NATURAL RESOURCES STATE TECHNICAL REPORT

Monroe Connector-Bypass
Mecklenburg and Union Counties, North Carolina

STIP R-3329 and R-2559

NORTH CAROLINA
Turnpike Authority

December 2008

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1.0 INTRODUCTION

The North Carolina Turnpike Authority (NCTA) proposes to construct a toll road facility known as the Monroe Connector-Bypass highway from US Route 74 (US 74) near Interstate 485 (I-485) in Mecklenburg County to US 74 near the town of Marshville in Union County, North Carolina (STIP R-3329 and R-2559) (Figure 1). The study area is approximately 21.1 miles in length and is approximately 7,938 acres in aerial extent. The study area is comprised of 12 preferred segments that were derived from a larger corridor made up of 36 potential segments. The following Natural Resources Technical Report (NRTR) has been prepared to assist in the preparation of an Environmental Impact Statement (EIS) for the proposed project.

2.0 METHODOLOGY AND QUALIFICATIONS

All work was conducted as per the North Carolina Department of Transportation (NCDOT) Natural Resource Technical Report/Investigation Protocols dated October 7, 2004. Field work was conducted from February 20 to April 24, 2008. A preliminary review of selected jurisdictional areas within the study area was performed by Steve Lund of the U.S. Army Corps of Engineers (USACE) and Polly Lespinasse of the North Carolina Division of Water Quality (NCDWQ) on May 28, 2008 and May 29, 2008. Additional review of the study area was performed by Polly Lespinasse on June 2, 2008. Documentation of the final jurisdictional determination will be provided to NCTA at a later date. The principal personnel contributing to this document were:

Principal Investigator:	Paul Petitgout
Education:	M.S. in Forest Resources, Clemson University
Experience:	Senior Project Manager, Environmental Services, Inc., 1993-Present
Responsibilities:	Natural resource investigations, wetland delineations, and QA/QC
Investigator:	Jeff Benton
Education:	B.A. Environmental Studies, University of North Carolina at Wilmington
Experience:	Senior Scientist, Environmental Services, Inc., 2002-Present
Responsibilities:	Natural resource investigations, wetland delineations, GPS data collection, document preparation

Additional personnel who contributed to portions of the field work and/or document preparation for this project were Vincent Condon, Jan Gay, Charles Johnston, Kevin Markham, Brandon Smith, AJ Steffen, Gail Tyner, and Edward Wagner. Appendix D lists the qualifications of these contributors.

3.0 PHYSICAL RESOURCES

The study area is located in the Southern Outer Piedmont (45b) and Carolina Slate Belt (45c) ecoregions of the Piedmont physiographic province of North Carolina. Topography in the project vicinity is generally characterized as gently rolling, well rounded hills and long low ridges with a

few feet of elevation difference between the hills and valleys. Elevations in the study area range from approximately 450 ft above mean sea level (MSL) to approximately 780 ft above MSL (Figures 2 A-D).

The study area is dominated by agricultural lands and mixed hardwood forest with urban/disturbed areas covering approximately 21 percent of the study area. Land use in the project vicinity ranges from urban to agricultural.

3.1 Soils

The Mecklenburg County and Union County Soil Surveys identify 31 soil types within the study area (Table 1).

Table 1. Soils in the study area.

Soil Series	Mapping Unit	Drainage Class	Hydric Status
Chewacla silt loam, 0-2% slopes, frequently flooded	ChA	Somewhat Poorly Drained	Hydric*
Colfax sandy loam, 0-3% slopes	CoA	Somewhat Poorly Drained	Hydric*
Helena fine sandy loam, 2-8% slopes	HeB	Moderately Well Drained	Hydric*
Secrest-Cid complex, 0-3% slopes	ScA	Moderately Well Drained	Hydric*
Appling sandy loam, 2-8% slopes	ApB	Well Drained	Nonhydric
Appling sandy loam, 8-15% slopes	ApD	Well Drained	Nonhydric
Badin channery silt loam, 2-8% slopes	BaB	Well Drained	Nonhydric
Badin channery silt loam, 8-15% slopes	BaC	Well Drained	Nonhydric
Badin channery silty clay loam, 2-8% slopes, eroded	BdB2	Well Drained	Nonhydric
Badin channery silty clay loam, 8-15% slopes, eroded	BdC2	Well Drained	Nonhydric
Badin-Urban land complex, 2-8% slopes	BuB	Well Drained	Nonhydric
Cecil gravelly sandy clay loam, 2-8% slopes, eroded	CeB2	Well Drained	Nonhydric
Cecil gravelly sandy clay loam, 8-15% slopes, eroded	CeC2	Well Drained	Nonhydric
Cecil sandy clay loam, 8-15% slopes, eroded	CeD2	Well Drained	Nonhydric
Cecil-Urban land complex, 2-8% slopes	CuB	Well Drained	Nonhydric
Cid channery silt loam, 1-15% slopes	CmB	Somewhat Poorly Drained	Nonhydric
Cid-Urban land complex, 1-15% slopes	CnB	Somewhat Poorly Drained	Nonhydric
Enon sandy loam, 2-8% slopes	EnB	Well Drained	Nonhydric

Table 1 continues.

Table 1 concluded.

Soil Series	Mapping Unit	Drainage Class	Hydric Status
Georgeville silty clay loam, 2-8% slopes, eroded	GfB2	Well Drained	Nonhydric
Goldston very channery silt loam, 4-15% slopes	GoC	Well Drained	Nonhydric
Goldston very channery silt loam, 15-45% slopes	GoE	Well Drained	Nonhydric
Goldston-Badin complex, 2-8% slopes	GsB	Excessively Drained	Nonhydric
Goldston-Badin complex, 8-15% slopes	GsC	Excessively Drained	Nonhydric
Goldston-Badin complex, 15-45% slopes	GsE	Excessively Drained	Nonhydric
Misenheimer-Cid complex, 0-3% slopes	MhA	Moderately Well Drained	Nonhydric
Tatum gravelly silt loam, 2-8% slopes	TaB	Well Drained	Nonhydric
Tatum gravelly silty clay loam, 2-8% slopes, eroded	TbB2	Well Drained	Nonhydric
Tatum gravelly silty clay loam, 8-15% slopes, eroded	TbC2	Well Drained	Nonhydric
Tatum-Urban land complex, 2-8% slopes	TuB	Well Drained	Nonhydric
Udorthents, loamy	Ud	Varies	Nonhydric
Zion gravelly loam, 2-8% slopes	ZnB	Well Drained	Nonhydric

***-** Soils which are primarily nonhydric, but which contain hydric inclusions

3.2 Water Resources

Water resources in the study area are located within the Catawba and Yadkin-Pee Dee River Basins (U.S. Geological Survey [USGS] Hydrologic Units 03050103 and 03040105). Approximately two hundred streams were identified in the study area (Table 2). The location of each water resource is shown in Figures 3 A-R. The physical characteristics of these streams are provided in Table 3.

Table 2. Water resources in the study area.

Stream Name	Map ID*	Figure Number	DWQ Index Number	Best Usage Classification
UT to Irvins Creek	S001a	3a	11-137-9-2	C
UT to Irvins Creek	S001b	3a	11-137-9-2	C
UT to Fourmile Creek	S002a	3a	11-137-9-4	C
UT to Fourmile Creek	S002b	3a	11-137-9-4	C
UT to Fourmile Creek	S003a	3b	11-137-9-4	C
UT to Fourmile Creek	S003b	3b	11-137-9-4	C
UT to Fourmile Creek	S004	3b	11-137-9-4	C

Table 2 continues.

Table 2 continued.

Stream Name	Map ID*	Figure Number	DWQ Index Number	Best Usage Classification
UT to North Fork Crooked Creek	S005a	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S005b	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S005c	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S006a	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S006b	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S007	3b	13-17-20-1	C
North Fork Crooked Creek	S008a	3b	13-17-20-1	C
North Fork Crooked Creek	S008b	3c	13-17-20-1	C
North Fork Crooked Creek	S008c	3c	13-17-20-1	C
UT to North Fork Crooked Creek	S009a	3c	13-17-20-1	C
UT to North Fork Crooked Creek	S009b	3c	13-17-20-1	C
UT to North Fork Crooked Creek	S009c	3c	13-17-20-1	C
UT to North Fork Crooked Creek	S010	3c	13-17-20-1	C
UT to North Fork Crooked Creek	S011	3c	13-17-20-1	C
UT to North Fork Crooked Creek	S012a	3c	13-17-20-1	C
UT to North Fork Crooked Creek	S012b	3c	13-17-20-1	C
UT to North Fork Crooked Creek	S013a	3c	13-17-20-1	C
UT to North Fork Crooked Creek	S013b	3c	13-17-20-1	C
UT to North Fork Crooked Creek	S013c	3c	13-17-20-1	C
UT to North Fork Crooked Creek	S013d	3c	13-17-20-1	C
UT to North Fork Crooked Creek	S014a	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S014b	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S014c	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S014d	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S014e	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S015a	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S015b	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S016a	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S016b	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S016c	3b	13-17-20-1	C
UT to North Fork Crooked Creek	S017a	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S017b	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S017c	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S017d	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S017e	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S018	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S019	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S020	3d	13-17-20-1	C

Table 2 continues.

Table 2 continued.

Stream Name	Map ID*	Figure Number	DWQ Index Number	Best Usage Classification
UT to North Fork Crooked Creek	S021a	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S021b	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S021c	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S022	3d	13-17-20-1	C
UT to South Fork Crooked Creek	S023a	3d	13-17-20-2	C
UT to South Fork Crooked Creek	S023b	3d	13-17-20-2	C
UT to South Fork Crooked Creek	S024	3d	13-17-20-2	C
UT to South Fork Crooked Creek	S025	3d	13-17-20-2	C
UT to South Fork Crooked Creek	S026	3d	13-17-20-2	C
UT to North Fork Crooked Creek	S027	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S028a	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S028b	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S028c	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S029a	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S029b	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S029c	3d	13-17-20-1	C
UT to North Fork Crooked Creek	S030a	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S030b	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S031a	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S031b	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S031c	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S032	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S033	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S034	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S035	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S036	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S037a	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S037b	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S037c	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S037d	3e	13-17-20-1	C
UT to North Fork Crooked Creek	S038a	3f	13-17-20-1	C
UT to North Fork Crooked Creek	S038b	3f	13-17-20-1	C
UT to North Fork Crooked Creek	S039a	3f	13-17-20-1	C
UT to North Fork Crooked Creek	S039b	3f	13-17-20-1	C
UT to North Fork Crooked Creek	S039c	3f	13-17-20-1	C
UT to North Fork Crooked Creek	S040	3f	13-17-20-1	C
UT to North Fork Crooked Creek	S041a	3f	13-17-20-1	C
UT to North Fork Crooked Creek	S041b	3f	13-17-20-1	C

Table 2 continues.

Table 2 continued.

Stream Name	Map ID*	Figure Number	DWQ Index Number	Best Usage Classification
UT to North Fork Crooked Creek	S042	3f	13-17-20-1	C
UT to North Fork Crooked Creek	S043	3f	13-17-20-1	C
UT to South Fork Crooked Creek	S044	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S045a	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S045b	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S046	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S047	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S048	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S049a	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S049b	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S050	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S051a	3i	13-17-20-2	C
UT to South Fork Crooked Creek	S051b	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S051c	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S052a	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S052b	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S052c	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S053	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S054	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S055	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S056a	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S056b	3g	13-17-20-2	C
UT to South Fork Crooked Creek	S056c	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S057a	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S057b	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S058a	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S058b	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S058c	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S058d	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S059	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S060	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S061	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S062a	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S062b	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S062c	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S062d	3h	13-17-20-2	C
UT to South Fork Crooked Creek	S063	3h	13-17-20-2	C
UT to East Fork Stewarts Creek	S064a	3h	13-17-36-9-2	WS III

Table 2 continues.

Table 2 continued.

Stream Name	Map ID*	Figure Number	DWQ Index Number	Best Usage Classification
UT to East Fork Stewarts Creek	S064b	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S064c	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S064d	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S064e	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S064f	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S064g	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S064h	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S064i	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S065	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S066a	3h	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S066b	3h	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S066c	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S067a	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S067b	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S068a	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S068b	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S068c	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S068d	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S069	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S070a	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S070b	3j	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S071	3j	13-17-36-9-2	WS III
UT to Stewarts Creek	S072	3i	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S073a	3i	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S073b	3i	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S073c	3i	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S074a	3j	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S074b	3j	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S074c	3j	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S075	3j	13-17-36-9-(1)	WS III
East Fork Stewarts Creek	S076	3k	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S077	3k	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S078a	3k	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S078b	3k	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S078c	3k	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S078d	3k	13-17-36-9-2	WS III
UT to East Fork Stewarts Creek	S079	3k	13-17-36-9-2	WS III
UT to Stewarts Creek	S080a	3k	13-17-36-9-(1)	WS III

Table 2 continues.

Table 2 continued.

Stream Name	Map ID*	Figure Number	DWQ Index Number	Best Usage Classification
UT to Stewarts Creek	S080b	3k	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S080c	3k	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S081a	3l	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S081b	3l	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S081c	3l	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S081d	3l	13-17-36-9-(1)	WS III
Stewarts Creek	S082	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S083a	3l	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S083b	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S084	3m	13-17-36-9-(1)	WS III
Stumplick Branch	S085	3l	13-17-36-9-4	WS III
UT to Stewarts Creek	S086	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S087	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S088a	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S088b	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S088.5	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S089a	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S089b	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S090	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S091a	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S091b	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S092a	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S092b	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S093a	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S093b	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S094	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S095a	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S095b	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S096	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S097	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S098a	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S098b	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S099	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S100	3m	13-17-36-9-(1)	WS III
UT to Stewarts Creek	S101	3m	13-17-36-9-(1)	WS III
UT to Richardson Creek	S102a	3m	13-17-36-(5)	C
UT to Richardson Creek	S102b	3m	13-17-36-(5)	C
UT to Richardson Creek	S103a	3n	13-17-36-(5)	C

Table 2 continues.

Table 2 continued.

Stream Name	Map ID*	Figure Number	DWQ Index Number	Best Usage Classification
UT to Richardson Creek	S103b	3n	13-17-36-(5)	C
UT to Richardson Creek	S103c	3n	13-17-36-(5)	C
UT to Richardson Creek	S104	3n	13-17-36-(5)	C
UT to Richardson Creek	S105	3n	13-17-36-(5)	C
UT to Richardson Creek	S106	3n	13-17-36-(5)	C
UT to Richardson Creek	S107	3n	13-17-36-(5)	C
UT to Richardson Creek	S107.5	3n	13-17-36-(5)	C
UT to Richardson Creek	S108a	3n	13-17-36-(5)	C
UT to Richardson Creek	S108b	3n	13-17-36-(5)	C
UT to Richardson Creek	S109a	3n	13-17-36-(5)	C
UT to Richardson Creek	S109b	3n	13-17-36-(5)	C
UT to Richardson Creek	S110a	3n	13-17-36-(5)	C
UT to Richardson Creek	S110b	3n	13-17-36-(5)	C
Richardson Creek	S111	3n	13-17-36-(5)	C
UT to Richardson Creek	S111.5	3n	13-17-36-(5)	C
Ray's Fork	S112	3n	13-17-36-8	C
UT to Ray's Fork	S113	3n	13-17-36-8	C
UT to Ray's Fork	S114a	3n	13-17-36-8	C
UT to Ray's Fork	S114b	3n	13-17-36-8	C
UT to Richardson Creek	S115a	3o	13-17-36-(5)	C
UT to Richardson Creek	S115b	3o	13-17-36-(5)	C
UT to Richardson Creek	S115.5	3n	13-17-36-(5)	C
UT to Richardson Creek	S116	3o	13-17-36-(5)	C
UT to Richardson Creek	S117	3o	13-17-36-(5)	C
UT to Richardson Creek	S118a	3o	13-17-36-(5)	C
UT to Richardson Creek	S118b	3o	13-17-36-(5)	C
UT to Richardson Creek	S118c	3o	13-17-36-(5)	C
UT to Richardson Creek	S119a	3o	13-17-36-(5)	C
UT to Richardson Creek	S119b	3o	13-17-36-(5)	C
UT to Richardson Creek	S120	3o	13-17-36-(5)	C
UT to Richardson Creek	S121	3o	13-17-36-(5)	C
UT to Richardson Creek	S121.5	3o	13-17-36-(5)	C
UT to Richardson Creek	S122a	3n	13-17-36-(5)	C
UT to Richardson Creek	S122b	3n	13-17-36-(5)	C
UT to Richardson Creek	S122c	3n	13-17-36-(5)	C
UT to Richardson Creek	S123	3n	13-17-36-(5)	C
UT to Richardson Creek	S124	3n	13-17-36-(5)	C
UT to Richardson Creek	S125	3n	13-17-36-(5)	C

Table 2 continues.

Table 2 continued.

Stream Name	Map ID*	Figure Number	DWQ Index Number	Best Usage Classification
UT to Richardson Creek	S126	3n	13-17-36-(5)	C
UT to Richardson Creek	S127a	3n	13-17-36-(5)	C
UT to Richardson Creek	S127b	3n	13-17-36-(5)	C
UT to Richardson Creek	S127c	3n	13-17-36-(5)	C
UT to Richardson Creek	S128a	3n	13-17-36-(5)	C
UT to Richardson Creek	S128b	3n	13-17-36-(5)	C
UT to Richardson Creek	S128.5	3n	13-17-36-(5)	C
UT to Richardson Creek	S129	3n	13-17-36-(5)	C
UT to Richardson Creek	S130a	3o	13-17-36-(5)	C
UT to Richardson Creek	S130b	3o	13-17-36-(5)	C
UT to Richardson Creek	S130c	3o	13-17-36-(5)	C
UT to Richardson Creek	S131a	3o	13-17-36-(5)	C
UT to Richardson Creek	S131b	3o	13-17-36-(5)	C
UT to Richardson Creek	S132a	3o	13-17-36-(5)	C
UT to Richardson Creek	S132b	3o	13-17-36-(5)	C
UT to Richardson Creek	S132.5	3o	13-17-36-(5)	C
UT to Richardson Creek	S133a	3n	13-17-36-(5)	C
UT to Richardson Creek	S133b	3n	13-17-36-(5)	C
UT to Richardson Creek	S134	3n	13-17-36-(5)	C
UT to Richardson Creek	S135	3n	13-17-36-(5)	C
UT to Richardson Creek	S136a	3n	13-17-36-(5)	C
UT to Richardson Creek	S136b	3n	13-17-36-(5)	C
UT to Richardson Creek	S136.5	3n	13-17-36-(5)	C
UT to Richardson Creek	S137	3o	13-17-36-(5)	C
UT to Richardson Creek	S138a	3o	13-17-36-(5)	C
UT to Richardson Creek	S138b	3o	13-17-36-(5)	C
UT to Richardson Creek	S138c	3o	13-17-36-(5)	C
UT to Richardson Creek	S138d	3o	13-17-36-(5)	C
UT to Richardson Creek	S138.5	3o	13-17-36-(5)	C
UT to Richardson Creek	S139	3o	13-17-36-(5)	C
UT to Ray's Fork	S140a	3o	13-17-36-8	C
UT to Ray's Fork	S140b	3o	13-17-36-8	C
UT to Ray's Fork	S140c	3o	13-17-36-8	C
UT to Ray's Fork	S140d	3o	13-17-36-8	C
UT to Ray's Fork	S140e	3o	13-17-36-8	C
UT to Ray's Fork	S140f	3o	13-17-36-8	C
UT to Ray's Fork	S140g	3o	13-17-36-8	C
UT to Ray's Fork	S140.5a	3o	13-17-36-8	C

Table 2 continues.

Table 2 continued.

Stream Name	Map ID*	Figure Number	DWQ Index Number	Best Usage Classification
UT to Ray's Fork	S140.5b	3o	13-17-36-8	C
UT to Ray's Fork	S141	3o	13-17-36-8	C
UT to Ray's Fork	S142	3o	13-17-36-8	C
UT to Ray's Fork	S143	3o	13-17-36-8	C
UT to Ray's Fork	S144a	3o	13-17-36-8	C
UT to Ray's Fork	S144b	3o	13-17-36-8	C
UT to Ray's Fork	S145	3o	13-17-36-8	C
UT to Meadow Branch	S146a	3o	13-17-36-11	C
UT to Meadow Branch	S146b	3o	13-17-36-11	C
UT to Meadow Branch	S146c	3o	13-17-36-11	C
UT to Meadow Branch	S146c	3o	13-17-36-11	C
UT to Meadow Branch	S147	3o	13-17-36-11	C
UT to Meadow Branch	S148	3o	13-17-36-11	C
UT to Meadow Branch	S150	3o	13-17-36-11	C
UT to Meadow Branch	S151	3o	13-17-36-11	C
Meadow Branch	S152	3p	13-17-36-11	C
UT to Meadow Branch	S153a	3p	13-17-36-11	C
UT to Meadow Branch	S153b	3p	13-17-36-11	C
UT to Meadow Branch	S154a	3p	13-17-36-11	C
UT to Meadow Branch	S154b	3p	13-17-36-11	C
UT to Meadow Branch	S154c	3p	13-17-36-11	C
UT to Meadow Branch	S155	3p	13-17-36-11	C
Spring Branch	S156a	3o	13-17-36-11-1	C
Spring Branch	S156b	3o	13-17-36-11-1	C
UT to Spring Branch	S157a	3o	13-17-36-11-1	C
UT to Spring Branch	S157b	3o	13-17-36-11-1	C
UT to Meadow Branch	S158	3p	13-17-36-11	C
UT to Meadow Branch	S159	3p	13-17-36-11	C
UT to Meadow Branch	S160a	3p	13-17-36-11	C
UT to Meadow Branch	S160b	3p	13-17-36-11	C
UT to Meadow Branch	S160c	3p	13-17-36-11	C
UT to Meadow Branch	S160d	3p	13-17-36-11	C
UT to Negro Head Creek	S161a	3q	13-17-36-15	C
UT to Negro Head Creek	S161b	3q	13-17-36-15	C
UT to Negro Head Creek	S161c	3q	13-17-36-15	C
UT to Negro Head Creek	S162	3q	13-17-36-15	C
UT to Negro Head Creek	S163	3q	13-17-36-15	C
UT to Negro Head Creek	S164a	3q	13-17-36-15	C

Table 2 continues.

Table 2 concluded.

Stream Name	Map ID*	Figure Number	DWQ Index Number	Best Usage Classification
UT to Negro Head Creek	S164b	3q	13-17-36-15	C
UT to Negro Head Creek	S164c	3q	13-17-36-15	C
UT to Negro Head Creek	S164d	3q	13-17-36-15	C
UT to Negro Head Creek	S165a	3q	13-17-36-15	C
UT to Negro Head Creek	S165b	3q	13-17-36-15	C
UT to Negro Head Creek	S166	3q	13-17-36-15	C
UT to Negro Head Creek	S167	3q	13-17-36-15	C
UT to Negro Head Creek	S168a	3q	13-17-36-15	C
UT to Negro Head Creek	S168b	3q	13-17-36-15	C
Negro Head Creek	S169a	3q	13-17-36-15	C
Negro Head Creek	S169b	3q	13-17-36-15	C
Negro Head Creek	S169c	3q	13-17-36-15	C
Negro Head Creek	S169d	3q	13-17-36-15	C
UT to Negro Head Creek	S170	3q	13-17-36-15	C
UT to Negro Head Creek	S171	3q	13-17-36-15	C
UT to Negro Head Creek	S171.5	3q	13-17-36-15	C
UT to Negro Head Creek	S172a	3q	13-17-36-15	C
UT to Negro Head Creek	S172b	3q	13-17-36-15	C
UT to Negro Head Creek	S172c	3q	13-17-36-15	C
UT to Negro Head Creek	S172d	3q	13-17-36-15	C
UT to Negro Head Creek	S173a	3q	13-17-36-15	C
UT to Negro Head Creek	S173b	3q	13-17-36-15	C
UT to Negro Head Creek	S174	3q	13-17-36-15	C
UT to Negro Head Creek	S175	3q	13-17-36-15	C
UT to Negro Head Creek	S176a	3q	13-17-36-15	C
UT to Negro Head Creek	S176b	3q	13-17-36-15	C
UT to Negro Head Creek	S177	3q	13-17-36-15	C
UT to Negro Head Creek	S178	3q	13-17-36-15	C
UT to Negro Head Creek	S179	3q	13-17-36-15	C
UT to Negro Head Creek	S180	3q	13-17-36-15	C
UT to Negro Head Creek	S181a	3r	13-17-36-15	C
UT to Negro Head Creek	S181b	3r	13-17-36-15	C
UT to Negro Head Creek	S181c	3r	13-17-36-15	C
UT to Negro Head Creek	S181d	3r	13-17-36-15	C
UT to Negro Head Creek	S182	3r	13-17-36-15	C
UT to Negro Head Creek	S183	3r	13-17-36-15	C
UT to Negro Head Creek	S184	3r	13-17-36-15	C

* Distinct segments of same stream indicated by lower case letter modifier (i.e., S001a, S001b).

Table 3a. Physical characteristics of water resources in the study area.

Map ID	Fig. No.	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Channel Substrate	Velocity	Clarity
S001a	3a	1.5	3	3	Sand, Gravel, Cobble	Moderate	Slightly Turbid
S001b	3a	1.5	3	3	Sand, Gravel, Cobble	Moderate	Slightly Turbid
S002a	3a	2	2.5	5	Silt, Sand, Gravel	Slow	Slightly Turbid
S002b	3a	2	2.5	5	Silt, Sand, Gravel	Slow	Slightly Turbid
S003a	3b	1	2	2	Sand, Gravel, Cobble	Moderate	Clear
S003b	3b	4	3	3	Sand, Gravel, Cobble	Slow	Clear
S004	3b	1	2.5	4	Sand, Gravel	Moderate	Slightly Turbid
S005a	3b	1	3	3	Sand, Gravel, Cobble	Slow	Slightly Turbid
S005b	3b	2	4	4	Sand, Gravel, Cobble	Slow	Slightly Turbid
S005c	3b	2	4	4	Sand, Gravel, Cobble	Slow	Slightly Turbid
S006a	3b	0.8	2	2	Sand, Gravel, Cobble	Moderate	Slightly Turbid
S006b	3b	1.5	3.5	3	Sand, Gravel, Cobble	Moderate	Slightly Turbid
S007	3b	1	3	3	Sand, Gravel, Cobble	Moderate	Slightly Turbid
S008a	3b	5	8	20	Silt, Sand, Cobble, Bedrock	Slow	Slightly Turbid
S008b	3c	5	8	20	Silt, Sand, Cobble, Bedrock	Slow	Slightly Turbid
S008c	3c	5	8	20	Silt, Sand, Cobble, Bedrock	Slow	Slightly Turbid
S009a	3c	2	3.5	4	Silt, Sand, Gravel	Slow	Slightly Turbid
S009b	3c	3	4	5	Silt, Sand, Gravel	Slow	Slightly Turbid
S009c	3c	3	4	5	Silt, Sand, Gravel	Slow	Slightly Turbid
S010	3c	1	2.5	4	Silt, Sand	Moderate	Slightly Turbid
S011	3c	2	3	6	Silt, Sand	Moderate	Slightly Turbid
S012a	3c	0.8	2.5	2	Silt, Sand, Gravel	Moderate	Clear
S012b	3c	0.8	2.5	2	Silt, Sand, Gravel	Moderate	Clear
S013a	3c	2.5	3.5	4	Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S013b	3c	2.5	3.5	4	Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S013c	3c	2	4	4	Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S013d	3c	2	4	4	Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S014a	3b	5	8	8	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S014b	3b	5	8	8	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S014c	3b	5	8	8	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S014d	3b	5	8	8	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S014e	3b	5	8	8	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S015a	3b	1.5	3	2	Silt, Sand, Gravel	Moderate	Slightly Turbid
S015b	3b	1.5	3	2	Silt, Sand, Gravel	Moderate	Slightly Turbid
S016a	3d	1.5	3	3	Silt, Sand	Slow	Slightly Turbid
S016b	3b	1.5	3	3	Silt, Sand	Slow	Slightly Turbid
S016c	3b	1.5	3.5	3	Silt, Sand, Gravel	Slow	Slightly Turbid
S017a	3d	5	8	6	Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S017b	3d	5	8	6	Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S017c	3d	5	8	6	Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S017d	3d	5	8	6	Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S017e	3d	5	8	6	Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S018	3d	2	2	0	Sand, Gravel	Moderate	Slightly Turbid
S019	3d	1	2	3	Sand, Gravel	Moderate	Slightly Turbid

Table 3a continues.

Table 3a continued.

Map ID	Fig. No.	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Channel Substrate	Velocity	Clarity
S020	3d	1	2.5	3	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S021a	3d	0.8	2	3	Sand, Gravel, Cobble	Moderate	Clear
S021b	3d	1	3	4	Sand, Cobble, Bedrock	Moderate	Clear
S021c	3d	1	3	4	Sand, Cobble, Bedrock	Moderate	Clear
S022	3d	1	2.5	3	Silt, Sand, Gravel	Moderate	Clear
S023a	3d	1.5	2.5	6	Sand, Gravel, Cobble	Slow	Slightly Turbid
S023b	3d	1.5	3.5	6	Sand, Gravel, Cobble	Slow	Slightly Turbid
S024	3d	1.5	5	4	Sand, Gravel, Cobble	Slow	Slightly Turbid
S025	3d	1	4	4	Sand, Gravel, Cobble	Slow	Slightly Turbid
S026	3d	1.5	3	3	Silt, Sand, Gravel	Slow	Slightly Turbid
S027	3d	1.5	2.5	3	Silt, Sand	Slow	Slightly Turbid
S028a	3d	1.5	3	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S028b	3e	1.5	3	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S028c	3e	1.5	3	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S029a	3d	0.8	2.5	2	Silt, Sand, Gravel	Slow	Clear
S029b	3d	0.8	2.5	2	Silt, Sand, Gravel	Slow	Clear
S029c	3d	1	3	3	Silt, Sand, Gravel, Cobble	Slow	Clear
S030a	3e	1.5	3	3	Silt, Sand, Gravel	Slow	Slightly Turbid
S030b	3e	1	3	3	Silt, Sand, Gravel	Slow	Slightly Turbid
S031a	3e	1.5	3	4	Silt, Sand, Gravel	Moderate	Slightly Turbid
S031b	3e	1.5	3.5	4	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S031c	3e	1.5	3.5	4	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S032	3e	0.5	3	1	Silt, Sand, Gravel	Slow	Clear
S033	3e	1	2.5	2	Silt, Sand, Gravel	Slow	Clear
S034	3e	2.5	4	7	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S035	3e	0.8	2	2	Silt, Sand, Gravel	Moderate	Clear
S036	3e	1	3	3	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S037a	3e	2	4	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S037b	3e	2	4	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S037c	3e	2	4	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S037d	3e	2	4	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S038a	3e	2	4	3	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S038b	3f	3	5	4	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S039a	3f	3	5	5	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S039b	3f	3	5	5	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S039c	3f	3	5	5	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S040	3f	3	5	5	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S041a	3f	1	3	2	Sand, Gravel	Moderate	Slightly Turbid
S041b	3f	2	4	2	Sand, Gravel	Moderate	Slightly Turbid
S042	3f	1	2.5	2	Sand, Gravel	Slow	Clear
S043	3f	0.8	2	1	Sand, Gravel	Slow	Slightly Turbid
S044	3g	0.5	2	0.2	Sand, Gravel	Slow	Clear
S045a	3g	0.5	2	0.2	Silt, Sand, Gravel	Moderate	Slightly Turbid
S045b	3g	2	4	4	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid

Table 3a continues.

Table 3a continued.

Map ID	Fig. No.	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Channel Substrate	Velocity	Clarity
S046	3g	0.8	2	0.2	Sand, Gravel	Slow	Clear
S047	3g	6	12	7	Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S048	3g	4	6	7	Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S049a	3g	1	2.5	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S049b	3g	1	2.5	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S050	3g	1	3	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S051a	3i	1.5	4	2	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S051b	3g	2	4	4	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S051c	3g	2	4	4	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S052a	3g	1	3	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S052b	3g	1	3	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S052c	3g	1	3	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S053	3g	0.8	2.5	1	Silt, Sand, Gravel	Slow	Clear
S054	3h	1	2.5	1	Silt, Sand, Gravel	Slow	Slightly Turbid
S055	3h	1.5	4	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S056a	3g	1.5	3.5	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S056b	3h	1.5	3.5	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S056c	3h	1.5	3.5	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S057a	3h	1	2.5	1	Silt, Sand, Gravel	Slow	Slightly Turbid
S057b	3h	1	2.5	1	Silt, Sand, Gravel	Slow	Slightly Turbid
S058a	3h	1	3	2	Silt, Sand, Gravel	Moderate	Slightly Turbid
S058b	3h	1	3	2	Silt, Sand, Gravel	Moderate	Slightly Turbid
S058c	3h	1.5	3.5	2	Silt, Sand, Gravel	Moderate	Slightly Turbid
S058d	3h	1.5	3.5	2	Silt, Sand, Gravel	Moderate	Slightly Turbid
S059	3h	1	3	2	Silt, Sand, Gravel	Moderate	Slightly Turbid
S060	3h	1	3	2	Silt, Sand, Gravel	Moderate	Slightly Turbid
S061	3h	2.5	4	3	Silt, Sand, Gravel	Moderate	Slightly Turbid
S062a	3h	1.5	3.5	3	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S062b	3h	1.5	3.5	3	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S062c	3h	2.5	4	4	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S062d	3h	2.5	4	4	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S063	3h	1.5	3.5	4	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S064a	3h	0.6	2	0.2	Silt, Sand, Gravel	Slow	Clear
S064b	3j	1	3	0.5	Silt, Sand, Gravel, Cobble	Slow	Clear
S064c	3j	1	3	0.5	Silt, Sand, Gravel, Cobble	Slow	Clear
S064d	3j	2	4.5	1	Silt, Sand, Gravel, Cobble	Slow	Clear
S064e	3j	2	4.5	1	Silt, Sand, Gravel, Cobble	Slow	Clear
S064f	3j	2	4.5	1	Silt, Sand, Gravel, Cobble	Slow	Clear
S064g	3j	2	4.5	1	Silt, Sand, Gravel, Cobble	Slow	Clear
S064h	3j	2	4.5	1	Silt, Sand, Gravel, Cobble	Slow	Clear
S064i	3j	2	4.5	1	Silt, Sand, Gravel, Cobble	Slow	Clear
S065	3j	1	3	0.5	Silt, Sand, Gravel, Cobble	Slow	Clear
S066a	3h	1	2.5	1	Silt, Sand, Gravel, Cobble	Slow	Clear
S066b	3j	1	2.5	1	Silt, Sand, Gravel, Cobble	Slow	Clear
S066c	3j	1	2.5	1	Silt, Sand, Gravel, Cobble	Slow	Clear

Table 3a continues.

Table 3a continued.

Map ID	Fig. No.	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Channel Substrate	Velocity	Clarity
S067a	3j	2	3	1	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S067b	3j	2	3	1	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S068a	3j	1.5	3	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S068b	3j	2	4	3	Silt, Sand, Gravel	Slow	Slightly Turbid
S068c	3j	2	4	3	Silt, Sand, Gravel	Slow	Slightly Turbid
S068d	3j	2	4	3	Silt, Sand, Gravel	Slow	Slightly Turbid
S069	3j	1	2.5	2	Silt, Sand, Gravel, Cobble	Slow	Clear
S070a	3j	1.5	3	2	Silt, Sand, Gravel, Cobble	Slow	Clear
S070b	3j	1.5	3	2	Silt, Sand, Gravel, Cobble	Slow	Clear
S071	3j	1.5	3	2	Silt, Sand, Gravel, Cobble	Slow	Clear
S072	3i	1.5	4	4	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S073a	3i	1	3	3	Silt, Sand, Gravel, Cobble	Slow	Clear
S073b	3i	1	3	3	Silt, Sand, Gravel, Cobble	Slow	Clear
S073c	3i	1.5	4	4	Silt, Sand, Gravel, Cobble	Slow	Clear
S074a	3j	1.5	3.5	3	Silt, Sand, Gravel	Moderate	Slightly Turbid
S074b	3j	1.5	3.5	3	Silt, Sand, Gravel	Moderate	Slightly Turbid
S074c	3j	2	5	5	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S075	3j	1.5	3.5	3	Silt, Sand, Gravel	Moderate	Slightly Turbid
S076	3k	5	11	20	Silt, Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S077	3k	2	4.5	6	Silt, Sand, Gravel	Moderate	Clear
S078a	3k	1.5	4	6	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S078b	3k	1.5	4	6	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S078c	3k	1.5	4	6	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S078d	3k	2.5	5	10	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S079	3k	2	3	1	Silt, Sand, Gravel	Moderate	Clear
S080a	3k	3.5	7	10	Silt, Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S080b	3k	3.5	7	10	Silt, Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S080c	3k	3.5	7	10	Silt, Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S081a	3l	3	5	5	Silt, Sand, Gravel, Cobble	Slow	Clear
S081b	3l	3	5	5	Silt, Sand, Gravel, Cobble	Slow	Clear
S081c	3l	3	5	6	Silt, Sand, Gravel, Cobble	Slow	Clear
S081d	3l	3	5	6	Silt, Sand, Gravel, Cobble	Slow	Clear
S082	3m	8	20	24	Silt, Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S083a	3m	1	3	5	Silt, Sand, Gravel, Cobble	Slow	Clear
S083b	3m	2	4.5	5	Silt, Sand, Gravel, Cobble	Slow	Clear
S084	3m	3	2.5	3	Silt, Sand, Gravel, Cobble	Slow	Clear
S085	3l	6	15	18	Silt, Sand, Cobble, Bedrock	Moderate	Clear
S086	3m	4	8	10	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S087	3m	2	3.5	3	Silt, Sand, Gravel	Moderate	Clear
S088a	3m	1.5	4	3	Silt, Sand, Gravel	Slow	Clear
S088b	3m	4	8	10	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S088.5	3m	1.5	3	2	Silt, Sand, Gravel	Slow	Clear
S089a	3m	1	2.5	2	Silt, Sand, Gravel	Moderate	Slightly Turbid
S089b	3m	1.5	4	3	Silt, Sand, Gravel	Moderate	Slightly Turbid
S090	3m	2	3	0.1	Silt, Sand, Gravel, Cobble	Moderate	Clear

Table 3a continues.

Table 3a continued.

Map ID	Fig. No.	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Channel Substrate	Velocity	Clarity
S091a	3m	1	2.5	3	Silt, Sand, Gravel	Slow	Clear
S091b	3m	1.5	4	5	Silt, Sand, Gravel	Slow	Clear
S092a	3m	1	3	3	Silt, Sand, Gravel	Slow	Clear
S092b	3m	1	3	3	Silt, Sand, Gravel	Slow	Clear
S093a	3m	1	3	3	Silt, Sand, Gravel, Cobble	Moderate	Clear
S093b	3m	2	4	4	Silt, Sand, Gravel, Cobble	Moderate	Clear
S094	3m	1.5	3.5	2	Silt, Sand, Gravel	Slow	Clear
S095a	3m	1	3	2	Silt, Sand, Gravel	Slow	Clear
S095b	3m	1	3	2	Silt, Sand, Gravel	Slow	Clear
S096	3m	1	3	2	Silt, Sand, Gravel	Slow	Clear
S097	3m	1	3	3	Silt, Sand, Gravel, Cobble	Moderate	Clear
S098a	3m	2	4	4	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S098b	3m	2	4	4	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S099	3m	2	4	4	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S100	3m	1	2.5	1	Silt, Sand, Gravel	Moderate	Clear
S101	3m	1	2.5	1	Silt, Sand, Gravel	Moderate	Clear
S102a	3m	1	3	1	Silt, Sand, Gravel	Moderate	Clear
S102b	3m	1	3	1	Silt, Sand, Gravel	Moderate	Clear
S103a	3n	2	3.5	3	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S103b	3n	2	3.5	3	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S103c	3n	2	3.5	3	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S104	3n	2	3.5	3	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S105	3n	2	3.5	3	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S106	3n	1.5	3	1	Silt, Sand, Gravel	Moderate	Clear
S107	3n	1.5	3	1	Silt, Sand, Gravel	Moderate	Clear
S107.5	3n	0.8	2	0.1	Silt, Sand, Gravel	Moderate	Clear
S108a	3n	1.5	3.5	2	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S108b	3n	1.5	4	2	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S109a	3n	1	2.5	1	Silt, Sand, Gravel	Moderate	Clear
S109b	3n	2	3.5	1	Silt, Sand, Gravel	Moderate	Clear
S110a	3n	1	2.5	1	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S110b	3n	2	3.5	4	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S111	3n	15	20	30	Silt, Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S111.5	3n	1	3	3	Silt, Sand, Gravel	Moderate	Clear
S112	3n	8	15	24	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S113	3n	0.8	2.5	1	Silt, Sand, Gravel	Slow	Clear
S114a	3n	1	3	3	Silt, Sand, Gravel	Moderate	Clear
S114b	3n	1	3	3	Silt, Sand, Gravel	Moderate	Clear
S115a	3o	1	2.5	2	Silt, Sand, Gravel	Moderate	Clear
S115b	3n	3.5	3.5	3	Silt, Sand, Gravel	Moderate	Clear
S115.5	3n	2.5	3.5	2	Silt, Sand, Gravel	Slow	Clear
S116	3o	1	2.5	2	Silt, Sand, Gravel	Moderate	Clear
S117	3o	1	2.5	2	Silt, Sand, Gravel	Moderate	Clear
S118a	3o	1	2.5	1	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S118b	3o	1.5	3.5	4	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid

Table 3a continues.

Table 3a continued.

Map ID	Fig. No.	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Channel Substrate	Velocity	Clarity
S118c	3o	1.5	3.5	4	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S119a	3o	0.8	2.5	1	Silt, Sand, Gravel	Moderate	Clear
S119b	3o	0.8	2.5	1	Silt, Sand, Gravel	Moderate	Clear
S120	3o	0.8	2	1	Silt, Sand, Gravel	Moderate	Clear
S121	3o	1	2.5	1	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S121.5	3o	0.6	2	0.5	Silt, Sand, Gravel	Moderate	Clear
S122a	3n	1	3	2	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S122b	3n	3	5	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S122c	3n	3	5	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S123	3n	1	2.5	1	Silt, Sand, Gravel	Moderate	Slightly Turbid
S124	3n	1	2.5	0.5	Silt, Sand, Gravel	Moderate	Slightly Turbid
S125	3n	1	2.5	0.5	Silt, Sand, Gravel	Moderate	Slightly Turbid
S126	3n	3	5	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S127a	3n	1	2.5	1	Silt, Sand, Gravel	Moderate	Slightly Turbid
S127b	3n	1	2.5	1	Silt, Sand, Gravel	Moderate	Slightly Turbid
S127c	3n	1	2.5	1	Silt, Sand, Gravel	Moderate	Slightly Turbid
S128a	3n	0.8	2	1	Silt, Sand, Gravel	Moderate	Slightly Turbid
S128b	3n	0.8	2	1	Silt, Sand, Gravel	Moderate	Slightly Turbid
S128.5	3n	3	5	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S129	3n	1	3	2	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S130a	3o	1.5	4	2	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S130b	3o	1.5	4	2	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S130c	3o	1.5	4	2	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S131a	3o	1	2.5	1	Silt, Sand, Gravel	Moderate	Clear
S131b	3o	1	2.5	1	Silt, Sand, Gravel	Moderate	Clear
S132a	3o	1	3	1	Silt, Sand, Gravel	Moderate	Clear
S132b	3o	1	3	1	Silt, Sand, Gravel	Moderate	Clear
S132.5	3o	0.8	2	0.5	Silt, Sand, Gravel	Moderate	Clear
S133a	3n	0.8	3	1	Silt, Sand, Gravel	Slow	Clear
S133b	3n	0.8	3	1	Silt, Sand, Gravel	Slow	Clear
S134	3n	3	6	6	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S135	3n	0.8	2	1	Silt, Sand, Gravel	Slow	Clear
S136a	3n	1	3	2	Silt, Sand, Gravel	Moderate	Clear
S136b	3n	1	3	2	Silt, Sand, Gravel	Moderate	Clear
S136.5	3n	1	2.5	2	Silt, Sand, Gravel	Moderate	Clear
S137	3o	1	2.5	1	Silt, Sand, Gravel	Moderate	Slightly Turbid
S138a	3o	1	3	2	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S138b	3o	1	3	3	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S138c	3o	1	3	3	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S138d	3o	1.5	3.5	4	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S138.5	3o	0.8	2.5	1	Silt, Sand, Gravel	Slow	Clear
S139	3o	1.5	3.5	4	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S140a	3o	1	3	2	Silt, Sand, Gravel	Slow	Clear
S140b	3o	1	3	2	Silt, Sand, Gravel	Slow	Clear

Table 3a continues.

Table 3a continued.

Map ID	Fig. No.	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Channel Substrate	Velocity	Clarity
S140c	3o	1	3	2	Silt, Sand, Gravel	Slow	Clear
S140d	3o	1	3.5	2	Silt, Sand, Gravel	Slow	Clear
S140e	3o	2	4	5	Silt, Sand, Gravel, Cobble	Slow	Clear
S140f	3o	2.5	5	6	Silt, Sand, Gravel, Cobble	Slow	Clear
S140g	3o	2.5	5	6	Silt, Sand, Gravel, Cobble	Slow	Clear
S140.5a	3o	1	2.5	1	Silt, Sand, Gravel	Slow	Clear
S140.5b	3o	1	2.5	1	Silt, Sand, Gravel	Slow	Clear
S141	3o	0.8	2	0.5	Silt, Sand, Gravel	Slow	Clear
S142	3o	1	2.5	0.5	Silt, Sand, Gravel	Moderate	Clear
S143	3o	2	4.5	6	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S144a	3o	0.5	2.5	2	Silt, Sand, Gravel	Moderate	Clear
S144b	3o	1.5	3.5	4	Silt, Sand, Gravel	Moderate	Clear
S145	3o	1	3	3	Silt, Sand, Gravel	Moderate	Clear
S146a	3o	1	3	4	Silt, Sand, Gravel	Moderate	Slightly Turbid
S146b	3o	1	3	4	Silt, Sand, Gravel	Moderate	Slightly Turbid
S146c	3o	1	3	4	Silt, Sand, Gravel	Moderate	Slightly Turbid
S146d	3o	1.5	4	5	Silt, Sand, Gravel	Moderate	Slightly Turbid
S147	3o	2	3	3	Silt, Sand, Gravel	Moderate	Slightly Turbid
S148	3o	2	3	2	Silt, Sand, Gravel	Moderate	Clear
S150	3o	0.8	2	1	Silt, Sand, Gravel	Moderate	Clear
S151	3o	1	1.5	0.5	Silt, Sand, Gravel	Moderate	Clear
S152	3p	5	10	12	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S153a	3p	2	5	7	Silt, Sand, Gravel	Moderate	Clear
S153b	3p	2	5	7	Silt, Sand, Gravel	Moderate	Clear
S154a	3p	1	2.5	3	Silt, Sand, Gravel	Slow	Slightly Turbid
S154b	3p	1	3	5	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S154c	3p	1	3	5	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S155	3p	1	2.5	3	Silt, Sand, Gravel	Moderate	Clear
S156a	3p	4	9	9	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S156b	3p	4	9	9	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S157a	3p	0.8	2.5	1	Silt, Sand, Gravel	Slow	Clear
S157b	3p	0.8	2.5	1	Silt, Sand, Gravel	Slow	Clear
S158	3p	2	5	7	Silt, Sand, Gravel	Moderate	Clear
S159	3p	1	2.5	4	Silt, Sand, Gravel	Moderate	Clear
S160a	3p	1	3	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S160b	3p	1	3	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S160c	3p	1	3	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S160d	3p	1	3	2	Silt, Sand, Gravel	Slow	Slightly Turbid
S161a	3q	1.5	3	4	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S161b	3q	1.5	3	4	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S161c	3q	2	4.5	6	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S162	3q	1.5	2	1	Silt, Sand, Gravel	Moderate	Slightly Turbid
S163	3q	1.5	2	1	Silt, Sand, Gravel	Slow	Clear
S164a	3q	0.8	2.5	1	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S164b	3q	0.8	2.5	1	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid

Table 3a continues.

Table 3a concluded.

Map ID	Fig. No.	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Channel Substrate	Velocity	Clarity
S164c	3q	1	3	3	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S164d	3q	1	3	3	Silt, Sand, Gravel, Cobble	Slow	Slightly Turbid
S165a	3q	1	2.5	2	Silt, Sand, Gravel	Moderate	Slightly Turbid
S165b	3q	1	3	2	Silt, Sand, Gravel	Moderate	Slightly Turbid
S166	3q	4	7	15	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S167	3q	1	3	4	Silt, Sand, Gravel	Moderate	Slightly Turbid
S168a	3q	0.8	1.5	0.5	Silt, Sand, Gravel	Moderate	Clear
S168b	3q	0.8	1.5	0.5	Silt, Sand, Gravel	Moderate	Clear
S169a	3q	6	12	15	Silt, Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S169b	3q	6	12	15	Silt, Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S169c	3q	6	12	15	Silt, Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S169d	3q	6	12	15	Silt, Sand, Cobble, Bedrock	Moderate	Slightly Turbid
S170	3q	0.8	2	0.5	Silt, Sand, Gravel	Moderate	Clear
S171	3q	2	6	8	Silt, Sand, Gravel	Moderate	Clear
S171.5	3q	0.6	1.5	0.2	Silt, Sand, Gravel	Moderate	Slightly Turbid
S172a	3q	1	3	3	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S172b	3q	1	3	3	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S172c	3q	1	3	3	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S172d	3q	2	4	5	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S173a	3q	0.5	2.5	0.5	Silt, Sand, Gravel	Moderate	Slightly Turbid
S173b	3q	0.5	2.5	0.5	Silt, Sand, Gravel	Moderate	Slightly Turbid
S174	3q	0.5	2	1	Silt, Sand, Gravel	Moderate	Clear
S175	3q	0.5	2	1	Silt, Sand, Gravel	Moderate	Clear
S176a	3q	1	3	3	Silt, Sand, Gravel	Slow	Slightly Turbid
S176b	3q	1	3	3	Silt, Sand, Gravel	Slow	Slightly Turbid
S177	3q	0.8	2.5	0.5	Silt, Sand, Gravel	Slow	Slightly Turbid
S178	3q	1	3	0.5	Silt, Sand, Gravel	Slow	Clear
S179	3q	1	3	0.5	Silt, Sand, Gravel	Slow	Clear
S180	3r	0.6	2.5	0.3	Silt, Sand	Slow	Clear
S181a	3r	3	5	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S181b	3r	3	5	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S181c	3r	3	5	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S181d	3r	3	5	6	Silt, Sand, Gravel, Cobble	Moderate	Slightly Turbid
S182	3r	1	2.5	2	Silt, Sand, Gravel	Slow	Clear
S183	3r	1	2.5	2	Silt, Sand, Gravel	Slow	Clear
S184	3r	1	2.5	4	Silt, Sand, Gravel	Slow	Clear

Approximately 70 ponds are located within the study area (Table 3b). Thirty-seven of these ponds consist of impounded stream systems with surface connections to other jurisdictional features. Approximately 29 ponds within the study area are isolated with no jurisdictional connection.

Table 3b. Ponds in the study area

Map ID	Figure Number	Connected to Surface Water*	Area (ac)
P001	3a	No	0.12
P002	3b	S004	0.90
P003	3c	No	0.44
P004	3d	S027	0.30
P005	3e	No	0.14
P006	3e	S033	0.59
P007	3e	S037	0.25
P008	3e	S037	0.16
P009	3e	No	0.07
P010	3e	No	0.07
P011	3f	No	0.08
P012	3f	No	0.21
P013	3f	No	0.26
P014	3g	W033b	0.08
P015	3h	No	0.13
P016	3h	No	0.13
P017	3g	S052c	0.08
P018	3g	S047	1.18
P019	3g	S051c	0.41
P020	3i	S051a	0.25
P021	3g	No	0.10
P022	3i	W053	0.50
P023	3i	W052	0.66
P024	3h	No	2.98
P025	3h	No	0.22
P026	3h	S058d	0.55
P027	3h	S058b	0.67
P028	3h	W046	0.16
P029	3j	S066b	0.05
P030	3j	S064b	0.78
P031	3j	W068a	5.25
P032	3i	W067	0.18
P033	3i	No	0.13
P034	3j	W069a	1.55
P035	3j	No	2.00

Map ID Number	Figure Number	Connected to Surface Water*	Area (ac)
P036	3j	W070a	0.22
P037	3j	No	0.45
P038	3j	W074	0.85
P039	3j	No	0.17
P040	3l	S081c	1.06
P041	3l	W087	0.20
P042a	3l	W86	0.70
P042b	3l	W86	0.06
P043	3m	W099	2.06
P044	3m	No	1.16
P045	3m	S091a	0.92
P046	3m	S098	1.02
P047	3m	No	0.88
P048	3m	No	0.64
P049	3m	No	0.90
P050	3n	S105	1.38
P051	3n	W107	0.21
P052	3n	No	1.11
P053	3n	No	0.02
P054	3o	No	0.36
P055	3o	W148	0.12
P056	3o	W148	0.29
P057	3o	S146a	1.04
P058	3o	S146c	0.63
P059	3o	No	0.98
P060a	3o	S157a	0.29
P060b	3o	S157a	0.56
P061	3p	No	0.97
P062	3p	No	0.44
P063a	3q	No	0.26
P063b	3q	No	1.21
P064	3q	S166	3.22
P065	3q	No	0.09
P066	3q	S171	0.05

* - Map ID from Table 2 and Table 6 shown for connectivity to surface water feature (stream or wetland), if present

There are no waters designated North Carolina Wildlife Resources Commission (NCWRC) trout waters, anadromous fish waters, or primary nursery areas present in the study area. Three stream segments within the study area have been listed as impaired waters according to the 2006 final 303(d) list. North Fork Crooked Creek (S008) from its source to Crooked Creek is listed for impaired biological integrity and a standard violation of turbidity. South Fork Crooked Creek (S047) from SR 1515 to Crooked Creek is listed for impaired biological integrity. Richardson Creek (S111) from Monroe Water Supply Dam (Lake Lee) to the mouth of Negro Head Creek is

listed for impaired biological integrity. There are no Outstanding Resource Waters (ORW), High Quality Waters (HQW), or Water Supply (WS-I or WS-II) Waters within 1.0 mile downstream of the study area.

No benthic or fish monitoring data have been collected within 1.0 mile upstream or downstream of the study area.

4.0 BIOTIC RESOURCES

4.1 Terrestrial Communities

Seven terrestrial communities were identified in the study area: Urban/Disturbed, Mesic Mixed Hardwood Forest (Piedmont Subtype), Basic Mesic Forest (Piedmont Subtype), Pine Forest, Piedmont/Low Mountain Alluvial Forest, Agriculturally Maintained, and Successional. Three of the terrestrial communities identified within the study area are listed in Schafale and Weakeley's Classification of the Natural Communities of North Carolina, including Mesic Mixed Hardwood Forest (Piedmont Subtype), Basic Mesic Forest (Piedmont Subtype), and Piedmont/Low Mountain Alluvial Forest. Figures 4 A-R shows the location and extent of these terrestrial communities in the study area. A brief description of each community type follows. Scientific names of all species identified are included in Appendix B.

4.1.1 Urban/Disturbed

Urban/Disturbed areas occupy a large percentage of land within the study area, especially along the existing roads. This category includes areas with disturbed vegetation and/or soils with man-made structures including buildings, roadways, parking lots, maintained yards, and similar areas where other human activities dominate. Wide maintained roadside rights-of-way, powerline corridors, maintained road frontages, private home sites, residential communities, and commercial complexes are included in this category. Ornamental trees, shrubs, and grasses intermix with native pines, hardwoods, and occasionally invasive weeds in an anthropogenic landscape setting. Urban/disturbed areas may include red maple, willow oak, crate myrtle, dog-fennel, Japanese honeysuckle, common dandelion, goldenrod, blackberry, and fescue.

4.1.2 Mesic Mixed Hardwood Forest (Piedmont Subtype)

The Mesic Mixed Hardwood Forest community is found within the study area along lower slopes, ravines, and occasionally well-drained small stream bottoms, on acidic soils. The community is dominated by white oak, red oak, tulip poplar, red maple, and eastern red cedar, with an occasional American beech. Pines, mostly loblolly, may be present, but represent less than 20 percent of the canopy coverage. The understory varies in density and includes saplings of the canopy species, flowering dogwood, American holly, and deerberry, with an occasional winged elm. Groundcover consists of vines such as Japanese honeysuckle, greenbrier, poison ivy, with other herbaceous species such as Christmas fern, violet, bedstraw, and panic grass.

4.1.3 Basic Mesic Forest (Piedmont Subtype)

The Basic Mesic Forest community is found within the study area along lower slopes, ravines, and occasionally well-drained small stream bottoms, on basic soils. These areas are usually associated with plants occurring on neutral to basic soils (Chewacla, Secrest-Cid, and Zion) and plants more characteristic of bottomlands. The community is dominated by tulip poplar, American beech, red maple, sweetgum, and red oak. The understory varies in density and includes saplings of the canopy species, flowering dogwood, ironwood, and slippery elm. Groundcover consists of vines such as Japanese honeysuckle, greenbrier, and poison ivy, with other herbaceous species such as Christmas fern, common ladyfern, wild ginger, and violet. On some slopes along natural drainage areas, these communities may include seepage areas which support various sedges, cinnamon fern, and rushes.

4.1.4 Pine Forest

The Pine Forest community is found within the study area along interstream uplands and is characterized by predominance (greater than 80 percent cover) of pines in the canopy. Many pine stands are silvicultural plantings managed for timber or pulpwood production. Other pine stands represent natural pine woodland communities or seral stages resulting from old-field succession or from timber management. In addition to a dominance of loblolly pine, common hardwood species present may include sweetgum, red maple, and tulip poplar. The understory varies in density depending on the age of the stand and includes saplings of the canopy species, flowering dogwood, and eastern red cedar. Vines such as Japanese honeysuckle and greenbrier are also common, and blackberry may also be present.

4.1.5 Piedmont/Low Mountain Alluvial Forest

The Piedmont/Low Mountain Alluvial Forest community is found within the study area along stream channels and floodplains in which separate fluvial landforms and associated vegetation zones are too small to distinguish. These areas are usually associated with small stream floodplains and/or floodplains in areas of deeply cut intermittent streams, which have poor development of the depositional fluvial landforms which determine vegetation. The community is dominated by river birch, American sycamore, tulip poplar, red maple, and sweetgum, with an occasional winged elm. The understory varies in density and includes saplings of the canopy species, box elder, American holly, ironwood, Chinese privet, and silky dogwood, with an occasional pawpaw. Groundcover consists of vines such as Virginia creeper, greenbrier, poison ivy, and herbs such as various sedges, cinnamon fern, and rush. Giant cane may also be present.

4.1.6 Agriculturally Maintained

Agricultural Maintained land is used for the cultivation of row crops and field crops as well as for grazing pasture. The primary use noted for the areas identified within the study area was pasture

which was dominated by grass and herb mixes such as fescue, wild onion, clover, common dandelion, and goldenrod.

4.1.7 Successional

The Successional land within the study area includes early successional and fallow agricultural areas that are dominated by a mixture of ornamental and successional species. Areas that are in an early successional state include dog-fennel, broomsedge, Japanese honeysuckle, poison ivy, common dandelion, goldenrod, blackberry, wild onion, and fescue.

4.1.8 Terrestrial Community Impacts

Terrestrial communities within the study area may be impacted by project construction as a result of grading and paving portions of the study area. At this point, decisions regarding the final location and design of the proposed toll road facility have not been made. Therefore, community data are presented in the context of total coverage for each community type within the study area (Table 4). Once final alignment and preliminary design have been determined, probable impacts to each community type will be calculated.

Table 4. Coverage of terrestrial communities in the study area.

Community	**Coverage (ac)** *
Urban/Disturbed	1,694.6
Mesic Mixed Hardwood Forest (Piedmont Subtype)	2,395.6
Basic Mesic Forest (Piedmont Subtype)	128.3
Pine Forest	30.7
Piedmont/Low Mountain Alluvial Forest	162.7
Agriculturally Maintained	2,950.2
Successional	340.5
Total:	7,698.6

* - Study area includes open water area (68.5 ac) and impervious surfaces (roads) (170.9 ac) not included in this terrestrial community assessment.

4.2 Terrestrial Wildlife

Terrestrial communities in the study area are comprised of both natural and disturbed habitats that may support a diversity of wildlife species (those species actually observed are indicated with *). Mammal species that commonly exploit forested habitats and stream corridors found within the study area include species such as gray squirrel*, Virginia opossum*, eastern cottontail*, raccoon, beaver*, gray fox, and white-tailed deer*. Birds commonly found in agricultural and other maintained or disturbed areas within the study area include turkey vulture*, mourning dove, Canada goose*, American robin*, European starling, chipping sparrow*, brown-headed cowbird, and American crow*. Birds that typically inhabit forested areas found within the study area include many of these species as well as wild turkey*, red-headed woodpecker*, red-bellied woodpecker, red-shouldered hawk*, red-tailed hawk*, Carolina wren*, gray catbird*, and orchard oriole. Species that may generally be observed in or near aquatic habitats within the study area

include mallard*, wood duck*, great blue heron*, and prothonotary warbler. Reptile and amphibian species that may use terrestrial communities located in the study area include eastern box turtle*, Carolina anole, black racer*, copperhead*, five-lined skink, rat snake, eastern garter snake, American toad*, common gray treefrog, red salamander, marbled salamander, and spring peeper.

4.3 Aquatic Communities

Aquatic communities in the study area include both intermittent and perennial Piedmont streams, as well as still water ponds. Perennial streams in the study area could support golden shiner, bluegill, eastern mosquitofish, spottail shiner, sandbar shiner, swallowtail shiner, white sucker, creek chubsucker, greenfin shiner, whitefin shiner, bluehead chub, and tessellated darter. The larger streams within the study area would be expected to support populations of game fish such as white catfish, flat bullhead, largemouth bass, and several sunfish species including redbreast sunfish, green sunfish, and bluegill. Ponds in the study area may support populations of bluegill and largemouth bass, as well as other species.

Streams within the study area provide riparian and benthic habitat for amphibians, aquatic reptiles, crustaceans and various aquatic invertebrates. Aquatic reptiles expected within the study area include snapping turtle*, mud turtle, and northern water snake. Aquatic amphibians expected within the study area include bullfrog* and southern leopard frog. Crustaceans may include various species of crayfish*, while various benthic macroinvertebrates such as stonefly* and caddisfly* populate the streams.

4.4 Invasive Species

Seven species from the NCDOT Invasive Exotic Plant List for North Carolina were found to occur in the study area. The species identified were Bradford pear (Threat level 3), Chinese privet (Threat level 1), multiflora rose (Threat level 1), autumn olive (Threat level 2), kudzu (Threat level 1), English ivy (Threat level 2), and Japanese honeysuckle (Threat level 2). NCTA will follow the NCDOT's Best Managememt Practices (BMPs) for the management of invasive plant species.

5.0 JURISDICTIONAL ISSUES

5.1 Clean Water Act Waters of the U.S.

Approximately two hundred jurisdictional streams were identified in the study area (Table 5). The location of these streams is depicted on Figures 3 A-R. USACE Stream Quality Assessment Worksheets and NCDWQ Stream Identification Forms are included in Appendix C. The physical characteristics and water quality designations of each jurisdictional stream are detailed in Section 3.2. All jurisdictional streams in the study area have been designated as Warm water streams for the purposes of stream mitigation. Until documentation of the final jurisdictional determination is

received, the need for compensatory mitigation for streams within the study area will remain "Undetermined."

Table 5. Jurisdictional characteristics of water resources within the study area.

Map ID	Length (ft)	Classification	Compensatory Mitigation Required	River Basin Buffer*
S001a	227	Perennial	Undetermined	*Not Subject
S001b	448	Intermittent	Undetermined	*Not Subject
S002a	110	Intermittent	Undetermined	*Not Subject
S002b	36	Perennial	Undetermined	*Not Subject
S003a	46	Intermittent	Undetermined	*Not Subject
S003b	63	Perennial	Undetermined	*Not Subject
S004	116	Intermittent	Undetermined	*Not Subject
S005a	44	Intermittent	Undetermined	*NA
S005b	1,017	Perennial	Undetermined	*NA
S005c	265	Perennial	Undetermined	*NA
S006a	408	Intermittent	Undetermined	*NA
S006b	915	Perennial	Undetermined	*NA
S007	169	Perennial	Undetermined	*NA
S008a	1,261	Perennial	Undetermined	*NA
S008b	514	Perennial	Undetermined	*NA
S008c	1,274	Perennial	Undetermined	*NA
S009a	248	Intermittent	Undetermined	*NA
S009b	189	Perennial	Undetermined	*NA
S009c	835	Perennial	Undetermined	*NA
S010	645	Intermittent	Undetermined	*NA
S011	444	Perennial	Undetermined	*NA
S012a	304	Intermittent	Undetermined	*NA
S012b	797	Intermittent	Undetermined	*NA
S013a	242	Intermittent	Undetermined	*NA
S013b	146	Intermittent	Undetermined	*NA
S013c	137	Perennial	Undetermined	*NA
S013d	401	Perennial	Undetermined	*NA
S014a	14	Perennial	Undetermined	*NA
S014b	297	Perennial	Undetermined	*NA
S014c	74	Perennial	Undetermined	*NA
S014d	240	Perennial	Undetermined	*NA
S014e	26	Perennial	Undetermined	*NA
S015a	21	Intermittent	Undetermined	*NA
S015b	17	Intermittent	Undetermined	*NA
S016a	409	Intermittent	Undetermined	*NA

Table 5 continues.

Table 5 continued.

Map ID	Length (ft)	Classification	Compensatory Mitigation Required	River Basin Buffer*
S016b	258	Intermittent	Undetermined	*NA
S016c	112	Perennial	Undetermined	*NA
S017a	810	Perennial	Undetermined	*NA
S017b	63	Perennial	Undetermined	*NA
S017c	305	Perennial	Undetermined	*NA
S017d	94	Perennial	Undetermined	*NA
S017e	479	Perennial	Undetermined	*NA
S018	104	Intermittent	Undetermined	*NA
S019	182	Intermittent	Undetermined	*NA
S020	70	Intermittent	Undetermined	*NA
S021a	154	Intermittent	Undetermined	*NA
S021b	669	Perennial	Undetermined	*NA
S021c	79	Perennial	Undetermined	*NA
S022	168	Intermittent	Undetermined	*NA
S023a	386	Intermittent	Undetermined	*NA
S023b	1,355	Perennial	Undetermined	*NA
S024	159	Intermittent	Undetermined	*NA
S025	146	Intermittent	Undetermined	*NA
S026	77	Intermittent	Undetermined	*NA
S027	59	Intermittent	Undetermined	*NA
S028a	2,789	Perennial	Undetermined	*NA
S028b	301	Perennial	Undetermined	*NA
S028c	1,765	Perennial	Undetermined	*NA
S029a	187	Intermittent	Undetermined	*NA
S029b	215	Intermittent	Undetermined	*NA
S029c	361	Perennial	Undetermined	*NA
S030a	541	Intermittent	Undetermined	*NA
S030b	49	Perennial	Undetermined	*NA
S031a	263	Intermittent	Undetermined	*NA
S031b	246	Perennial	Undetermined	*NA
S031c	388	Perennial	Undetermined	*NA
S032	884	Intermittent	Undetermined	*NA
S033	260	Intermittent	Undetermined	*NA
S034	3,053	Perennial	Undetermined	*NA
S035	188	Intermittent	Undetermined	*NA
S036	1,213	Perennial	Undetermined	*NA
S037a	77	Perennial	Undetermined	*NA
S037b	1,129	Perennial	Undetermined	*NA

Table 5 continues.

Table 5 continued.

Map ID	Length (ft)	Classification	Compensatory Mitigation Required	River Basin Buffer*
S037c	301	Perennial	Undetermined	*NA
S037d	1,078	Perennial	Undetermined	*NA
S038a	554	Intermittent	Undetermined	*NA
S038b	1,391	Perennial	Undetermined	*NA
S039a	1,020	Perennial	Undetermined	*NA
S039b	366	Perennial	Undetermined	*NA
S039c	3,641	Perennial	Undetermined	*NA
S040	1,180	Perennial	Undetermined	*NA
S041a	758	Intermittent	Undetermined	*NA
041b	1,652	Perennial	Undetermined	*NA
S042	403	Intermittent	Undetermined	*NA
S043	1,259	Intermittent	Undetermined	*NA
S044	656	Intermittent	Undetermined	*NA
S045a	59	Intermittent	Undetermined	*NA
S045b	3,689	Perennial	Undetermined	*NA
S046	79	Intermittent	Undetermined	*NA
S047	10,981	Perennial	Undetermined	*NA
S048	202	Perennial	Undetermined	*NA
S049a	167	Intermittent	Undetermined	*NA
S049b	88	Intermittent	Undetermined	*NA
S050	1,224	Intermittent	Undetermined	*NA
S051a	3,050	Intermittent	Undetermined	*NA
S051b	168	Perennial	Undetermined	*NA
S051c	703	Perennial	Undetermined	*NA
S052a	1,590	Intermittent	Undetermined	*NA
S052b	1,615	Intermittent	Undetermined	*NA
S052c	1,348	Intermittent	Undetermined	*NA
S053	46	Intermittent	Undetermined	*NA
S054	1,025	Intermittent	Undetermined	*NA
S055	1,821	Intermittent	Undetermined	*NA
S056a	201	Intermittent	Undetermined	*NA
S056b	1,391	Intermittent	Undetermined	*NA
S056c	1,351	Intermittent	Undetermined	*NA
S057a	291	Intermittent	Undetermined	*NA
S057b	989	Intermittent	Undetermined	*NA
S058a	161	Intermittent	Undetermined	*NA
S058b	334	Intermittent	Undetermined	*NA
S058c	1,040	Intermittent	Undetermined	*NA

Table 5 continues.

Table 5 continued.

Map ID	Length (ft)	Classification	Compensatory Mitigation Required	River Basin Buffer*
S058d	231	Intermittent	Undetermined	*NA
S059	21	Intermittent	Undetermined	*NA
S060	26	Intermittent	Undetermined	*NA
S061	107	Intermittent	Undetermined	*NA
S062a	98	Intermittent	Undetermined	*NA
S062b	271	Intermittent	Undetermined	*NA
S062c	677	Perennial	Undetermined	*NA
S062d	165	Perennial	Undetermined	*NA
S063	108	Perennial	Undetermined	*NA
S064a	467	Intermittent	Undetermined	*NA
S064b	471	Intermittent	Undetermined	*NA
S064c	1,042	Intermittent	Undetermined	*NA
S064d	766	Perennial	Undetermined	*NA
S064e	2,852	Perennial	Undetermined	*NA
S064f	178	Perennial	Undetermined	*NA
S064g	507	Perennial	Undetermined	*NA
S064h	756	Perennial	Undetermined	*NA
S064i	252	Perennial	Undetermined	*NA
S065	27	Intermittent	Undetermined	*NA
S066a	50	Intermittent	Undetermined	*NA
S066b	1,526	Intermittent	Undetermined	*NA
S066c	63	Intermittent	Undetermined	*NA
S067a	77	Intermittent	Undetermined	*NA
S067b	392	Intermittent	Undetermined	*NA
S068a	1,320	Intermittent	Undetermined	*NA
S068b	556	Perennial	Undetermined	*NA
S068c	785	Perennial	Undetermined	*NA
S068d	867	Perennial	Undetermined	*NA
S069	615	Intermittent	Undetermined	*NA
S070a	241	Intermittent	Undetermined	*NA
S070b	1,327	Intermittent	Undetermined	*NA
S071	827	Intermittent	Undetermined	*NA
S072	1,777	Perennial	Undetermined	*NA
S073a	259	Intermittent	Undetermined	*NA
S073b	285	Intermittent	Undetermined	*NA
S073c	178	Perennial	Undetermined	*NA
S074a	194	Intermittent	Undetermined	*NA
S074b	436	Intermittent	Undetermined	*NA

Table 5 continues.

Table 5 continued.

Map ID	Length (ft)	Classification	Compensatory Mitigation Required	River Basin Buffer*
S074c	281	Perennial	Undetermined	*NA
S075	56	Intermittent	Undetermined	*NA
S076	2,370	Perennial	Undetermined	*NA
S077	475	Intermittent	Undetermined	*NA
S078a	252	Intermittent	Undetermined	*NA
S078b	65	Intermittent	Undetermined	*NA
S078c	124	Intermittent	Undetermined	*NA
S078d	804	Perennial	Undetermined	*NA
S079	186	Intermittent	Undetermined	*NA
S080a	680	Perennial	Undetermined	*NA
S080b	571	Perennial	Undetermined	*NA
S080c	472	Perennial	Undetermined	*NA
S081a	408	Perennial	Undetermined	*NA
S081b	330	Perennial	Undetermined	*NA
S081c	59	Perennial	Undetermined	*NA
S081d	244	Perennial	Undetermined	*NA
S082	2,295	Perennial	Undetermined	*NA
S083a	209	Intermittent	Undetermined	*NA
S083b	97	Perennial	Undetermined	*NA
S084	48	Intermittent	Undetermined	*NA
S085	286	Perennial	Undetermined	*NA
S086	2,055	Perennial	Undetermined	*NA
S087	28	Intermittent	Undetermined	*NA
S088a	341	Intermittent	Undetermined	*NA
S088b	131	Perennial	Undetermined	*NA
S088.5	93	Intermittent	Undetermined	*NA
S089a	642	Intermittent	Undetermined	*NA
S089b	994	Perennial	Undetermined	*NA
S090	26	Intermittent	Undetermined	*NA
S091a	659	Intermittent	Undetermined	*NA
S091b	305	Perennial	Undetermined	*NA
S092a	118	Intermittent	Undetermined	*NA
S092b	261	Intermittent	Undetermined	*NA
S093a	136	Intermittent	Undetermined	*NA
S093b	145	Perennial	Undetermined	*NA
S094	941	Intermittent	Undetermined	*NA
S095a	38	Intermittent	Undetermined	*NA
S095b	235	Intermittent	Undetermined	*NA

Table 5 continues.

Table 5 continued.

Map ID	Length (ft)	Classification	Compensatory Mitigation Required	River Basin Buffer*
S096	64	Intermittent	Undetermined	*NA
S097	731	Intermittent	Undetermined	*NA
S098a	31	Perennial	Undetermined	*NA
S098b	506	Perennial	Undetermined	*NA
S099	41	Perennial	Undetermined	*NA
S100	308	Intermittent	Undetermined	*NA
S101	204	Intermittent	Undetermined	*NA
S102a	394	Intermittent	Undetermined	*NA
S102b	801	Intermittent	Undetermined	*NA
S103a	1,201	Perennial	Undetermined	*NA
S103b	474	Perennial	Undetermined	*NA
S103c	196	Perennial	Undetermined	*NA
S104	572	Perennial	Undetermined	*NA
S105	62	Perennial	Undetermined	*NA
S106	562	Intermittent	Undetermined	*NA
S107	105	Intermittent	Undetermined	*NA
S107.5	66	Intermittent	Undetermined	*NA
S108a	1,805	Intermittent	Undetermined	*NA
S108b	492	Perennial	Undetermined	*NA
S109a	466	Intermittent	Undetermined	*NA
S109b	44	Intermittent	Undetermined	*NA
S110a	106	Intermittent	Undetermined	*NA
S110b	32	Perennial	Undetermined	*NA
S111	5,488	Perennial	Undetermined	*NA
S111.5	1,097	Intermittent	Undetermined	*NA
S112	2,183	Perennial	Undetermined	*NA
S113	95	Intermittent	Undetermined	*NA
S114a	627	Intermittent	Undetermined	*NA
S114b	214	Intermittent	Undetermined	*NA
S115a	367	Intermittent	Undetermined	*NA
S115b	572	Perennial	Undetermined	*NA
S115.5	180	Intermittent	Undetermined	*NA
S116	1,879	Intermittent	Undetermined	*NA
S117	171	Intermittent	Undetermined	*NA
S118a	1,382	Intermittent	Undetermined	*NA
S118b	225	Perennial	Undetermined	*NA
S118c	140	Perennial	Undetermined	*NA
S119a	310	Intermittent	Undetermined	*NA

Table 5 continues.

Table 5 continued.

Map ID	Length (ft)	Classification	Compensatory Mitigation Required	River Basin Buffer*
S119b	887	Intermittent	Undetermined	*NA
S120	32	Intermittent	Undetermined	*NA
S121	14	Intermittent	Undetermined	*NA
S121.5	61	Intermittent	Undetermined	*NA
S122a	1,007	Intermittent	Undetermined	*NA
S122b	1,858	Perennial	Undetermined	*NA
S122c	3,158	Perennial	Undetermined	*NA
S123	236	Intermittent	Undetermined	*NA
S124	58	Intermittent	Undetermined	*NA
S125	80	Intermittent	Undetermined	*NA
S126	44	Perennial	Undetermined	*NA
S127a	33	Intermittent	Undetermined	*NA
S127b	33	Intermittent	Undetermined	*NA
S127c	168	Intermittent	Undetermined	*NA
S128a	128	Intermittent	Undetermined	*NA
S128b	327	Intermittent	Undetermined	*NA
S128.5	50	Perennial	Undetermined	*NA
S129	279	Intermittent	Undetermined	*NA
S130a	517	Intermittent	Undetermined	*NA
S130b	230	Intermittent	Undetermined	*NA
S130c	769	Intermittent	Undetermined	*NA
S131a	146	Intermittent	Undetermined	*NA
S131b	126	Intermittent	Undetermined	*NA
S132a	118	Intermittent	Undetermined	*NA
S132b	27	Intermittent	Undetermined	*NA
S132.5	316	Intermittent	Undetermined	*NA
S133a	81	Intermittent	Undetermined	*NA
S133b	534	Intermittent	Undetermined	*NA
S134	537	Perennial	Undetermined	*NA
S135	27	Intermittent	Undetermined	*NA
S136a	473	Intermittent	Undetermined	*NA
S136b	22	Intermittent	Undetermined	*NA
S136.5	619	Intermittent	Undetermined	*NA
S137	524	Intermittent	Undetermined	*NA
S138a	482	Intermittent	Undetermined	*NA
S138b	122	Perennial	Undetermined	*NA
S138c	690	Perennial	Undetermined	*NA
S138d	993	Perennial	Undetermined	*NA

Table 5 continues.

Table 5 continued.

Map ID	Length (ft)	Classification	Compensatory Mitigation Required	River Basin Buffer*
S138.5	447	Intermittent	Undetermined	*NA
S139	36	Perennial	Undetermined	*NA
S140a	354	Intermittent	Undetermined	*NA
S140b	311	Intermittent	Undetermined	*NA
S140c	299	Intermittent	Undetermined	*NA
S140d	539	Intermittent	Undetermined	*NA
S140e	922	Perennial	Undetermined	*NA
S140f	1,628	Perennial	Undetermined	*NA
S140g	47	Perennial	Undetermined	*NA
S140.5a	54	Intermittent	Undetermined	*NA
S140.5b	152	Intermittent	Undetermined	*NA
S141	110	Intermittent	Undetermined	*NA
S142	612	Intermittent	Undetermined	*NA
S143	469	Perennial	Undetermined	*NA
S144a	348	Intermittent	Undetermined	*NA
S144b	67	Perennial	Undetermined	*NA
S145	1,805	Intermittent	Undetermined	*NA
S146a	125	Intermittent	Undetermined	*NA
S146b	505	Intermittent	Undetermined	*NA
S146c	1,191	Intermittent	Undetermined	*NA
S146d	898	Perennial	Undetermined	*NA
S147	638	Intermittent	Undetermined	*NA
S148	41	Intermittent	Undetermined	*NA
S150	389	Intermittent	Undetermined	*NA
S151	492	Intermittent	Undetermined	*NA
S152	2,439	Perennial	Undetermined	*NA
S153a	49	Perennial	Undetermined	*NA
S153b	535	Perennial	Undetermined	*NA
S154a	151	Intermittent	Undetermined	*NA
S154b	348	Perennial	Undetermined	*NA
S154c	189	Perennial	Undetermined	*NA
S155	335	Intermittent	Undetermined	*NA
S156a	1,377	Perennial	Undetermined	*NA
S156b	1,730	Perennial	Undetermined	*NA
S157a	208	Intermittent	Undetermined	*NA
S157b	96	Intermittent	Undetermined	*NA
S158	2,033	Perennial	Undetermined	*NA
S159	88	Intermittent	Undetermined	*NA

Table 5 continues.

Table 5 continued.

Map ID	Length (ft)	Classification	Compensatory Mitigation Required	River Basin Buffer*
S160a	21	Intermittent	Undetermined	*NA
S160b	626	Intermittent	Undetermined	*NA
S160c	220	Intermittent	Undetermined	*NA
S160d	186	Intermittent	Undetermined	*NA
S161a	518	Intermittent	Undetermined	*NA
S161b	1,532	Intermittent	Undetermined	*NA
S161c	3,649	Perennial	Undetermined	*NA
S162	285	Intermittent	Undetermined	*NA
S163	107	Intermittent	Undetermined	*NA
S164a	313	Intermittent	Undetermined	*NA
S164b	30	Intermittent	Undetermined	*NA
S164c	797	Perennial	Undetermined	*NA
S164d	686	Perennial	Undetermined	*NA
S165a	110	Intermittent	Undetermined	*NA
S165b	146	Perennial	Undetermined	*NA
S166	1,051	Perennial	Undetermined	*NA
S167	422	Intermittent	Undetermined	*NA
S168a	72	Intermittent	Undetermined	*NA
S168b	58	Intermittent	Undetermined	*NA
S169a	428	Perennial	Undetermined	*NA
S169b	393	Perennial	Undetermined	*NA
S169c	69	Perennial	Undetermined	*NA
S169d	1,562	Perennial	Undetermined	*NA
S170	124	Intermittent	Undetermined	*NA
S171	165	Perennial	Undetermined	*NA
S171.5	12	Intermittent	Undetermined	*NA
S172a	411	Intermittent	Undetermined	*NA
S172b	382	Intermittent	Undetermined	*NA
S172c	318	Intermittent	Undetermined	*NA
S172d	426	Perennial	Undetermined	*NA
S173a	64	Intermittent	Undetermined	*NA
S173b	228	Intermittent	Undetermined	*NA
S174	152	Intermittent	Undetermined	*NA
S175	155	Intermittent	Undetermined	*NA
S176a	46	Intermittent	Undetermined	*NA
S176b	524	Intermittent	Undetermined	*NA
S177	57	Intermittent	Undetermined	*NA
S178	188	Intermittent	Undetermined	*NA

Table 5 continues.

Table 5 concluded.

Map ID	Length (ft)	Classification	Compensatory Mitigation Required	River Basin Buffer*
S179	20	Intermittent	Undetermined	*NA
S180	32	Intermittent	Undetermined	*NA
S181a	293	Perennial	Undetermined	*NA
S181b	8	Perennial	Undetermined	*NA
S181c	25	Perennial	Undetermined	*NA
S181d	562	Perennial	Undetermined	*NA
S182	333	Intermittent	Undetermined	*NA
S183	47	Intermittent	Undetermined	*NA
S184	192	Intermittent	Undetermined	*NA

* NA/Not Subject – See Section 5.4

Approximately two hundred jurisdictional wetlands were identified in the study area (Figure 3A-R). Wetland classification and quality rating data are presented in Table 6. All wetlands in the study area are within the Catawba and Yadkin-Pee Dee River Basins (U.S. Geological Survey [USGS] Hydrologic Units 03050103 and 03040105). USACE Routine Wetland Determination Forms and NCDWQ Wetland Rating Worksheets for each site are included in Appendix C. Descriptions of the natural communities at each wetland site are presented in Section 4.1. Palustrine forested (PFO) wetlands within the study area are located primarily within the Mesic Mixed Hardwood, Basic Mesic Forest, Piedmont/Low Mountain Alluvial Forest, and Pine Forest terrestrial communities. Palustrine scrub/shrub (PSS) wetlands within the study area are located primarily in the Successional terrestrial community. Palustrine emergent (PEM) and unconsolidated bottom (PUB) wetlands within the study area are located primarily in the Agriculturally Maintained, Successional, and Urban/Disturbed terrestrial communities.

Table 6. Jurisdictional characteristics of wetlands within the study area.

Map ID	Figure Number	Cowardin Classification	Hydrologic Classification	NCDWQ Wetland Rating	Area (ac.)
W001	3b	PFO1	Riverine	30	0.05
W002	3b	PFO1	Riverine	27	0.07
W003	3b	PUB3	Riverine	27	0.11
W004	3b	PFO1	Riverine	61	2.32
W005	3c	PFO1	Riverine	65	1.08
W006	3b	PFO1	Riverine	38	0.04
W007	3b	PFO1	Riverine	38	0.06
W008	3d	PFO1	Riverine	37	0.13
W009	3d	PFO1	Riverine	38	0.25
W010	3d	PSS1	Riverine	51	0.33
W011	3d	PFO1	Riverine	16	0.18
W012	3d	PFO1	Riverine	62	2.04

Table 6 continues.

Table 6 continued.

Map ID	Figure Number	Cowardin Classification	Hydrologic Classification	NCDWQ Wetland Rating	Area (ac.)
W013	3d	PFO1	Riverine	62	0.12
W014	3d	PFO1	Riverine	62	0.61
W015	3e	PFO1	Riverine	38	0.39
W016	3e	PEM1	Riverine	41	0.08
W017	3e	PEM1	Riverine	41	0.21
W018	3e	PFO1	Riverine	41	0.12
W019	3e	PFO1	Riverine	41	0.12
W020	3e	PFO1	Riverine	23	0.03
W021	3e	PFO1	Riverine	34	0.01
W022a	3e	PFO6	Riverine	48	0.57
W022b	3e	PFO6	Riverine	48	1.10
W024	3e	PFO1	Riverine	48	0.46
W025	3e	PFO1	Riverine	38	0.12
W026	3f	PFO1	Riverine	38	0.06
W027	3f	PFO1	Riverine	37	0.08
W028	3f	PFO1	Riverine	37	0.01
W029	3f	PSS1	Riverine	37	0.01
W030a	3f	PFO1	Riverine	68	0.29
W030b	3f	PFO1	Riverine	68	0.40
W031	3g	PFO1	Riverine	35	0.24
W032	3g	PSS1	Riverine	39	0.50
W033a	3g	PFO6	Riverine	52	1.15
W033b	3g	PFO6	Riverine	52	1.50
W034	3g	PFO1	Riverine	68	8.15
W035	3g	PSS1	Riverine	27	0.05
W036	3g	PFO1	Riverine	60	0.95
W037	3g	PSS1	Riverine	32	0.04
W038	3h	PEM1	Riverine	32	0.06
W039	3h	PFO1	Riverine	43	0.05
W040a	3h	PFO6	Riverine	51	0.09
W040b	3h	PSS1	Riverine	51	0.01
W040c	3h	PSS1	Riverine	51	0.60
W040d	3h	PFO1	Riverine	47	0.12
W041	3h	PFO1	Riverine	43	0.02
W042	3h	PFO1	Riverine	68	1.58
W043	3h	PFO1	Riverine	68	0.50
W044	3h	PFO1	Riverine	45	0.04
W045	3h	PFO1	Riverine	45	0.17

Table 6 continues.

Table 6 continued.

Map ID	Figure Number	Cowardin Classification	Hydrologic Classification	NCDWQ Wetland Rating	Area (ac.)
W046	3h	PFO1	Riverine	56	0.39
W047	3h	PFO1	Riverine	56	0.09
W048	3h	PFO1	Riverine	56	0.05
W049	3h	PFO1	Riverine	52	0.12
W050	3h	PFO1	Riverine	52	0.10
W051	3h	PFO1	Riverine	52	0.25
W052	3h	PSS1	Riverine	37	0.16
W053	3i	PFO1	Riverine	43	0.67
W054	3g	PSS6	Riverine	58	1.08
W067	3i	PFO1	Riverine	43	0.39
W068a	3j	PSS1	Riverine	44	0.06
W068b	3j	PSS1	Riverine	44	0.72
W069a	3j	PFO1	Riverine	49	0.04
W069b	3j	PFO1	Riverine	49	0.46
W070	3j	PFO1	Riverine	50	0.21
W071	3j	PFO1	Riverine	45	0.10
W072	3j	PFO1	Riverine	45	0.07
W073a	3j	PSS1	Riverine	52	0.01
W073b	3j	PSS1	Riverine	52	0.01
W074	3j	PFO1	Riverine	52	0.65
W075	3k	PFO1	Riverine	54	0.05
W076	3k	PFO1	Riverine	54	0.07
W077	3k	PSS1	Riverine	54	0.10
W078	3k	PFO1	Riverine	47	0.03
W079	3k	PFO1	Riverine	30	0.26
W080	3k	PFO1	Riverine	52	0.33
W081	3l	PFO1	Riverine	15	0.09
W082	3l	PFO1	Riverine	46	0.02
W083	3l	PFO1	Riverine	46	0.04
W084	3l	PFO1	Riverine	46	0.13
W085	3l	PFO1	Riverine	46	0.03
W086	3l	PSS1	Riverine	93	5.41
W087	3l	PFO1	Riverine	26	0.07
W088	3l	PFO1	Riverine	24	0.00
W089	3l	PFO1	Riverine	48	0.27
W090	3m	PFO1	Riverine	46	0.02
W091	3m	PFO1	Riverine	46	0.01
W092	3m	PFO1	Riverine	46	0.25

Table 6 continues.

Table 6 continued.

Map ID	Figure Number	Cowardin Classification	Hydrologic Classification	NCDWQ Wetland Rating	Area (ac.)
W093	3m	PFO1	Riverine	49	0.05
W095	3m	PFO1	Riverine	49	0.11
W096	3m	PFO1	Riverine	51	0.74
W097	3m	PFO1	Riverine	51	0.06
W098	3m	PFO1	Riverine	42	0.15
W099	3m	PSS1	Riverine	36	0.07
W100	3m	PSS1	Riverine	37	0.09
W101	3m	PFO1	Riverine	59	0.12
W102	3m	PFO1	Riverine	59	0.09
W103	3m	PFO1	Riverine	59	0.15
W104	3m	PFO1	Riverine	57	0.58
W104.5	3m	PFO1	Riverine	57	0.01
W105	3m	PFO1	Riverine	59	0.25
W106	3m	PFO1	Riverine	59	0.60
W107	3n	PFO1	Riverine	48	0.49
W108	3n	PFO1	Riverine	65	0.80
W109	3n	PFO1	Riverine	65	0.40
W110	3n	PFO1	Riverine	65	0.80
W111	3n	PFO1	Riverine	65	0.08
W112	3n	PFO1	Riverine	65	0.59
W113	3n	PFO1	Riverine	52	0.39
W114	3n	PFO1	Riverine	52	0.09
W115	3n	PFO1	Riverine	52	0.23
W116	3n	PFO1	Riverine	24	0.06
W117	3n	PFO1	Riverine	24	0.06
W118	3n	PFO1	Riverine	37	0.57
W119	3n	PFO1	Riverine	28	0.01
W120	3n	PFO1	Riverine	46	0.06
W121	3n	PFO1	Riverine	46	0.18
W122	3n	PFO1	Riverine	39	0.04
W123	3n	PFO1	Riverine	56	0.56
W124	3n	PFO1	Riverine	42	0.20
W125	3n	PFO1	Riverine	49	0.13
W126	3n	PFO1	Riverine	49	0.40
W127	3o	PFO1	Riverine	44	0.09
W128	3o	PFO1	Riverine	44	0.11
W129	3o	PFO1	Riverine	44	0.02
W130	3o	PFO1	Riverine	44	0.25

Table 6 continues.

Table 6 continued.

Map ID	Figure Number	Cowardin Classification	Hydrologic Classification	NCDWQ Wetland Rating	Area (ac.)
W131	3o	PFO1	Riverine	44	0.14
W132	3o	PFO1	Riverine	42	0.24
W133	3o	PFO1	Riverine	42	0.02
W134	3o	PFO1	Riverine	42	0.52
W135	3o	PFO1	Riverine	42	0.17
W136	3o	PFO1	Riverine	43	0.34
W137	3o	PFO1	Riverine	48	0.37
W138	3n	PFO1	Riverine	52	0.44
W139	3o	PFO1	Riverine	45	0.05
W140	3o	PFO1	Riverine	45	0.01
W141	3o	PFO1	Riverine	42	0.03
W142	3o	PFO1	Riverine	42	0.07
W143	3o	PFO1	Riverine	35	0.03
W144	3o	PFO1	Riverine	43	0.01
W145	3o	PFO1	Riverine	43	0.01
W146	3o	PFO1	Riverine	43	0.01
W147	3o	PFO1	Riverine	43	0.19
W148	3o	PSS1	Riverine	39	0.15
W149	3o	PSS1	Riverine	44	0.08
W150	3o	PFO1	Riverine	44	0.03
W151	3o	PFO1	Riverine	44	0.00
W152	3o	PFO1	Riverine	44	0.12
W153	3o	PFO1	Riverine	43	0.06
W154	3o	PFO1	Riverine	43	0.24
W155	3p	PSS1	Riverine	47	0.17
W156	3p	PFO1	Riverine	47	0.02
W157	3p	PFO1	Riverine	47	0.05
W158	3p	PFO1	Riverine	47	0.02
W159	3p	PFO1	Riverine	47	0.30
W160	3p	PFO1	Riverine	47	0.04
W161	3p	PFO1	Riverine	47	0.02
W162	3p	PSS1	Riverine	49	0.00
W163	3p	PFO1	Riverine	49	0.20
W164	3p	PSS1	Riverine	44	0.02
W165	3p	PFO1	Riverine	44	0.02
W166	3p	PFO1	Riverine	44	0.13
W167	3p	PFO6	Riverine	44	4.56
W168	3p	PFO1	Riverine	44	0.05

Table 6 continues.

Table 6 concluded.

Map ID	Figure Number	Cowardin Classification	Hydrologic Classification	NCDWQ Wetland Rating	Area (ac.)
W169	3p	PSS1	Riverine	48	0.15
W170	3p	PSS1	Riverine	48	0.44
W171	3p	PFO1	Riverine	44	0.10
W172a	3p	PEM1	Riverine	37	0.02
W172b	3p	PEM1	Riverine	37	0.04
W173	3p	PFO1	Riverine	58	0.89
W174	3q	PFO6	Riverine	45	0.36
W175	3q	PSS1	Riverine	46	0.03
W176	3q	PFO6	Riverine	58	2.08
W177	3q	PFO1	Riverine	58	0.13
W178	3q	PFO1	Riverine	50	0.70
W179	3q	PFO1	Riverine	50	1.00
W180	3q	PFO1	Riverine	50	0.03
W181	3q	PFO1	Riverine	43	0.12
W182	3q	PFO1	Riverine	43	0.02
W183	3q	PSS1	Riverine	58	0.99
W184	3q	PFO1	Riverine	42	0.03
W185	3q	PFO1	Riverine	42	0.07
W186	3q	PFO1	Riverine	42	0.33
W187	3q	PFO1	Riverine	48	0.22
W188	3q	PFO1	Riverine	48	0.09
W189	3q	PFO1	Riverine	48	0.19
W190	3q	PFO1	Riverine	48	0.17
W191	3q	PSS1	Riverine	43	0.03
W192	3q	PSS1	Riverine	43	0.27
W193	3q	PFO1	Riverine	28	0.16
W194	3q	PFO1	Riverine	28	0.02
W195	3q	PFO1	Riverine	38	0.11
W196	3q	PFO1	Riverine	38	0.28
W197	3q	PFO1	Riverine	38	0.29
W198	3q	PFO1	Riverine	23	0.14
W199	3q	PFO1	Riverine	53	0.45
W200	3q	PFO1	Riverine	53	0.09
W201	3q	PFO1	Riverine	53	0.09
W202	3r	PFO1	Riverine	52	0.33
W203	3r	PFO1	Riverine	50	0.01
W204	3r	PFO1	Riverine	50	0.04
W205	3q	PUB3	Riverine	29	0.09

5.2 Clean Water Act Permits

The proposed project is anticipated to be processed with a Section 404 Individual Permit. The USACE holds the final discretion as to what permit or permits will be required to authorize project construction.

In addition to the Section 404 permit, other required authorizations include a corresponding Section 401 Water Quality Certification for the NCDWQ. A Section 401 Water Quality Certification is typically handled as a joint permit application to both the USACE and NCDWQ.

5.3 Construction Moratoria

There are no construction moratoria in effect for waters located within the study area.

5.4 N.C. River Basin Buffer Rules

The proposed project is located in the Catawba and Yadkin-Pee Dee River Basins. Buffer Rules for the Catawba River Basin apply only to lake shorelines and the mainstem of the Catawba River. The Yadkin-Pee Dee River Basin does not have River Basin Buffer Rules. As shown in Table 5, no streams in the study area are subject to river basin buffer rules.

5.5 Rivers and Harbors Act Section 10 Navigable Waters

No streams within the study area have been designated by the USACE as Navigable Waters under Section 10 of the Rivers and Harbors Act.

5.6 Wetland and Stream Mitigation

5.6.1 Avoidance and Minimization of Impacts

The NCTA will attempt to avoid and minimize impacts to streams and wetlands to the greatest extent practicable in choosing a preferred alternative and during project design. At this time, no final decisions have been made with regard to the location or design of the preferred alternative. A brief discussion of impacts for this project is currently being prepared and will be submitted as a technical memorandum.

5.6.2 Compensatory Mitigation of Impacts

The NCTA will investigate potential on-site stream and wetland mitigation opportunities once a final decision has been rendered on the location of the preferred alignment. If on-site mitigation is not feasible, mitigation will be provided by North Carolina Department of Environment and Natural Resources Ecosystem Enhancement Program (EEP). The EEP will be requested to provide

off-site mitigation to satisfy the federal Clean Water Act compensatory mitigation requirements for this project.

5.7 Endangered Species Act Protected Species

As of January 31, 2008 the US Fish and Wildlife Service (USFWS) lists four federally protected species for Mecklenburg and Union Counties (Table 7). A brief description of each species' habitat requirements follows, along with the Biological Conclusion rendered based on survey results in the study area. Habitat requirements for each species are based on the current best available information as per referenced literature and USFWS correspondence.

Table 7. Federally protected species listed for Mecklenburg and Union Counties.

Scientific Name	Common Name	Federal Status*	County@	Habitat Present	Biological Conclusion
Lasmigona decorata	Carolina heelsplitter	E	M, U	Yes	Unresolved
Rhus michauxii	Michaux's sumac	E	M, U	Yes	No Effect
Helianthus schweinitzii	Schweinitz's sunflower	E	M, U	Yes	May Affect, Not Likely to Adversely Affect
Echinacea laevigata	Smooth coneflower	E	M	Yes	No Effect

* E – Endangered
@ M = Mecklenburg, U = Union

Carolina heelsplitter (*Lasmigona decorata*)

USFWS optimal survey window: year round.

Habitat Description: The Carolina heelsplitter was historically known from several locations within the Catawba and Pee Dee River systems in North Carolina and the Pee Dee and Savannah River systems, and possibly the Saluda River system, in South Carolina. In North Carolina, the species is now known only from a handful of streams in the Rocky and Catawba River systems. The species exists in very low abundances, usually within 6 feet of shorelines, throughout its known range. The general habitat requirements for the Carolina heelsplitter are shaded areas in large rivers to small streams, often burrowed into clay banks between the root systems of trees, or in runs along steep banks with moderate current. The more recent habitat where the Carolina heelsplitter has been found is in sections of streams containing bedrock with perpendicular crevices filled with sand and gravel, and with wide riparian buffers.

Biological Conclusion: Unresolved

The larger streams within the study area may provide potentially suitable habitat for this species. ESI was not scoped to conduct surveys for Carolina heelsplitter. NCTA will coordinate with the USFWS to determine the appropriate course of action regarding the completion of surveys for Carolina heelsplitter within the study area. This survey will need to be conducted at least 1 year prior to the scheduled construction let date for the

project. A review of NCNHP records, updated August 27, 2008, indicates no documented occurrences of the Carolina heelsplitter within 1.0 mile of the study area.

Michaux's sumac (*Rhus michauxii*)

USFWS optimal survey window: May-October

Habitat Description: Michaux's sumac, endemic to the inner Coastal Plain and lower Piedmont, grows in sandy or rocky, open, upland woods on acidic or circumneutral, well-drained sands or sandy loam soils with low cation exchange capacities. The species is also found on sandy or submesic loamy swales and depressions in the fall line Sandhills region as well as in openings along the rim of Carolina bays; maintained railroad, roadside, power line, and utility rights-of-way; areas where forest canopies have been opened up by blow-downs and/or storm damage; small wildlife food plots; abandoned building sites; under sparse to moderately dense pine or pine/hardwood canopies; and in and along edges of other artificially maintained clearings undergoing natural succession. In the central Piedmont, it occurs on clayey soils derived from mafic rocks. The plant is shade intolerant and, therefore, grows best where disturbance (*e.g.*, mowing, clearing, grazing, periodic fire) maintains its open habitat.

Biological Conclusion: No Effect

Potential habitat is present within the study area along the roadside margins and utilitiy rights-of-ways. Areas identified as potentially suitable habitat were systematically surveyed along overlapping transects by ESI biologist from September, 25 to October 26, 2007. No individuals of Michaux's sumac were observed. A review of NCNHP records, updated August 27, 2008, indicates no documented occurrences of Michaux's sumac within 1.0 mile of the study area.

Schweinitz's sunflower (*Helianthus schweinitzii*)

USFWS optimal survey window: late August-October

Habitat Description: Schweinitz's sunflower, endemic to the Piedmont of North and South Carolina. The few sites where this rhizomatous perennial herb occurs in relatively natural vegetation are found in xeric hardpan forests. The species is also found along roadside rights-of-way, maintained power lines and other utility rights-of-way, edges of thickets and old pastures, clearings and edges of upland oak-pine-hickory woods and Piedmont longleaf pine forests, and other sunny or semi-sunny habitats where disturbances (*e.g.*, mowing, clearing, grazing, blow-downs, storms, frequent fire) help create open or partially open areas for sunlight. It is intolerant of full shade and excessive competition from other vegetation. Schweinitz's sunflower occurs in a variety of soil series, including Badin, Cecil, Cid, Enon, Gaston, Georgeville, Iredell, Mecklenburg, Misenheimer, Secrest, Tatum, Uwharrie, and Zion, among others. It is generally found growing on shallow sandy soils with high gravel content; shallow, poor, clayey hardpans; or shallow rocky soils, especially those derived from mafic rocks.

Biological Conclusion: May Affect, Not Likely to Adversely Affect.

Potential habitat is present within the study area along roadsides and utility rights-of-ways. Areas identified as potentially suitable habitat, were systematically surveyed along

overlapping transects by ESI biologist from September, 25 to October 26, 2007. Two population sites were located and documented during the field investigation. Both of these populations are located in the study area along Secrest Shortcut Road within a power line easement. Based on a preliminary review of the design in the areas of these populations, it is believed that no direct disturbance will occur to the populations from the construction activities. Care should be taken to reduce the potential for indirect impacts. A review of NCNHP records, updated August 27, 2008, indicates three (3) documented occurrences of Schweinitz's sunflower within 1.0 mile of the study area. These occurrences are located: 1) along the southwest bank of Secrest Shortcut Road in the 1618 block; 2) along US Highway 601 three miles north of junction with US 74 (extirpated 2005); and 3) along the side of Indian Trail – Fairview Road. The populations located along US Highway 601 and Indian Trail – Fairview Road are located outside of the study area. One of the populations of Schweinitz's sunflower, located during the 2007 survey, along Secrest Shortcut Road occurs across Secrest Shortcut Road from the population described by NCNHP. Upon review of the NCNHP site, no specimens of Schweinitz's sunflower were located during the 2007 survey.

Smooth coneflower (*Echinacea laevigata*)

USFWS optimal survey window: late May-October

Habitat Description: Smooth coneflower, a perennial herb, is typically found in meadows, open woodlands, the ecotonal regions between meadows and woodlands, cedar barrens, dry limestone bluffs, clear cuts, and roadside and utility rights-of-way. In North Carolina, the species normally grows in magnesium- and calcium-rich soil associated with gabbro and diabase parent material, and typically occurs in Iredell, Misenheimer, and Picture soil series. It grows best where there is abundant sunlight, little competition in the herbaceous layer, and periodic disturbances (*e.g.*, regular fire regime, well-timed mowing, careful clearing) that prevents encroachment of shade-producing woody shrubs and trees. On sites where woody succession is held in check, it is characterized by a number of species with prairie affinities.

Biological Conclusion: No Effect

Potential habitat is present within the study area along the roadside margins and utilities rights-of-ways. Areas identified as potentially suitable habitat were systematically surveyed along overlapping transects by ESI biologists from September, 25 to October 26, 2007. No individuals of smooth coneflower were observed. A review of NCNHP records, updated August 27, 2008, indicates no documented occurrences of smooth coneflower within 1.0 mile of the study area.

5.8 Bald and Golden Eagle Protection Act

Habitat for the bald eagle consists primarily of mature forest in proximity to large bodies of open water for foraging. Large dominate trees are utilized for nesting sites, typically within 1.0 mile of open water.

Although it appears from the map within the National Bald Eagle Management Guidelines that the bald eagle may have occurrences and nesting habitat along the Catawba River, the study area is greater than 1.0 mile from any potential habitat. A review of NCNHP records, updated August 27, 2008, indicate no documented occurrences of bald eagle nests within 1.0 mile of the study area.

5.9 Endangered Species Act Candidate Species

As of January 31, 2008, the USFWS lists one candidate species for Mecklenburg and Union counties, the Georgia aster (*Symphyotrichum georgianum*). Habitat would be considered present along the roadside margins for this species. A review of NCNHP records, updated August 27, 2008, indicates no documented occurrences of Georgia aster within 1.0 mile of the study area.

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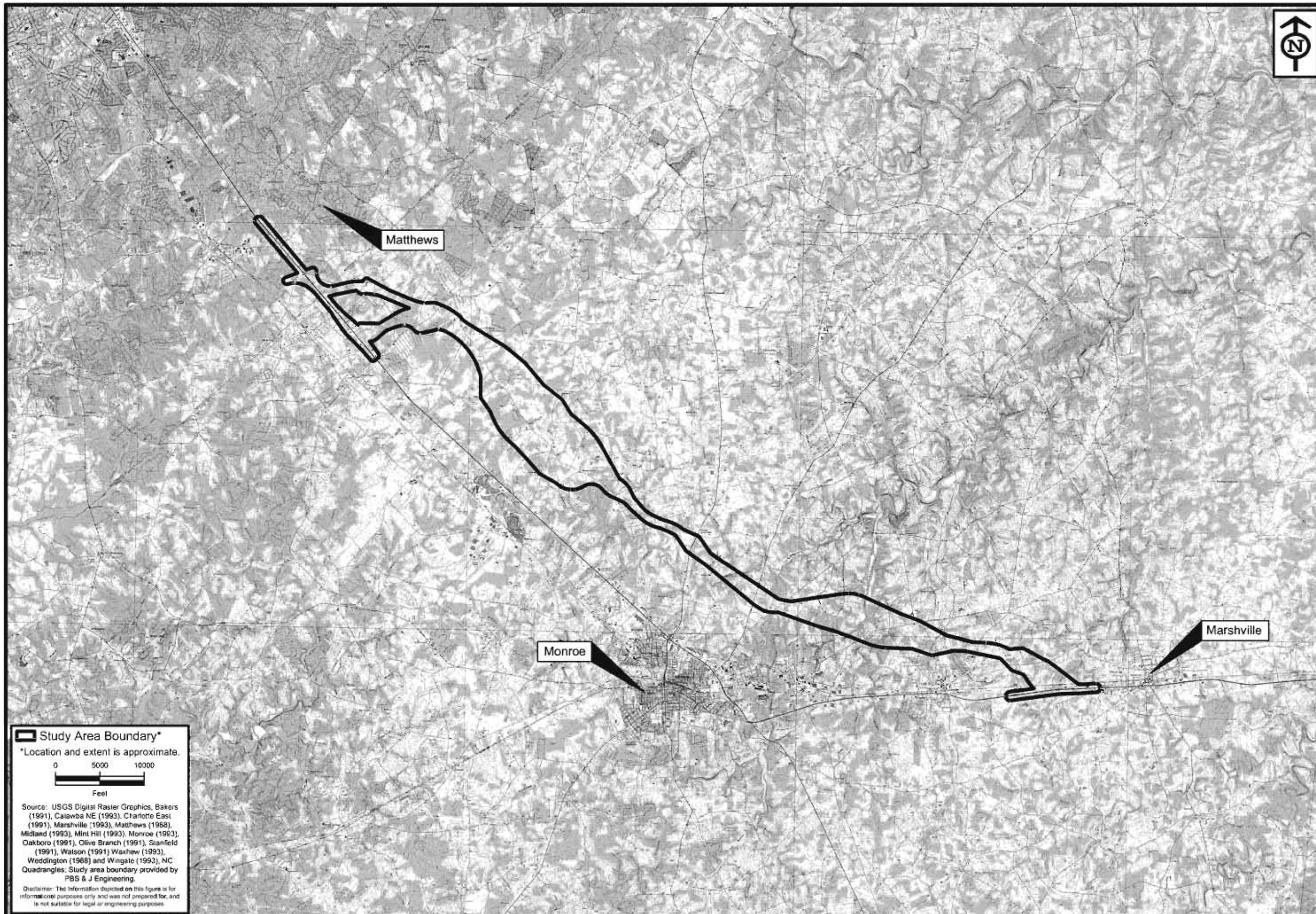
APPENDIX A
Figures



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Vicinity Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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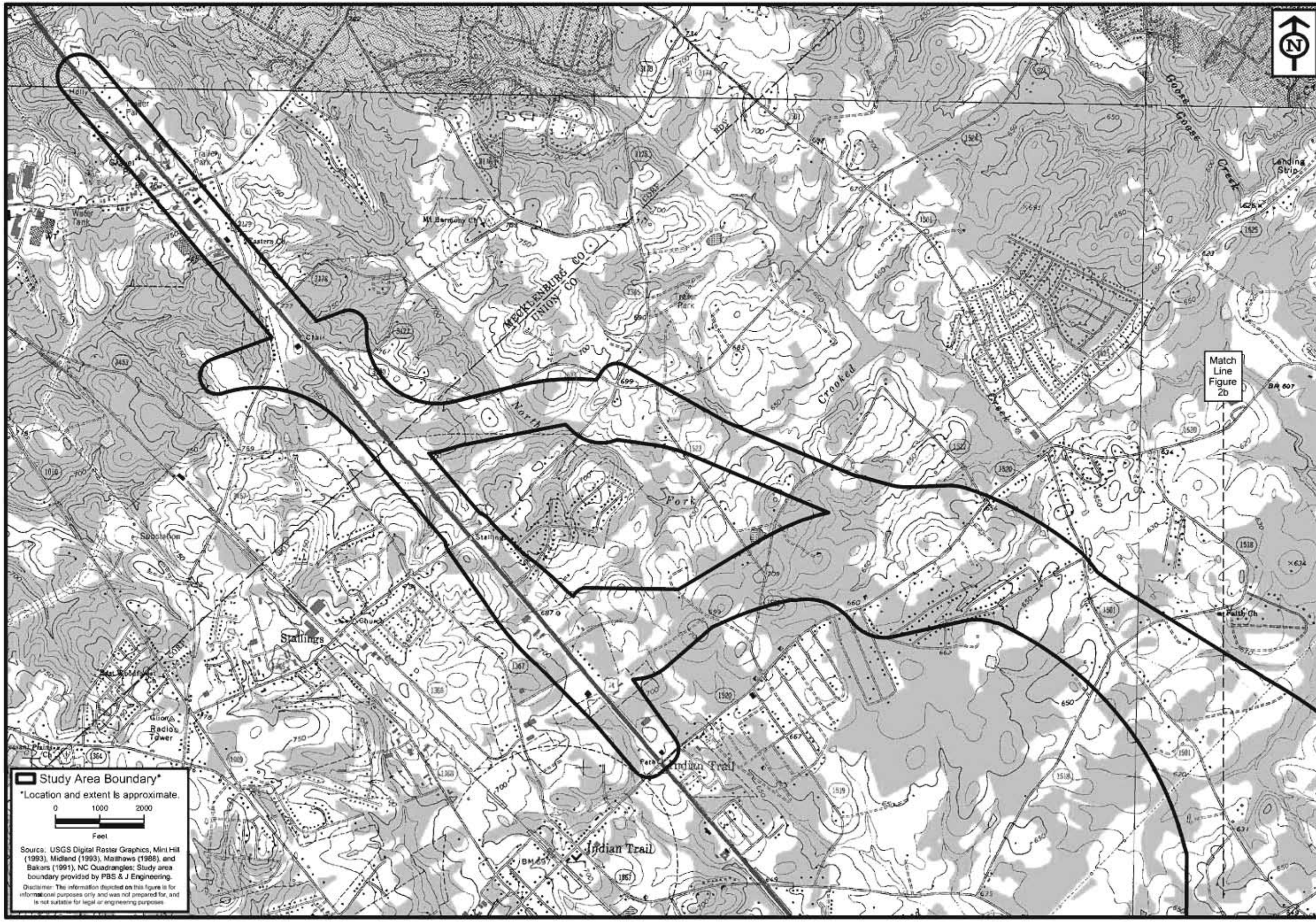

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Date:	Dec 2008
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Study Area Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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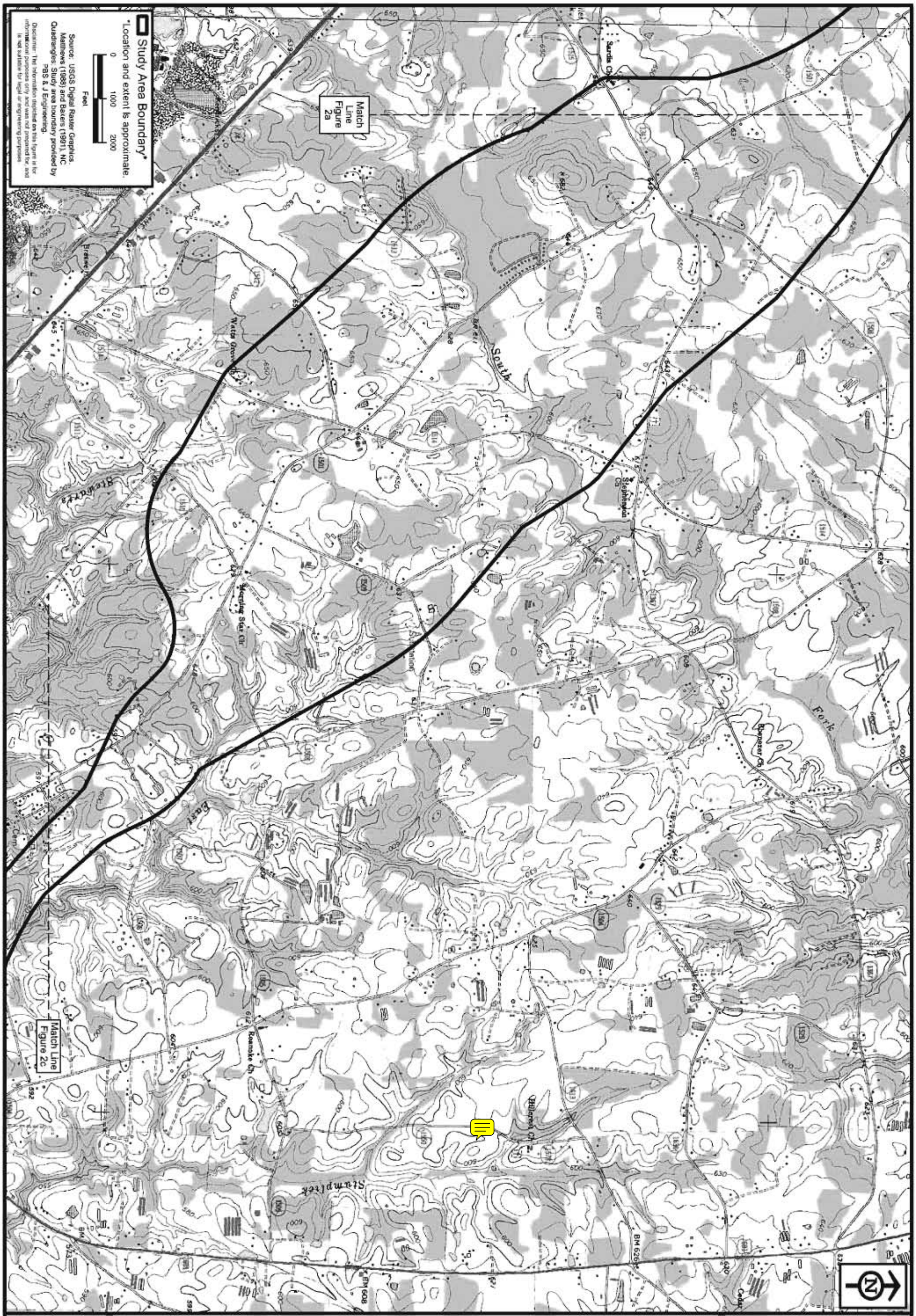

NORTH CAROLINA Turnpike Authority

Study Area Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

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Figure:	2c

Study Area Map
Monroe Connector-Bypass
Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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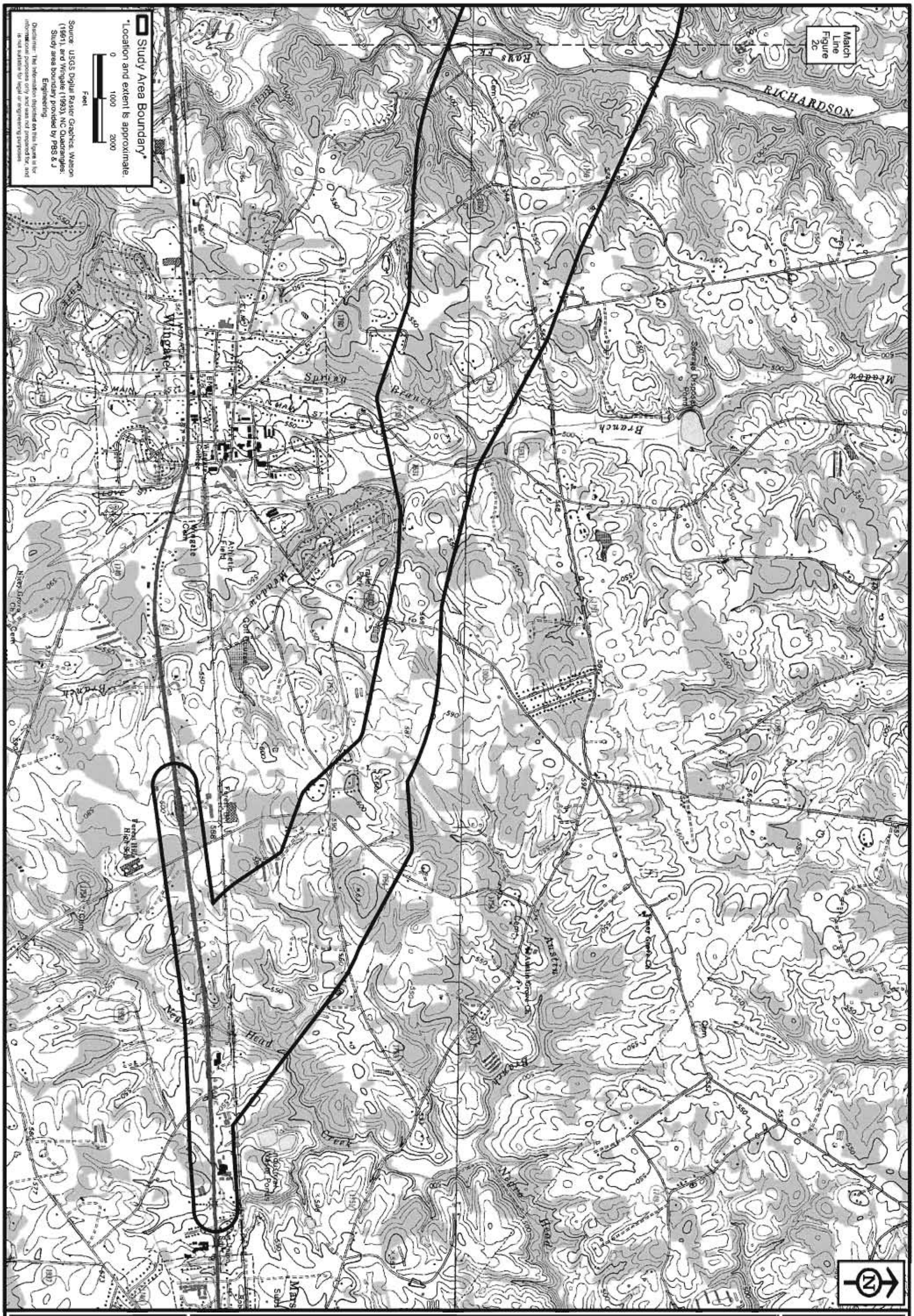

NORTH CAROLINA Turnpike Authority

Study Area Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

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Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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NORTH CAROLINA Turnpike Authority

Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

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Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

NORTH CAROLINA Turnpike Authority

Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

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Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

Project:	ET07007.01
Date:	Dec 2008
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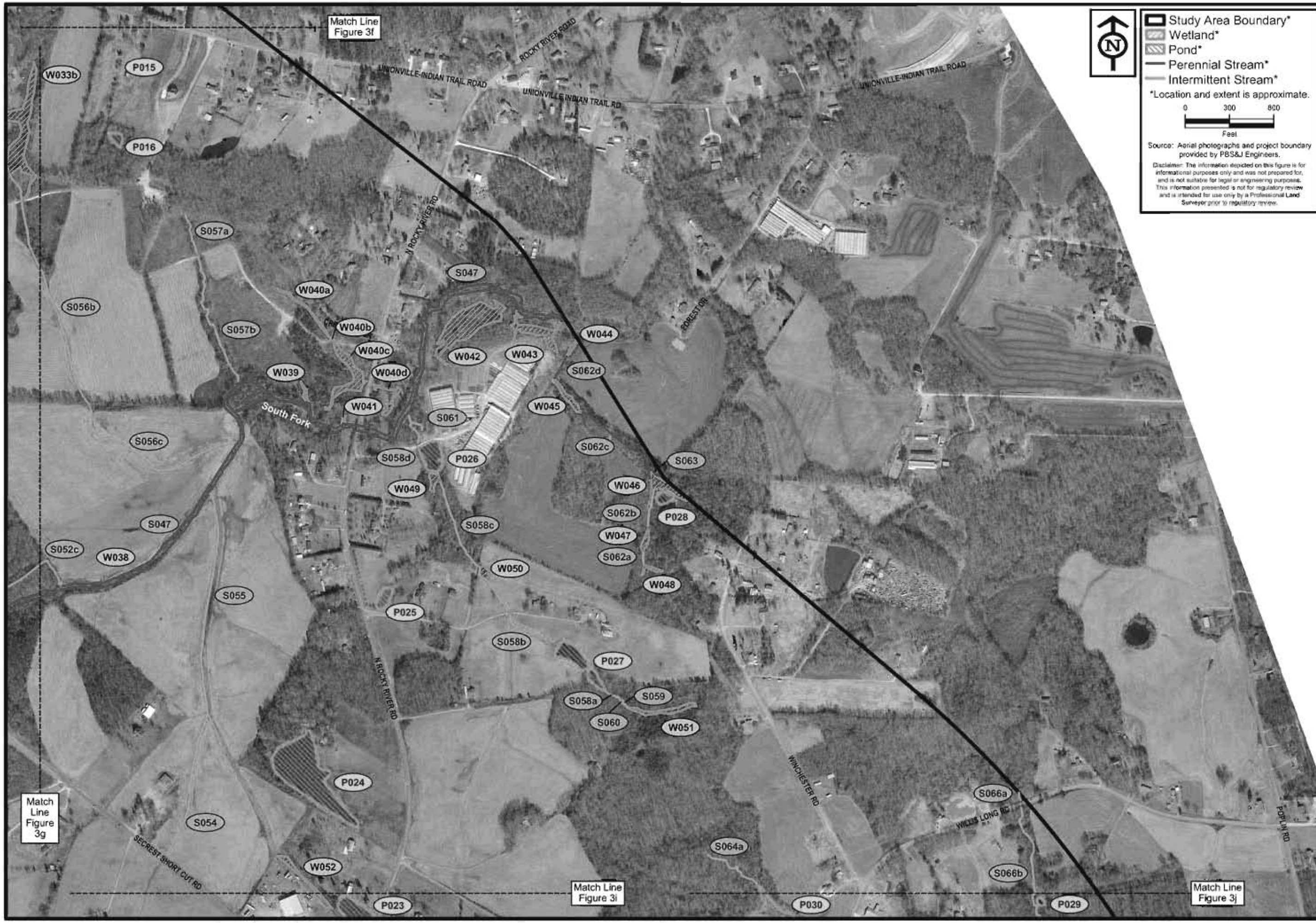
Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority



Study Area Boundary*
Wetland*
Pond*
Perennial Stream*
Intermittent Stream*
*Location and extent is approximate.

0 300 600
Feet

Source: Aerial photographs and project boundary provided by PBS&J Engineers.

Disclaimer: The information depicted on this figure is for informational purposes only and was not prepared for, and is not suitable for legal or engineering purposes. This information presented is not for regulatory review and is intended for use only by a Professional Land Surveyor prior to regulatory review.

Project:	ET07007.01
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Jurisdictional Features Map
Monroe Connector-Bypass
Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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NORTH CAROLINA Turnpike Authority

Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

Project:	ET07007.01
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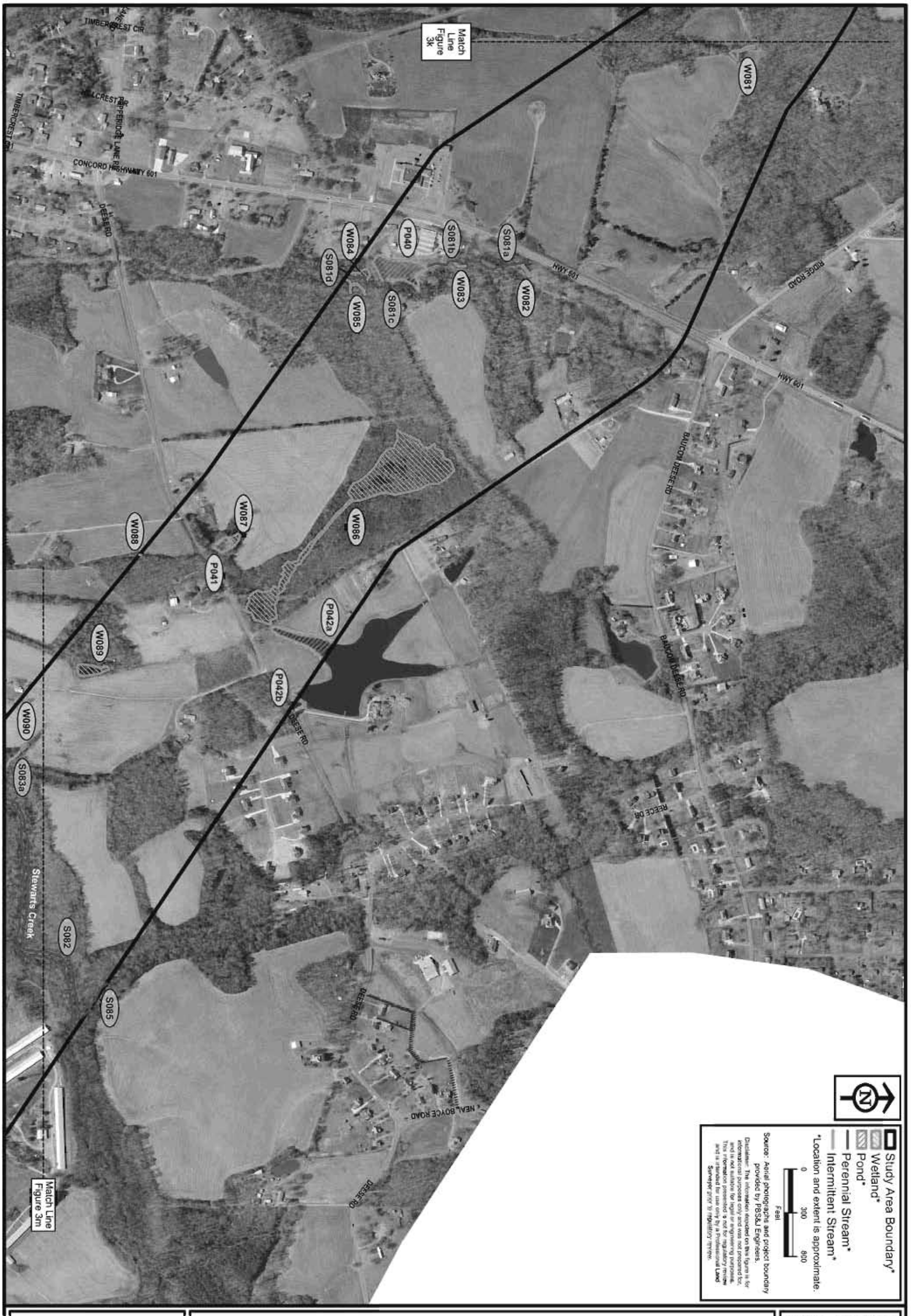

NORTH CAROLINA Turnpike Authority

Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

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Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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NORTH CAROLINA Turnpike Authority

Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

Project:	ET07007.01
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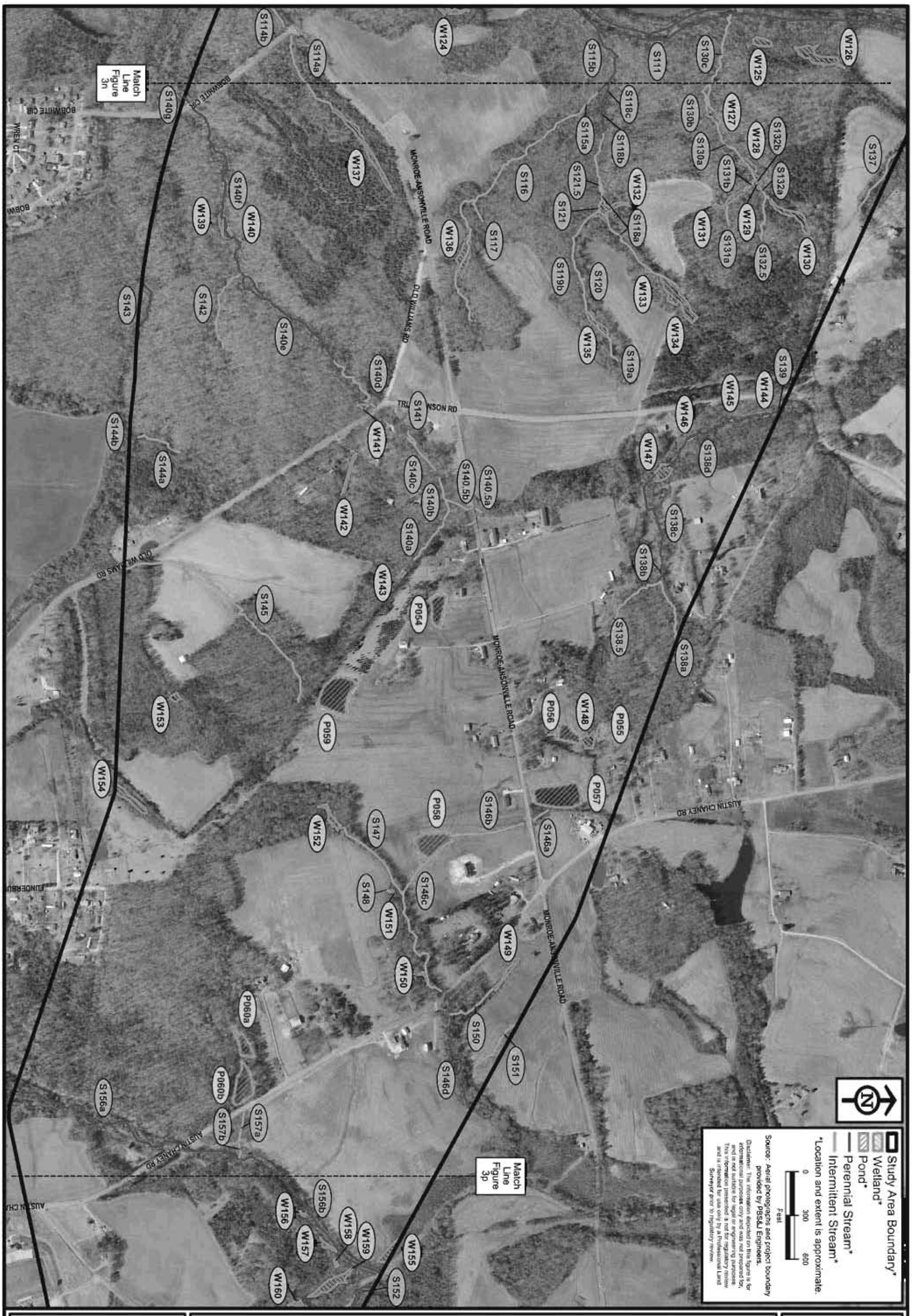

NORTH CAROLINA Turnpike Authority

Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

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Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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NORTH CAROLINA Turnpike Authority

Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

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Study Area Boundary*
Wetland*
Pond*
Perennial Stream*
Intermittent Stream*

*Location and extent is approximate.

0 300 600
Feet

Source: Aerial photographs and project boundary provided by PBS&J Engineers.

Disclaimer: The information depicted on this figure is for informational purposes only and was not prepared for, and is not suitable for legal or engineering purposes. This information presented is not for regulatory review and is intended for use only by a Professional Land Surveyor prior to regulatory review.

NORTH CAROLINA Turnpike Authority

Jurisdictional Features Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

Project:	ET07007.01
Date:	Dec 2008
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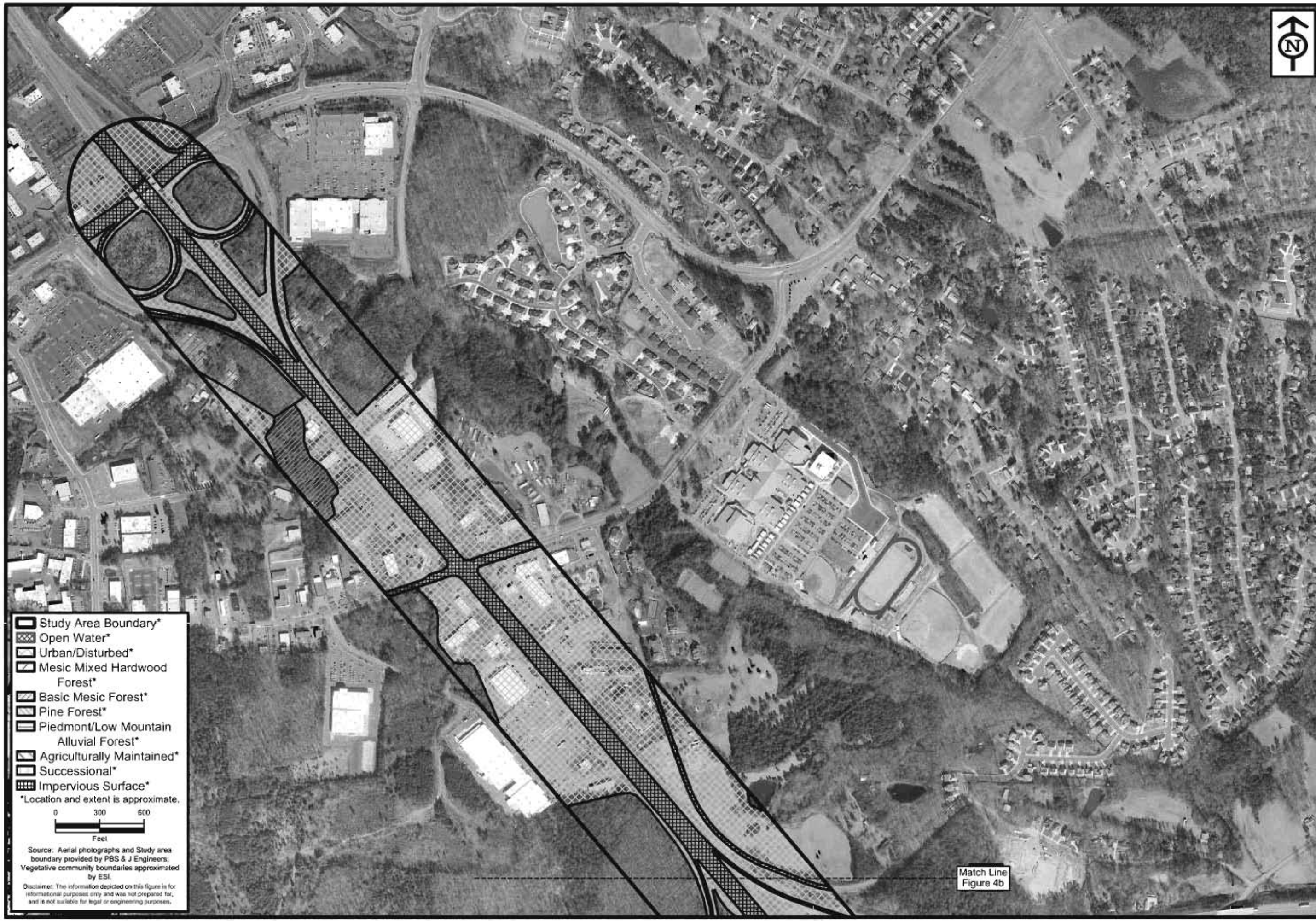

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Natural Communities Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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Figure:	4b

Natural Communities Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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Natural Communities Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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Natural Communities Map
Monroe Connector-Bypass
Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA
Turnpike Authority

Project:	ET07007.01
Date:	Dec 2008
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Natural Communities Map
Monroe Connector-Bypass
Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA
Turnpike Authority

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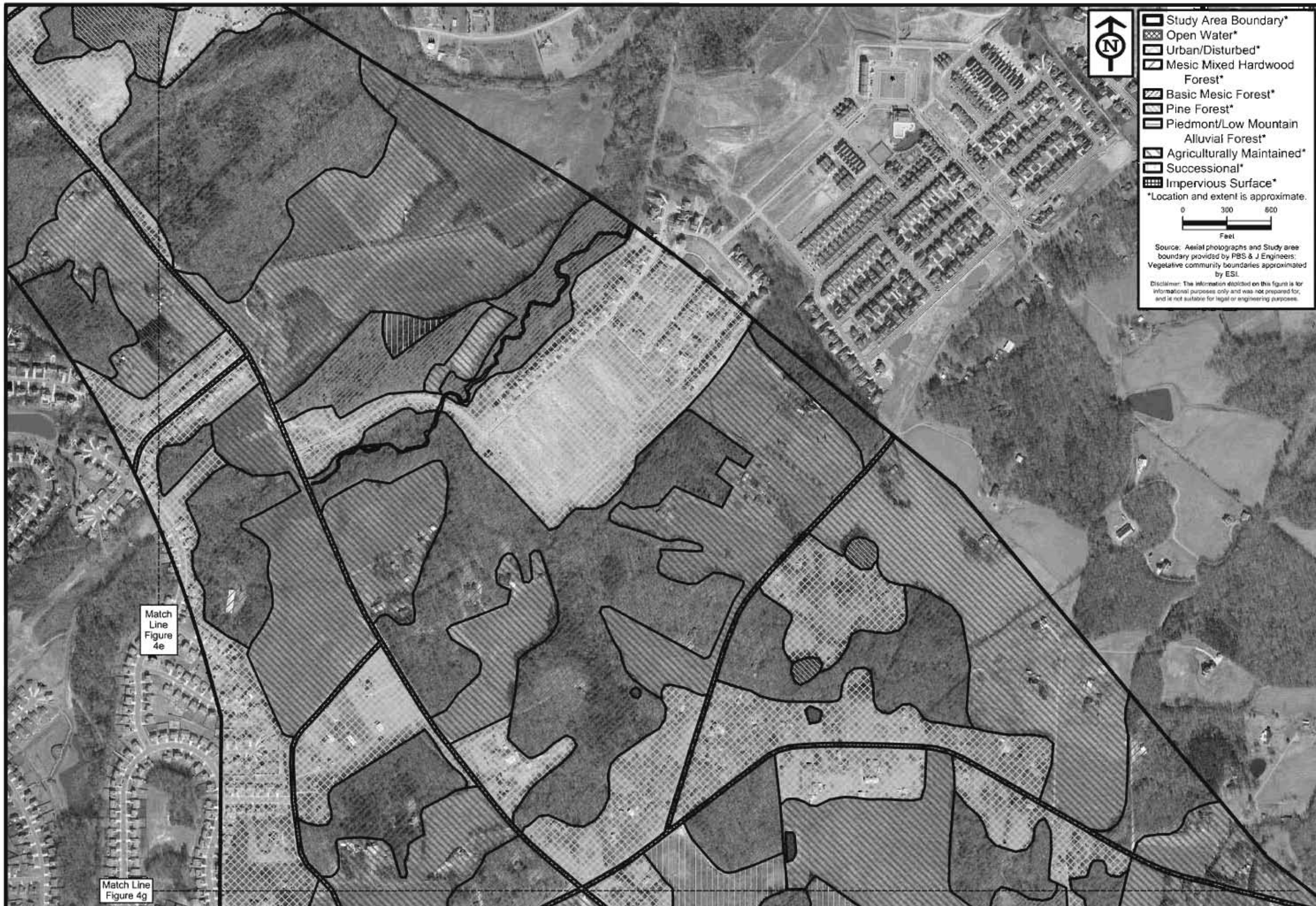

Project:	ET07007.01
Date:	Dec 2008
Drwn/Chkd:	AJS/PP
Figure:	4f

Natural Communities Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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Natural Communities Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

Project:	ET07007.01
Date:	Dec 2008
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Figure:	4g

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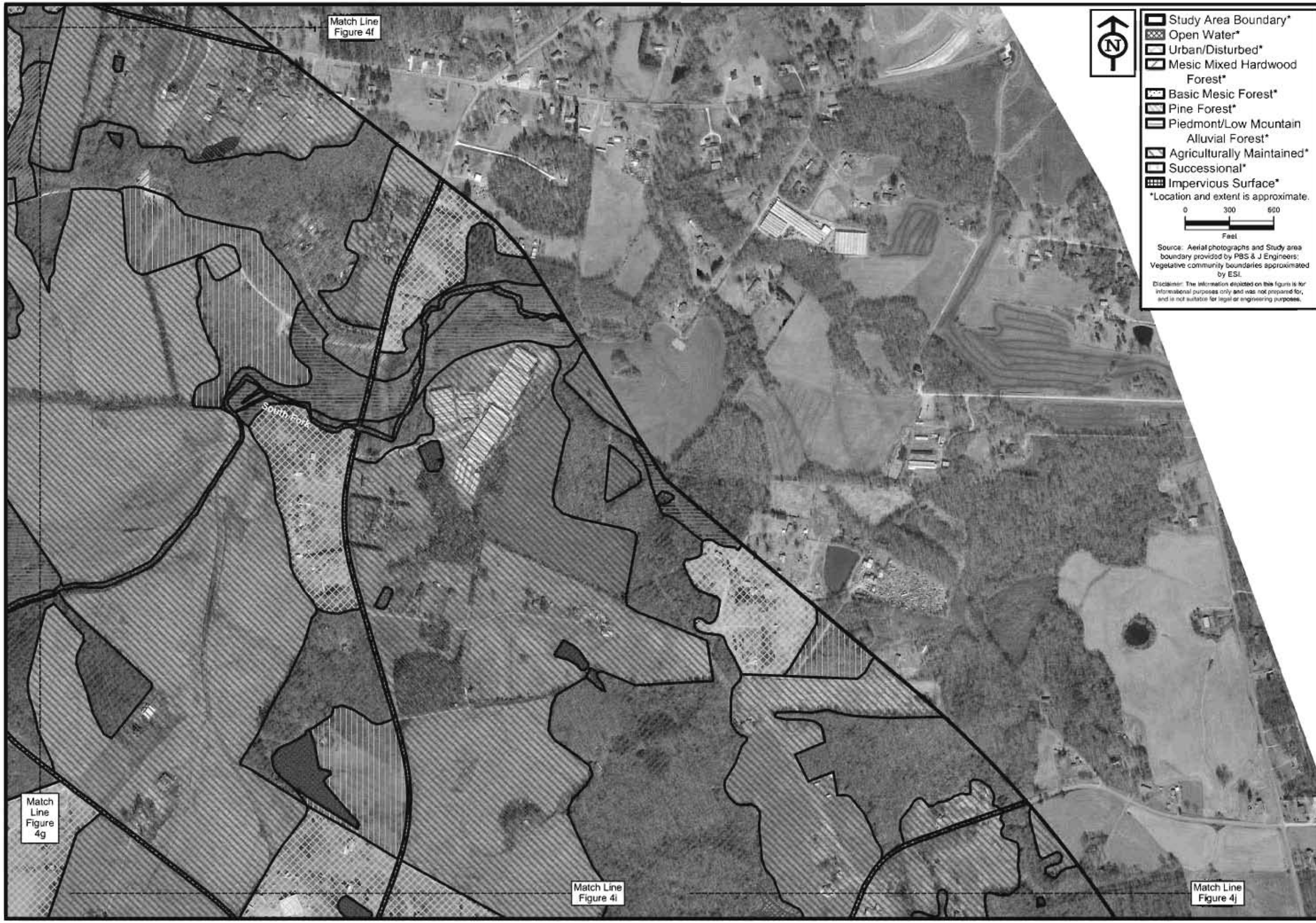

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Date:	Dec 2008
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Figure:	4h

Natural Communities Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

Natural Communities Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

Project:	ET07007.01
Date:	Dec 2008
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Figure:	4i

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Natural Communities Map
Monroe Connector-Bypass
Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

Project:	ET07007.01
Date:	Dec 2008
Drwn/Chkd:	AJS/PP
Figure:	4j

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Project:	ET07007.01
Date:	Dec 2008
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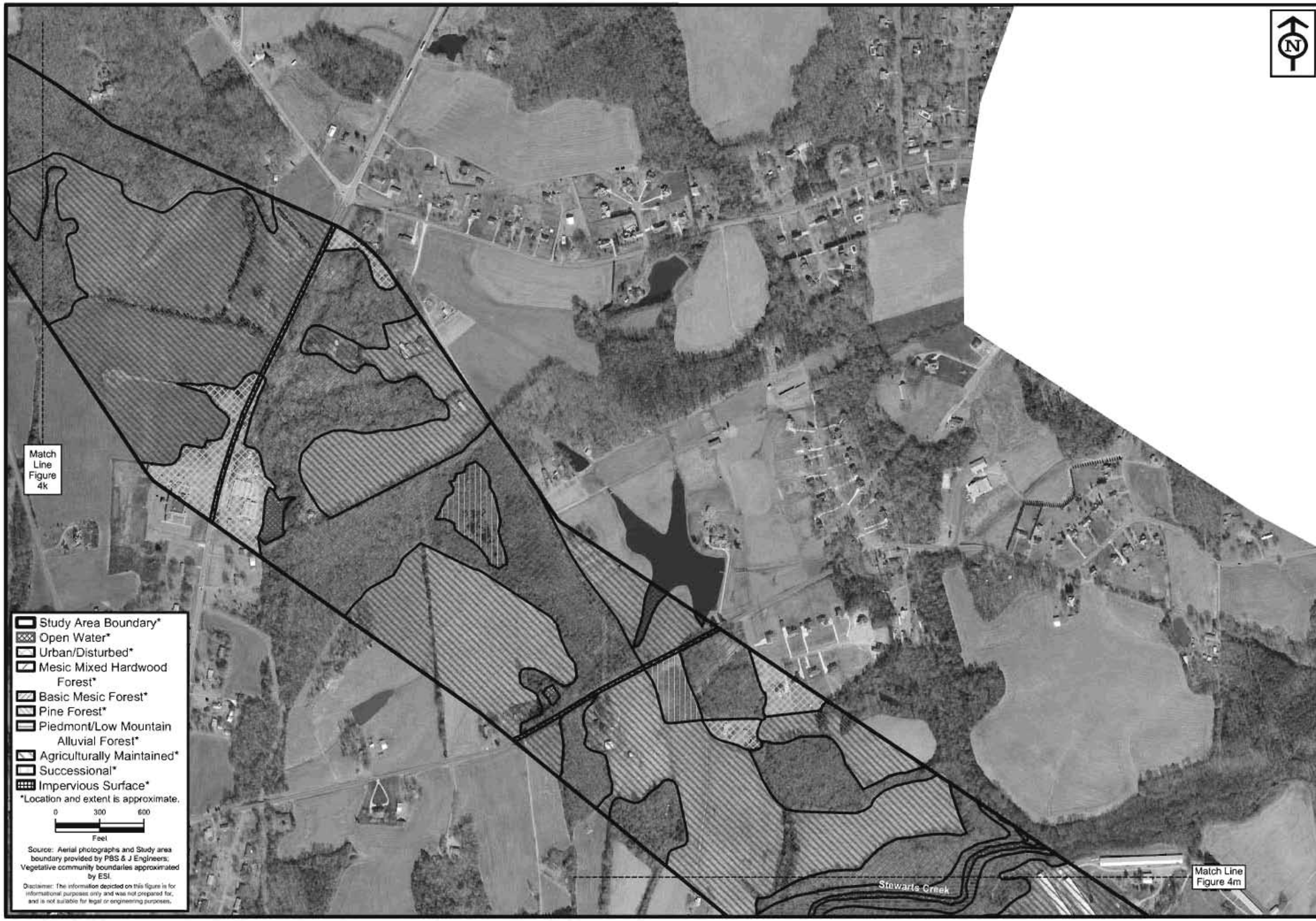
Figure:	4k

Natural Communities Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA
Turnpike Authority



Project:	ET07007.01
Date:	Dec 2008
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Figure:	4l

Natural Communities Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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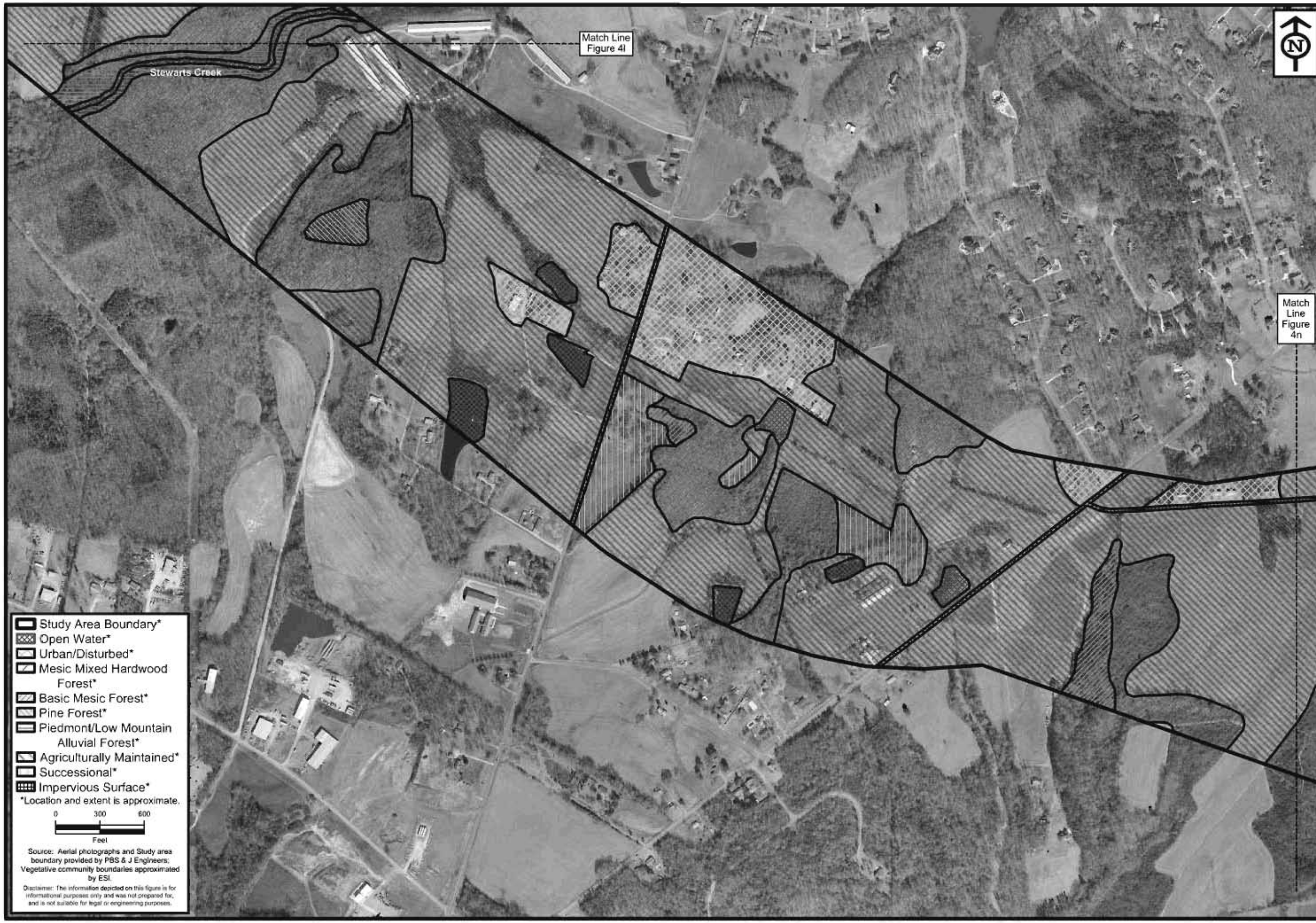

Project:	ET07007.01
Date:	Dec 2008
Drwn/Chkd:	AJS/PP
Figure:	4m

Natural Communities Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA
Turnpike Authority

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Project: ET07007.01
Date: Dec 2008
Drwn/Chkd: AJS/PP
Figure: 4n

Natural Communities Map
Monroe Connector-Bypass
Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA
Turnpike Authority

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Project:	ET07007.01
Date:	Dec 2008
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Figure:	4o

Natural Communities Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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Natural Communities Map

Monroe Connector-Bypass

Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

Project:	ET070007.01
Date:	Dec 2008
Drwn/Chkd:	AJS/PP
Figure:	4p

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Project:	ET07007.01
Date:	Dec 2008
Drwn/Chkd:	AJS/PP
Figure:	4q

Natural Communities Map
Monroe Connector-Bypass
Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA
Turnpike Authority

P:\GeoCorp\Projects\Office\ET\2007\007.01\Acad\FIG4_veg_comm.dwg, 12/8/2008 11:01:25 AM

Study Area Boundary*
Open Water*
Urban/Disturbed*
Mesic Mixed Hardwood Forest*
Basic Mesic Forest*
Pine Forest*
Piedmont/Low Mountain Alluvial Forest*
Agriculturally Maintained*
Successional*
Impervious Surface*
*Location and extent is approximate.

0 300 600
Feet

Source: Aerial photographs and Study area boundary provided by PBS & J Engineers; Vegetative community boundaries approximated by ESI.

Disclaimer: The information depicted on this figure is for informational purposes only and was not prepared for, and is not suitable for legal or engineering purposes.

Project:	ET07007.01
Date:	Dec 2008
Drwn/Chkd:	AJS/PP
Figure:	4r

Natural Communities Map
Monroe Connector-Bypass
Mecklenburg and Union Counties, North Carolina

NORTH CAROLINA Turnpike Authority

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APPENDIX B
Scientific Names of Species Identified in Report

Appendix B
Scientific Names of Species Identified in Report

Plants

Common Name	Scientific Name
American beech	*Fagus grandiflolia*
American holly	*Ilex opaca*
American sycamore	*Platanus occidentalis*
autumn olive	*Elaeagnus umbellata*
bedstraw	*Galium pilosum*
blackberry	*Rubus spp.*
box elder	*Acer negundo*
Bradford pear	*Pyrus calleryana*
broomsedge	*Andropogon virginicus*
Chinese privet	*Ligustrum sinense*
Christmas fern	*Polystichum acrostichoides*
cinnamon fern	*Osmunda cinnamomea*
clover	*Trifolium spp.*
common dandelion	*Taraxacum officinale*
common ladyfern	*Athyrium filix-femina*
crate myrtle	*Lagerstroemia indica*
deerberry	*Vaccinium stamineum*
dog-fennel	*Eupatorium capillifolium*
eastern red cedar	*Juniperus virginiana*
English ivy	*Hedera helix*
fescue	*Festuca spp.*
flowering dogwood	*Cornus florida*
giant cane	*Arundinaria gigantea*
goldenrod	*Solidago spp.*
greenbrier	*Smilax spp.*
ironwood	*Carpinus caroliniana*
Japanese honeysuckle	*Lonicera japonica*
kudzu	*Pueraria montana*
multiflora rose	*Rosa multiflora*
panic grass	*Panicum spp.*
pawpaw	*Asimina triloba*
poison ivy	*Toxicodendron radicans*
red maple	*Acer rubrum*
red oak	*Quercus rubra*
river birch	*Betula nigra*
rushes	*Juncus spp.*
sedges	*Carex spp.*
silky dogwood	*Cornus amomum*
slippery elm	*Ulmus rubra*
sweetgum	*Liquidambar styraciflua*

tulip poplar	*Liriodendron tulipifera*
violet	*Viola sororia*
Virginia creeper	*Parthenocissus quinquefolia*
white oak	*Quercus alba*
wild ginger	*Asarum canadense*
wild onion	*Allium canadense*
willow oak	*Quercus phellos*
winged elm	*Ulmus alata*

Animals

Common Name	Scientific Name
American crow	*Corvus brachyrhynchos*
American robin	*Turdus migratorius*
beaver	*Castor canadensis*
black racer	*Coluber constrictor*
bluegill	*Lepomis macrochirus*
bluehead chub	*Nocomis leptocephalus*
brown-headed cowbird	*Molothrus ater*
bullfrog	*Rana catesbeiana*
Canada goose	*Branta canadensis*
Carolina anole	*Anolis carolinensis*
Carolina wren	*Thryothorus ludovicianus*
chipping sparrow	*Spizella passerina*
common gray fox	*Urocyon cinereoargenteus*
common gray treefrog	*Hyla versicolor*
copperhead	*Agkistrodon contortrix*
creek chubsucker	*Erimyzon oblongus*
eastern box turtle	*Terrapene carolina*
eastern cottontail	*Sylvilagus floridanus*
eastern garter snake	*Thamnophis sirtalis*
eastern mosquitofish	*Gambusia holbrooki*
European starling	*Sturnus vulgaris*
five-lined skink	*Eumeces fasciatus*
flat bullhead catfish	*Ameiurus platycephalus*
golden shiner	*Notemigonus crysoleucas*
gray catbird	*Dumetella carolinensis*
gray squirrel	*Sciurus carolinensis*
great blue heron	*Ardea herodias*
green sunfish	*Lepomis cyanellus*
greenfin shiner	*Cyprinella chloristia*
largemouth bass	*Micropterus salmoides*
mallard	*Anas platyrhynchos*
marbled salamander	*Ambystoma opacum*
mourning dove	*Zenaida macroura*
mud turtle	*Kinosternon subrubrum*
northern water snake	*Nerodia sipedon*

orchard oriole	*Icterus spurius*
prothonotary warbler	*Protonotaria citrea*
raccoon	*Procyon lotor*
rat snake	*Elaphe obsoleta*
red breast sunfish	*Lepomis auritus*
red salamander	*Pseudotriton ruber*
red shouldered hawk	*Buteo lineatus*
red-bellied woodpecker	*Melanerpes carolinus*
redheaded woodpecker	*Melanerpes erythrocephalus*
red-tail hawk	*Buteo jamaicensis*
sandbar shiner	*Notropis scepticus*
snapping turtle	*Chelydra serpentina*
southern leopard frog	*Rana sphenocephala*
southern toad	*Bufo terrestris*
spottail shiner	*Notropis hudsonius*
spring peeper	*Pseudacris crucifer*
swallowtail shiner	*Notropis procne*
tessellated darter	*Etheostoma olmstedi*
turkey vulture	*Cathartes aura*
Virginia opossum	*Didelphis virginiana*
white catfish	*Ameiurus catus*
white sucker	*Catostomus commersonii*
whitefin shiner	*Cyprinella nivea*
white-tailed deer	*Odocoileus virginianus*
wild turkey	*Meleagris gallopavo*
wood duck	*Aix sponsa*

APPENDIX C
Wetland and Stream Forms

INCLUDED AS A SEPARATE BINDER

APPENDIX D
Qualifications of Contributors

Appendix D
Qualifications of Contributors

Investigator:	Vincent Condon
Education:	B.S. Resource Conservation, University of Florida
Experience:	Project Scientist, Environmental Services, Inc., 2007-Present
Responsibilities:	Natural resource investigations, wetland delineations, GPS data collection, document preparation

Investigator:	Jan Gay
Education:	M.S. Ecological Classification and Ecosystem Modeling, Clemson University
Experience:	Assistant Vice President, Environmental Services, Inc., 1995-Present
Responsibilities:	Natural resource investigations, wetland delineations

Investigator:	Charles Johnston
Education:	M.S. Ecology, North Carolina State University
Experience:	Senior Scientist, Environmental Services, Inc., 2005-Present
Responsibilities:	Natural resource investigations, wetland delineations, GPS data collection

Investigator:	Kevin Markham
Education:	M.S. Marine Biology, University of North Carolina at Wilmington
Experience:	Vice President, Ecology Division Director, Environmental Services, Inc., 1995-Present
Responsibilities:	Main QA/QC oversight

Investigator:	Brandon Smith
Education:	B.S. Natural Resource Management, University of Kentucky
Experience:	Senior Project Manager, Environmental Services, Inc., 1999-Present
Responsibilities:	Natural resource investigations, wetland delineations

Investigator:	AJ Steffen
Education:	B.S. Geography: Natural Resources Management, University of Wisconsin
Experience:	Project Scientist, Environmental Services, Inc., 2000-Present
Responsibilities:	File creation and editing of MicroStation and AutoCADD. Geographical information and editing. Report Graphics.

Investigator:	Gail Tyner
Education:	B.S. Fisheries and Wildlife Science, North Carolina State University
Experience:	Project Manager, Environmental Services, Inc., 1998-Present
Responsibilities:	Natural resource investigations, wetland delineations, GPS data collection

Investigator:	Edward Wagner
Education:	AutoCADD Certificate, 1996
Experience:	Senior CAD Technician, Environmental Services, Inc., 2008-Present
Responsibilities:	File creation and editing of MicroStation and AutoCADD. Geographical information and editing. Report Graphics.