Permit # 12-ES00358 for Bats, Northern Flying Squirrel, and Bog Turtle
US Fish and Wildlife Service Endangered Species Permit # TE82796A-0 for Bats, Northern Flying Squirrel, and Bog Turtle
Certified Wildlife Biologist ®, The Wildlife Society (since 2000)
Most recent rabies titer- 10/25/2011- 1.0 IU/ml

Experience and Qualifications

Mr. McGrath has been engaged in nongame and endangered species survey, research, monitoring, habitat management, and conservation for over 22 years. He has conducted research and surveys for a wide variety of species including freshwater fish and mussels, aquatic and terrestrial snails, mammals, birds, reptiles and amphibians. He has extensive experience with surveying and studying bats (volant and intra-hibernacula), northern flying squirrels, bog turtles, woodrats, green salamanders, peregrine falcons, songbirds, and freshwater mussels. Throughout his career with North Carolina Wildlife Resources Commission, he has been engaged on the review-end of NEPA and SEPA documentation and has extensive experience collaborating with the US Fish and Wildlife Service on Section 7 consultations and provision of technical guidance on endangered species to both the US Fish and Wildlife Service and permit applicants. Mr. McGrath has trained more than a dozen biologists in the capture, identification, and handling procedures and protocols with bats, flying squirrels, and bog turtles, as he advanced through the ranks of supervision and program coordination with the North Carolina Wildlife Resources Commission.

Appendix 1

Site Data

Table 1. Compilation of site assessment data forms.

Site #:	Date:	Road Name/SR Number:	Bridge #	Waterbody:	Lattitude:	Longitude:	Canopy Cover (% closed)				Surrounding habitat (%)		
							0-25%	26-50%	51-75%	76-100%	developed	natural	agricultural
1 (lower Bridge)	3/25/2013	I-40	100253		35.55412	82.61124	x				75	25	
1 (upper Bridge)	3/25/2013	I-40	?		35.55412	82.61124	x				75	25	
3	3/25/2013	Pond Rd	100238	Hominy Creek	35.54531	82.60479	x				75	25	
4	3/25/2013	Pond Rd	100235	Hominy Creek	35.54531	82.60479	x				75	25	
5	3/25/2013	Adjacent to I-26		Hominy Creek	35.54813	82.60484		x			50	50	
6	3/25/2013	I-40	100273		35.55441	82.60919	x				75	25	
8	3/25/2013	NC 191	100171		35.53377	82.60262	x				75	25	
9	3/25/2013			Drainage Pond	35.52907	82.60049	x				50	50	
10	3/25/2013	farm access	100226		35.52936	82.60017	x				25	25	50
b	3/25/2013	Adjacent to I-26		Westerly lake	35.52936	82.60017	x						100
11	3/26/2013	SR3482	100223		35.51964	82.59151					25	75	
12	3/26/2013		100214 & 100211	French Broad R	35.51308	82.58516	x					100	
13	3/26/2013	Adjacent to I-26			35.51522	82.58831			x			100	
e	3/26/2013	Adjacent to I-26			35.50833	82.57214							
14	3/27/2013	Blue Ridge Parkway	100205		35.49662	82.56429	x					100	
15	3/27/2013	pvt road	100157 & 100158		35.49026	82.56251	x					100	
16	3/27/2013	Adjacent to I-26			35.48584	82.56017				x		100	
17	3/27/2013	NC 146	100113 & 100114		35.48198	82.55688	x				50	50	
18	3/27/2013	NC 146	100053	French Broad R	35.48206	82.55753	x				50	50	
19	3/27/2013		Culvert	UT	35.48267	82.55848	x				75	25	
f	3/27/2013	Adjacent to I-26											
20	3/27/2013		100101	Powell Cr	35.47414	82.55402			x		50	50	
21	3/27/2013	pvt road	100094		35.47414	82.55402			x		50	50	
g	3/27/2013				35.46622	82.54941							
23	3/28/2013	SR 3495	100069 &100068		35.45675	82.54264	x				75	25	
24		NC 280	440240		35.43996	82.53581	x				100		

Table 1. continued.

Site #:	caves		abandoned mines		rock outcrops w/ protected crevices		Is there a water source nearby?				
	In project area	In vicinity	In project area	In vicinity	In project area	In vicinity	river	stream	pond	lake	swamp
1 (lower Bridge)	N	N	N	N	N	N					
1 (upper Bridge)	N	N	N	N	N	N					
3	N	N	N	N	N	N		Y			
4	N	N	N	N	N	N		Y			
5	N	N	N	N	N	N		Y			
6	N	N	N	N	N	N					
8	N	N	N	N	N	N					
9	N	N	N	N	N	N			Y		
10	N	N	N	N	N	N		Y	Y	Y	
b										Y	
11	N	N	N	N	N	N	Y	Y			
12	N	N	N	N	N	N	Y				
13					Y	N		Y			
e											
14	N	N	N	N	N	N					
15	N	N	N	N	N	N	Y				Y
16					Y	N					
17	N	N	N	N	N	N	Y				
18	N	N	N	N	N	N	Y				
19	N	N	N	N	N	N	Y	Y			
f											
20	N	N	N	N	N	N	Y	Y			
21	N	N	N	N	N	N	Y	Y			
g											
23	N	N	N	N	N	N	N				
24	N	N	N	N	N	N					

Table 1. continued.

Site #:	features:				Bridge type (Y/N)						
	stagnant	clear	pools	rapids	concrete guard rails	concrete deck	concrete support beams/girders	concrete end walls	vertical crevices 0.5-1.25 inches wide,	at least 4 inches deep and sealed at top	crevices > 12 inches deep and not sealed
1 (lower Bridge)					N	Y	Y	Y	Y	Y	N
1 (upper Bridge)					N	Y	Y	Y	Y	Y	N
3			Y	Y	1/2	Y	N	Y	Y	Y	N
4			Y	Y	1/2	Y	N	Y		N	N
5			Y	Y							
6					1/2	Y	N	Y	N	N	N
8					1/2	Y	N	Y	Y	Y	N
9											
10											
b											
11											
12			Y	Y	1/2	Y	N	Y	N	N	N
13		Y	Y								
e											
14					Y	Y	N	Y	Y	Y	N
15					Y	Y	N	Y	N	N	N
16											
17			Y	Y	Y	N	N	Y	N	N	N
18			Y	Y	Y	Y	Y	Y	Y	Y	N
19			Y	Y							
f											
20			Y	Y							
21			Y	Y							
g											
23					N	Y	N	Y	Y	Y	N
24					Y	N	N	Y	N	N	N

Table 1. continued.

Site #:	Bridge type		sun exposure			bridge alignment:	Culvert type			
	bridge/roost height at least 5 feet above ground or water	vertical concrete or wooden surfaces beneath bridge deck	minimal (hardly any summer sun for any portion of the day)	moderate (full summer sun at least 3.5 hours)	maximum (full summer sun for more than 3.5 hours)	N/S-E/W-NW/SE-NE/SW	concrete box culvert	5-10' tall inside	at least 300" long	are openings protected from high wind?
1 (lower Bridge)	Y	N			X	N/S				
1 (upper Bridge)	Y	N			X	NW/SE				
3	Y	N			X	N/S				
4	Y	N			X	N/S				
5										
6	Y	N			X	N/S				
8	Y	N			X	E/W				
9										
10							Y	Y	200'?	Y
b										
11						E/W	Y	Y, >	200'?	Y
12	Y	N			X	NW/SE				
13										
e										
14	Y	N			X	E/W				
15	Y	N			X	N/S				
16										
17	Y	N			X	N/S				
18	Y	Y			X	E/W				
19							Y	Y	Y	N
f										
20						E/W	Y	Y	Y	Y
21						E/W	Y	Y	Y	Y
g										
23	Y	N			X	N/S				
24	Y	N			X	E/W				

Table 1. continued.

Site #:	Culvert type		Human disturbance or traffic under bridge/in culvert	Migratory birds nests under bridge/culvert?	Evidence of bats using bridge/culvert ?	Possible corridors for netting:			Picture Files:
	crevices	rough surfaces or imperfections in concrete	High/Low/ Moderate	Species/Number	Y or N	None	Moderate	Excellent	
1 (lower Bridge)			Low		N	x			1D
1 (upper Bridge)			Low	E. Phoebe /1	N	x			1A,1B,1C
3			H		N	x			3A,3B,3C
4			L		N	x			4A,4B
5						x			5A,5B
6			L		N	x			6A,6B
8			L		N	x			8A,8B,8C
9									9A,9B
10	N	N	L		N				10A,10B
b									bA,bB
11	N	N	L		N		x		11A,11B,11C
12			L		N	x			12A,12B…12F
13									13A,13B,13C
e									eA
14			L	Raven, 1 pair 2 nests	N	x			14A,14B,14C,14D
15			L		N		x		15A,15B
16					N	x			16A,16B,16C
17			L		N	x			
18			L	Cliff swallows, 18 nests. Pigeons	Y	x			18A18B…18G
19	N	N	L		N				19A,19B
f									
20	Y	N	L		N		x		20A
21	N	N	L		N				21A
g									
23			H		N		x		23A,23B,23C
24			H		N	x			24A,24B

Table 1. continued.

Site #:	Additional Comments:
1 (lower Bridge)	
1 (upper Bridge)	Most crevices too wide, surrounded by steel girders, wet, or filled w/ sealant
3	
4	This pair of bridges provide poor roosting habitat. Creek is big enough for foraging habitat, particularly downstream w/wooded margin. These are already in construction.
5	Hominy Creek potential foraging habitat. Creek is about 25-30' wide, pools and riffles. Marginal foraging but no evidence of roosting habitat.
6	Crevices on N. end wall are open but wide and obstructed by steel
8	Expansion joints on south side provide access but are very wide. No crevices at end walls.
9	Drainage Pond for Biltmore Square Mall. 1-2 acres potential foraging habitat.
10	Road that connects Biltmore drainage pond to Westerly lake. Currently has water in it. Drainage supposed to go immediately adjacent in 4' metal.
b	Lake adjacent to I-26 in Biltmore estate vineyard. Across and connected to drainage pond. In combination provides small amount of potential foraging habitat.
11	2 side by side large box culverts for vehicles. Very smooth and open. No bat roosting potential. Stream immediately adjacent in metal culvert.
12	Very slight potential for bat roosts in expansion joints, but they have no good landing places. Abutments have wide/shallow crevices. River provides foraging habitat.
13	Small rock outcrop. 35'X10' high broken rock with many shallow crevices. No deep holes or extensive crevices. Could be summer roost for big brown or E. small footed, but not Gray bat.
e	Extensive wetlands at toe of slope between the highway and thin strip of ag fields immediately adjacent to the river. From this point to site 12. These wetlands & the river provide potential foraging habitat.
14	Only decent crevices are at sides of end wall with 1/2" wide and 8-10" deep crevices. Expansion joints too wide. No sign of bats though.
15	These twin bridges have no good crevices. None at endwalls, expansion joints are filled or too wide or blocked by steel girders
16	Small rock outcrop. 15 X 12' high broken rock with several 4-12" deep 1/2 inch crevices, but no large crevices or cave. Could be used as summer roost by M. Leibii or other species, but not gray bat.
17	This is one bridge recently constructed that replaces the former twin bridges. The expansion joints in the rails are open, but most are ~1" wide so not likely to be used by bats.
18	Found 1 Myotis leibii roosting in SE corner in endwall crevice with small amount of guano below the area. Also noted scattered guano on SW end. Good potential for use of this bridge by bats, but not gray bats. Swallows on outside Girders (both north and south).
19	6' box culvert with stream running through it. Very smooth concrete with no large cracks or crevices. Vines obscure Western end. Little potential for bat use.
f	Large wetland between I-26 and river. From 35.49067/82.56399 to 35.48598/82.56151. This is known bog turtle wetland. Combined with adjacent River provides decent foraging habitat for bats including Gray bats.
20	Double box culvert. Somewhat obscured by vegetation. Relatively smooth concrete. Unknown potential for bat roost.
21	Large vehicle box culvert. Smooth with no signs of bat use.
g	Wetland between I-26 and French Broad River from these coordinates to 35.46148/82.54556. In conjunction with the river, provides potential foraging habitat for gray bats.
23	Twin bridges with only shallow crevices at end walls. Expansion joints are filled. Little potential for bat roosting.
24	Metal deck. Expansion joints very wide. Endwall joints filled or shallow. Guardrails are jersey type barrier and offer potential roosts in joints, but no sign of bat use.

Appendix 2.

Modified NCDOT Bat Habitat Assessment Form

Bat Habitat Assessment Form NCDOT

Observers: TIP or project number: I-4400/I-4700

Date: Road Name/SR Number:

County: Buncombe Waterbody:

Site #: Lattitude: Longitude:

Canopy Cover (% closed) 0-25% 26-50% 51-75% 76-100%

Surrounding habitat (%) developed_____ natural_____ agricultural_____

Presence of:	In project area		In vicinity	
caves	yes	no	yes	no
abandoned mines	yes	no	yes	no
rock outcrops w/ protected crevices	yes	no	yes	no

Is there a water source nearby? yes no

type: river stream pond lake swamp

features: stagnant clear pools rapids

Bridge type

concrete guard rails	yes	no
concrete deck	yes	no
concrete support beams/girders	yes	no
concrete end walls	yes	no
vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top	yes	no
crevices > 12 inches deep and not sealed	yes	no

bridge/roost height at least 5 feet above ground or water yes no

_____ feet

vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting yes no

Bridge type, continued

sun exposure minimal (hardly any summer sun for any portion of the day)

moderate (full summer sun at least 3.5 hours)

maximum (full summer sun for more than 3.5 hours)

bridge alignment: N/S E/W NW/SE NE/SW

Culvert type

concrete box culvert	yes	no
5-10' tall inside	yes	no
at least 300" long	yes	no
are openings protected from high wind?	yes	no
crevices	yes	no
rough surfaces or imperfections in concrete	yes	no

Human disturbance or traffic under bridge/in culvert high low none

Migratory birds nests under bridge/culvert?

species_____ number_____

species_____ number_____

species_____ number_____

check bird nests with binoculars to see if any bats are roosting in them.

Evidence of bats using bridge/culvert? yes no

check large bridges with binoculars and spotlight for guano/staining

Possible corridors for netting: none/poor marginal excellent

Picture Files:

Additional Comments:

Appendix 3

Data Sheets

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA			TIP or project number:	I-4400/I-4700		
Date:	3/25			Road Name/SR Number:	Bridge 100253 Lower Br		
County:	**Buncombe**			Waterbody:			
Site #:	[redacted]		Lattitude:		Longitude:		
Canopy Cover (% close	0-25%		26-50%		51-75%		76-100%
Surrounding habitat (%)	developed_____		natural_____		agricultural_____		
Presence of:			In project area			In viciinty	
	caves		yes	no		yes	no
	abandoned mines		yes	no		yes	no
	rock outcrops w/ protected crevices		yes	no		yes	no
Is there a water source nearby?					yes		no
	type:		river	stream	pond	lake	swamp
	features:		stagnant	clear	pools	rapids	
Bridge type							
	concrete guard rails				yes		no
	concrete deck				yes		no
	concrete support beams/girders				yes		no
	concrete end walls				yes		no
	vertical crevices 0.5-1.25 inches wide,				narrow and shallow at ends		
	at least 4 inches deep and sealed at top				yes		no
	crevices > 12 inches deep and not sealed				yes		(no)
	bridge/roost height at least 5 feet above ground or water				(yes)		no
					_____	feet	
	vertical concrete or wooden surfaces beneath bridge deck						
	protected from wind and moisture for night roosting				yes		(no)
Bridge type, continued							
	sun exposu	minimal	(hardly any summer sun for any portion of the day)				
		moderate	(full summer sun at least 3.5 hours)				
		(maximum)	(full summer sun for more than 3.5 hours)				

	bridge alignment:	N/S	E/W	NW/SE	NE/SW		
Culvert type							
	concrete box culvert			yes		no	
	5-10' tall inside			yes		no	
	at least 300" long			yes		no	
	are openings protected from high wind?			yes		no	
	crevices			yes		no	
	rough surfaces or imperfections						
	in concrete			yes		no	
Human disturbance or traffic under bridge/in culvert				high	low	none	
Migratory birds nests under bridge/culvert?							
		species_____			number_____		
		species_____			number_____		
		species_____			number_____		
	check bird nests with binoculars to see if any bats are roosting in them.						
Evidence of bats using bridge/culvert?				yes		no	
	check large bridges with bionoculars and spotlight for guano/staining						
Possible corridors for netting:		none/poor		marginal		excellent	
Picture Files:							
Additional Comments:							

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA			TIP or project number:	I-4400/I-4700		Top Bridge#
Date:	3/25			Road Name/SR Number:	Bridge # 100253		
County:	Buncombe			Waterbody:	I-40		
Site #:	1	Lattitude:	35.55412	Longitude:	082.61124		waypoint #40
Canopy Cover (% close	0-25%		26-50%		51-75%		76-100%
Surrounding habitat (%)	developed 75		natural 25		agricultural		

Presence of:			In project area			In vicinty	
	caves		yes	no		yes	no
	abandoned mines		yes	no		yes	no
	rock outcrops w/ protected crevices		yes	no		yes	no
Is there a water source nearby?					yes		no
	type:		river	stream	pond	lake	swamp
	features:		stagnant	clear	pools	rapids	
Bridge type							
	concrete guard rails				yes		no
	concrete deck				yes	w/asphalt	no
	concrete support beams/girders				yes		no
	concrete end walls				yes		no
	vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top				yes	extends	no
	crevices > 12 inches deep and not sealed				yes		no
	bridge/roost height at least 5 feet above ground or water				yes		no
					_____	feet	
	vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting				yes		no
Bridge type, continued							
	sun exposu	minimal	(hardly any summer sun for any portion of the day)				
		moderate	(full summer sun at least 3.5 hours)				
		maximum ✓	(full summer sun for more than 3.5 hours)				

1

	bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type						
	concrete box culvert			yes		no
	5-10' tall inside			yes		no
	at least 300' long			yes		no
	are openings protected from high wind?			yes		no
	crevices			yes		no
	rough surfaces or imperfections					
	in concrete			yes		no
Human disturbance or traffic under bridge/in culvert				high	low	none
Migratory birds nests under bridge/culvert?						
	species E. Phoebe				number 1	
No sign of Pigeons.	species				number	
	species				number	
	check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?				yes		no
	check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:		none/poor		marginal		excellent
Picture Files: 1-4 For Both Bridges here						
Additional Comments:						

No good crevices for roosting, most are too wide, surrounded by steel girders, wet or filled w/ expanded foam

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA			TIP or project number:	I-4400/I-4700		
Date:	3/25			Road Name/SR Number:	Bridge 100232		
County:	Buncombe			Waterbody:	Pond Rd & Hominy Cr. (western)		
Site #:	3	Lattitude:	35.54531	Longitude:	82.60479	waypoint #51	
Canopy Cover (% close	0-25%		26-50%		51-75%		76-100%
Surrounding habitat (%)	developed 75		natural ≈ 25		agricultural ___		
Presence of:			In project area			In vicinty	
	caves		yes	no		yes	no
	abandoned mines		yes	no		yes	no
	rock outcrops w/ protected crevices		yes	no		yes	no
Is there a water source nearby?					yes		no
	type:		river	stream	pond	lake	swamp
	features:		stagnant	clear	pools	rapids	≈ 30-40 wide
Bridge type							
	concrete guard rails				yes ½		no
	concrete deck				yes		no
	concrete support beams/girders				yes		no
	concrete end walls				yes		no
	vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top				yes at end wall		no
	crevices > 12 inches deep and not sealed				yes		no
	bridge/roost height at least 5 feet above ground or water				yes		no
					___ feet		
	vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting				yes		no
Bridge type, continued							
	sun exposu	minimal	(hardly any summer sun for any portion of the day)				
		moderate	(full summer sun at least 3.5 hours)				
		maximum	(full summer sun for more than 3.5 hours)				

1

	bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type						
	concrete box culvert			yes		no
	5-10' tall inside			yes		no
	at least 300" long			yes		no
	are openings protected from high wind?			yes		no
	crevices			yes		no
	rough surfaces or imperfections in concrete			yes		no
Human disturbance or traffic under bridge/in culvert				high	low	none
				construction now		
Migratory birds nests under bridge/culvert?						
		species_____			number_____	
		species_____			number_____	
		species_____			number_____	
	check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?				yes		no
	check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:		none/poor		marginal		excellent
Picture Files:						
Additional Comments:						

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA		TIP or project number:	I-4400/I-4700		
Date:	3/25		Road Name/SR Number:	Bridge 100235 (Eastern)		
County:	**Buncombe**		Waterbody:	Hominy Cr at Pond Rd		
Site #:	4	Lattitude:		Longitude:		
Canopy Cover (% close	0-25%		26-50%	51-75%		76-100%
Surrounding habitat (%)	developed 25		natural 25	agricultural		

Presence of:		In project area		In vicinty	
	caves	yes no		yes	no
	abandoned mines	yes no		yes	no
	rock outcrops w/ protected crevices	yes no		yes	no
Is there a water source nearby?			yes		no
	type:	river stream	pond	lake	swamp
	features:	stagnant clear	pools	rapids	

Bridge type			
	concrete guard rails	yes (½ concrete + metal)	no
	concrete deck	yes	no
	concrete support beams/girders	yes	no
	concrete end walls	yes	no
	vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top	yes	no
	crevices > 12 inches deep and not sealed	yes	no
	bridge/roost height at least 5 feet above ground or water	yes 20 feet	no
	vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting	yes	no

Bridge type, continued		
sun exposu	minimal	(hardly any summer sun for any portion of the day)
	moderate	(full summer sun at least 3.5 hours)
	maximum	(full summer sun for more than 3.5 hours)

bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type					
concrete box culvert			yes		no
5-10' tall inside			yes		no
at least 300" long			yes		no
are openings protected from high wind?			yes		no
crevices			yes		no
rough surfaces or imperfections					
in concrete			yes		no
Human disturbance or traffic under bridge/in culvert			high	low	none
Migratory birds nests under bridge/culvert?			No		
species				number	
species				number	
species				number	
check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?			yes		no
check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:	none/poor		marginal		excellent
Picture Files: 7 to 11 are @ this pair of bridges.					
Additional Comments:					

Creek is big enough to provide foraging habitat particularly downstream with wooded margin.

Bridges do not provide any roosting habitat and are ~~[illegible]~~ already in construction zone.

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA			TIP or project number:	I-4400/I-4700			
Date:	3/25			Road Name/SR Number:	@ Hominy Creek Fringe habitat			
County:	Buncombe			Waterbody:	HominyCr			
Site #: 5	waypoint #53		Lattitude: 35.54813			Longitude: 82.60484		
Canopy Cover (% close	0-25%		26-50%			51-75%		76-100%
Surrounding habitat (%)	developed ½		natural ½			agricultural		
Presence of:			In project area			In vicinty		
	caves		yes	no		yes	no	
	abandoned mines		yes	no		yes	no	
	rock outcrops w/ protected crevices		yes	no		yes	no	
Is there a water source nearby?					yes		no	
	type:		river	stream	pond	lake	swamp	
	features:		stagnant	clear	pools	rapids		
Bridge type								
	concrete guard rails				yes		no	
	concrete deck				yes		no	
	concrete support beams/girders				yes		no	
	concrete end walls				yes		no	
	vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top				yes		no	
	crevices > 12 inches deep and not sealed				yes		no	
	bridge/roost height at least 5 feet above ground or water				yes		no	
					_____	feet		
	vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting				yes		no	
Bridge type, continued								
	sun exposu	minimal	(hardly any summer sun for any portion of the day)					
		moderate	(full summer sun at least 3.5 hours)					
		maximum	(full summer sun for more than 3.5 hours)					

	bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type						
	concrete box culvert			yes		no
	5-10' tall inside			yes		no
	at least 300" long			yes		no
	are openings protected from high wind?			yes		no
	crevices			yes		no
	rough surfaces or imperfections					
	in concrete			yes		no
Human disturbance or traffic under bridge/in culvert				high	low	none
Migratory birds nests under bridge/culvert?						
	species_____				number_____	
	species_____				number_____	
	species_____				number_____	
	check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?				yes		no
	check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:		(none/poor)		marginal		excellent
Picture Files:	1241 3 - upstream - downstream					
Additional Comments:						

Creek provides some foraging habitat. No roosting that we can find though.

Creek is about 25-30 feet at this point. some deep pools and riffles w some boulders.

Bat Habitat Assessment Form

NCDOT

Observers:	CM JM		TIP or project number:	I-4400/I-4700		
Date:	7/25		Road Name/SR Number:	I40 Bridge # 00273		
County:	Buncombe		Waterbody:	—		
Site #:	6 Wpt #54	Lattitude:	35.55441	Longitude:	82.60919	
Canopy Cover (% close	0-25%		26-50%	51-75%		76-100%
Surrounding habitat (%)	developed 75		natural 25	agricultural		

Presence of:		In project area		In vicinty	
	caves	yes	no	yes	no
	abandoned mines	yes	no	yes	no
	rock outcrops w/ protected crevices	yes	no	yes	no

Is there a water source nearby?				yes		no
	type:	river	stream	pond	lake	swamp
	features:	stagnant	clear	pools	rapids	

Bridge type				
	concrete guard rails	yes ½		no
	concrete deck	yes		no
	concrete support beams/girders	yes		no
	concrete end walls	yes		no
	vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top	yes	sealed @ End	no
	crevices > 12 inches deep and not sealed	yes		no
	bridge/roost height at least 5 feet above ground or water	yes		no
		15 feet		
	vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting	yes		no

Bridge type, continued		
sun exposu	minimal	(hardly any summer sun for any portion of the day)
	moderate	(full summer sun at least 3.5 hours)
	maximum	(full summer sun for more than 3.5 hours)

	bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type						
	concrete box culvert			yes		no
	5-10' tall inside			yes		no
	at least 300" long			yes		no
	are openings protected from high wind?			yes		no
	crevices			yes		no
	rough surfaces or imperfections in concrete			yes		no
Human disturbance or traffic under bridge/in culvert				high	low	none
Migratory birds nests under bridge/culvert?						
	species_____			number_____		
	species_____			number_____		
	species_____			number_____		
	check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?				yes		no
	check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:		none/poor		marginal		excellent
Picture Files: 14-15						
Additional Comments:						

crevices on N. end wall are open but fairly wide and blocked by steel

Bat Habitat Assessment Form

NCDOT

Observers:		TIP or project number:	I-4400/I-4700			
Date:		Road Name/SR Number:	NC 191 Bridge # 100171			
County:	Buncombe	Waterbody:				
Site #:	8 waypt 59 Lattitude:	35.53377		Longitude:	82.60262	
Canopy Cover (% close	0-25%	26-50%		51-75%		76-100%
Surrounding habitat (%)	developed 75	natural 25		agricultural		
Presence of:		In project area			In vicinty	
	caves	yes	no		yes	no
	abandoned mines	yes	no		yes	no
	rock outcrops w/ protected crevices	yes	no		yes	no
is there a water source nearby?				yes		no
	type:	river	stream	pond	lake	swamp
	features:	stagnant	clear	pools	rapids	
Bridge type						
	concrete guard rails			yes ½		no
	concrete deck			yes		no
	concrete support beams/girders			yes		no
	concrete end walls			yes		no
	vertical crevices 0.5-1.25 inches wide,			some at expansion joints, not at ends		
	at least 4 inches deep and sealed at top			yes		no
	crevices > 12 inches deep and not sealed			yes		no
	bridge/roost height at least 5 feet above ground or water			yes		no
				15 feet		
	vertical concrete or wooden surfaces beneath bridge deck					
	protected from wind and moisture for night roosting			yes		no
Bridge type, continued						
	sun exposu minimal	(hardly any summer sun for any portion of the day)				
	moderate	(full summer sun at least 3.5 hours)				
	maximum	(full summer sun for more than 3.5 hours)				

	bridge alignment:	N/S	E/W	NW/SE	NE/SW		
Culvert type							
	concrete box culvert			yes		no	
	5-10' tall inside			yes		no	
	at least 300" long			yes		no	
	are openings protected from high wind?			yes		no	
	crevices			yes		no	
	rough surfaces or imperfections						
	in concrete			yes		no	
Human disturbance or traffic under bridge/in culvert				high	low	none	
Migratory birds nests under bridge/culvert?							
	species_____				number_____		
	species_____				number_____		
	species_____				number_____		
	check bird nests with binoculars to see if any bats are roosting in them.						
Evidence of bats using bridge/culvert?				yes		no	
	check large bridges with bionoculars and spotlight for guano/staining						
Possible corridors for netting:		none/poor		marginal		excellent	
Picture Files: 18, 19, 20							
Additional Comments:							

expansion joints on S. side offer access but are about 1.25" wide.

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA		TIP or project number:	**I-4400/I-4700**		
Date:	7/25		Road Name/SR Number:			
County:	**Buncombe**		Waterbody: Drainage Pond @ Biltmore square mall			
Site #: 9	Wypt #60	Lattitude:	35.52907	Longitude: 82.60049		
Canopy Cover (% close	(0-25%)		26-50%	51-75%		76-100%
Surrounding habitat (%)	developed 50		natural 50	agricultural ______		
Presence of:			In project area		In vicinity	
	caves		yes	(no)	yes	(no)
	abandoned mines		yes	(no)	yes	(no)
	rock outcrops w/ protected crevices		yes	(no)	yes	(no)
Is there a water source nearby?				(yes)		no
	type:	river	stream	(pond)	lake	swamp
	features:	stagnant	clear	pools	rapids	
Bridge type						
	concrete guard rails			yes		no
	concrete deck			yes		no
	concrete support beams/girders			yes		no
	concrete end walls			yes		no
	vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top			yes		no
	crevices > 12 inches deep and not sealed			yes		no
	bridge/roost height at least 5 feet above ground or water			yes		no
				______	feet	
	vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting			yes		no
Bridge type, continued						
	sun exposu	minimal	(hardly any summer sun for any portion of the day)			
		moderate	(full summer sun at least 3.5 hours)			
		maximum	(full summer sun for more than 3.5 hours)			

1

	bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type						
	concrete box culvert			yes		no
	5-10' tall inside			yes		no
	at least 300" long			yes		no
	are openings protected from high wind?			yes		no
	crevices			yes		no
	rough surfaces or imperfections					
	in concrete			yes		no
Human disturbance or traffic under bridge/in culvert				high	low	none
Migratory birds nests under bridge/culvert?						
		species_____			number_____	
		species_____			number_____	
		species_____			number_____	
	check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?				yes		no
	check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:		none/poor		marginal		excellent
Picture Files: 21,22						
Additional Comments:						

Pond 2+ acres possible foraging habitat

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA			TIP or project number:	I-4400/I-4700		
Date:	3/25			Road Name/SR Number:	I-26 - Bridge # 100226		
County:	Buncombe			Waterbody:			
Site #:	10 waypoint #61	Lattitude:	35.52936	Longitude:	82.60017		
Canopy Cover (% close	0-25%		26-50%		51-75%		76-100%
Surrounding habitat (%)	developed 25		natural 25		agricultural 50		
Presence of:			In project area			In vicinty	
	caves		yes	no		yes	no
	abandoned mines		yes	no		yes	no
	rock outcrops w/ protected crevices		yes	no		yes	no
Is there a water source nearby?					yes		no
	type:		river	stream	pond	lake	swamp
	features:		stagnant	clear	pools	rapids	
Bridge type							
	concrete guard rails				yes		no
	concrete deck				yes		no
	concrete support beams/girders				yes		no
	concrete end walls				yes		no
	vertical crevices 0.5-1.25 inches wide,						
	at least 4 inches deep and sealed at top				yes		no
	crevices > 12 inches deep and not sealed				yes		no
	bridge/roost height at least 5 feet above ground or water				yes		no
					_____	feet	
	vertical concrete or wooden surfaces beneath bridge deck						
	protected from wind and moisture for night roosting				yes		no
Bridge type, continued							
	sun exposu	minimal	(hardly any summer sun for any portion of the day)				
		moderate	(full summer sun at least 3.5 hours)				
		maximum	(full summer sun for more than 3.5 hours)				

bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type					
concrete box culvert			yes		no
5-10' tall inside			yes		no
at least 300" long			yes		no maybe 200
are openings protected from high wind?			yes		no
crevices			yes		no
rough surfaces or imperfections in concrete			yes		no
Human disturbance or traffic under bridge/in culvert			high	low	none
Migratory birds nests under bridge/culvert?					
species_____				number_____	
species_____				number_____	
species_____				number_____	
check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?			yes		no
check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:	none/poor		marginal		excellent
Picture Files: 23 & 24					
Additional Comments:					

Road that connects the mall/drainage pond with Biltmore's Westerly lake. Filled w/ water now. Drainage goes adjacent in 3.5 foot corrugated metal culvert.

Pictures 38 & 39 are of Westerly Lake across the interstate from this drainage pond

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA			TIP or project number:	I-4400/I-4700		
Date:	3/26/13			Road Name/SR Number:	SR 3482. Bridge # 158203		
County:	Buncombe			Waterbody:			
Site #:	11 mypt# 63	Lattitude:	35.51964	Longitude:	82.59151		
Canopy Cover (% close	0-25%		26-50%		51-75%		76-100%
Surrounding habitat (%)	developed 25		natural 75		agricultural		
Presence of:			In project area			In vicinty	
	caves		yes	no		yes	no
	abandoned mines		yes	no		yes	no
	rock outcrops w/ protected crevices		yes	no		yes	no
Is there a water source nearby?					yes		no
	type:		river	stream	pond	lake	swamp
	features:		stagnant	clear	pools	rapids	
			Tiny stream in corrugated metal				
Bridge type							
	concrete guard rails				yes		no
	concrete deck				yes		no
	concrete support beams/girders				yes		no
	concrete end walls				yes		no
	vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top				yes		no
	crevices > 12 inches deep and not sealed				yes		no
	bridge/roost height at least 5 feet above ground or water				yes		no
					_____	feet	
	vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting				yes		no
Bridge type, continued							
	sun exposu	minimal	(hardly any summer sun for any portion of the day)				
		moderate	(full summer sun at least 3.5 hours)				
		maximum	(full summer sun for more than 3.5 hours)				

bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type					
concrete box culvert			yes		no
5-10' tall inside	~15' tall		yes		no
at least 300" long			yes		no maybe 150-200
are openings protected from high wind?			yes		no
crevices			yes		no
rough surfaces or imperfections in concrete			yes		no
Human disturbance or traffic under bridge/in culvert			high	low	none
Migratory birds nests under bridge/culvert? NO					
species_____				number_____	
species_____				number_____	
species_____				number_____	
check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?			yes		no
check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:	none/poor		marginal		excellent
Picture Files: 25,26,27					
Additional Comments:					

2 side By side large Box culverts for Vehicles.
Very smooth and open no Bad roosting potential

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA			TIP or project number:	I-4400/I-4700	Bridge #	100214 / 100211
Date:	3/20/13			Road Name/SR Number:	I-26		
County:	Buncombe			Waterbody:	French Broad		
Site #:	12 Ways 64	Lattitude:	35.51308	Longitude:	82.58516		
Canopy Cover (% close	0-25%		26-50%		51-75%		76-100%
Surrounding habitat (%)	developed_____		natural 100		agricultural_____		

Presence of:	In project area		In vicinity	
caves	yes	no	yes	no
abandoned mines	yes	no	yes	no
rock outcrops w/ protected crevices	yes	no	yes	no

Is there a water source nearby?			yes		no
type:	river	stream	pond	lake	swamp
features:	stagnant	clear	pools	rapids	

Bridge type			
concrete guard rails		yes ½	no
concrete deck		yes	no
concrete support beams/girders		yes	no
concrete end walls		yes	no
vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top		yes	no
crevices > 12 inches deep and not sealed		yes	no
bridge/roost height at least 5 feet above ground or water		yes	no
		20 feet	
vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting		yes	no

Bridge type, continued	
sun exposu minimal	(hardly any summer sun for any portion of the day)
moderate	(full summer sun at least 3.5 hours)
maximum	(full summer sun for more than 3.5 hours)

bridge alignment:	N/S	E/W	NW/SE	NE/SW		
Culvert type						
concrete box culvert			yes		no	
5-10' tall inside			yes		no	
at least 300" long			yes		no	
are openings protected from high wind?			yes		no	
crevices			yes		no	
rough surfaces or imperfections in concrete			yes		no	
Human disturbance or traffic under bridge/in culvert			high	low	none	
Migratory birds nests under bridge/culvert? No						
species_____				number_____		
species_____				number_____		
species_____				number_____		
check bird nests with binoculars to see if any bats are roosting in them.						
Evidence of bats using bridge/culvert?			yes		no	
check large bridges with bionoculars and spotlight for guano/staining						
Possible corridors for netting:	none/poor		marginal		excellent	
Picture Files: 28, 29, 30, 31, 32, 33						
Additional Comments:						

Large Bridges with slight potential for bat roosting in expansion joints only. Abutments have wide but shallow crevices and only at sides of each bridge. Expansion joints on deck look >1" wide and no good landing spots adjacent.

Low potential

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA			TIP or project number:	I-4400/I-4700		
Date:	7/26			Road Name/SR Number:			
County:	Buncombe			Waterbody:	- UT		
Site #:	13 waypoint #65		Lattitude:	35.51522	Longitude:	82.58831	
Canopy Cover (% close	0-25%			26-50%	51-75%		76-100%
Surrounding habitat (%)	developed			natural 100	agricultural		

Presence of:		In project area		In vicinity	
	caves	yes	no	yes	no
	abandoned mines	yes	no	yes	no
→	rock outcrops w/ protected crevices	yes	no	yes	no

Is there a water source nearby?				yes		no
	type:	river	stream	pond	lake	swamp
	features:	stagnant	clear	pools	rapids	

≈ 6ft wide right at base of rock

Bridge type			
	concrete guard rails	yes	no
	concrete deck	yes	no
	concrete support beams/girders	yes	no
	concrete end walls	yes	no
	vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top	yes	no
	crevices > 12 inches deep and not sealed	yes	no
	bridge/roost height at least 5 feet above ground or water	yes	no
		_____ feet	
	vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting	yes	no

Bridge type, continued		
sun exposu	minimal	(hardly any summer sun for any portion of the day)
	moderate	(full summer sun at least 3.5 hours)
	maximum	(full summer sun for more than 3.5 hours)

bridge alignment:	N/S	E/W	NW/SE	NE/SW		
Culvert type						
concrete box culvert			yes		no	
5-10' tall inside			yes		no	
at least 300" long			yes		no	
are openings protected from high wind?			yes		no	
crevices			yes		no	
rough surfaces or imperfections						
in concrete			yes		no	
Human disturbance or traffic under bridge/in culvert			high	low	none	
Migratory birds nests under bridge/culvert?						
species_____				number_____		
species_____				number_____		
species_____				number_____		
check bird nests with binoculars to see if any bats are roosting in them.						
Evidence of bats using ~~bridge/culvert~~? Rock			yes		no	
check large bridges with bionoculars and spotlight for guano/staining						
Possible corridors for netting:	none/poor		marginal		excellent	
Picture Files: 34,35,36						
Additional Comments:						

Small Rock outcrop adjacent to Toe of I 26 W slope and Stream. 35'x10'high broken rocks w many shallow crevices. No deep holes or extensive crevices. Could be used as summer roost for big brown or E. small footed, but not very likely and not for other species.

Bat Habitat Assessment Form

NCDOT

Observers:	CMJA		TIP or project number:	I-4400/I-4700		
Date:	3/27/13		Road Name/SR Number:	BRP. Bridge# 100205		
County:	Buncombe		Waterbody:			
Site #:	14 waypoint#67	Lattitude:	35.49662	Longitude:	82.56429	
Canopy Cover (% close	0-25%		26-50%	51-75%		76-100%
Surrounding habitat (%)	developed		natural 100	agricultural		

Presence of:		In project area			In vicinty	
	caves	yes	no		yes	no
	abandoned mines	yes	no		yes	no
	rock outcrops w/ protected crevices	yes	no		yes	no
Is there a water source nearby?				yes		no
	type:	river	stream	pond	lake	swamp
	features:	stagnant	clear	pools	rapids	

Bridge type				
	concrete guard rails		yes	no
	concrete deck		yes	no
	concrete support beams/girders		yes	no
	concrete end walls		yes	no
	vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top		yes	no
	crevices > 12 inches deep and not sealed		yes	no
	bridge/roost height at least 5 feet above ground or water		yes	no
			100 feet	
	vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting		yes	no

Bridge type, continued		
sun exposu	minimal	(hardly any summer sun for any portion of the day)
	moderate	(full summer sun at least 3.5 hours)
	maximum	(full summer sun for more than 3.5 hours)

bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type					
concrete box culvert			yes		no
5-10' tall inside			yes		no
at least 300" long			yes		no
are openings protected from high wind?			yes		no
crevices			yes		no
rough surfaces or imperfections in concrete			yes		no
Human disturbance or traffic under bridge/in culvert			high	low	none
Migratory birds nests under bridge/culvert?					
species Raven nests (2)			number same pair		
species			number		
species			number		
check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?			yes		no
check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:		none/poor	marginal		excellent
Picture Files: 42,43,44,45					
Additional Comments:					

Only decent crevices at sides of end walls ≥ ½" x 8-10" deep

Expansion joints too wide. No sign of bats

Bat Habitat Assessment Form

NCDOT

Observers:	CM, SH	TIP or project number:	I-4400/I-4700		
Date:	3/27/13	Road Name/SR Number:	Bridges 100571 & 100158		
County:	Buncombe	Waterbody:			
Site #:	15 waypoint #68	Lattitude:	35.49026	Longitude:	82.56251
Canopy Cover (% close	(0-25%)	26-50%	51-75%		76-100%
Surrounding habitat (%)	developed_____	natural 100	agricultural_____		

Presence of:	In project area		In vicinty	
caves	yes	(no)	yes	(no)
abandoned mines	yes	(no)	yes	(no)
rock outcrops w/ protected crevices	yes	(no)	yes	(no)

Is there a water source nearby?			(yes)		no 200yds
type:	(river)	stream	pond	lake	(swamp)
features:	stagnant	clear	pools	rapids	

Bridge type		
concrete guard rails	(yes)	no
concrete deck	(yes)	no
concrete support beams/girders	yes	(no)
concrete end walls	(yes)	no
vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top	yes	(no)
crevices > 12 inches deep and not sealed	yes	(no)
bridge/roost height at least 5 feet above ground or water	(yes)	no
	15 feet	
vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting	yes	(no)

Bridge type, continued		
sun exposu	minimal	(hardly any summer sun for any portion of the day)
	moderate	(full summer sun at least 3.5 hours)
	(maximum)	(full summer sun for more than 3.5 hours)

	bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type						
	concrete box culvert			yes		no
	5-10' tall inside			yes		no
	at least 300" long			yes		no
	are openings protected from high wind?			yes		no
	crevices			yes		no
	rough surfaces or imperfections in concrete			yes		no
Human disturbance or traffic under bridge/in culvert				high	low	none
Migratory birds nests under bridge/culvert?						
	species_____			number_____		
	species_____			number_____		
	species_____			number_____		
	check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?				yes	no	
	check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:		none/poor		marginal		excellent
Picture Files: 46, 47						
Additional Comments:						

These twin bridges have no good crevices. None at endwalls. Expansion joints are filled and either too wide or inaccessible between steel girders.

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA			TIP or project number:	I-4400/I-4700		
Date:	3/27/13			Road Name/SR Number:	–		
County:	Buncombe			Waterbody:	–		
Site #:	16 waypt # 109		Lattitude:	35.48584	Longitude:	82.56017	
Canopy Cover (% close	0-25%			26-50%	51-75%		76-100%
Surrounding habitat (%)	developed			natural 100	agricultural		
Presence of:				In project area		In vicinty	
	caves			yes no		yes	no
	abandoned mines			yes no		yes	no
→	rock outcrops w/ protected crevices			yes	no	yes	no
Is there a water source nearby?					yes		no
	type:			river	stream	pond	lake	swamp
	features:			stagnant	clear	pools	rapids	
Bridge type							
	concrete guard rails					yes		no
	concrete deck					yes		no
	concrete support beams/girders					yes		no
	concrete end walls					yes		no
	vertical crevices 0.5-1.25 inches wide,							
	at least 4 inches deep and sealed at top					yes		no
	crevices > 12 inches deep and not sealed					yes		no
	bridge/roost height at least 5 feet above ground or water					yes		no
						_____	feet	
	vertical concrete or wooden surfaces beneath bridge deck							
	protected from wind and moisture for night roosting					yes		no
Bridge type, continued								
	sun exposu	minimal		(hardly any summer sun for any portion of the day)				
		moderate		(full summer sun at least 3.5 hours)				
		maximum		(full summer sun for more than 3.5 hours)				

	bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type						
	concrete box culvert			yes		no
	5-10' tall inside			yes		no
	at least 300" long			yes		no
	are openings protected from high wind?			yes		no
	crevices			yes		no
	rough surfaces or imperfections in concrete			yes		no
Human disturbance or traffic under bridge/in culvert				high	low	none
Migratory birds nests under bridge/culvert?						
	species_____				number_____	
	species_____				number_____	
	species_____				number_____	
	check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using ~~bridge/culvert~~? Rock outcrop				yes		no
	check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:		none/poor		marginal		excellent
Picture Files: 48, 49, 50						
Additional Comments:						

Small 15'x12' rock outcrop with several 4-12" deep 1/2 inch crevices
NO caves or large crevices, Could be used as roost for leibii
or septentrionalis, but not for gray bats

Bat Habitat Assessment Form

NCDOT

Observers:	CMJA		TIP or project number:	I-4400/I-4700		
Date:	3/27/13		Road Name/SR Number:	I-26-Long Shoals R. Bridges 100117 100118		
County:	Buncombe		Waterbody:	n/a		
Site #:	17 waypt # 72	Lattitude:	35.48198	Longitude:	82.55688	
Canopy Cover (% close	0-25%		26-50%	51-75%		76-100%
Surrounding habitat (%)	developed 55		natural 50	agricultural		

Presence of:	In project area		In vicinty	
caves	yes	no	yes	no
abandoned mines	yes	no	yes	no
rock outcrops w/ protected crevices	yes	no	yes	no

Is there a water source nearby?			yes		no
type:	river	stream	pond	lake	swamp
features:	stagnant	clear	pools	rapids	

Bridge type		
concrete guard rails	yes	no
concrete deck	yes	no
concrete support beams/girders	yes	no
concrete end walls	yes	no
vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top	yes	no
crevices > 12 inches deep and not sealed	yes	no
bridge/roost height at least 5 feet above ground or water	yes	no
	15 feet	
vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting	yes	no

Bridge type, continued		
sun exposu	minimal	(hardly any summer sun for any portion of the day)
	moderate	(full summer sun at least 3.5 hours)
	maximum	(full summer sun for more than 3.5 hours)

1

bridge alignment:	(N/S)	E/W	NW/SE	NE/SW	
Culvert type					
concrete box culvert			yes		no
5-10' tall inside			yes		no
at least 300" long			yes		no
are openings protected from high wind?			yes		no
crevices			yes		no
rough surfaces or imperfections					
in concrete			yes		no
Human disturbance or traffic under bridge/in culvert			high	(low)	none
Migratory birds nests under bridge/culvert? N/a					
species_____				number_____	
species_____				number_____	
species_____				number_____	
check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?			yes	(no)	
check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:	(none/poor)		marginal		excellent
Picture Files:					
Additional Comments:					

This is one bridge recently constructed that replaces the two #ed bridges.

expansion joints in outside Rails are open, but most are at least 1" wide, so not likely used

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA			TIP or project number:	I-4400/I-4700		
Date:	3/27/13			Road Name/SR Number:	Long Shoals. Bridge # 100053		
County:	Buncombe			Waterbody:	French Broad		
Site #:	18 Sample # 73		Lattitude:	35.48206	Longitude:	82.55753	
Canopy Cover (% close	0-25%			26-50%	51-75%		76-100%
Surrounding habitat (%)	developed 50			natural 50	agricultural		
Presence of:				In project area		In vicinty	
	caves			yes no		yes	no
	abandoned mines			yes no		yes	no
	rock outcrops w/ protected crevices			yes no		yes	no
Is there a water source nearby?					yes		no
	type:		river	stream	pond	lake	swamp
	features:		stagnant	clear	pools	rapids	
Bridge type							
	concrete guard rails				yes		no
	concrete deck				yes		no
	concrete support beams/girders				yes		no
	concrete end walls				yes		no
	vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top				yes		no
	crevices > 12 inches deep and not sealed				yes		no
	bridge/roost height at least 5 feet above ground or water				yes		no
					25 feet		
	vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting				yes		no
Bridge type, continued							
	sun exposu	minimal	(hardly any summer sun for any portion of the day)				
		moderate	(full summer sun at least 3.5 hours)				
		maximum	(full summer sun for more than 3.5 hours)				

bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type					
concrete box culvert			yes		no
5-10' tall inside			yes		no
at least 300" long			yes		no
are openings protected from high wind?			yes		no
crevices			yes		no
rough surfaces or imperfections					
in concrete			yes		no
Human disturbance or traffic under bridge/in culvert			high	low	none
Migratory birds nests under bridge/culvert?					
species Pigeons			number		
species Cliff swallow			number 18 nests		
species			number		
check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?			yes		no
check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:	none/poor		marginal		excellent
Picture Files:					
Additional Comments:					

Found 1 m. leibii in SE corner in endwall/crevice small amount guano below it. small amount guano on SW endwall

good potential for other use by bats in this bridge.

- swallows on S side girder and North side too.

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA			TIP or project number:	I-4400/I-4700		
Date:	3/27/13			Road Name/SR Number:	along I-26 - US		
County:	Buncombe			Waterbody:			
Site #:	19 waypt 74		Lattitude:	35.46267	Longitude:	82.55848	
Canopy Cover (% close		0-25%		26-50%	51-75%		76-100%
Surrounding habitat (%)	developed 75			natural 25	agricultural		
Presence of:				In project area		In vicinty	
	caves			yes no		yes	no
	abandoned mines			yes no		yes	no
	rock outcrops w/ protected crevices			yes no		yes	no
Is there a water source nearby?					yes		no
	type:			river stream	pond	lake	swamp
	features:			stagnant clear	pools	rapids	
Bridge type							
	concrete guard rails				yes		no
	concrete deck				yes		no
	concrete support beams/girders				yes		no
	concrete end walls				yes		no
	vertical crevices 0.5-1.25 inches wide,						
	at least 4 inches deep and sealed at top				yes		no
	crevices > 12 inches deep and not sealed				yes		no
	bridge/roost height at least 5 feet above ground or water				yes		no
					_____	feet	
	vertical concrete or wooden surfaces beneath bridge deck						
	protected from wind and moisture for night roosting				yes		no
Bridge type, continued							
	sun exposu	minimal		(hardly any summer sun for any portion of the day)			
		moderate		(full summer sun at least 3.5 hours)			
		maximum		(full summer sun for more than 3.5 hours)			

	bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type						
	concrete box culvert			yes		no
	5-10' tall inside			yes		no
	at least 300' long			yes		no
	are openings protected from high wind?			yes		no
	crevices			yes		no
	rough surfaces or imperfections in concrete			yes		no
Human disturbance or traffic under bridge/in culvert				high	low	none
Migratory birds nests under bridge/culvert?						
	species_____				number_____	
	species_____				number_____	
	species_____				number_____	
	check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?				yes		no
	check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:		none/poor		marginal		excellent
Picture Files: 51, 52						
Additional Comments:						

* Culvert with stream in it. ≈ 6' tall - 300' long. Smooth walls with no cracks. Vines obscure western entrance.

Bat Habitat Assessment Form

NCDOT

Observers:	CM JA			TIP or project number:	I-4400/I-4700		
Date:	3/27/13			Road Name/SR Number:	Bridge # 100101		
County:	Buncombe			Waterbody:	Powell Cr.		
Site #:	JD waypoint #75		Lattitude:	35.474/14	Longitude:	82.55402	
Canopy Cover (% close	0-25%		26-50%		51-75%		76-100%
Surrounding habitat (%)	developed	50	natural	50	agricultural		
Presence of:			In project area			In viciinty	
	caves		yes	no		yes	no
	abandoned mines		yes	no		yes	no
	rock outcrops w/ protected crevices		yes	no		yes	no
Is there a water source nearby?					yes		no
	type:		river	stream	pond	lake	swamp
	features:		stagnant	clear	pools	rapids	
Bridge type							
	concrete guard rails				yes		no
	concrete deck				yes		no
	concrete support beams/girders				yes		no
	concrete end walls				yes		no
	vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top				yes		no
	crevices > 12 inches deep and not sealed				yes		no
	bridge/roost height at least 5 feet above ground or water				yes		no
					_____	feet	
	vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting				yes		no
Bridge type, continued							
	sun exposu	minimal	(hardly any summer sun for any portion of the day)				
		moderate	(full summer sun at least 3.5 hours)				
		maximum	(full summer sun for more than 3.5 hours)				

	bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type						
	concrete box culvert			yes		no
	5-10' tall inside			yes		no
	at least 300" long			yes		no
	are openings protected from high wind?			yes		no
	crevices			yes		no
	rough surfaces or imperfections					
	in concrete			yes		no
Human disturbance or traffic under bridge/in culvert				high	low	none
Migratory birds nests under bridge/culvert?						
	species_____			number_____		
	species_____			number_____		
	species_____			number_____		
	check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?				yes		no
	check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:		none/poor		marginal		excellent
Picture Files: 53						
Additional Comments:						

double box culvert. somewhat obscured by vegetation - relatively smooth concrete. Not sure if usable by bats.

Bat Habitat Assessment Form

NCDOT

Observers:	CM SA			TIP or project number:	I-4400/I-4700		
Date:	3/27/13			Road Name/SR Number:	Bridge # 100094		
County:	Buncombe			Waterbody:			
Site #:	21 same location as 20		Lattitude:		Longitude:		
Canopy Cover (% close	0-25%			26-50%	51-75%		76-100%
Surrounding habitat (%)	developed 50			natural 50	agricultural		
Presence of:				In project area		In viciinty	
	caves			yes no		yes	no
	abandoned mines			yes no		yes	no
	rock outcrops w/ protected crevices			yes no		yes	no
Is there a water source nearby?					yes		no
	type:			river stream	pond	lake	swamp
	features:			stagnant clear	pools	rapids	
Bridge type							
	concrete guard rails				yes		no
	concrete deck				yes		no
	concrete support beams/girders				yes		no
	concrete end walls				yes		no
	vertical crevices 0.5-1.25 inches wide,						
	at least 4 inches deep and sealed at top				yes		no
	crevices > 12 inches deep and not sealed				yes		no
	bridge/roost height at least 5 feet above ground or water				yes		no
					_____	feet	
	vertical concrete or wooden surfaces beneath bridge deck						
	protected from wind and moisture for night roosting				yes		no
Bridge type, continued							
	sun exposu	minimal		(hardly any summer sun for any portion of the day)			
		moderate		(full summer sun at least 3.5 hours)			
		maximum		(full summer sun for more than 3.5 hours)			

	bridge alignment:	N/S	E/W	NW/SE	NE/SW	
Culvert type						
	concrete box culvert			yes		no
	5-10' tall inside			yes		no
	at least 300" long			yes		no
	are openings protected from high wind?			yes		no
	crevices			yes		no
	rough surfaces or imperfections in concrete			yes		no
Human disturbance or traffic under bridge/in culvert				high	low	none
Migratory birds nests under bridge/culvert?						
	species_____				number_____	
	species_____				number_____	
	species_____				number_____	
	check bird nests with binoculars to see if any bats are roosting in them.					
Evidence of bats using bridge/culvert?				yes		no
	check large bridges with bionoculars and spotlight for guano/staining					
Possible corridors for netting:		none/poor		marginal		excellent
Picture Files: 54						
Additional Comments:						

large (10' high) vehicular box culvert. smooth with no sign of bat use.

Bat Habitat Assessment Form

NCDOT

Observers: CMIA
Date: 3/28/13
County: **Buncombe**
Site #: 23 waypoint #80
TIP or project number: **I-4400/I-4700**
Road Name/SR Number: Glen Bridge & Bridge 100069 & 100068
Waterbody:
Lattitude: 35.415675
Longitude: 82.54264
Canopy Cover (% close (0-25%) 26-50% 51-75% 76-100%
Surrounding habitat (%) developed 75 natural 25 agricultural

Presence of:	In project area		In vicinty	
caves	yes	no	yes	no
abandoned mines	yes	no	yes	no
rock outcrops w/ protected crevices	yes	no	yes	no

Is there a water source nearby? yes no

type:	river	stream	pond	lake	swamp
features:	stagnant	clear	pools	rapids	

Bridge type

concrete guard rails	yes	no
concrete deck	yes	no
concrete support beams/girders	yes	no
concrete end walls	yes	no
vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top	yes	no
crevices > 12 inches deep and not sealed	yes	no
bridge/roost height at least 5 feet above ground or water	yes 15 feet	no
vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting	yes	no

Bridge type, continued

sun exposu minimal	(hardly any summer sun for any portion of the day)
moderate	(full summer sun at least 3.5 hours)
(maximum)	(full summer sun for more than 3.5 hours)

bridge alignment: (N/S) E/W NW/SE NE/SW

Culvert type

concrete box culvert	yes	no
5-10' tall inside	yes	no
at least 300" long	yes	no
are openings protected from high wind?	yes	no
crevices	yes	no
rough surfaces or imperfections in concrete	yes	no

Human disturbance or traffic under bridge/in culvert (high) low none

Migratory birds nests under bridge/culvert?

species_____ number_____

species_____ number_____

species_____ number_____

check bird nests with binoculars to see if any bats are roosting in them.

Evidence of bats using bridge/culvert? yes (no)

check large bridges with bionoculars and spotlight for guano/staining

Possible corridors for netting: none/poor (marginal) excellent

Picture Files: 55,56,57

Additional Comments:

Twin Bridges, only shallow crevices at end walls. expansion Joints filled with little potential for bat roosting.

Bat Habitat Assessment Form

NCDOT

Observers: CmJA
Date: 3/28/13
County: **Buncombe**
Site #: 24 waypoint # 82
TIP or project number: **I-4400/I-4700**
Road Name/SR Number: NC280 Bridge 440240
Waterbody:
Lattitude: 35.43996
Longitude: 82.53581

Canopy Cover (% close: 0-25% (circled) | 26-50% | 51-75% | 76-100%

Surrounding habitat (%) developed 100 | natural _____ | agricultural _____

Presence of:	In project area		In vicinity	
caves	yes	no (circled)	yes	no (circled)
abandoned mines	yes	no (circled)	yes	no (circled)
rock outcrops w/ protected crevices	yes	no (circled)	yes	no (circled)

Is there a water source nearby? yes | no (circled)

type:	river	stream	pond	lake	swamp
features:	stagnant	clear	pools	rapids	

Bridge type

concrete guard rails	yes (circled)	no
concrete deck	yes	no (circled)
concrete support beams/girders	yes	no (circled)
concrete end walls	yes (circled)	no
vertical crevices 0.5-1.25 inches wide, at least 4 inches deep and sealed at top	yes	no (circled)
crevices > 12 inches deep and not sealed	yes	no (circled)
bridge/roost height at least 5 feet above ground or water	yes (circled) 15 feet	no
vertical concrete or wooden surfaces beneath bridge deck protected from wind and moisture for night roosting	yes	no (circled)

Bridge type, continued

sun exposu minimal (hardly any summer sun for any portion of the day)
moderate (full summer sun at least 3.5 hours)
maximum (circled) (full summer sun for more than 3.5 hours)

bridge alignment: N/S (E/W) NW/SE NE/SW

Culvert type

concrete box culvert	yes	no
5-10' tall inside	yes	no
at least 300' long	yes	no
are openings protected from high wind?	yes	no
crevices	yes	no
rough surfaces or imperfections in concrete	yes	no

Human disturbance or tramc under bridge/in culvert (high) low none

Migratory birds nests under bridge/culvert?

species_____ number_____

species_____ number_____

species_____ number_____

check bird nests with binoculars to see if any bats are roosting in them.

Evidence of bats using bridge/culvert? yes (no)

check large bridges with bionoculars and spotlight for guano/staining

Possible corridors for netting: (none/poor) marginal excellent

Picture Files: 58,59

Additional Comments:

metal deck- expansion joints very large(wide)

End wall expansion joints Filled or wide and shallow

Guardrail joints offer potential roosts

concrete Jersey Barrier type.

Appendix 4.
Project Photographs (other than previously shown)
Reference Table 1 (Appendix 1) for locations.

Picture 1A

Picture 1C

Picture 1B

Picture 1D

Picture 3A

Picture 4B

Picture 4A

Picture 3B

Picture 3C

Picture 6A

Picture 6B

Picture 8A

Picture 8B

Picture 8C

Picture 9B

Picture 10A

Picture 11A

Picture 11C

Picture 12A

Picture 12B

Picture 12C

Picture 12D

Picture 12E

Picture 12F

Picture 13B

Picture 13C

Picture bB

Picture 14A

Picture 14B

Picture 14C

Picture 14D

Picture 15A

Picture 15B

Picture 16B

Picture 16C

Picture 19B

Picture 20A

Picture 21A

Picture 23A

Picture 23B

Picture 23C

Picture 24A

Picture 24B

Picture 18A

Picture 18B

Picture 18E

Picture 18C

Picture 18F

Picture 18D

Picture 18G