

**MACY GROVE ROAD IMPROVEMENTS
TOWN OF KERNERSVILLE, FORSYTH COUNTY
NORTH CAROLINA**

**STIP PROJECTS U-2800 AND U-4734
WBS NO. 34858.1.1 AND 36600.1.2
FEDERAL AID PROJECT NO. STP-2601 (1) AND STP-2601(3)**

**ADMINISTRATIVE ACTION
ENVIRONMENTAL ASSESSMENT**

**U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
AND
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**

**DOCUMENT PREPARATION BY:
URS CORPORATION – NORTH CAROLINA**



Submitted Pursuant to the National Environmental Policy Act 42 USC 4332(2)(C)

9/9/10
Date

Eric Mitty

FOR Gregory J. Thorpe, Ph.D.
Manager
Project Development and Environmental Analysis Branch
North Carolina Department of Transportation

9/30/10
Date

John F. Sullivan, III

FOR John F. Sullivan, III, PE
Division Administrator
Federal Highway Administration

**MACY GROVE ROAD IMPROVEMENTS
TOWN OF KERNERSVILLE, FORSYTH COUNTY
NORTH CAROLINA**

**STIP PROJECTS U-2800 AND U-4734
WBS NO. 34858.1.1 AND 36600.1.2
FEDERAL AID PROJECT NO. STP-2601 (1) AND STP-2601(3)**

**ADMINISTRATIVE ACTION
ENVIRONMENTAL ASSESSMENT**

**U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
AND
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**

**DOCUMENT PREPARED BY:
URS CORPORATION – NORTH CAROLINA**

9/9/2010
Date

Joanna Harrington
Joanna Harrington
Project Planner

9/9/2010
Date

Christopher Werner
Christopher Werner, P.E.
Project Manager



**FOR THE:
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**

9/9/10
Date

Vince Rhea
Vince Rhea, P.E.
Project Development Engineer

9/9/10
Date

Derrick Weaver
Derrick Weaver, P.E.
Project Development Group Supervisor

September 2010

Project Commitments

Macy Grove Road Improvements

Federal Aid Project No. STP-2601 (1) and STP-2601(3)
WBS No. 34858.1.1 and 36600.1.2
STIP Projects U-2800 and U-4734
Forsyth and Guilford Counties, North Carolina

Hydraulics Unit

1. FEMA Coordination. The Hydraulics Unit will coordinate with the NC Floodplain Mapping Program (FMP) to determine the status of the project with regard to applicability of NCDOT's Memorandum of Agreement or approval of a Conditional Letter of Map Revision (CLOMR) and subsequent final Letter of Map Revision (LOMR).

Division 9

1. Reedy Fork Crossing. This project involves construction activities on or adjacent to a FEMA-regulated stream; therefore, the Division shall submit sealed as-built construction plans to the Hydraulics Unit upon completion of project construction, certifying that the drainage structure and roadway embankment that are located within the 100-year floodplain were built as shown in the construction plans, both horizontally and vertically.

Hydraulics Unit, Roadway Design Unit

1. Future Piedmont Greenway Crossing. Through coordination with Triad Park, preliminary designs were developed to accommodate the future Piedmont Greenway. A concrete path, immediately adjacent to the sloping abutments associated with the proposed bridge crossing of Reedy Fork, will be built during construction of STIP U-4734 at NCDOT's expense. Results of coordination with the park officials suggest the pathway be constructed above the 10-year storm elevation (approximate elevation 886.5 pending final design verification), with a recommended vertical clearance of 9 feet.

SUMMARY

TYPE OF ACTION

In accordance with the National Environmental Policy Act of 1969 (NEPA), as amended, an Environmental Assessment (EA) has been prepared for the proposed improvements and extension of SR 2601 (Macy Grove Road) near the Town of Kernersville in Forsyth County, North Carolina. According to FHWA's toolkit on NEPA Documentation, an EA is prepared when the significance of impacts of a transportation project is uncertain. The EA will disclose the project benefits and environmental impacts to the public and to other local, state, and federal agencies to obtain their comments on the proposed action and assist the NCDOT and Federal Highway Administration (FHWA) in the decision-making process. If at any point in the process of preparing an EA, it is discovered that the project would result in significant impacts, an Environmental Impact Statement will be prepared. If after completing the EA, it is determined that there are no significant impacts associated with the project, a Finding of No Significant Impact (FONSI) will be prepared, addressing comments received on the EA from the public, and local, state, and federal agencies.

The content of this EA conforms to the Council on Environmental Quality (CEQ) guidelines, which provide direction regarding implementation of the procedural provisions of NEPA, and the FHWA's *Guidance for Preparing and Processing Environmental and Section 4(f) Documents*. The FHWA and the North Carolina Department of Transportation (NCDOT) are lead agencies for the proposed action.

DESCRIPTION OF ACTION

The NCDOT 2009-2015 State Transportation Improvement Program (STIP) and the Winston-Salem Urban Area Metropolitan Planning Organization's 2009-2015 Metropolitan Transportation Improvement Program (MTIP) include the proposed widening and extension of SR 2601 (Macy Grove Road) in Forsyth County, North Carolina, near the Town of Kernersville. In both the STIP and MTIP, the projects are referred to as U-2800 and U-4734.

NCDOT has decided to prepare a combined EA for both projects, given the proximity and dependent relationship of the two projects. For clarity in describing details within this document, the two projects will be referred to as the "project." Should discussion on specific details of each STIP project be required, they will be identified individually. U-2800 consists of widening Macy Grove Road to multi-lanes, extending the roadway on new location from SR 2042 (Old Greensboro Road) to north of SR 1005 (Old US 421/East Mountain Street), and converting a grade separation at I-40 Business/US 421 to an interchange. Grade separations are also proposed on new location crossing the Norfolk Southern (NS) Railroad and SR 1005 (Old US 421/East Mountain Street). U-4734 includes extending Macy Grove Road on new location from north of Old US 421/East Mountain Street to NC 150.

SUMMARY OF PURPOSE AND NEED

The primary purpose of the proposed project is to:

- **Provide a link between I-40 Business/US 421 and NC 150 (N. Main Street) north of Kernersville**

No direct link currently exists between I-40 Business and NC 150 north of Kernersville. The *Roadway Connector System Feasibility Study* notes that traffic traveling between residential areas north of Kernersville and employment/retail centers in Forsyth and

Guilford counties must use the Town of Kernersville's existing thoroughfare system. This infrastructure is configured in a radial pattern where all major routes come together in the center of town before being distributed in other directions. Radial routes north of Kernersville ultimately converge at the NC 66/NC 150 intersection in downtown Kernersville and include West Mountain Street, Bodenhamer Street, SR 2024 (Old Valley School Road), SR 2021 (Kerner Road), SR 1969 (Piney Grove Road), and NC 150. At this intersection, vehicles traveling west on I-40 Business have the option of utilizing either the South Main Street interchange or the NC 66/NC 150 interchange; however, vehicles traveling east on I-40 Business/US 421 must utilize the NC 66/NC 150 interchange because it provides a more direct connection to I-40 Business/US 421.

OTHER POTENTIAL BENEFITS

In addition to addressing the primary need, other potential benefits may result from the proposed project including the following:

- **Reduce congestion in downtown Kernersville and at the existing NC 66/NC 150 interchange with I-40 Business/US 421**

According to the *Roadway Connector System Feasibility Study* prepared for the Town of Kernersville and the *Macy Grove Road Extension Feasibility Study* prepared for NCDOT, traffic volumes along NC 66, Bodenhamer Street, North Main Street, and other streets in town are high enough to result in northbound peak hour traffic backing up to the I-40 Business/US 421 interchange while waiting to get through the East Mountain Street and Bodenhamer Street intersection. Contributing to the intersection delay is the NS Railroad at-grade crossing of Bodenhamer Street, located approximately 80 feet north of the East Mountain Street and Bodenhamer Street intersection, which serves four to six trains per day according to the NCDOT Rail Division.

As documented in the *Roadway Connector System Feasibility Study*, "Kernersville's thoroughfare system is configured in a radial pattern where all major routes come together in the center of town before being distributed in other directions. The existing roads have become more difficult to travel over the past few years due to increased congestion from rapid development along major thoroughfares leading into town." The dispersion of traffic from these converging routes is partially processed at the NC 66/NC 150 interchange at I-40 Business. The *Town of Kernersville Development Plan* (Town of Kernersville, January 2005) also states that the Town of Kernersville is in its fifth and final stage of transportation development, which includes addressing the major issue of connectivity. By improving connectivity, the Town of Kernersville hopes to provide a street system with multiple connections between destinations, allowing for the distribution of traffic rather than concentrating traffic which causes traffic congestion.

Coordination with the NCDOT Highway Division 9 confirms that the current interchange configuration of NC 66/NC 150 interchange at I-40 Business is operating over capacity even with the recent addition of a second eastbound left-turn lane at the loop terminal intersection with NC 66. The Division stated that poor operations are due to high peak hour volumes along NC 66 (within the vicinity of I-40 Business/US 421), the inability of the signalized ramp terminals to process the peak hour traffic volumes, and constrained operations associated with the weaving movement between the East Mountain Street entrance ramp to westbound I-40 Business/US 421 and the westbound I-40 Business/US 421 exit ramp to NC 66.

- **Provide a segment of the future Kernersville Loop Road**

The proposed project is a component of the future *Town of Kernersville Loop Road System*, which is included in the *Kernersville Thoroughfare and Street Plan* (Town of Kernersville, July 2005) and the *Winston-Salem Urban Area 2035 Long Range Transportation Plan (2035 LRTP)* (Winston-Salem Urban Area Metropolitan Planning Organization, January 2009). Construction of the Loop Road System is also the top priority for Kernersville on the Winston-Salem Urban Area Metropolitan Planning Organization's Transportation Needs list (Winston-Salem Urban Area Metropolitan Planning Organization, March 2004). The Town of Kernersville is prepared to construct the portion of the Kernersville Loop Road System between NC 150 to Piney Grove Road once the Macy Grove Road extension and proposed interchange at I-40 Business is in place.

ALTERNATIVES CONSIDERED

A full range of alternatives, including the No-Build Alternative, Alternative Modes of Transportation, Transportation Systems Management (TSM) Alternative, Improve Existing Facility Alternative, and New Location Build Alternatives were evaluated for the proposed action. Most of the alternatives were eliminated from further consideration because they did not have the potential to meet the purpose and need for the project. Only the New Location Build Alternatives had the potential to meet the purpose and need and were further evaluated. The No-Build Alternative did not meet the purpose and need, but was carried forward for purposes of comparison.

After an evaluation of interchange locations along I-40 Business that took into consideration constraints in the surrounding natural and human environment, the existing Macy Grove Road grade separation was recommended for the proposed U-2800 interchange location. Initially seven preliminary New Location Build Alternatives were identified for U-4734, called Alternatives 1-7. All U-4734 alternatives begin at the U-2800 match point, vary in location near the Reedy Fork crossing, and ultimately converge, improving Smith Edwards Road before terminating at NC 150.

The New Location Build Alternatives were then qualitatively screened for potential impacts to the human and natural environment and design and construction feasibility. Alternatives 6 and 7 were eliminated due to wetland, stream, floodplain, and/or residential impacts. Given their close proximity, Alternative 1 and Alternative 3 were combined and referred to as Alternative 1. Similarly, Alternatives 4 and 5 were combined and referred to as Alternative 5.

Functional Designs and an evaluation of potential impacts were prepared for Alternatives 1, 2, and 5, and for three structure types for the proposed Reedy Fork crossing. The three structure types included (1) box culvert option, (2) span the natural system and floodplain with a minimum hydraulically required bridge, and (3) span the natural system and floodplain completely. A field meeting with resource agency representatives resulted in the recommendation to bridge the Reedy Fork crossing with a minimum hydraulically required bridge. Preliminary Designs were then prepared for Alternatives 1, 2, and 5 to refine the designs in an effort to avoid and minimize impacts.

SUMMARY OF ENVIRONMENTAL EFFECTS

The potential impacts for the three New Location Build Alternatives are shown in Table S.1.

Table S.1: Summary of Impacts for New Location Build Alternatives

Impact	U-4734			U-2800
	Alternative 1	Alternative 2	Alternative 5	
Length (miles)	1.54	1.59	1.55	0.94
Bridges over Streams (#)	1	1	1	0
Major Culvert Crossings >72" (#)	1	1	1	0
Stream Crossings (#/length in ft)	1/294	1/294	2/478	10/2,343
Wetlands (#/acres)	2/1.8	2/1.1	2/1.0	1/0.1
Ponds (#/acres)	1/0.3	1/0.2	1/0.1	0
100-Year Floodplain (acres)	1.7	1.0	1.1	0
Total Protected Riparian Buffer (ft ²)	28,983	29,831	44,976	168,726
Water Supply Critical Areas (Y/N)	N	N	N	N
Prime Farmlands (acres)	95.4 (includes U-2800)	96.1 (includes U-2800)	94.3 (includes U-2800)	(included in U-4734)
VADs and EVADs (Y/N)	N	N	N	N
Significant Natural Heritage Areas (# of crossings)	0	0	0	0
Known Critical Habitat of Federally Listed Threatened & Endangered Species (#)	0	0	0	1
Presence of Threatened and Endangered Species – Federally Listed (Y/N)	N	N	N	N
Presence of Threatened and Endangered Species – State Listed (Y/N)	N	N	N	N
Forest Impacts (acres)	35.9	36.9	37.4	47.1
Historic Properties (#)	0	0	0	0
Section 6(f) Properties (Y/N)	N	N	N	N
Archaeological Sites (#)	0	0	0	0
Parks (#/acres)	1/7.1	1/6.5	1/6.0	0
Wildlife Refuge and Gamelands (Y/N)	N	N	N	N
Federal Lands (Y/N)	N	N	N	N
Greenway Crossings (#)	1	1	1	0
Potential Section 4(f) Impacts (Y/N)	N	N	N	N
Residential Relocations (#)	6	4	5	10
Business Relocations (#)	1	1	1	6
Non-Profit Organizations (#)	0	0	0	2
Low Income/Minority Populations (Y/N)	N	N	N	N
Limited English Proficiency (LEP) Populations Present (Y/N)	Y – according to Demographic Study Area			
Schools (#)	0	0	0	0
Churches (#)	0	0	0	0
Cemeteries (#)	0	0	0	0
Railroad Crossings (#)	0	0	0	1
Major Utility Crossings (#)	1	1	1	1
Noise (# of receptors*)	5	4	6	3
Air Quality (Y/N)	N	N	N	N
Hazardous Materials Sites (#/severity)	0/none	0/none	0/none	3/low-mod 1/mod-high
Estimated Utility Cost	\$233,552	\$153,600	\$153,600	\$614,346
Estimated Right-of-way Cost	\$4,372,000	\$3,996,000	\$4,050,500	\$8,552,300
Estimated Construction Cost	\$10,800,000	\$11,400,000	\$11,900,000	\$32,700,000
Total Cost	\$15,405,552	\$15,549,600	\$16,104,100	\$41,866,646

Note: All impacts based on preliminary design slopestakes plus 25 feet except for forest impacts, which are based on preliminary design right-of-way. Additionally, prime farmlands impacts are based upon functional designs plus 40 feet.

* Noise receptors may consist of houses, churches, parks, schools, libraries, or hotels.

A qualitative discussion of environmental effects not summarized in Table S.1 follows.

Each alternative will impact the Triad Park; however, the proposed project is consistent with Triad Park's master plan, with this portion of the park being developed once the project has been constructed. In addition, because Triad Park officials were consulted during the development of the project alternatives and preliminary designs, the activities, features, and attributes of the Triad Park are not adversely affected. Based on this coordination and agreement, FHWA anticipates a *de minimis* effect on the Section 4(f) resource; however, this determination is subject to comments received from the public after the EA is circulated, and before a preferred alternative is selected.

Social effects to neighborhoods/communities within the project study area differ depending on where the existing roadway is being upgraded versus where the proposed project is on new location. In the southern portion of the study area, widening of Macy Grove Road will have fewer direct impacts because most residences are south of the proposed project. By providing additional access to I-40 Business, higher traffic volumes may result; however, the planned hospital/medical center and Triad Business Park (which are all currently under construction) will bring this change regardless of the proposed project. In the middle of the study area, little disruption to community/neighborhood stability is expected as this area is mainly light industrial business or planned for commercial retail. The northern portion of the study area is mainly residential rural in nature. By providing a new four-lane facility, additional traffic will be present as a result of altered travel patterns. The change in rural character may cause some residents to choose to relocate, which will impact the neighborhood structure and existing cohesion. No concentrations of minority or low-income residents would be impacted by the proposed project.

Effects to bicycle and pedestrian facilities within the project study area result in improved connectivity from areas north and south of Kernersville to current and future recreational facilities such as the Triad Park and the Piedmont Greenway. All build alternatives create a new access point to the western portion of the park and include 14-foot wide outside travel lanes to accommodate bicycle traffic and a 10-foot wide berm to accommodate future sidewalks. In addition, the proposed project is part of the future Kernersville Loop Road, which will intersect with the future US 70/I-40 Business transit corridor, providing an opportunity for a Bus Rapid Transit (BRT) stop within the project study area.

INDIRECT AND CUMULATIVE EFFECTS

Indirect Effects

The pace, location, and extent of industrial development will likely be affected by the proposed project, as follows:

- The project will improve access to current and planned industrial areas and is expected to result in more rapid industrial growth in these areas, especially around the new interchange area.
- Industrial development planned in the southern portion of the study area may happen sooner due to improved access.
- Kernersville is currently looking at potential build sites for industrial, commercial, and retail sites that typically depend heavily on available transportation infrastructure. If built, the proposed project could influence the location decisions of such sites.

While long-term economic impacts associated with the project are considered positive, the short-term impacts during construction activities and local impacts to neighborhoods along the proposed Macy Grove Road extension are considered a negative impact. Long-term traffic related noise is also a likely indirect effect of the project to residents and businesses located in the immediate vicinity of the project.

Cumulative Effects

The proposed project alone will not have substantial cumulative impacts; however, if the other sections of the Kernersville Loop Road are constructed as presented in local and regional transportation plans, there is a possibility for increased traffic, commercial and industrial development, and associated sprawl in areas outside of the study area. When considered cumulatively with the future widening of East Mountain Street/Old US 421 (U-3617), the proposed project could notably improve accessibility to potentially developable land in the northern and middle portions of the study area, again affecting location decisions for industrial development.

RECOMMENDED IMPROVEMENT

Based on the expected direct, indirect, and cumulative effects and coordination with the Triad Park, it is NCDOT's recommendation that U-4734 Alternative 2, in conjunction with U-2800, be implemented to fulfill the purpose and need for the project. The preliminary designs are subject to change in the final design to ensure compliance with local, state, and federal regulations and permits.

PERMITS REQUIRED

Project construction activities require environmental regulatory permits from federal and state agencies. A list of these permits, organized by issuing agency, is provided in this section. The NCDOT will obtain all necessary permits prior to construction. Many of the environmental issues and mitigation measures discussed in this EA will be further quantified and evaluated as final roadway designs are completed.

United States Army Corps of Engineers

Section 404 Permit: any action that proposes to place fill into “Waters of the United States” falls under the jurisdiction of the United States Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act (CWA) (33 USC 1344). The CWA provides for public notice and review of pending Section 404 permit applications. Encroachments into areas determined as subject under the CWA must be reviewed and approved by the USACE through the Section 404 program. It is anticipated that a Department of the Army Nationwide Permit #14 – Linear Transportation Projects will be required for impacts to Reedy Fork and its associated wetland system, and a Section 10 permit will be required for the proposed bridge crossing of Reedy Fork.

North Carolina Department of Environment and Natural Resources, Division of Water Quality

Section 401 Water Quality Certification: any activity which may result in discharge to navigable waters and requires a federal permit must obtain a certification through the North Carolina Division of Water Quality (NCDWQ) that such discharge would be in compliance with applicable state water quality standards. This permit is required in association with the Section 404 permitting process and is required prior to Section 404 authorization.

Randleman Lake Watershed Riparian Buffer Rules: an “Authorization Certificate” is required for any non-exempt activity within the 50-foot wide riparian buffer along all perennial and intermittent streams in the watershed of Randleman Lake in portions of Forsyth, Guilford, and Randolph Counties. A listing of allowable uses of the buffer areas is provided in the rules.

Jordan Lake Riparian Buffer Rules: an “Authorization Certificate” is required for any non-exempt activity within the 50-foot wide riparian buffer along all perennial and intermittent streams in the watershed of Jordan Lake. A listing of allowable uses of the buffer areas is provided in the rules.

North Carolina Department of Environment and Natural Resources, Division of Land Resources

Erosion and Sedimentation Control Plan: in accordance with the North Carolina Sedimentation Pollution Control Act of 1973, projects disturbing more than one acre of land must submit an Erosion and Sedimentation Control Plan to the NCDENR Division of Land Resources (DLR). The plan must include erosion control measures and be approved by the DLR prior to construction.

North Carolina Department of Environment and Natural Resources, Division of Forest Resources

Open Burning Permit: a permit is required to start a fire in woodlands or within 500 feet of woodlands under the protection of the Division of Forest Resources. Thirty-day permits can be issued for highway construction.

COORDINATION

The following federal, state, and local agencies and officials were consulted regarding this project:

- USACE
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- FHWA
- North Carolina Department of Environment and Natural Resources
 - N.C. Division of Water Quality/Wetlands
 - N.C. Division of Environmental Health
 - N.C. Division of Forest Resources
 - N.C. Wildlife Resources Commission
- N.C. State Clearinghouse Department of Administration
- N.C. Division of Archives and History/Department of Cultural Resources
- Winston-Salem Urban Area Metropolitan Planning Organization
- Town of Kernersville Community Development Department
- Town of Kernersville Public Works Department
- Town of Kernersville Fire Department
- Town of Kernersville Police Department
- Forsyth County – Parks and Recreation Department
- Guilford County – Parks and Recreations Department
- Forsyth County Schools – Transportation Department

CONTACT INFORMATION

Federal Highway Administration

Mr. John F. Sullivan III, P.E.
Division Administrator
Federal Highway Administration
310 New Bern Avenue, Suite 410
Raleigh, North Carolina 27601
Telephone: (919) 856-4346

North Carolina Department of Transportation

Dr. Gregory J. Thorpe
Manager, Project Development and Environmental Analysis Branch
North Carolina Department of Transportation
1548 Mail Service Center
Raleigh, North Carolina 27699-1548
Telephone: (919) 733-3141

Table of Contents

1.0	Description of Proposed Action.....	1
1.1	General Description.....	1
1.2	Project History and Status.....	1
2.0	Purpose and Need for Project.....	4
2.1	Need for Project.....	4
2.2	Purpose of Project.....	5
2.3	OTHER Potential Benefits.....	5
2.4	Description of Existing Conditions.....	6
2.4.1	Physical Description of Existing Facility.....	6
2.4.1.1	Intersections/Interchanges.....	6
2.4.1.2	Railroad Crossings.....	7
2.4.1.3	Structures.....	7
2.4.1.4	Bicycle and Pedestrian Facilities/Greenways.....	7
2.4.1.5	Airports.....	7
2.4.1.6	Utilities.....	8
	Fiber Optic/Communication Cables/Electric Power Transmission Lines.....	8
	Natural Gas Lines.....	8
	Water and Sanitary Sewer.....	9
2.4.2	School Bus Usage.....	9
2.4.3	Traffic Carrying Capacity.....	9
2.4.3.1	Design Level of Service.....	10
2.4.3.2	Traffic Capacity Analysis.....	11
	2008 Existing Conditions Traffic Volumes and Analyses.....	11
	2030 No Build Conditions Traffic Volumes and Analyses.....	11
	2035 No Build Conditions Traffic Volumes and Analyses.....	11
2.4.3.3	Crash Data.....	11
2.5	Transportation and Land Use Plans.....	15
2.5.1	Transportation Plans.....	15
2.5.1.1	North Carolina Transportation Improvement Program (STIP).....	15
2.5.1.2	Winston-Salem Urban Area Long Range Transportation Plan.....	16
2.5.2	Local Thoroughfare Plans.....	16
2.5.2.1	Winston-Salem/Forsyth County Urban Area Thoroughfare Plan.....	17
2.5.2.2	Town of Kernersville Thoroughfare and Street Plan.....	17
2.5.3	Bicycle and Pedestrian Plans.....	17
2.5.4	Land Use Plans.....	18
2.5.4.1	Town of Kernersville Land Use Plan.....	18
2.5.4.2	Town of Kernersville Development Plan.....	18
2.5.4.3	Legacy Comprehensive Plan.....	18
2.5.5	Other Plans.....	18
2.6	System Linkage/Travel Time/Access Need.....	24
2.6.1	Existing Road Network.....	24
2.6.1.1	Primary US Routes and NC Routes.....	24
2.6.1.2	Secondary Routes and Local Roads.....	24
2.6.2	Commuting Patterns.....	25
2.6.3	Modal Interrelationships.....	26
2.6.3.1	Public Transportation.....	26
2.6.3.2	Rail Service.....	26
2.6.3.3	Motor Freight Service.....	26

2.6.3.4	Air Service	26
2.6.4	Economic Development/Land Use Changes	27
2.6.4.1	Demographics	27
Population—Trends and Composition	27	
Racial Makeup	28	
Ethnic Makeup	28	
2.6.4.2	Economic and Infrastructure Data	28
3.0	Alternatives	32
3.1	Preliminary Study Alternatives	32
3.1.1	Alternative Modes of Transportation	32
3.1.1.1	Travel Demand Management (TDM)	32
3.1.1.2	Mass Transit/Multi-Modal	32
3.1.2	Transportation Systems Management (TSM)	33
3.1.3	Improve Existing Facility	33
3.1.4	New Location Alternatives	34
3.1.5	No-Build Alternative	34
3.2	Detailed Study Alternatives	34
3.2.1	Project Logical Termini/Independent Utility	34
3.2.2	U-2800	36
3.2.3	U-4734	36
3.3	Traffic Capacity Analysis Summary of Build Alternatives	37
3.3.1	2030 Build Conditions	37
3.3.2	2035 Build Conditions	37
3.4	Cost estimates	38
4.0	Proposed Improvements	43
4.1	Roadway Cross-Section and Alignment	43
4.2	Right-of-way and Access Control	43
4.3	Speed Limit	43
4.4	Design Speed	43
4.5	Anticipated Design Exceptions	43
4.6	Intersections/Interchanges	45
4.6.1	U-2800	45
4.6.2	U-4734	46
4.7	Service Roads	49
4.8	Railroad Crossings	49
4.9	Structures	49
4.9.1	U-2800	49
4.9.2	U-4734	49
4.10	Bicycle and Pedestrian Facilities/Greenways	50
4.11	Utilities	50
4.12	Noise Barriers	50
4.13	Work Zone, Traffic Control, and Construction Phasing	50
5.0	Environmental Effects of Proposed Action	52
5.1	Natural Resources	52
5.1.1	Physical Characteristics	52
5.1.2	Biotic Resources	52
5.1.2.1	Terrestrial Communities	52
Mesic Mixed Hardwood Forest (Piedmont Subtype)	54	
Piedmont Alluvial Forest	54	
Pine Forest	54	
Agriculture	54	

Maintained/Disturbed.....	55
5.1.2.2 Terrestrial Wildlife	55
5.1.2.3 Summary of Anticipated Effects	55
5.1.3 Water Resources	56
5.1.3.1 Aquatic Communities	59
5.1.3.2 Summary of Anticipated Effects	60
5.1.4 Waters of the United States	60
5.1.4.1 Streams, Rivers, Impoundments	60
5.1.4.2 Riparian Buffers	61
5.1.4.3 Wetlands.....	62
5.1.4.4 Summary of Anticipated Effects	62
5.1.4.5 Avoidance, Minimization, and Mitigation.....	64
5.1.4.6 Anticipated Permit Requirements	65
5.1.5 Rare and Protected Species	65
5.1.5.1 Federally-Protected Species	65
5.1.5.2 Bald Eagle and Golden Eagle Protection Act	68
5.1.5.3 Endangered Species Act (ESA) Candidate Species.....	68
5.1.5.4 Federal Species of Concern/State-Protected Species.....	68
5.1.6 Soils.....	69
5.2 Cultural Resources	70
5.2.1 Historic Architectural Resources	70
5.2.1.1 Historic Properties.....	70
5.2.1.2 Potential Project Effects	70
5.2.2 Archaeological Resources	71
5.2.2.1 Archaeological Sites.....	71
5.2.2.2 Potential Project Effects	71
5.3 Section 4(f).....	71
5.3.1 Description of Section 4(f) Resources	72
5.3.1.1 Public Parks and Recreation Areas.....	72
Triad Park.....	72
5.3.2 Use of Section 4(f) Property	72
5.3.2.1 Permanent Incorporation of Property.....	73
Triad Park.....	73
5.3.2.2 Temporary Use of Property	73
5.3.2.3 Constructive Use of Property	73
5.3.2.4 Summary of Use of Section 4(f) Properties	73
5.3.3 De Minimis Impacts.....	74
5.3.3.1 Parks and Recreation Areas	74
5.3.4 Measures to Minimize Harm.....	74
5.3.4.1 Historic Sites	74
5.3.4.2 Parks and Recreation Areas	74
5.4 Section 6(f) Resources	77
5.5 Farmland	77
5.5.1 Voluntary Agricultural Districts and Enhanced Voluntary Agricultural Districts...	77
5.6 Social Effects.....	78
5.6.1 Neighborhoods/Communities	78
5.6.2 Relocation of Residences and Businesses.....	79
5.6.2.1 U-2800	79
5.6.2.2 U-4734	79
5.6.3 Environmental Justice.....	79
5.6.4 Bicycle and Pedestrian Facilities.....	80

5.6.5	Recreational Facilities.....	80
5.6.6	Other Public Facilities and Services.....	80
5.7	Economic Effects.....	81
5.8	Land Use.....	81
5.8.1	Kernersville.....	82
5.8.2	Forsyth County.....	82
5.8.3	Guilford County.....	83
5.8.4	Future Land Use.....	83
5.8.5	Project Compatibility with Local Plans.....	86
5.9	Indirect and Cumulative Effects.....	86
5.9.1	Indirect Assessment.....	86
5.9.2	Cumulative Assessment.....	87
5.9.3	Cumulative Effects Statement.....	87
5.10	Flood Hazard Elevation.....	88
5.11	Noise.....	91
5.11.1	Noise Abatement Criteria.....	91
5.11.2	Ambient Noise Levels.....	92
5.11.3	Future Traffic Noise Levels.....	93
5.11.4	Traffic Noise Impacts.....	95
5.11.5	Traffic Noise Abatement Alternatives.....	95
5.11.5.1	Roadway Alignment.....	95
5.11.5.2	Traffic System Management Measures.....	95
5.11.5.3	Noise Barriers.....	96
5.11.5.4	Other Mitigation Measures Considered.....	96
5.11.6	Construction Noise.....	96
5.11.7	Effects.....	96
5.12	Air Quality Analysis.....	97
5.12.1	Background Carbon Monoxide (CO) Concentrations.....	97
5.12.2	Conformity Determination.....	98
5.12.3	Air Quality Analysis Results.....	99
5.12.4	Mobile Source Air Toxics.....	99
5.12.5	Construction Air Quality Effects.....	99
5.12.6	Summary.....	100
5.13	Hazardous Material.....	100
6.0	Comments and Coordination.....	101
6.1	Citizens Informational Workshop.....	101
6.2	Newsletters.....	101
6.3	Public Hearing.....	101
6.4	NEPA/404 Merger Process.....	101
6.5	Other Agency Coordination.....	103
7.0	References.....	104

List of Tables

Table 1: Level of Service Definitions	10
Table 2: Other STIP Projects in the Vicinity of the Study Area	15
Table 3: Build Alternative Cost Estimates.....	38
Table 4: Anticipated Impacts to Terrestrial Communities.....	55
Table 5: Streams in the Study Area.....	58
Table 6: Physical Characteristics of Streams in the Study Area	58
Table 7: Jurisdictional Characteristics of Water Resources in the Study Area	60
Table 8: Riparian Buffer Impacts.....	62
Table 9: Jurisdictional Characteristics of Wetlands in the NRTR Study Area.....	62
Table 10: Anticipated Stream Impacts.....	63
Table 11: Anticipated Wetland Impacts.....	63
Table 12: Federally Protected Species Listed for Forsyth and Guilford Counties	65
Table 13: Federal Species of Concern Listed for Forsyth and Guilford Counties.....	68
Table 14: Soils in the Study Area	69
Table 15: Section 4(f) Property Takings in Acres	73
Table 16: Summary of Uses of Section 4(f) Properties.....	73
Table 17: FHWA Noise Abatement Criteria	92
Table 18: Criteria for Substantial Noise Increase, Hourly A-Weighted Sound Level	92
Table 19: Ambient Noise Levels (Leq)	93
Table 20: Traffic Noise Level Increase Summary	95
Table 21: Maximum Predicted CO Concentrations for All Modeled Scenarios.....	98

List of Figures

Figure 1: Project Vicinity	2
Figure 2: Project Study Area	3
Figure 3: 2008 No Build Level of Service (LOS).....	12
Figure 4: 2030 No-Build Level of Service (LOS).....	13
Figure 5: 2035 No-Build Level of Service (LOS).....	14
Figure 6: Other STIP Projects in the Vicinity	20
Figure 7: Winston-Salem Urban Area 2035 Transportation Plan	21
Figure 8: Winston-Salem/Forsyth County Urban Area Thoroughfare Plan.....	22
Figure 9: Kernersville Thoroughfare Plan	23
Figure 10: Demographic Study Area	30
Figure 11: Direct Community Impact Area.....	31
Figure 12: New Location Build Alternatives	39
Figure 13: Alternatives to Carry Forward.....	40
Figure 14: 2030 Build Scenario Level of Service (LOS).....	41
Figure 15: 2035 Build Scenario Level of Service (LOS).....	42
Figure 16: Macy Grove Road Proposed Typical Section	44
Figure 17: East Mountain Street Service Roads.....	46
Figure 18: Left-over Intersection Configuration Concept	48
Figure 19: Natural Communities within the Project Study Area	53
Figure 20: Jurisdictional Features	57
Figure 21: Section 4(f) Properties within the Study Area	76
Figure 22: Kernersville Future Land Use Plan	84
Figure 23: Future Land Use Study Area.....	85
Figure 24: Floodplains.....	90
Figure 25: Noise Reading Sites.....	94

Appendices

- Appendix A: Comments Received from Federal and State Agencies and Regional and Local Governments
- Appendix B: Traffic Forecast Figures
- Appendix C: Section 4(f) Evaluation
- Appendix D: Farmland Conversion Impact Rating Forms
- Appendix E: NCDOT Relocation Assistance Program/Relocation Reports
- Appendix F: Citizens Informational Workshop Press Release
- Appendix G: Newsletters
- Appendix H: NEPA 404 Merger Team Concurrence Forms

1.0 DESCRIPTION OF PROPOSED ACTION

1.1 GENERAL DESCRIPTION

The North Carolina Department of Transportation (NCDOT) 2009-2015 State Transportation Improvement Program (STIP) includes the proposed improvements and extension of SR 2601 (Macy Grove Road) in Forsyth County, North Carolina, near the Town of Kernersville as projects U-2800 and U-4734. The goal of this study is to identify solutions to create a new transportation link between I-40 Business/US 421 and NC 150 (N. Main Street) north of Kernersville. The project vicinity and project study area are shown on Figure 1 and Figure 2, respectively.

U-2800 consists of widening Macy Grove Road to multi-lanes, extending the roadway on new location from SR 2042 (Old Greensboro Road) to north of SR 1005 (Old US 421/East Mountain Street), and converting a grade separation at I-40 Business/US 421 to an interchange. Grade separations are also proposed on new location crossing the Norfolk Southern (NS) Railroad and Old US 421/East Mountain Street.

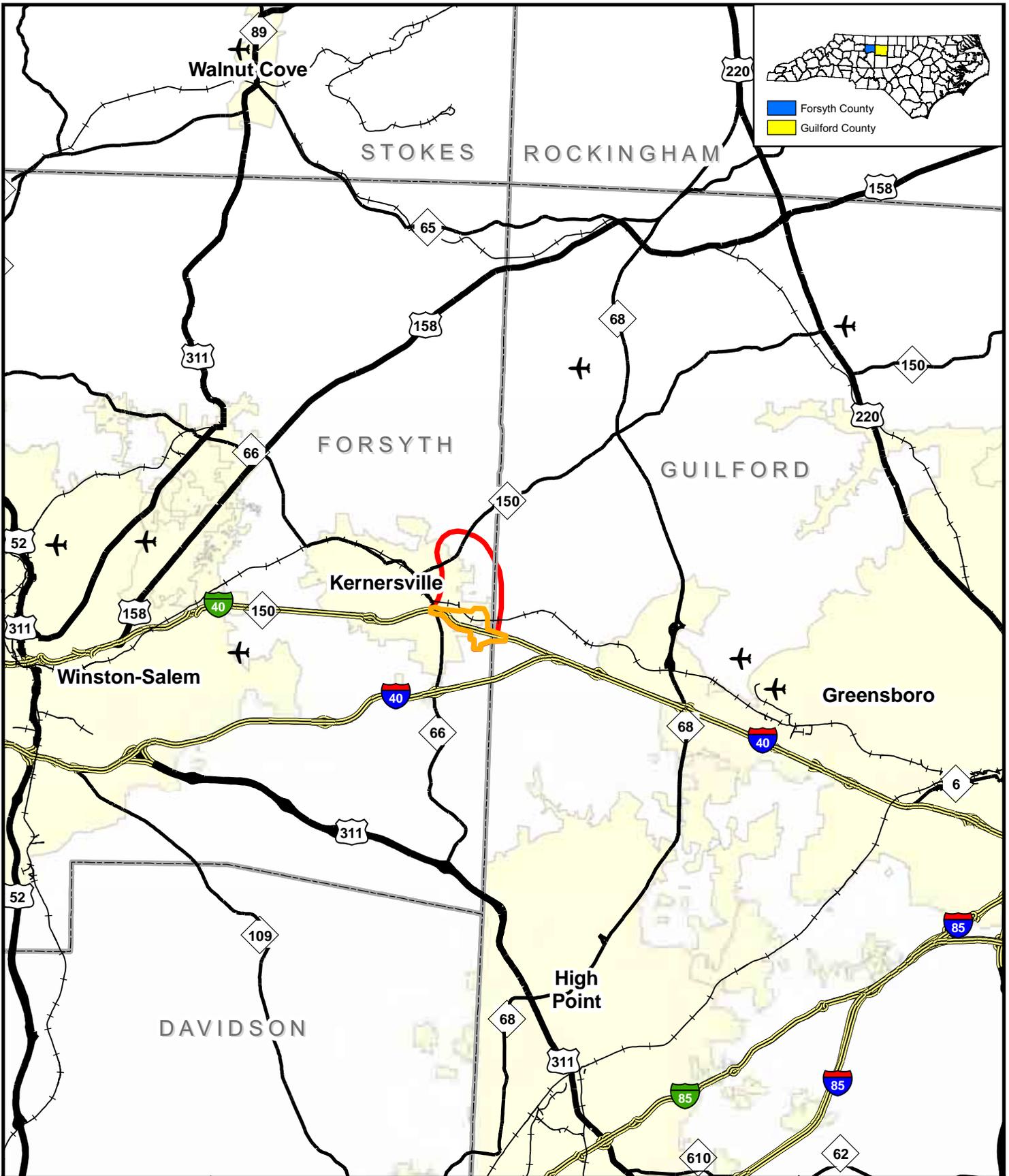
U-4734 includes extending Macy Grove Road on new location from north of Old US 421/East Mountain Street to NC 150.

In accordance with the National Environmental Policy Act of 1969 (NEPA), as amended, an Environmental Assessment (EA) has been prepared for the proposed improvements and extension of Macy Grove Road. According to FHWA's toolkit on NEPA Documentation, an EA is prepared when the significance of impacts of a transportation project is uncertain. The EA will disclose the project benefits and environmental impacts to the public and to other local, state, and federal agencies to obtain their comments on the proposed action and assist the NCDOT and Federal Highway Administration (FHWA) in the decision-making process. If at any point in the process of preparing an EA, it is discovered that the project would result in significant impacts, an Environmental Impact Statement will be prepared. If after completing the EA, it is determined that there are no significant impacts associated with the project, a Finding of No Significant Impact (FONSI) will be prepared, addressing comments received on the EA from the public, and local, state, and federal agencies.

The content of this EA conforms to the Council on Environmental Quality (CEQ) guidelines, which provide direction regarding implementation of the procedural provisions of NEPA, and the FHWA's *Guidance for Preparing and Processing Environmental and Section 4(f) Documents*. The FHWA and NCDOT are lead agencies for the proposed action.

1.2 PROJECT HISTORY AND STATUS

The NCDOT 2009-2015 STIP and the Winston-Salem Urban Area Metropolitan Planning Organization's 2009-2015 Metropolitan Transportation Improvement Program (MTIP) include the proposed widening and extension of SR 2601 (Macy Grove Road) in Forsyth County, North Carolina, near the Town of Kernersville. In both the STIP and MTIP, the projects are referred to as U-2800 and U-4734. A combined EA has been prepared for both projects, given their close proximity and dependent relationship. For clarity in describing details within this document, the two projects will be referred to as the "project." Should discussion on specific details of each STIP project be required, they will be identified individually. According to the NCDOT 2009-2015 STIP, right-of-way acquisition for U-2800 is currently scheduled for federal fiscal year (FFY) 2011 and construction is scheduled for FFY 2013. U-4734 is not currently funded for right-of-way or construction.



North Carolina
Department of Transportation

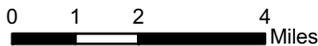


Date: May 2010

- U-2800 Study Area
- U-4734 Study Area
- Interstate
- US Route
- NC Route

Legend

- Railroad
- County Boundary
- Municipal Boundary
- Airport

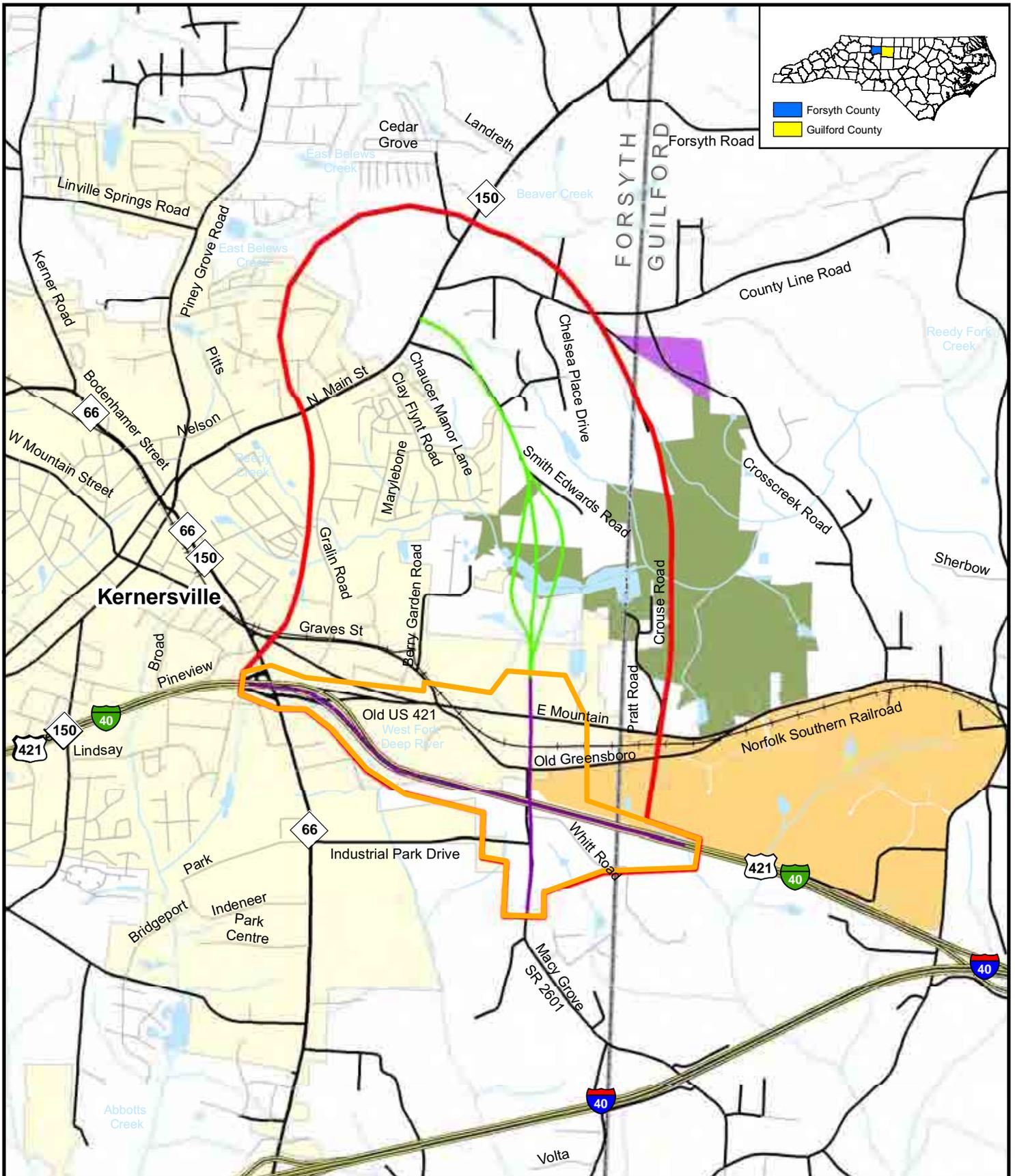


Macy Grove Road Improvements
Forsyth County, NC

STIP U-2800 & U-4734

Figure 1

Project Vicinity



North Carolina
Department of Transportation



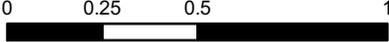
Date: May 2010

Legend

- U-2800 Alignment
- U-4734 Alignment
- U-2800 Study Area
- U-4734 Study Area
- Interstate
- US Route
- NC Route
- Local Road
- Railroad
- County Boundary
- Stream
- Open Water
- Triad Park
- Triad Business Park
- VAD Property
- Municipal Boundary



0 0.25 0.5 1 Miles



Macy Grove Road Improvements
Forsyth County, NC

STIP U-2800 & U-4734

Figure 2

Project Study Area

2.0 PURPOSE AND NEED FOR PROJECT

2.1 NEED FOR PROJECT

The need for the widening and extension of Macy Grove Road is discussed in further detail below.

- **There is no direct roadway link between I-40 Business and NC 150 north of Kernersville.**

The *Roadway Connector System Feasibility Study* notes that traffic traveling between residential areas north of Kernersville and employment/retail centers in Forsyth and Guilford counties must use the Town of Kernersville's existing thoroughfare system. As described, the infrastructure is configured in a radial pattern where all major routes come together in the center of town before being distributed in other directions. Radial routes north of Kernersville ultimately converge at the NC 66/NC 150 intersection in downtown Kernersville and include West Mountain Street, Bodenhamer Street, SR 2024 (Old Valley School Road), SR 2021 (Kerner Road), SR 1969 (Piney Grove Road), and North Main Street. At this intersection, drivers wishing to travel west on I-40 Business have the option of utilizing either the South Main Street interchange or the NC 66/NC 150 interchange; however, drivers wishing to travel east on I-40 Business/US 421 must utilize the NC 66/NC 150 interchange because it provides a more direct connection to I-40 Business/US 421.

Other than the Gralin Street improvements project (located east of downtown Kernersville), no major infrastructure additions have been made since the Roadway Connector System Feasibility Study was prepared; therefore, the description of the need for the project remains relevant today.

- **Congestion exists in downtown Kernersville and at the existing NC 66/NC 150 interchange with I-40 Business/US 421**

According to the *Roadway Connector System Feasibility Study* prepared for the Town of Kernersville and the *Macy Grove Road Extension Feasibility Study* prepared for NCDOT, traffic volumes along NC 66, Bodenhamer Street, North Main Street, and other streets in town are high enough to result in northbound peak hour traffic backing up to the I-40 Business/US 421 interchange while waiting to get through the West Mountain Street and Bodenhamer Street intersection. Contributing to the intersection delay is the NS Railroad at-grade crossing of Bodenhamer Street, located approximately 80 feet north of the West Mountain Street and Bodenhamer Street intersection, which serves four to six trains per day, according to the NCDOT Rail Division.

As documented in the Roadway Connector System Feasibility Study, "Kernersville's thoroughfare system is configured in a radial pattern where all major routes must come together in the center of town before being distributed in other directions. The existing roads have become more difficult to travel over the past few years due to increased congestion from rapid development along major thoroughfares leading into town." The dispersion of traffic from these converging routes is partially processed at the NC 66/NC 150 interchange at I-40 Business. The *Town of Kernersville Development Plan* (Town of Kernersville, January 2005) also states that the Town of Kernersville is in

its fifth and final stage of transportation development, which includes addressing the major issue of connectivity. By improving connectivity, the Town of Kernersville hopes to provide a street system with multiple connections between destinations, allowing for the distribution of traffic rather than concentrating traffic which causes traffic congestion.

Coordination with the NCDOT Highway Division 9 confirms that the current interchange configuration of NC 66/NC 150 interchange at I-40 Business is operating over capacity even with the recent addition of a second eastbound left-turn lane at the loop terminal intersection with NC 66. The Division stated that poor operations are due to high peak hour volumes along NC 66 (within the vicinity of I-40 Business/US 421), the inability of the signalized ramp terminals to process the peak hour traffic volumes, and constrained operations associated with the weaving movement between the East Mountain Street entrance ramp to westbound I-40 Business/US 421 and the westbound I-40 Business/US 421 exit ramp to NC 66.

- **Future Kernersville Loop Road System**

The proposed project is a component of the Town of Kernersville Loop Road System, which is included in the Kernersville *Thoroughfare and Street Plan* (Town of Kernersville, July 2005) and the *Winston-Salem Urban Area 2035 Long Range Transportation Plan* (2035 LRTP) (Winston-Salem Urban Area Metropolitan Planning Organization, January 2009). Construction of the Loop Road System is also the top priority for Kernersville on the Winston-Salem Urban Area Metropolitan Planning Organization's Transportation Needs list (Winston-Salem Urban Area Metropolitan Planning Organization, March 2004). The Town of Kernersville is prepared to construct the portion of the Kernersville Loop Road System between NC 150 (North Main Street) to SR 1969 (Piney Grove Road) once the proposed project is in place.

2.2 PURPOSE OF PROJECT

The primary purpose of the proposed project is to:

- **Provide a roadway link between I-40 Business/US 421 and NC 150 (N. Main Street) north of Kernersville**

The performance measure for evaluating potential alternatives is the ability to provide a roadway link between I-40 Business/US 421 and NC 150 (N. Main Street) north of Kernersville.

2.3 OTHER POTENTIAL BENEFITS

In addition to addressing the primary need, other potential benefits may result from the proposed project including the following:

- **Reduce congestion in downtown Kernersville and at the existing NC 66/NC 150 interchange with I-40 Business/US 421**

By providing a roadway link between I-40 Business/US 421 and NC 150 (N. Main Street) north of Kernersville, the project has the potential to reduce congestion in downtown Kernersville and at the existing NC 66/NC 150 interchange with I-40 Business/US 421 by providing an alternative access point to and from I-40 Business/US 421.

- **Provide a segment of the future Kernersville Loop Road**

By providing a roadway link between I-40 Business/US 421 and NC 150 (N. Main Street) north of Kernersville, the project has the potential to complete a segment of the proposed Town of Kernersville Loop Road System.

2.4 DESCRIPTION OF EXISTING CONDITIONS

2.4.1 PHYSICAL DESCRIPTION OF EXISTING FACILITY

Macy Grove Road currently has two 12-foot wide lanes with 4- to 6-foot wide soil shoulders. Macy Grove Road is a north/south collector street approximately 1.9 miles in length, with an existing right-of-way width of 60 feet, no control of access, and a posted speed limit of 45 miles per hour (mph). Macy Grove Road begins at SR 2007 (South Bunker Hill Road) just south of I-40, traverses north, and ends at SR 2042 (Old Greensboro Road). Macy Grove Road is used from the south to access NC 66, I-40 Business, and downtown Kernersville via Industrial Park Drive. Macy Grove Road is also used to access I-40 Business and East Mountain Street via Old Greensboro Road.

2.4.1.1 Intersections/Interchanges

Two major intersections are located along existing Macy Grove Road within the proposed project study limits. In addition, west of the existing Macy Grove Road grade separation, there is a full movement interchange with I-40 Business and NC 66, as well as a partial interchange (does not provide all movements to and from East Mountain Street) with I-40 Business/US 421 and East Mountain Street. These four intersections and interchanges are described as follows:

SR 2601 (Macy Grove Road) and SR 4319 (Industrial Park Drive)

SR 4319 (Industrial Park Drive) currently forms a T-intersection with Macy Grove Road. Industrial Park Drive has an exclusive left-turn lane and an exclusive right-turn lane onto Macy Grove Road. Macy Grove Road has one northbound lane consisting of a shared left-turn and through lane and one southbound lane consisting of a shared right-turn and through lane. This intersection is currently controlled with a stop sign placed on Industrial Park Drive.

SR 2601 (Macy Grove Road) and SR 2042 (Old Greensboro Road)

Macy Grove Road currently forms a T-intersection with Old Greensboro Road. Northbound Macy Grove Road consists of a shared left-turn and right-turn lane. Old Greensboro Road has one westbound lane consisting of a shared left-turn and through lane, and one eastbound lane consisting of a shared right-turn and through lane. This intersection is currently controlled with a stop sign placed on Macy Grove Road.

I-40 Business/US 421 and NC 66

The interchange at I-40 Business/US 421 and NC 66 consists of a simple diamond interchange configuration, utilizing an internal loop-ramp in the northwest quadrant, with no exit ramp in the northeast quadrant. Both ramp intersections at NC 66 are currently controlled by traffic signals. The loop-ramp in the northwest quadrant creates a weaving section, where westbound I-40 Business traffic exiting to NC 66 conflicts with the westbound entrance ramp traffic from East Mountain Street.

I-40 Business/US 421 and SR 1005 (East Mountain Street)

The partial interchange at I-40 Business/US 421 and East Mountain Street consists of a one-lane on-ramp from East Mountain Street onto westbound I-40 Business/US 421 and a one-lane left-hand exit off-ramp from eastbound I-40 Business/US 421 onto eastbound East Mountain Street. There is currently no access onto eastbound I-40 Business/US 421 from East Mountain Street or to East Mountain Street from westbound I-40 Business/US 421. I-40 Business/US 421 has a full-access interchange with NC 66 just west of the partial interchange with East Mountain Street.

2.4.1.2 Railroad Crossings

The NS Railroad parallels Old Greensboro Road within the project study area and has a grade separated crossing over East Mountain Street just west of the proposed project. The tracks cross east/west through the project study area.

2.4.1.3 Structures

Bridge Number 370, located on Macy Grove Road, creates a grade separation over I-40 Business/US 421 and consists of a concrete deck, bents, wing walls, and guardrails with steel girders. The bridge is considered structurally deficient and functionally obsolete. The bridge has a posted weight limit of 41 tons. The posted vertical clearance under the bridge is 14 feet. No utilities are currently attached to this structure. Bridge Number 369, located on westbound I-40 Business/US 421, passes over the off-ramp from eastbound I-40 Business/US 421 to eastbound East Mountain Street. The bridge is considered structurally deficient and functionally obsolete. Bridge Number R251, owned by NS Railway, is a railroad that passes over East Mountain Street, approximately 0.30 miles west of Macy Grove Road.

2.4.1.4 Bicycle and Pedestrian Facilities/Greenways

There are presently no bicycle accommodations, pedestrian facilities, or greenways along existing Macy Grove Road or SR 2036 (Smith Edwards Road).

2.4.1.5 Airports

The Piedmont Triad International Airport (PTI) is located to the east of the Town of Kernersville, approximately 5 miles east of the proposed project, and is accessed via I-40. The airport is operated by the Piedmont Triad Airport Authority and provides available non-stop flights to 17 cities. The PTI also provides international cargo, corporate, and recreational flights.

The Smith Reynolds Airport is located about 3 miles northeast of downtown Winston-Salem and is located approximately 10 miles from the proposed project. According to the 2035 LRTP, the majority of air traffic in Winston-Salem and Forsyth County departs or originates at the Smith Reynolds Airport. This airport, operated by the Airport Commission of Forsyth County, serves the local citizenry as a general aviation airport.

2.4.1.6 Utilities

Existing utilities located within the project study area are as follows:

Fiber Optic/Communication Cables/Electric Power Transmission Lines

- MCI has underground fiber-optic cable along the west side of Macy Grove Road that crosses under I-40 Business/US 421, Old Greensboro Road, and NS Railroad to the north side of the tracks before turning 90 degrees toward the east.
- Qwest Communications has buried fiber-optic toll cable along the south side of NS railroad.
- AT&T has buried fiber-optic toll cable along the south side of I-40 Business/US 421. They also have underground fiber-optic and/or copper cable along the north side of East Mountain Street that crosses under the road to the south side of Mountain Street in Guilford County.
- Williams Communication Group has buried fiber-optic cable parallel to the transcontinental gas transmission right-of-way that crosses under East Mountain Street, NS Railroad, Old Greensboro Road, I-40 Business/US 421, and Macy Grove Road.
- NCDOT has underground fiber-optic ITS communication cable on the south side of I-40 Business/US 421.
- Time Warner Cable has aerial and underground digital communication cable located within the study area.
- Embarq has underground and aerial copper cable along the west side of Macy Grove Road crossing over I-40 Business/US 421 to Old Greensboro Road and on the south side of East Mountain Street. Embarq also has underground fiber-optic cable along the north side of East Mountain Street; buried copper cable on Smith Edwards Road, NC 150, and County Line Road; and buried fiber-optic cable on the south side of NC 150 (N. Main Street) to the County Line Road Operations Center.
- Duke Energy has aerial power service lines throughout the project study area, with high tension transmission lines crossing the study area between SR 2042 (Berry Garden Road) and Smith Edwards Road.

Natural Gas Lines

- Transcontinental Gas Pipeline Corporation has one 30-inch and two 36-inch, high pressure, natural gas transmission lines crossing under Macy Grove Road, I-40 Business/US 421, Old Greensboro Road, NS Railroad, East Mountain Street, and SR 2000 (Pratt Road).
- A measuring-metering-regulating station that feeds Piedmont Natural Gas is located along Old Greensboro Road. Piedmont Natural Gas has a 10-inch high pressure gas transmission main from the Kernersville Border Station 16 to the north side of Old Greensboro Road, with a crossing under East Mountain Street to Graves Street, another crossing under NS railroad to the east side of SR 2041 (Berry Garden Road) and the west side of Clay Flynt Road, and a crossing under and along NC 150 (N. Main Street) before heading cross-country toward the north. Piedmont Natural Gas also has a 16-inch

high pressure gas transmission main from Border Station 16 cross-county to Guilford County crossing under I-40 Business/US 421. An 8-inch high pressure gas transmission main from Border Station 16 parallels the south side of Old Greensboro Road crossing to the north side of East Mountain Street heading toward Colfax. A 4-inch plastic service main and a Transco Pipeline inside a 6-inch steel casing are located on the north side of SR 4319 (Industrial Park Drive) crossing Macy Grove Road. A 6-inch steel service main from Border Station 16 runs along the south side of Old Greensboro Road to East Mountain Street and on the west side of Lakeview Drive and SR 2041 (Berry Garden Road). A 4-inch plastic gas service main is location on the south side of NC 150 and a 2-inch plastic gas service line is located on the east side of Smith Edwards Road.

Water and Sanitary Sewer

- The Town of Kernersville sold their water and sanitary sewer mains to the City of Winston-Salem.
- The City of Winston-Salem has an 8-inch water main along Berry Garden Road and NC 66. A 12-inch water main is located along Industrial Park Drive and crosses I-40 Business/US 421 at Dudley Products Boulevard across from East Mountain Street and along Graves Street. Eight 8-inch water mains run along NC 150, Clay Flynt Road, and Chaucer Manor Lane. A 12-inch water main is located along Gralin Road, and 6-inch water mains are located along County Line Road, Bost Street, and Donnell Street. The City of Winston-Salem has a 15-16-inch sanitary sewer interceptor running along Reedy Fork to a treatment facility next to the stream. They also have a 12-inch sanitary sewer force main from the Reedy Fork pump station along the stream, and along Crouse Road and Pratt Road. A 12-inch force main runs along the north side of East Mountain Street toward NC 66, and a 10-inch Deep River sanitary sewer interceptor crosses I-40 Business/US 421 from Dudley Projects toward Industrial Park. Eight 8-inch sanitary sewer mains run along Old Greensboro Road, East Mountain Street, Graves Street through the Dudley Products Complex, Lakeview Drive, Clay Flynt Road, County Line Road, NC 150, Donnell Street, and Gralin Road. The City of Winston-Salem recently constructed a 12-inch water main along existing Macy Grove Road, beginning south of Wishbone Drive and north to Industrial Park Drive.
- A private lift station has a 3-inch sewer force main running along Chaucer Manor Lane to the north side of NC 150.
- The City of Winston-Salem is currently planning construction of the Proposed Reedy Fork Pump Station, which will cross I-40 Business and continue to the north along Lakeview Drive and cross through the Triad Park property where a force main, pump station site, and gravity sewer are proposed.

2.4.2 SCHOOL BUS USAGE

Five school buses use existing Macy Grove Road twice daily. The Forsyth County School System indicated that seven school buses travel within the project study area daily.

2.4.3 TRAFFIC CARRYING CAPACITY

The proposed project was analyzed utilizing the techniques contained in the 2000 Edition of the Highway Capacity Manual (HCM) and its associated Highway Capacity Software (HCS Plus, version 5.2). Standard practices recommended in the NCDOT Congestion Management

Section’s “TIP Project Analysis Guidelines” were also utilized. The analysis of unsignalized and signalized intersections was completed utilizing Synchro Version 7 analysis software, which is based on the HCM methodologies. The roundabouts within the project study area were analyzed using Sidra. The analysis includes the evaluation of Level of Service (LOS) for the 2008 Existing Conditions, the 2030 No-Build Conditions, the 2035 No-Build Conditions, as well as the Build Conditions for both 2030 and 2035.

2.4.3.1 Design Level of Service

The procedures used to define the operational qualities of the roadways are based on the concepts of capacity and LOS as set forth in the HCM. The LOS is defined with letter designations from A to F, as shown in Table 1. LOS A represents the best operating conditions along a road or at an intersection, while LOS F represents the worst conditions. The minimum acceptable LOS for the design year 2030 was determined to be LOS D, based on the American Association of State Highway Transportation Officials (AASHTO) guidelines for a collector facility within urban and suburban areas.

Table 1: Level of Service Definitions

Level of Service	Signalized Intersections	Road Segments
A	Very low delay (<10.0 seconds per vehicle). Most vehicles do not have to stop at all.	Free flow. Individuals are unaffected by other vehicles and operations are constrained only by roadway geometry and driver preferences. Maneuverability within traffic stream is good. Comfort level and convenience are excellent.
B	10.0-20.0 second delay. Good progression and short cycle length.	Free flow, but the presence of other vehicles begins to be noticeable. Average travel speeds are the same as in LOS A, but there is a slight decline in freedom to maneuver and level of comfort.
C	20.1 to 35.0 second delay. Fair progression and/or longer cycles. The number of vehicles stopping is significant.	Influence of traffic density on operations becomes marked. The ability to maneuver within the traffic stream is clearly affected by other vehicles. Multi-lane highways with a free flow speed (FFS) above 50 miles per hour (mph), the speeds reduce somewhat. Minor disruptions can cause serious local deteriorations and queues will form behind any significant traffic disruption.
D	35.1 to 55.0 second delay. Many vehicles stop. Individual cycle failures are noticeable.	The ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating.
E	55.1 to 80.0 second delay. Individual cycle failures are frequent.	Operating conditions at or near the capacity level, usually unstable. The densities vary, depending on the FFS. Vehicles are operating with the minimum spacing for maintaining uniform flow. Disruptions cannot be dissipated readily. Most multilane highways with FFS between 45 and 60 mph vehicle mean speeds at capacity range from 42 to 55 mph, but are highly variable and unpredictable.
F	Delay in excess of 80.0 seconds. Considered unacceptable to most drivers.	Breakdown flow. Traffic is over capacity at points. Queues form behind such locations, which are characterized by extremely unstable stop-and-go waves. Travel speed within queues are generally less than 30 mph.

Source: Transportation Research Board, 2000.

2.4.3.2 Traffic Capacity Analysis

The following sections are summarized from the *Macy Grove Road Extensions Project Traffic Capacity Analysis Memorandum* and present the traffic volumes and operational analyses, including the evaluation of LOS for the 2008 Existing Conditions, 2030 No Build Conditions, and 2035 No-Build Conditions. Figures depicting the Annual Average Daily Traffic (AADT) that were used in the operational analyses for the LOS evaluations can be found in Appendix B.

2008 Existing Conditions Traffic Volumes and Analyses

The traffic forecast used for the traffic operations analyses were obtained from the *Traffic Forecasts for NCDOT STIP Project No. U-4734 and NCDOT STIP Project No. U-2800, Macy Grove Road Extension and Widening, Forsyth County, North Carolina – June 2009* (Traffic Forecast Technical Memorandum). The traffic forecast provided AADT volumes for the transportation network within the study area for the 2008 Existing Conditions. Existing traffic volumes on Macy Grove Road within the study area range from 1,600 AADT to 2,400 AADT. The analysis shows that 18 of 41 analysis points in the project study area are operating at LOS E or worse in either the AM or PM peak hour (Figure 3).

2030 No Build Conditions Traffic Volumes and Analyses

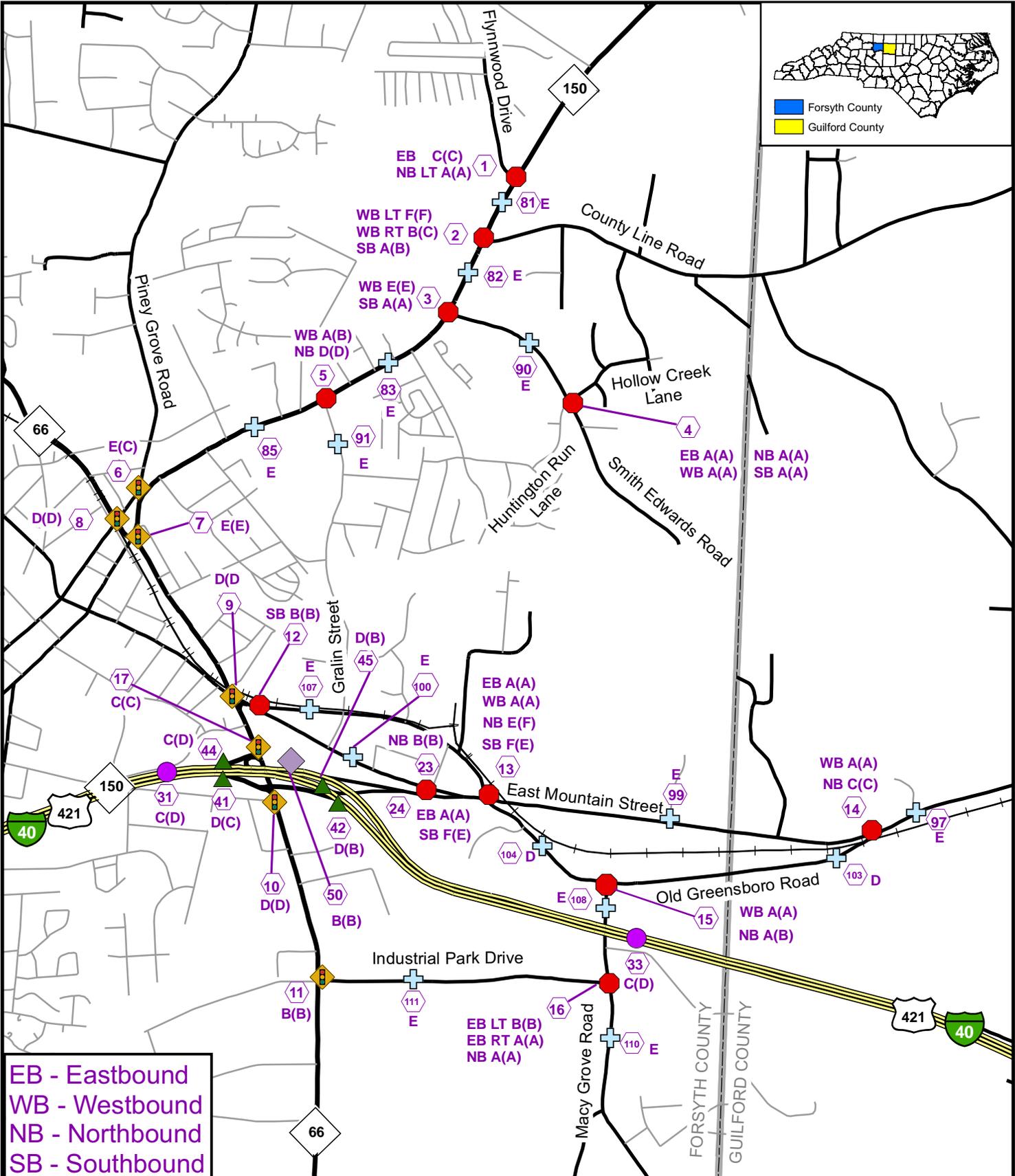
The traffic forecast provided AADT volumes for the transportation network within the study area for the 2030 No Build Conditions and assumed that all improvements contained in the City of Winston-Salem Metropolitan Planning Organization (MPO) and the Greensboro Urban Area MPO's fiscally constrained *Long-Range Transportation Plan* are constructed, with the exception of the proposed project. Projected 2030 No Build traffic volumes on Macy Grove Road within the study area range from 13,200 AADT to 17,800 AADT. The analysis shows that 28 of 43 analysis points are operating at LOS E or worse in either the AM or PM peak hour (Figure 4).

2035 No Build Conditions Traffic Volumes and Analyses

The traffic forecast provided AADT volumes for the transportation network within the study area for the 2035 No Build Conditions and assumed that all improvements contained in the City of Winston-Salem MPO's and the Greensboro Urban Area MPO's fiscally constrained *Long-Range Transportation Plan* are constructed (including the I-74/Airport Connector Road), with the exception of the proposed project. Projected 2035 No Build traffic volumes on Macy Grove Road within the study area range from 13,400 AADT to 16,800 AADT. The analysis shows that 18 of 43 analysis points are operating at LOS E or worse in either the AM or PM peak hour (Figure 5).

2.4.3.3 Crash Data

Crash data for major roadways within the project study area, provided by NCDOT for a three-year period, were compared to Statewide Average Crash Rates for similar roadways throughout North Carolina to determine if the roadway exceeded the statewide average. The crash rates were also compared to the Calculated Critical Crash Rate, a more appropriate methodology, which is a statistically derived number that can be used to identify locations where crash occurrence is higher than expected for a facility type. As reported in the *Traffic Safety Analysis: Macy Grove Road Extension*, several roadway segments resulted with crash rates exceeding the statewide average and/or the Calculated Critical Rate; however, it is not possible to correlate any future changes in crash rates to the proposed action.



EB - Eastbound
 WB - Westbound
 NB - Northbound
 SB - Southbound

North Carolina
 Department of Transportation

Date: May 2010

Legend

- Interstate
- US Route
- NC Route
- Local Roads
- Railroad
- County Boundary
- # Segment/Intersection Number
- A (A) Level of Service (AM/PM)
- Two-Lane Roadway Segment
- Unsignalized Intersection
- Signalized Intersection
- Freeway Segment
- Freeway Ramp Merge/Diverge
- Freeway Weaving Segment

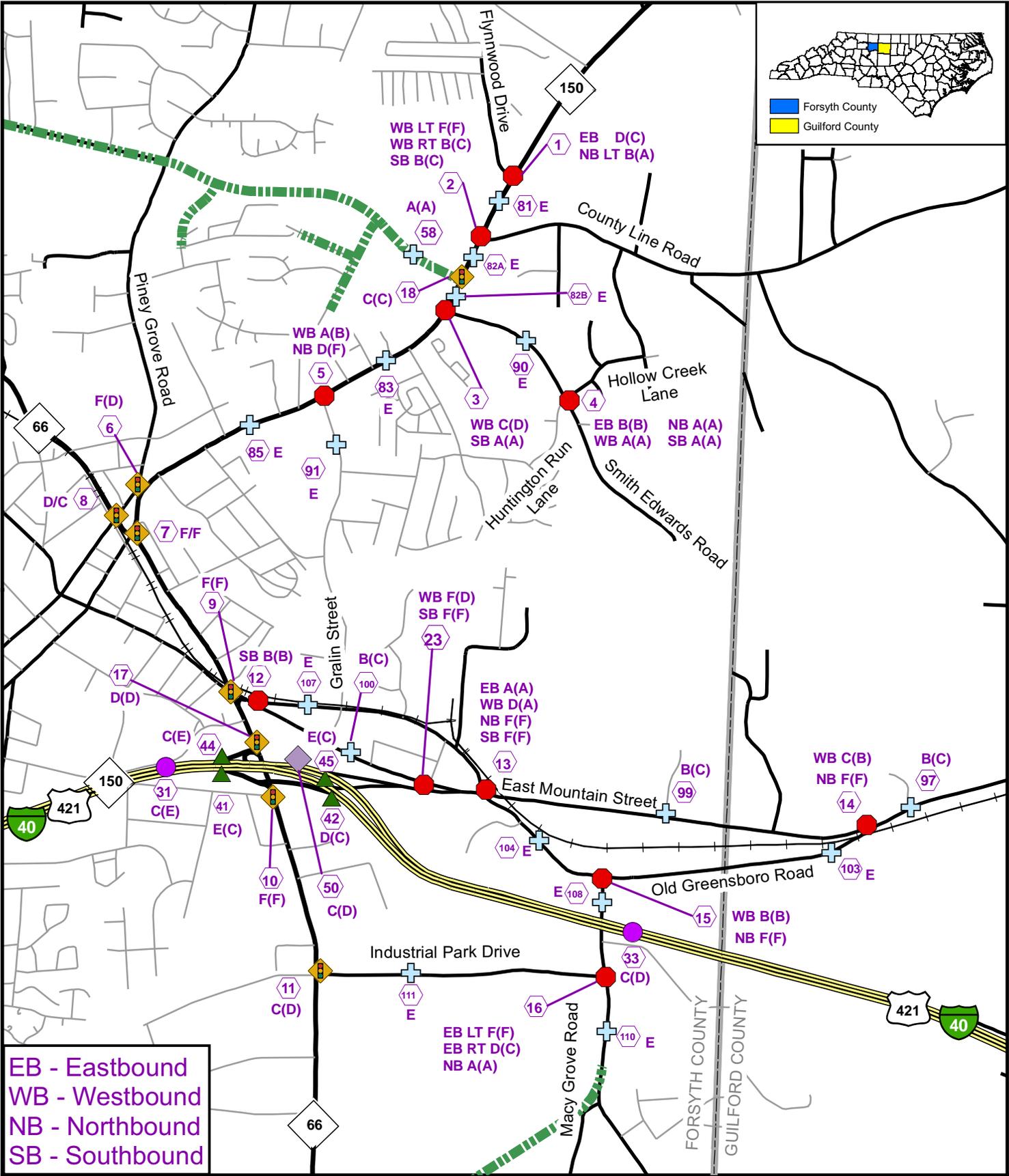
N
 W — E
 S

0 1,000 2,000 Feet

Macy Grove Road Improvements
 Forsyth County, NC
 STIP U-2800 & U-4734

Figure 3

2008 No-Build Scenario
 Level of Service



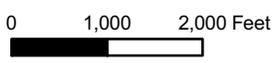
EB - Eastbound
 WB - Westbound
 NB - Northbound
 SB - Southbound

North Carolina
 Department of Transportation

Date: May 2010

Legend

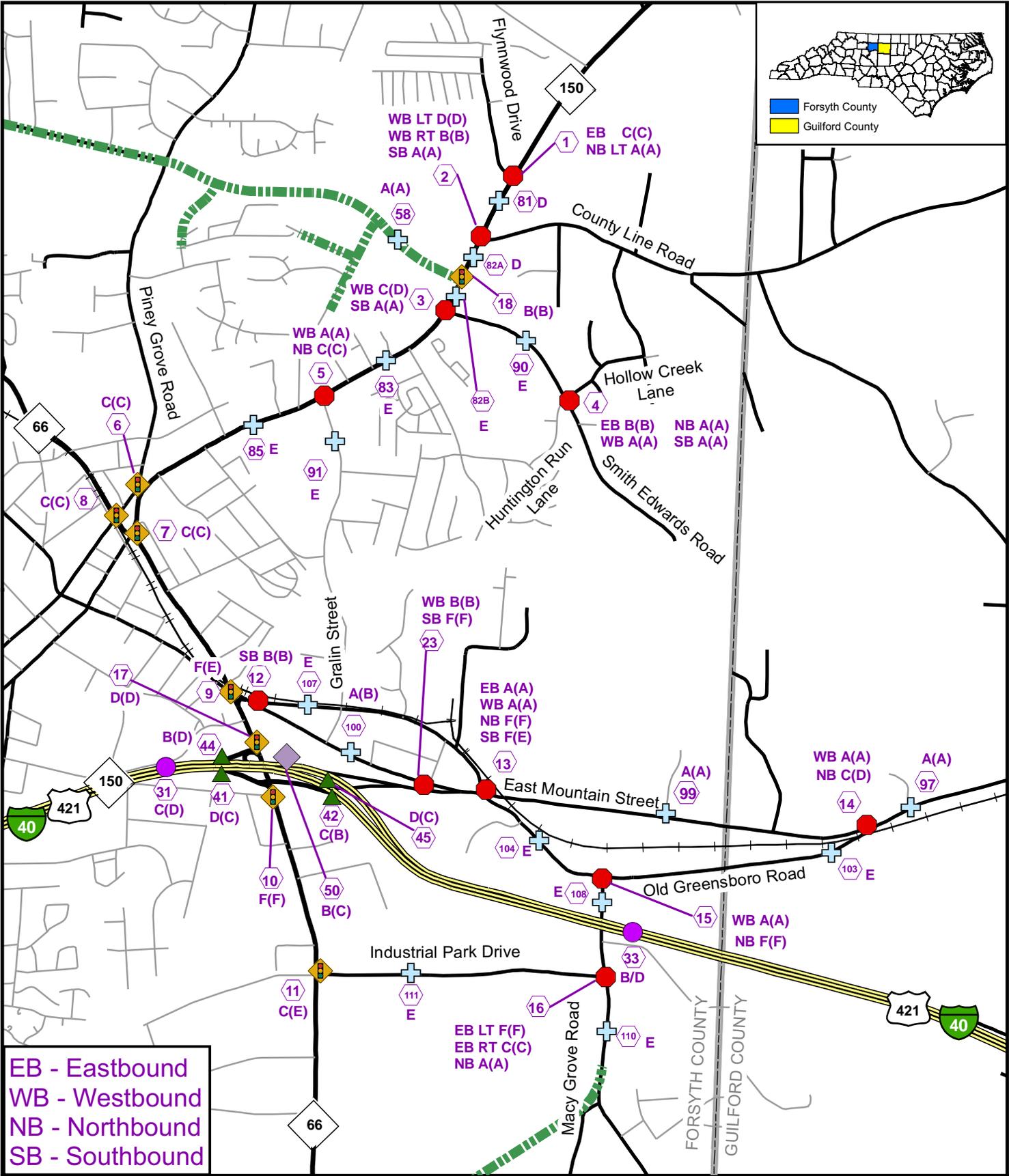
- Interstate
- US Route
- NC Route
- Local Roads
- Railroad
- County Boundary
- Future Kenersville Loop Road
- # Segment/Intersection Number
- A (A) Level of Service (AM/PM)
- Two-Lane Roadway Segment
- Unsignalized Intersection
- Signalized Intersection
- Freeway Segment
- Freeway Ramp Merge/Diverge
- Freeway Weaving Segment



Macy Grove Road Improvements
 Forsyth County, NC
 STIP U-2800 & U-4734

Figure 4

2030 No-Build Scenario
 Level of Service



EB - Eastbound
 WB - Westbound
 NB - Northbound
 SB - Southbound

North Carolina
 Department of Transportation

Date: May 2010

Legend

- Interstate
- US Route
- NC Route
- Local Roads
- Railroad
- County Boundary
- Future Kernersville Loop Road
- Segment/Intersection Number
- Level of Service (AM/PM)
- Two-Lane Roadway Segment
- Unsignalized Intersection
- Signalized Intersection
- Freeway Segment
- Freeway Ramp Merge/Diverge
- Freeway Weaving Segment

0 1,000 2,000 Feet

Macy Grove Road Improvements
 Forsyth County, NC

STIP U-2800 & U-4734

Figure 5

2035 No-Build Scenario
 Level of Service

2.5 TRANSPORTATION AND LAND USE PLANS

This section describes the consistency of the project with transportation and land use plans.

2.5.1 TRANSPORTATION PLANS

2.5.1.1 North Carolina Transportation Improvement Program (STIP)

The proposed Macy Grove Road improvements are included in the NCDOT's 2009-2015 STIP as Project No. U-2800 and Project No. U-4734. The STIP describes U-2800 as "SR 2601 (Macy Grove Road), Industrial Park Drive to Old US 421; widen to multi-lanes, part on new location and convert grade separation at I-40 Business to an interchange." U-4734 is described as "Macy Grove Road Extension, East Mountain Street to NC 150 (North Main Street); multi-lane facility on new location." U-2800 is scheduled for right-of-way in federal fiscal year (FFY) 2011 and construction in FFY 2013. Right-of-way and construction for U-4734 are currently unfunded.

Other major STIP projects in and around the vicinity of this project are listed in Table 2, with the general locations shown on Figure 6.

Table 2: Other STIP Projects in the Vicinity of the Study Area

STIP No.*	Description	Schedule (Fiscal Years)
I-4924	I-73/74 Connector – Winston-Salem Beltway north of Kernersville to NC 68 west of Greensboro. Multi-lane freeway on new location.	Programmed for planning and environmental study only Future North Carolina Turnpike Authority Project
B-4510	I-40 Business/US 421 – West of US 158 in Forsyth County to west of SR 1850 in Guilford County. Pavement and bridge rehabilitation.	ROW – unfunded Construction – unfunded
R-0609	US 311 Bypass – High Point, South of SR 1920 East of Archdale to West of High Point Reservoir. Four lanes divided, new location.	Under construction
R-2611	SR 1008 (West Market Street) – SR 2007 at Colfax to NC 68. Widen to multi-lanes.	ROW – FY 09 Construction – FY 11
R-2577	US 158 – Multi-lanes north of US 421/I-40 Business in Winston-Salem to US 220. Widen to multi-lanes.	Programmed for planning and environmental study only. ROW – unfunded Construction – unfunded
R-2247	New route – Winston-Salem Northern Beltway. Four lane expressway on new location.	ROW – unfunded Construction – unfunded
R-2413	US 220-NC 68 – SR 2113 (Pleasant Ridge Road) to US 220-NC 68. Multi-lane connector on new location, NC 68 to US 220 and multi-lane US 220 to NC 68.	Planning/design – in progress: ROW – 2011 Construction - 2015
R-0952	West of US 158 in Forsyth County to west of SR 1850 in Guilford County. Pavement and Bridge Rehabilitation (8.5 miles)	Section A complete Section B unfunded

STIP No.*	Description	Schedule (Fiscal Years)
U-3617	SR 2045 (East Mountain Street/Old US 421), SR 1005, SR 1008, NC 66 in Kernersville (Forsyth County) to SR 2001 (Guilford County). Widen to multi-lanes.	ROW – unfunded Construction – unfunded
U-2579	Winston-Salem Northern Beltway, Eastern section (Future I-74), US 52 to US 311. Multi-lane freeway on new location.	Planning/design – in progress ROW – FY 08 (Section B) Construction – FY 13 (Section B)
U-4909	SR 2643 (Union Cross Road), SR 2691 (Wallburg Road) to SR 2632 (Sedge Garden Road). Widen to multi-lanes.	ROW – In progress Construction - 2012
U-2826	US 52, I-40 Bypass to proposed western loop interchange. Widen and upgrade roadway and interchanges.	Planning/Design – In progress ROW – unfunded Construction - unfunded
U-3615	SR 1003-SR 1820 (Skeet Club Road), US 311 to NC 68 (Eastchester Drive). Widen to multi-lanes.	ROW – unfunded Construction – unfunded
U-2524	Western Loop, North of I-85 to Lawndale Drive. Construct freeway on new location.	ROW – unfunded Construction – unfunded

Source: NCDOT 2009-2015 State Transportation Improvement Program, Divisions 7 and 9.

* I – Interstate Projects. B – Bridge Projects. R – Rural Projects. U – Urban Projects.

2.5.1.2 Winston-Salem Urban Area Long Range Transportation Plan

One of the objectives of the 2035 LRTP is “to create a first class street and highway network that meets short and long-term needs of the Winston-Salem Urban Area MPO.” The Macy Grove Road project is part of this goal. The U-2800 and U-4734 sections of the project are identified in the 2035 LRTP’s Street and Highway Project list as being completed between 2016 and 2025.

The 2035 LRTP 2008-35 Project Map is shown in Figure 7.

2.5.2 LOCAL THOROUGHFARE PLANS

The thoroughfare planning process is a comprehensive transportation planning process that integrates urban area planning practices with local, regional, and statewide transportation planning practices. The thoroughfare planning process identifies transportation needs by evaluating land development and population growth trends in urbanized areas. The process begins through cooperative efforts between NCDOT’s Transportation Planning Branch and the local planning officials. Socioeconomic data are collected, including business and residential area inventories, existing street inventories, identification of environmental constraints, and historical information of the area. A base-year transportation model is built. Utilizing input from local planning officials, land development and population growth trends are projected and applied to the model. This information leads to the development of the future year (2035) transportation model. Through this modeling process and local knowledge of the area’s socioeconomic conditions, the thoroughfare planning team identifies transportation deficiencies and determines short- and long-term solutions for eliminating or diminishing those deficiencies.

2.5.2.1 Winston-Salem/Forsyth County Urban Area Thoroughfare Plan

The proposed project is listed as part of the Kernersville Loop System in the *Winston-Salem/Forsyth County Urban Area Thoroughfare Plan Technical Report* (Winston-Salem Department of Transportation and NCDOT, February 2002). The Kernersville Loop System is proposed as a Major Thoroughfare and includes Macy Grove Road, North Main/Piney Grove Road Connector (including Smith-Edwards Road), East Mountain/North Main Street Connector, Linville Springs Road/Extension, Whicker Road/Shields Road, and Big Mill Farm/Hopkins Road (Figure 8).

2.5.2.2 Town of Kernersville Thoroughfare and Street Plan

The Town of Kernersville *Thoroughfare and Street Plan Map* (Town of Kernersville, July 2005) shows the project as a proposed Major Thoroughfare that begins at Macy Grove Road (shown as an existing Major Thoroughfare) and extends northward across East Mountain Street to North Main Street (Figure 9).

2.5.3 BICYCLE AND PEDESTRIAN PLANS

The *Winston-Salem Urban Area Comprehensive Bicycle Master Plan* (City of Winston-Salem, Department of Transportation, September 2005) was developed to provide the necessary updates to the original bicycle route map and to support the integration of bicycle planning into the long-range growth management efforts of the community. In the plan, it is recommended that several existing facilities in the Town of Kernersville be signed as bicycle routes (roads within and in the vicinity of the project study area include N. Main Street and Old Greensboro Road). Traffic volumes and/or speeds on these roads are low enough to provide suitable bicycling conditions without additional bicycle facilities. The plan also suggests that bicycle facilities be constructed on several roads in the Kernersville area. According to the plan, within the project vicinity, shoulders should be added to East Mountain Street, Graves Street, and Old Greensboro Road on the east side of town. Shoulders should also be added to NC 150 at the northern terminus of the project. The Pedestrian and Bicycle Planning Committee (PBPC) of the Town of Kernersville recommended that NC 66 South be designated as a bicycle route.

According to the *Winston-Salem Urban Area Comprehensive Bicycle Master Plan*, a shared-use path should be provided along with the freeway loop that is proposed for the north side of Kernersville. It will be important to provide connector pathways to connect this main path with surrounding neighborhoods.

The Town of Kernersville's *Pedestrian and Bicycle Plan* (Town of Kernersville, March 2007) states that there must be "sidewalks along all new construction for the loop or connector roads shown on the transportation plan."

As of October 2006, the Town of Kernersville had 48 miles of existing sidewalks within the city limits. Several routes have been suggested by the PBPC and outlined in the Town of Kernersville Pedestrian and Bicycle Plan. This includes all sections of the future loop/connector road (which includes the Macy Grove Extension to N. Main Street) to have sidewalks along all new construction. Other pedestrian planning within the project study area vicinity includes new sidewalks on North Main Street to County Line Road, new sidewalks along East Mountain Street from the intersection at Highway 66 (NC 66) South to Kirkman Street, and new sidewalks on NC 66 from East Mountain Street to Interstate 40.

The Town of Kernersville's *Bicycle and Pedestrian and Bicycle Plan* highlights Reedy Fork Trail, located within the project study area, as a proposed greenway. Reedy Fork is the link between downtown Kernersville and several N. Main Street neighborhoods to Triad Park. The Town constructed a sidewalk/bicycle tunnel under Gralin Street to accommodate this link. The Town of Kernersville also owns property along this corridor and has a few easements along Reedy Fork. A joint study with Triad Park will take place to determine the best pedestrian and bicycle access from Kernersville to the park.

The Piedmont Greenway is a proposed project identified in the *Winston-Salem Forsyth County Greenway Plan* (City-County Planning Board for Forsyth County and Winston-Salem, June 2003) for Winston-Salem and Forsyth County and the *Parks and Open Space Plan for Winston-Salem and Forsyth County* (City-County Planning Board for Forsyth County and Winston-Salem, March 2006). The proposed greenway will run from Salem Lake to Triad Park, thus connecting downtown Kernersville and surrounding neighborhoods with Triad Park and supporting community cohesion. The extension of Macy Grove Road on new location will run through Triad Park and across this future greenway.

2.5.4 LAND USE PLANS

2.5.4.1 Town of Kernersville Land Use Plan

The Town of Kernersville's *Land Use Plan*, adopted in 2004, promotes orderly development and achievement of community goals. In terms of transportation, the plan includes the proposed Kernersville Loop Road System, which consists of Macy Grove Road and several other future sections. The Loop is planned to connect the major north/south and east/west transportation routes through Kernersville, including North and South Main Street, East and West Mountain Street, Piney Grove/Union Cross Roads, and NC 66.

2.5.4.2 Town of Kernersville Development Plan

The *Kernersville Development Plan* (Town of Kernersville, January 2005) is a document that is periodically updated to evaluate the current and projected status of the Town of Kernersville's growth, economy, land use, infrastructure, parks/recreation facilities, and greenways. The Kernersville Loop Road System is designated as a "Major Proposed Connection" in the Thoroughfare and Street Plan section of the *Kernersville Development Plan*.

2.5.4.3 Legacy Comprehensive Plan

The *Legacy Comprehensive Plan*, adopted in 2001, is Forsyth County's comprehensive plan. Within this plan is a *Growth Management Plan* (developed in 2006) designed to guide and manage growth within the county. The *Growth Management Plan* classifies land area in the county as City/Town Center, Urban Neighborhood, Suburban Neighborhood, Future Growth Area, and Rural Area. It also identifies the limits of municipal services (water/sewer). The proposed project borders between the Suburban Neighborhood/Future Growth Area limit identified in the *Growth Management Plan*. The project is consistent with this plan.

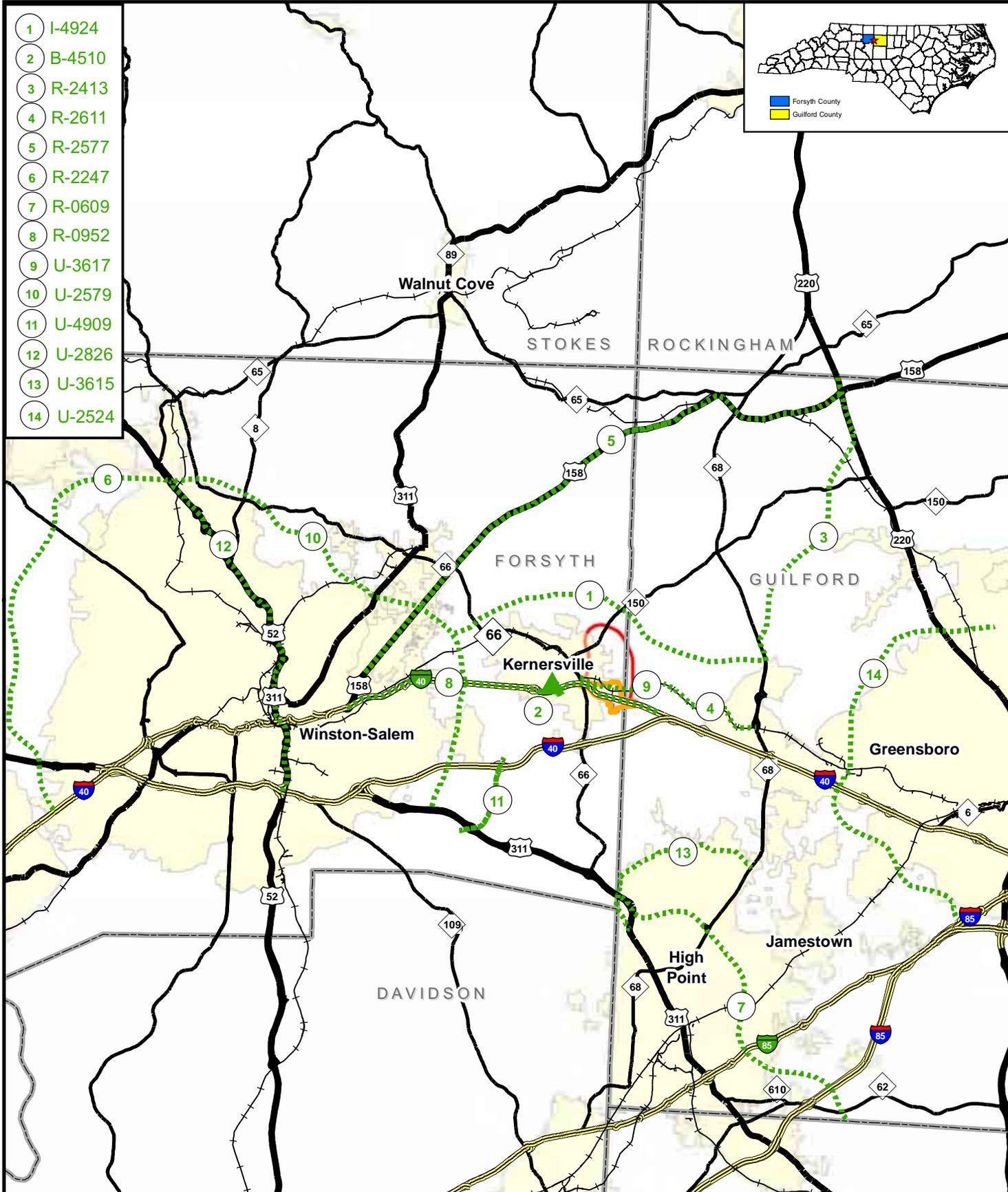
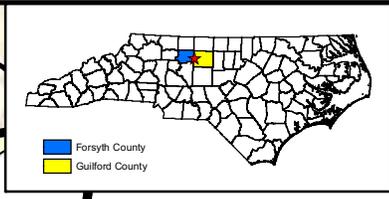
2.5.5 OTHER PLANS

The Piedmont Greenway is a proposed project identified in the *Winston-Salem Forsyth County Greenway Plan* (City-County Planning Board for Forsyth County and Winston-Salem, June 2003) for Winston-Salem and Forsyth County and the *Parks and Open Space Plan for Winston-Salem and Forsyth County* (City-County Planning Board for Forsyth County and Winston-Salem, March 2006). The greenway will run from Salem Lake to Triad Park, thus connecting

downtown Kernersville and surrounding neighborhoods with Triad Park and supporting community cohesion. The extension of Macy Grove Road on new location will run through Triad Park and across the future greenway. Accommodations for this future greenway are explained in Section 4.10.

The Heart of the Triad (HOT) is a land use master plan developed by a planning committee with members from Guilford and Forsyth Counties, the City of High Point, the City of Winston-Salem, the City of Greensboro, and the towns of Oak Ridge and Kernersville. The purpose of this study is to develop a master plan for 7,500 acres of land, named Heart of the Triad, located along the Guilford-Forsyth County line, west of PTI and along I-40, I-40 Business, and US 421 corridors (HOT Web site: www.partnc.org/HOT.html).

- 1 I-4924
- 2 B-4510
- 3 R-2413
- 4 R-2611
- 5 R-2577
- 6 R-2247
- 7 R-0609
- 8 R-0952
- 9 U-3617
- 10 U-2579
- 11 U-4909
- 12 U-2826
- 13 U-3615
- 14 U-2524



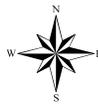
North Carolina
Department of Transportation



Date: May 2010

Legend

- U-4734 Study Area
- U-2800 Study Area
- County Boundary
- Municipal Boundary
- STIP Projects
- ▲ STIP Project Points



0 4 Miles



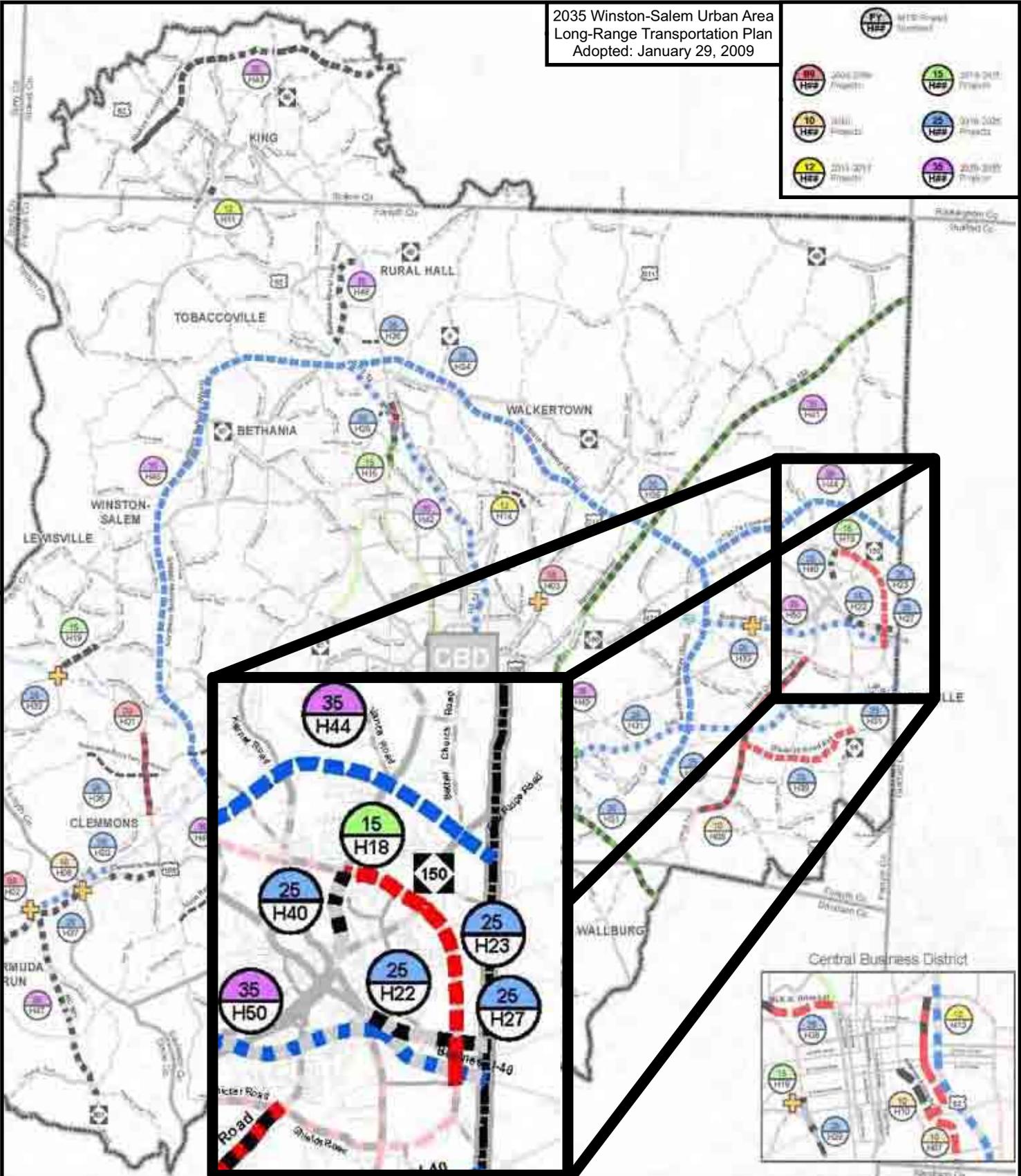
Macy Grove Road Improvements
Forsyth County, North Carolina

STIP U-2800 & U-4734

Figure 6

STIP Projects in the
Vicinity of U-4734 and U-2800

2035 Winston-Salem Urban Area
Long-Range Transportation Plan
Adopted: January 29, 2009



North Carolina
Department of Transportation



Date: July 2010

Legend

L RTP Projects	Other Roads	L RTP Projects	Other Roads
Freeway	Other Major Thoroughfare	Freeway	Other Major Thoroughfare
Freeway Needs Improvement	Other Major Thoroughfare Needs Improvement	Freeway Needs Improvement	Other Major Thoroughfare Needs Improvement
Freeway Recommended	Other Major Thoroughfare Recommended	Freeway Recommended	Other Major Thoroughfare Recommended
Expressway	Minor Thoroughfare	Expressway	Minor Thoroughfare
Expressway Needs Improvement	Minor Thoroughfare Needs Improvement	Expressway Needs Improvement	Minor Thoroughfare Needs Improvement
Expressway Recommended	Minor Thoroughfare Recommended	Expressway Recommended	Minor Thoroughfare Recommended
Boulevard	Bridge/Interchange/Intersection Projects	Boulevard	Bridge/Interchange/Intersection Projects
Boulevard Needs Improvement	Metropolitan Area Boundary	Boulevard Needs Improvement	Metropolitan Area Boundary
Boulevard Recommended	Counties	Boulevard Recommended	Counties
	Smith Reynolds Airport		Smith Reynolds Airport



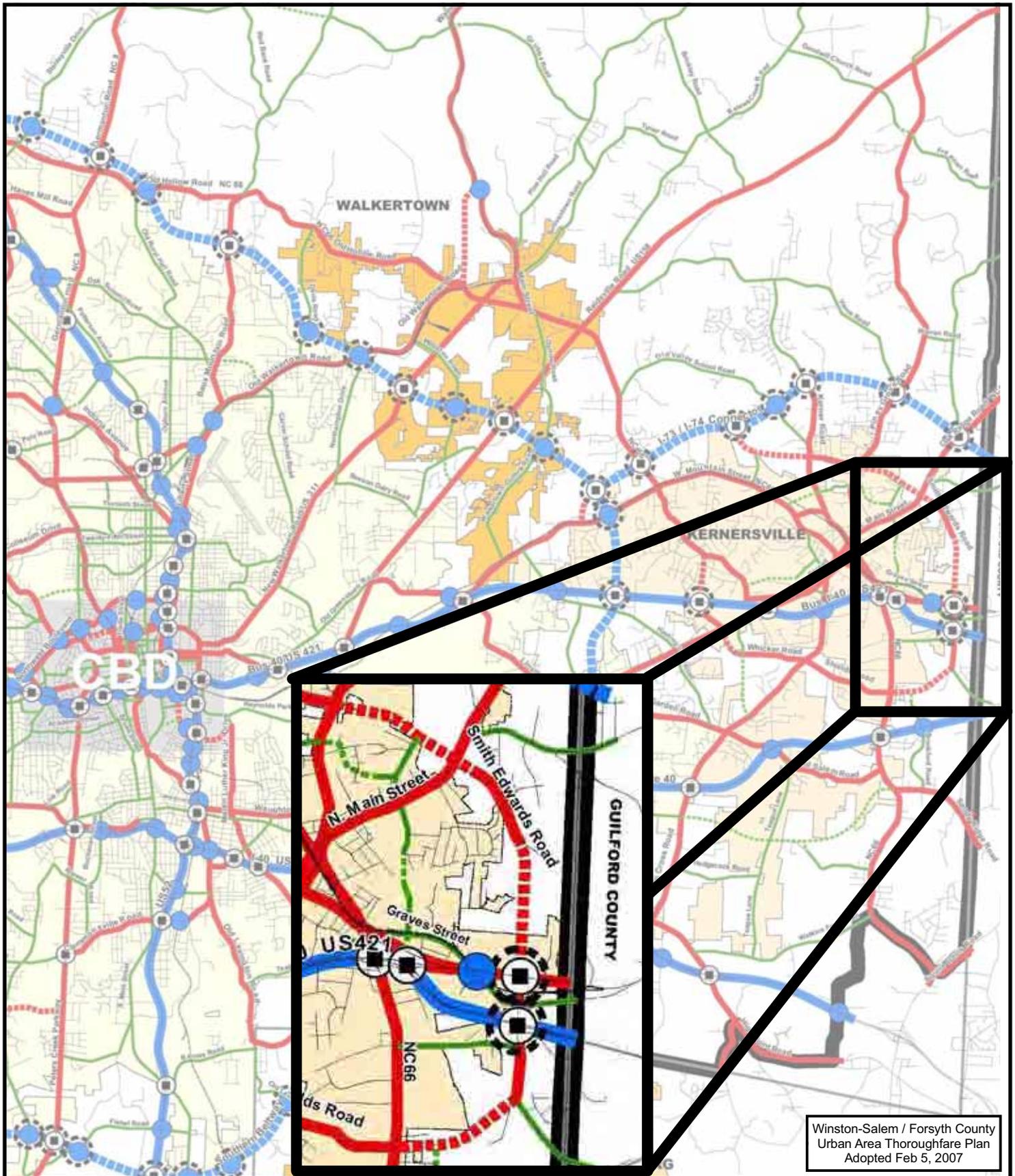
Not to Scale

Macy Grove Road Improvements
Forsyth County, NC

STIP U-2800 & U-4734

Figure 7

2035 Winston-Salem Urban Area
Long-Range Transportation Plan



Winston-Salem / Forsyth County
 Urban Area Thoroughfare Plan
 Adopted Feb 5, 2007

North Carolina
 Department of Transportation



Date: May 2010

Legend

- | | |
|---|---|
| <ul style="list-style-type: none"> ★ EXISTING INTERCHANGE ⊕ PROPOSED INTERCHANGE ● EXISTING GRADE SEPARATION ⊕ PROPOSED GRADE SEPARATION LOCAL ROADS & COLLECTORS RAILROAD □ COUNTY BOUNDARY | <ul style="list-style-type: none"> — FREEWAY/EXPRESSWAY — MAJOR THOROUGHFARE — MINOR THOROUGHFARE — PROPOSED FREEWAY/EXPRESSWAY — PROPOSED MAJOR THOROUGHFARE — PROPOSED MINOR THOROUGHFARE ■ METROPOLITAN AREA BOUNDARY |
|---|---|

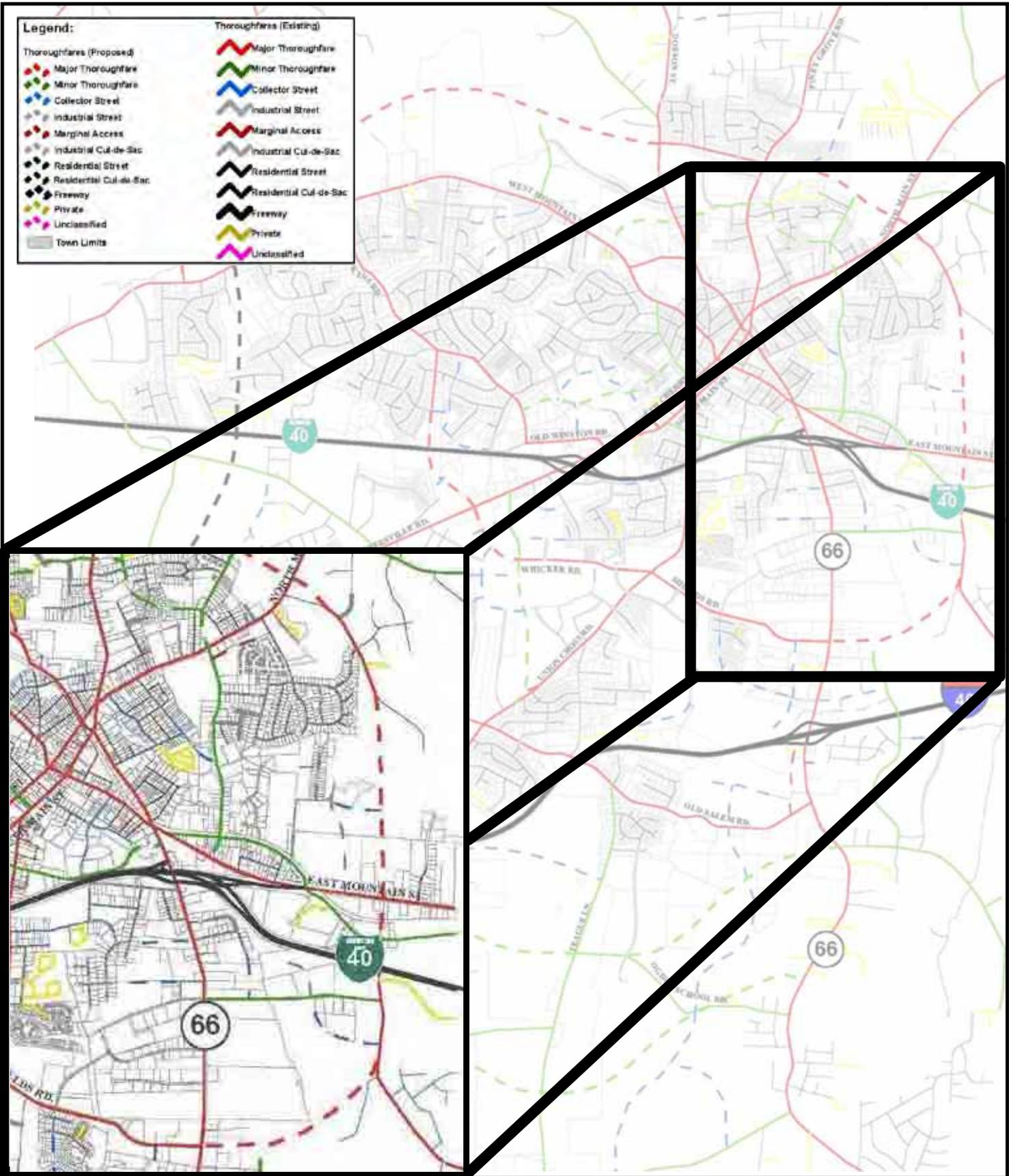
Not to Scale

Macy Grove Road Improvements
 Forsyth County, NC

STIP U-2800 & U-4734

Figure 8

Winston-Salem / Forsyth County
 Major Thoroughfare Plan



North Carolina
Department of Transportation



Date: May 2010



Not to Scale

Macy Grove Road Improvements
Forsyth County, NC

STIP U-2800 & U-4734

Figure 9

Kenersville Thoroughfare &
Streets Plan

2.6 SYSTEM LINKAGE/TRAVEL TIME/ACCESS NEED

2.6.1 EXISTING ROAD NETWORK

The existing roadways in and around the project study area are shown on Figure 1 and Figure 2 and are described as follows:

2.6.1.1 Primary US Routes and NC Routes

I-40 Business/US 421

I-40 is an east/west Interstate route that runs from Barstow, California, to Wilmington, North Carolina. Within the vicinity of the project, I-40 Business splits from I-40 west of Winston-Salem, converges with US 421, and runs east through the project study area somewhat parallel with I-40 to the south. I-40 Business/US 421 then continues east through Kernersville, where it rejoins I-40. US 421/I-40 then continues east through Guilford County, east of Greensboro, where US 421 turns southeast, separating from I-40. I-40 Business is the major east-west route in the area, used to access Winston-Salem to the west and I-40, Greensboro, and the Piedmont Triad International Airport to the east. Within the project study area, I-40 Business/US 421 is a four-lane, median-divided facility with full control of access and a posted speed limit of 60 mph.

NC 150 (Bodenhamer Street to North Main Street)

NC 150 (known as Bodenhamer Street and North Main Street near the project) is an east/west route that runs from the South Carolina state line in Cleveland County, North Carolina, to US 158 in Caswell County, North Carolina. NC 150 enters the project study area from the west as a part of I-40 Business, before turning north into downtown Kernersville as Bodenhamer Street at the NC 66 interchange. NC 150 then turns right onto North Main Street, ultimately exiting the project study area to the north. North of the NC 66 interchange, NC 150 has a posted speed limit of 35 mph and transitions from a five-lane to a three-lane roadway until Chaucer Manor Lane, where it becomes a two-lane road. North of Smith Edwards Road, NC 150 has a posted speed limit of 50 mph. Once split from I-40 Business, NC 150 has no control of access.

NC 66

NC 66 is an east/west route that begins at NC 89 in Stokes County, North Carolina, and travels southeast to its terminus at US 311 in Davidson County. The primary I-40 Business access to Kernersville from the east is by NC 66. South of I-40 Business, NC 66 is a five-lane facility with no control of access, and transitions from a speed limit of 45 mph to 35 mph as it approaches I-40 Business. North of I-40 Business, NC 66 has a posted speed limit of 35 mph and follows NC 150 along East Bodenhamer Street to Main Street, where NC 66 continues as West Bodenhamer Street, a three-lane facility, before exiting the project study area to the west.

2.6.1.2 Secondary Routes and Local Roads

SR 2601 (Macy Grove Road)

As described in the discussion of the existing facility, Macy Grove Road is a two-lane, north/south route approximately 1.9 miles in length, with no control of access, that begins at South Bunker Hill Road, just south of I-40, and ends at SR 2402 (Old Greensboro Road). Macy Grove Road is used from the south to access NC 66, I-40 Business, and downtown Kernersville via Industrial Park Drive. In addition, Macy Grove Road is used to access I-40 Business and

East Mountain Street via Old Greensboro Road. Macy Grove Road will also provide access to the Kernersville Medical Park, which is currently under construction. The posted speed limit along Macy Grove Road is 45 mph.

SR 4319 (Industrial Park Drive)

Industrial Park Drive is an east/west route approximately 0.8 miles in length that runs from NC 66 to Macy Grove Road. It is used to access industrial offices in the area. The roadway is a three-lane facility with a center turn lane, no control of access, and a posted speed limit of 35 mph.

SR 2042 (Old Greensboro Road)

Old Greensboro Road is an east/west route approximately 1.2 miles in length that begins inside the project study area at East Mountain Street/Old US 421. It then continues east, parallel to East Mountain Street/Old US 421, until it rejoins East Mountain Street/Old US 421 east of the study area. The roadway is a two-lane facility with no control of access, a posted speed limit of 35 mph to the west of Macy Grove Road, and a posted speed limit of 45 mph to the east of Macy Grove Road. Old Greensboro Road is used to access a school, several businesses, and the existing Macy Grove Road.

SR 1005 (East Mountain Street/Old US 421)

East Mountain Street/Old US 421 is an east/west route approximately 2 miles in length that enters the project study area north of the intersection of NC 66 and Business I-40. East Mountain Street/Old US 421 continues east to the Guilford County line, where it is then known as SR 1008 (West Market Street) as it exits the project study area. East Mountain Street/Old US 421/West Market Street is a two-lane roadway with no control of access, although it is listed on the NCDOT 2009-2015 STIP to be widened to multiple lanes from NC 66, east into Guilford County. East Mountain Street, east of NC 66 has a posted speed limit of 45 mph.

SR 2036 (Smith Edwards Road)

Smith Edwards Road is an east/west residential road that begins at NC 150 (North Main Street) and terminates approximately one mile southeast. The roadway is a two-lane facility with no control of access. No posted speed limit is identified.

2.6.2 COMMUTING PATTERNS

The Demographic Study Area (DSA) for this project is composed of Census Tract 32.02- Block Group 2, and Tract 33.05- Block Group 1 in Forsyth County, the 2000 US Census Block Groups that most closely represent the project study area (Figure 10). According to the 2000 Census, 52% of employees in the DSA spent less than 20 minutes commuting to work. This is comparable to Forsyth County overall, in which 53% spent less than 20 minutes commuting to work. Since 2000, some employers and employment centers have closed, and many employees have had to commute further to work. According to town planners, many employees within the study area are commuting to Greensboro for work.

2.6.3 MODAL INTERRELATIONSHIPS

2.6.3.1 Public Transportation

The Town of Kernersville is served by the Piedmont Authority for Regional Transportation (PART), which provides regional bus service in the Triad interconnecting the city bus systems of Greensboro, High Point, and Winston-Salem. One fixed bus route, the Winston-Salem Express, begins in downtown Winston-Salem and makes one stop in Kernersville at South Main Street, approximately 2 miles west of the Macy Grove Road and Old Greensboro Road intersection.

PART is planning a six-county regional transportation system that will include commuter and inter-city rail, as well as bus rapid transit (BRT) routes. The six counties served by PART include Alamance, Rockingham, Guilford, Randolph, Davidson, and Forsyth. The US 70/ Business I-40 Corridor has been identified as a future transit corridor between Greensboro, Kernersville, and Winston-Salem. The proposed Kernersville Loop Road system will intersect with the future transit corridor.

2.6.3.2 Rail Service

According to the 2035 LRTP, rail freight transportation in Winston-Salem and Forsyth County is operated by three different railroads, the Yadkin Valley Railroad, the Winston-Salem Southbound Railway, and the NS Railway. NS Railroad serves an automobile distribution center in Winston-Salem, with the tracks crossing east/west through the project study area. A grade separation is proposed for the Macy Grove Road extension over the NS.

Currently, there are no passenger rail services provided in the Town of Kernersville. The closest route is the Winston-Salem Connector operated by Amtrak, which runs from Winston-Salem to High Point. As stated, PART is planning a six-county regional transportation system that will include commuter and inter-city rail, as well as BRT routes. The six counties served by PART include Alamance, Rockingham, Guilford, Randolph, Davidson, and Forsyth. The US 70/ Business I-40 Corridor has been identified as a future transit corridor between Greensboro, Kernersville, and Winston-Salem. The proposed Kernersville Loop Road system will intersect with the future transit corridor.

2.6.3.3 Motor Freight Service

The 2035 LRTP notes that the Piedmont Triad offers excellent interstate highway access and competitive rail service and is within five-hour trucking proximity to deep-water ports at Wilmington and Morehead City in North Carolina, Charleston in South Carolina, and Norfolk in Virginia. Furthermore, the roadway system in Winston-Salem and the Forsyth County Urban Area easily supports truck freight transportation, as the convergence of major roadway arteries such as I-40, Business I-40, and US 52 (Future I-74) provide ideal access for the movement of goods and connects industry in the Piedmont Triad Urban Area with other regions throughout the state and country. Continual roadway improvements by NCDOT and the City of Winston-Salem have allowed all of the Urban Area's major industries to operate without truck freight transportation problems. STIP U-2800 is listed on the Winston-Salem Freight Transportation Improvement Project List.

2.6.3.4 Air Service

According to the 2035 LRTP, the majority of air traffic in Winston-Salem and Forsyth County departs or originates at the Smith Reynolds Airport. This airport, operated by the Airport Commission of Forsyth County, serves the local citizenry as a general aviation airport. The

airport is located about 3 miles northeast of downtown Winston-Salem, with good access to US 52. Prior to the opening of PTI Airport in neighboring Guilford County, Smith Reynolds Airport served as the regional passenger air carrier for northwestern North Carolina, with more than 33,400 daily passengers in 1983. After 1984, daily passenger volumes decreased to less than 3,000 due to the increased service at PTI. Today, there are no commuter flights originating from Smith Reynolds Airport (2035 LRTP, January 2009).

The 2035 LRTP also describes planned improvements for the Smith Reynolds Airport, including the rehabilitation of the main runway, additional corporate hangars and automobile parking, taxiway relocations, and construction of new Passenger and Air Carrier Terminals. The capacities of the existing roadway facilities accessing the airport are considered to be adequate to serve the projected traffic volumes through 2030. Good access to US 52 is considered to be critical to the future success of Smith Reynolds Airport. In the future, Smith Reynolds Airport would like to see the return of commuter flights in order to better serve the people of the Winston-Salem Urban Area.

The PTI is located just east of the Town of Kernersville and is accessed via I-40. The airport is operated by the Piedmont Triad Airport Authority, which currently provides available non-stop flights to 17 cities. PTI also provides international cargo, corporate, and recreational flights. Recent improvements to PTI include the June 2, 2009 opening of the FedEx Mid-Atlantic hub, which has the capacity to sort 24,000 packages per hour.

See Figure 1 for locations of these airports.

2.6.4 ECONOMIC DEVELOPMENT/LAND USE CHANGES

2.6.4.1 Demographics

Population—Trends and Composition

According to the 2000 Census, 4,845 people lived in the DSA (Figure 10). This number represents an increase of 871 people (22%) from the 1990 population numbers. The population growth rate in the DSA was higher than in Forsyth County overall, which increased by 40,189 people (15%) from 1990 to 2000. The median age was 31.5 within the DSA.

When looking at the DSA census block groups individually, population has increased considerably for Census Tract 32.02- Block Group 2 from 1990 to 2000 compared to Census Tract 33.05- Block Group 1, with growth rates of 46% and 4%, respectively. This can be attributed to the larger amount of new residential areas developed in the northern half of the project area, as opposed to more industrial uses in the southern portion of the project. According to the Town of Kernersville's *Land Use Plan*, 2,393 acres of industrial and office areas are designated in the area, most of which are southwest of the proposed interchange at Macy Grove Road and I-40 Business. This area encompasses the southern portion of the project area, which includes Census Tract 33.05- Block Group 1. According to the *Kernersville Development Plan* (2005), Kernersville has protected industrial and office areas from retail and housing encroachment in this area.

The North Carolina State Demographics Unit estimates Forsyth County's 2007 population at 338,679, which represents an increase of about 11% from 2000. According to the North Carolina State Demographics Unit, Forsyth County is projected to grow 15% between 2000 and 2010, approximately the same as it did between 1990 and 2000.

Racial Makeup

According to the 2000 Census, 74% of residents in the DSA identified themselves as White and 9% identified themselves as non-White. The DSA showed a slightly higher percentage of Whites and a notably lower percentage of non-Whites than Forsyth County, where 66% of the residents identified themselves as White and 25% of the residents identified themselves as non-White.

Ethnic Makeup

According to the 2000 Census, 15% of the residents in the DSA identified themselves as Hispanic or Latino. This was higher than the 6% for Forsyth County. Within the DSA, Census Tract 32.02– Block Group 2 had a higher concentration of Hispanic or Latino individuals (24%) than Block Group 1 (5%). Within Block Group 2, most residents of Hispanic or Latino ethnicity are reported to live in a neighborhood just north of Graves Street, outside of the Direct Community Impact Area (DCIA). According to town planners, the Hispanic and Latino population is attracted to this area due to affordable housing, such as lower-rent apartment complexes, as well as Kernersville’s central location in the Triad region providing job opportunities in the area.

For public outreach purposes, it is important to identify populations with limited English proficiency (LEP). There are several methods for identifying populations, one of which is to consider the number of linguistically isolated households, which refers to all household members over the age of 14 that have at least some difficulty with English. Within the DSA, approximately 145 out of 2,140 households (7%) are considered linguistically isolated. Of these 145 linguistically isolated households, 106 (5%) are Spanish language speakers. Another method of identification is to consider the percent of adults who speak English less than very well. According to the 2000 US Census, 472 out of 4,473 adults (11%) speak English less than very well, with 388 of those adults (9%) being Spanish language speakers.

The Department of Justice’s Safe Harbor threshold is 5% or 1,000 persons, which requires written translations of vital documents to these groups (Spanish), in addition to other measures assuring meaningful access. These measures include focus group, translators at public meetings, and outreach to Hispanic community organizations as deemed necessary in the public involvement plan. Because 9% of the DSA is comprised of Spanish speakers and 7% are linguistically isolated, translation of vital documents for the Spanish-speaking population is required.

2.6.4.2 Economic and Infrastructure Data

According to the 2000 Census, the median household income for the DSA was approximately \$36,111, with approximately 12% of the population living below the poverty level. This median household income was lower than for Forsyth County (\$42,097). This could be due to the location of the project on the eastern fringe of the town, in an area dominated by mixed business/industrial use. Residential areas here currently tend to be lower-income, as the neighboring uses reduce housing value.

The unemployment rate of Forsyth County was 3% in 2000, which has jumped to 6% as of October 2008. This compares to the state unemployment rate of 4% in 2000 and 7% in October 2008. According to town planners, the Triad region historically has had a higher unemployment rate than the state of North Carolina due to the decline in the furniture, tobacco, and textile industries. This trend appears to have become reversed in the last decade.

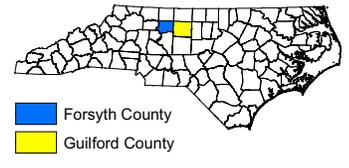
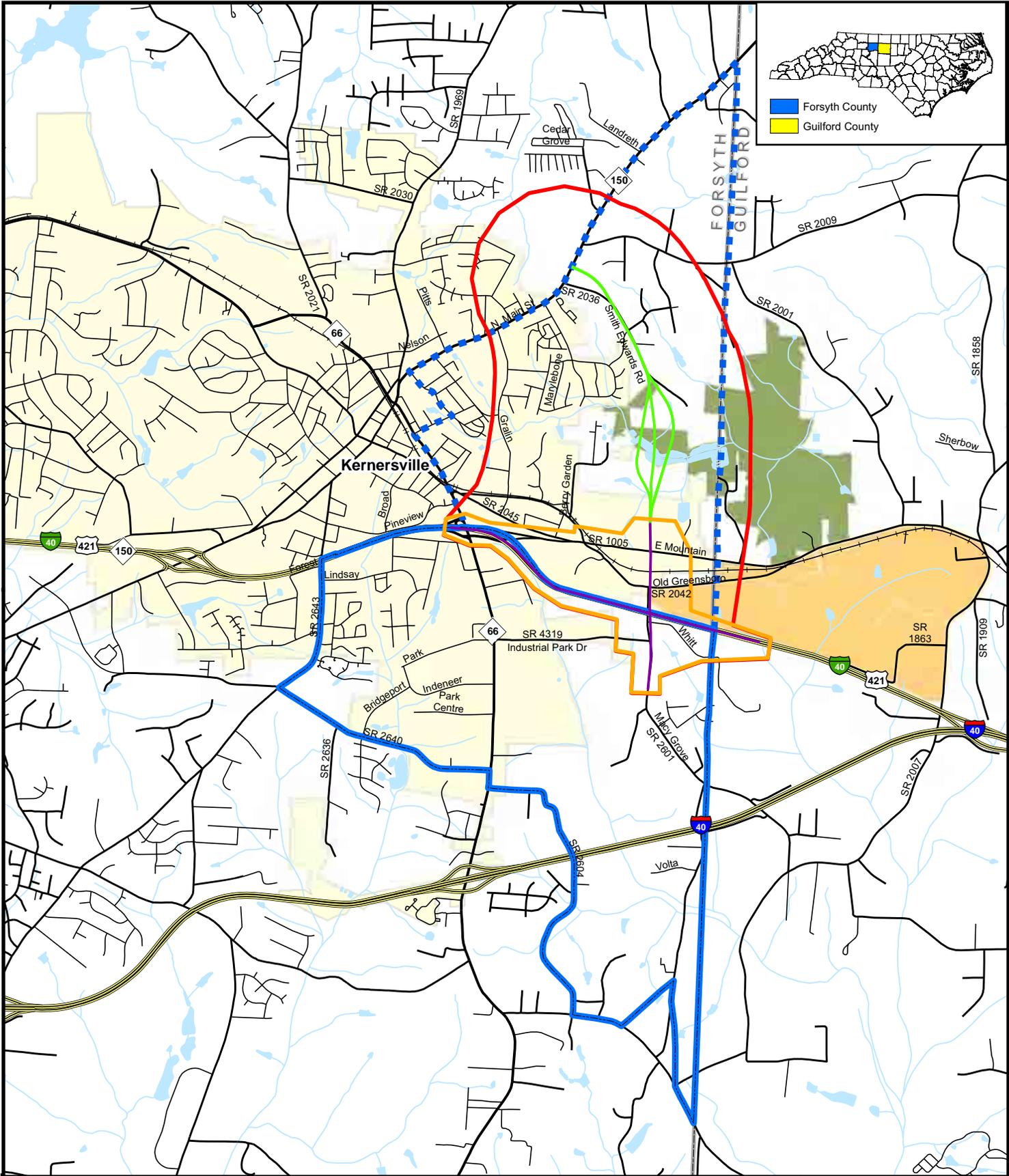
The Employment Security Commission identified the largest employers in Forsyth County in 2006 as the Winston-Salem Forsyth County School System, North Carolina Baptists Hospitals, Forsyth Memorial Hospital, Inc., Hanes Brands, Inc., and R.J. Reynolds Tobacco Company. The Kernersville Chamber of Commerce identified the largest employers in Kernersville in 2005 as Roadway Express, Wal-Mart, Deere-Hitachi, VP Buildings, Inc., and ABF Trucking. In October 2008, VP Buildings, Inc., announced that they would be closing due to economic conditions. Another major employer, Carauster, Inc., specializes in manufacturing paper tubes and is located in the project's DCIA on Industrial Park Drive (Figure 11).

In 2008, FedEx began construction of a new ground facility just east of the DCIA, which is expected to open in 2011 and include more than 1,200 full- and part-time employees. The 400,000 square-foot hub will be built at Old Greensboro Road and West Market Street in Guilford County, within the Kernersville town limits. FedEx will be part of the new Triad Business Park and is expected to attract other major industrial employers within the next few years.

Construction has begun for Kernersville Medical Park, located off Macy Grove Road at the southern end of the DCIA. The medical park will include a 50-bed hospital and is expected to employ approximately 300 people.

Other potential nonresidential, industrial, and commercial/retail development areas discussed in Section 5.2 may also contribute substantially to both the local and regional economy.

The *Kernersville Development Plan* (2005) outlines the town's plans for sustaining and enhancing a strong industrial and office base, which includes planning interchanges on I-40 and I-40 Business such as that proposed by this project. The plan also highlights the town's opportunity to stimulate and further the diversity of its economy due to close proximity to the Piedmont Triad International Airport, the existing trucking industry, availability of industrial buildings and land, and accessibility to interstates and rail.



North Carolina
Department of Transportation



Date: May 2010

Legend

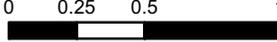
- U-2800 Alignment
- U-4734 Alignment
- U-2800 Study Area
- U-4734 Study Area
- Municipal Boundary
- Triad Park
- Triad Business Park

Demographic Study Area

- Block Group 1*
- Block Group 2*



0 0.25 0.5 1 Miles



Macy Grove Road Improvements
Forsyth County, NC

STIP U-2800 & U-4734

Figure 10

Demographic Study Area

3.0 ALTERNATIVES

A full range of preliminary study alternatives were evaluated for the proposed action. Several preliminary alternatives were eliminated from further consideration because they did not meet the purpose and need for the project. Three build alternatives were further developed into detailed study alternatives for evaluation. The following sections in this chapter discuss the preliminary study alternatives and the detailed study alternatives that were considered.

3.1 PRELIMINARY STUDY ALTERNATIVES

Preliminary study alternatives evaluated for the proposed action included Alternative Modes of Transportation, Transportation System Management (TSM), Improve Existing Facility, New Location Alternatives, and the No-Build Alternative. Descriptions of the preliminary study alternatives are presented in this section.

3.1.1 ALTERNATIVE MODES OF TRANSPORTATION

The Alternative Modes of Transportation option includes measures such as walking, bicycling, carpooling, telecommuting, and the use of public transit to lessen the public's dependence on the automobile. Travel Demand Management (TDM) improvements and Mass Transit provide options for other modes of transportation that reduce the number of trips made by single-occupancy vehicles and, in turn, reduce traffic congestion.

3.1.1.1 Travel Demand Management (TDM)

TDM improvements include measures and activities that change traveler behavior. Typically, they do not involve major capital improvements. The TDM Alternative includes demand management strategies such as staggered work hours, flex-time, and ridesharing. Ridesharing, such as carpools and vanpools, is generally viewed as more convenient than bus transit with regard to access, door-to-door travel times, and comfort; however, the ability of these voluntary programs to reduce traffic volumes on particular roadways is minimal.

TDM measures provide increased transportation choices in the area, but only for a small percentage of travelers who would take advantage of them. TDM measures do not provide a link between I-40 Business and NC 150 north of Kernersville. In addition, TDM measures are not likely to reduce congestion at the at-grade railroad crossing and at intersections in downtown Kernersville, and will not improve over-capacity issues at the existing NC 66/NC 150 interchange with I-40 Business. The TDM Alternative is not consistent with the *Town of Kernersville Loop Road System*. For these reasons, the TDM Alternative was eliminated from further consideration.

3.1.1.2 Mass Transit/Multi-Modal

The Mass Transit/Multi-Modal Alternative concept includes bus or rail passenger service. Mass transit can provide high-capacity energy-efficient movement in densely traveled corridors. It also serves high density areas by offering an option for automobile owners who do not wish to drive, as well as service to those without access to an automobile.

The Town of Kernersville is served by the PART, which provides regional bus service in the Triad interconnecting the city bus systems of Greensboro, High Point, and Winston-Salem. One fixed bus route, the Winston-Salem Express, begins in downtown Winston-Salem and makes

one stop in Kernersville at South Main Street, approximately 3 miles west of the Macy Grove Road and Old Greensboro Road intersection.

PART is planning a six-county regional transportation system that includes commuter and inter-city rail, as well as BRT routes. The six counties served by PART include Alamance, Rockingham, Guilford, Randolph, Davidson, and Forsyth. The US-70/I-40 Business Corridor has been identified as a future transit corridor between Greensboro, Kernersville, and Winston-Salem. The proposed Kernersville Loop Road system will intersect with the future transit corridor.

Regional Mass Transit/Multi-Modal, as planned by PART, may provide increased regional mobility and capacity by providing an alternative mode choice for commuters and other county-to-county and intra-county travelers; however, the Mass Transit/Multi-Modal Alternative for this project does not provide a link between I-40 Business and NC 150 north of Kernersville. In addition, this alternative does not divert enough vehicular traffic to reduce congestion at the at-grade railroad crossing and at intersections in downtown Kernersville, and will not improve over-capacity issues at the existing NC 66/NC 150 interchange with I-40 Business. The Mass Transit/Multi-Modal Alternative is not consistent with the *Town of Kernersville Loop Road System*. For these reasons, the Mass Transit/Multi-Modal Alternative was eliminated from further consideration.

3.1.2 TRANSPORTATION SYSTEMS MANAGEMENT (TSM)

TSM measures typically consist of low-cost minor transportation improvements to an existing facility in place of large-scale modifications. TSM is designed to maximize the use and energy efficiency of a facility and to enhance operations while minimizing capital outlay. There are two main types of TSM improvements: operational and physical. Operational changes are largely administrative in nature and include traffic law enforcement, flexible work hours to stagger traffic, turn prohibitions, speed restrictions, and signal phasing or timing changes. Physical changes are usually more capital intensive and include turn lanes, striping, warning devices, improved warning and information signs, and High Occupancy Vehicle lanes.

TSM improvements are low-cost measures that are effective in solving localized or site-specific capacity, safety, and operational problems in urban areas. Although it is likely that signal coordination and intersection improvements along portions of Bodenhamer Street could modestly reduce congestion, this alternative does not provide a link between I-40 Business and NC 150 north of Kernersville. Also, TSM improvements do not improve over-capacity issues at the existing NC 66/NC 150 interchange with I-40 Business, and they are not consistent with the *Town of Kernersville Loop Road System*. Therefore, the TSM Alternative was eliminated from further consideration.

3.1.3 IMPROVE EXISTING FACILITY

The Upgrade Existing Build Alternative consists of improving existing intersections and roadways in downtown Kernersville, such as Mountain Street, Bodenhamer Street, Piney Grove Road, and Main Street, amongst other converging or intersecting roadways.

To reduce congestion at intersections and at-grade railroad crossings, additional capacity is required along the above-mentioned roadways. Currently, these roadways have no control of access and provide unlimited access to and from adjacent residential, commercial, and industrial properties. Widening of the existing roadways will directly or indirectly affect many of these establishments, which are located very close to the existing roadways. Additionally,

widening of the existing roadways may have an adverse affect on historic resources located within downtown Kernersville, such as the South Main Street Historic District and the North Cherry Street Historic District. The Upgrade Existing Build Alternative has the potential to reduce congestion, which exists at an at-grade railroad crossing and at intersections in downtown Kernersville, and could potentially improve over-capacity issues at the existing NC 66/NC 150 interchange with I-40 Business; however, it does not provide a link between I-40 Business and NC 150 north of Kernersville. The Upgrade Existing Build Alternative is not consistent with the *Town of Kernersville Loop Road System*. For these reasons, the Upgrade Existing Build Alternative was eliminated from further consideration.

3.1.4 NEW LOCATION ALTERNATIVES

New Location Build Alternatives involve construction of a new roadway on new location from I-40 Business to NC 150, east of the Town of Kernersville. The facility type for this alternative is a collector with partial control of access, consistent with the 2035 LRTP.

The New Location Build Alternatives meet the purpose and need for this project because they provide a link between I-40 Business and NC 150 north of Kernersville. In addition, New Location Build Alternatives have the potential to reduce congestion that exists at an at-grade railroad crossing and at intersections in downtown Kernersville, and improve over-capacity issues at the existing NC 66/NC 150 interchange with I-40 Business by providing motorists an alternative to traveling through downtown Kernersville. New Location Build Alternatives are consistent with the *Town of Kernersville Loop Road System*. Therefore, New Location Build Alternatives were carried forward for further consideration.

3.1.5 NO-BUILD ALTERNATIVE

The No-Build Alternative provides no transportation improvements in the project area beyond other transportation improvements proposed in the current STIP. Major STIP projects in and around the vicinity of the proposed project are listed in Table 2 and shown in Figure 6.

The No-Build Alternative will not meet the project's purpose and need because it does not provide a link between I-40 Business and NC 150 north of Kernersville. In addition, the No-Build Alternative will not reduce congestion in downtown Kernersville and at the existing NC 66/NC 150 interchange with I-40 Business. The No-Build Alternative is not consistent with the *Town of Kernersville Loop Road System*, which is included in the *Kernersville Thoroughfare and Street Plan* (Town of Kernersville, July 2005) and the 2035 LRTP; however, in accordance with FHWA guidelines, the No-Build Alternative was given full consideration in order to provide a baseline for comparison with any other alternatives.

3.2 DETAILED STUDY ALTERNATIVES

New Location Build Alternatives were developed using information presented in the project's Preliminary Alternatives Screening Report. The following sections discuss efforts associated with the development of new location alternatives.

3.2.1 PROJECT LOGICAL TERMINI/INDEPENDENT UTILITY

FHWA regulations outline three general principles at 23 CFR 771.111(f) that must be used to frame a highway project:

In order to ensure meaningful evaluation of alternatives and to avoid commitments to transportation improvements before they are fully evaluated, the action evaluated in

each Environmental Impact Statement (EIS) or finding of no significant impact (FONSI) shall: (1) Connect logical termini and be of sufficient length to address environmental matters on a broad scope; (2) Have independent utility or independent significance, i.e., be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made; and (3) Not restrict consideration of alternatives for other reasonably foreseeable transportation improvements.

Interchange spacing has a pronounced effect on freeway operations. In areas of concentrated urban development, proper spacing is usually difficult to attain because of traffic demand for frequent access. Minimum spacing of arterial interchanges (distance between intersecting streets and ramps) is determined by weaving volumes, ability to sign, signal progression, and lengths of speed-change lanes. A general rule of thumb for minimum interchange spacing is 1 mile in urban areas and 2 miles in rural areas. In urban areas, spacing of less than 1 mile may be developed by grade-separated ramps or by adding collector-distributor roads (AASHTO, 2004).

The proposed southern terminus for the project includes a service interchange at I-40 Business, which is consistent with local and regional transportation plans. In order to thoroughly consider other potential interchange locations, existing I-40 Business was reviewed. Currently, Macy Grove Road is the only grade separation over I-40 Business, between the NC 66/I-40 Business interchange and the I-40/I-40 Business interchange. The Macy Grove Road grade separation is approximately 1.1 miles east of the existing NC 66/I-40 Business service interchange and approximately 1.8 miles west of the existing I-40/I-40 Business system interchange. Because the distance to the NC 66 interchange is slightly over a mile and the I-40 interchange is a system interchange, it is recommended the proposed interchange be located within the vicinity of the existing Macy Grove Road grade separation.

The proposed northern terminus for the project will create a three-approach intersection somewhere along NC 150 (Main Street) north of Kernersville. The location identified in previous studies resulted with the proposed intersection being located between the existing Smith Edwards Road intersection with NC 150 (Main Street) and the existing SR 2037 (County Line Road) intersection with NC 150 (Main Street). Shifting the proposed intersection location south will result in potential effects to the Hayworth-Miller-Cain Funeral Home and could create an increase in residential impacts associated with the future section of the Kernersville Loop Road System. Shifting the proposed intersection location north will lengthen the project, result in a reconnection of County Line Road, and create difficulties with the future section of the Kernersville Loop Road System. Therefore, it is recommended the approximate location identified in previous studies be utilized.

The proposed Macy Grove Road Improvements project termini, as recommended above, will be located at logical endpoints and will have a specific purpose. The proposed Macy Grove Road Improvements will not force immediate transportation improvements beyond the termini or along the connecting facilities. Thus, the proposed project has independent utility and its construction will be a useful and reasonable expenditure of funds, even if no additional transportation improvements in the area are made. The proposed project is of sufficient length to allow for evaluation of alternatives and environmental issues on a broad basis and will neither restrict consideration of alternatives nor prohibit implementation of other reasonably foreseeable transportation improvement projects.

3.2.2 U-2800

As discussed in the previous section, the recommended proposed U-2800 interchange location should be within the vicinity of the existing Macy Grove Road grade separation. Proposed interchange configurations considered for the I-40 Business interchange with Macy Grove Road include a Single Point Urban Interchange, a Partial Cloverleaf Interchange, and a Compressed Diamond Interchange. As a result of qualitative and quantitative analyses, including an assessment of traffic demands, adjacent intersection spacing, pedestrian accommodations, construction cost, and impacts to adjacent residents and businesses, the Compressed Diamond Interchange is the recommended interchange configuration. Because the proposed U-2800 interchange location will be in the vicinity of existing Macy Grove Road, the extension of Macy Grove Road will continue north to minimize impacts to adjacent business, thus creating a new grade separation over NS Railroad. As a result of the new grade separation over the NS Railroad, an at-grade intersection with East Mountain Street will not be possible; therefore, quadrant ramps will be utilized to provide access to and from East Mountain Street. Additional information regarding the proposed Macy Grove Road connection to East Mountain Street is discussed in Section 4.6. Limits for U-2800 will end north of the quadrant ramp connection, where all U-4734 New Location Build Alternatives begin.

3.2.3 U-4734

Based on the above recommendations, all U-4734 New Location Build Alternatives begin at the U-2800 match point, vary in location near the Reedy Fork crossing, and ultimately converge, improving Smith Edwards Road before terminating at NC 150. In June 2008, land suitability mapping, which focused on identifying constraints within the project study area, was prepared to assist with development of new location alternatives. These constraints included land use, communities and community facilities, businesses, natural resources, and cultural resources. New Location Build Alternatives were developed by identifying areas least constrained through which the proposed roadway corridor could be developed. For example, undeveloped areas, non-wetland areas, or areas where wetland systems narrowed offer opportunities to locate a proposed roadway corridor while minimizing adverse effects. The development process resulted in the identification of seven New Location Build Alternatives, which are shown in Figure 12.

The New Location Build Alternatives were then qualitatively screened for potential impacts to the human and natural environment and design and construction feasibility. Two of the alternatives were eliminated based on impacts to wetlands, streams, floodplains, and/or residential areas. Based on these impacts, the following alternatives were eliminated from further study:

- Alternative 6 – eliminated due to wetland, stream, floodplain, and residential impacts.
- Alternative 7 – eliminated due to wetland, floodplain, and residential impacts.

Given their close proximity, Alternative 1 and Alternative 3 were combined and are now referred to as Alternative 1. Similarly, Alternative 4 and Alternative 5 were combined and are now referred to as Alternative 5.

Functional Designs and an assessment of impacts were prepared for New Location Alternatives 1, 2, and 5 as alternatives to carry forward (Figure 13). Three structure types for the proposed Reedy Fork crossing were also evaluated. The structure types included (1) box culvert option, (2) span the natural system and floodplain with a minimum hydraulically required bridge, and (3) span the natural system and floodplain completely. A field meeting held with resource agency representatives on September 16, 2009, resulted in the recommendation to bridge the Reedy

Fork crossing with a minimum hydraulically required bridge. Preliminary Designs were then prepared for Alternatives 1, 2, and 5 to refine the designs in an effort to avoid/minimize impacts and to determine effects to the human and natural environment.

3.3 TRAFFIC CAPACITY ANALYSIS SUMMARY OF BUILD ALTERNATIVES

The following sections are summarized from the *Macy Grove Road Extensions Project Traffic Capacity Analysis Memorandum* and present the traffic volumes and operational analyses, including the evaluation of LOS for the 2030 Build Conditions and the 2035 Build Conditions. Because the proposed extension of Macy Grove Road is less than 2 miles long, all new location alternatives will have the same beginning and end point, and all alternatives will provide the same access points. Traffic forecast data is considered to be the same for all new location alternatives. Figures depicting the Annual Average Daily Traffic (AADT) that were used in the operational analyses for the LOS evaluations are located in Appendix B.

3.3.1 2030 BUILD CONDITIONS

The traffic forecast used for the traffic operations analyses was obtained from the Traffic Forecasts for NCDOT STIP Project No. U-4734 and NCDOT STIP Project No. U-2800, Macy Grove Road Extension and Widening, Forsyth County, North Carolina – June 2009 (Traffic Forecast Technical Memorandum). The traffic forecast provided AADT volumes for the transportation network within the study area for the 2030 Build Conditions and assumed that all improvements contained in the City of Winston-Salem MPO's and the Greensboro Urban Area MPO's fiscally constrained Long-Range Transportation Plan were constructed, including the proposed project but not the I-74/Airport Connector. Projected 2030 Build traffic volumes on Macy Grove Road within the study area range from 11,800 AADT to 34,400 AADT.

For the 2030 Build Conditions, the analysis consisted of the existing and proposed roadway network within the project study area. The project study area analysis shows that 22 of 55 analysis points will be operating at LOS E or worse in either the AM or PM peak hour (Figure 14). During future stages of the project, the Regional Traffic Engineer will ultimately determine whether any intersections warrant traffic signals.

It should be noted that the year 2030 is considered the build year for the Macy Grove Road extension project, which serves additional traffic until the I-74 Airport Connector Road project is constructed.

3.3.2 2035 BUILD CONDITIONS

The traffic forecast provided AADT volumes for the transportation network within the study area for the 2035 Build Conditions and assumed that all improvements contained in the City of Winston-Salem MPO's and the Greensboro Urban Area MPO's fiscally constrained Long-Range Transportation Plan were constructed, including the I-74/Airport Connector Road and the proposed project. Projected 2035 Build traffic volumes on Macy Grove Road within the study area range from 5,200 AADT to 20,800 AADT.

For the 2035 Build Conditions, the analysis consisted of the existing and proposed roadway network within the project study area. The project study area analysis shows that 11 of 55 analysis points will be operating at LOS D or worse in either the AM or PM peak hour (Figure 15). During future stages of the project, the Regional Traffic Engineer will ultimately determine whether any intersections warrant traffic signals.

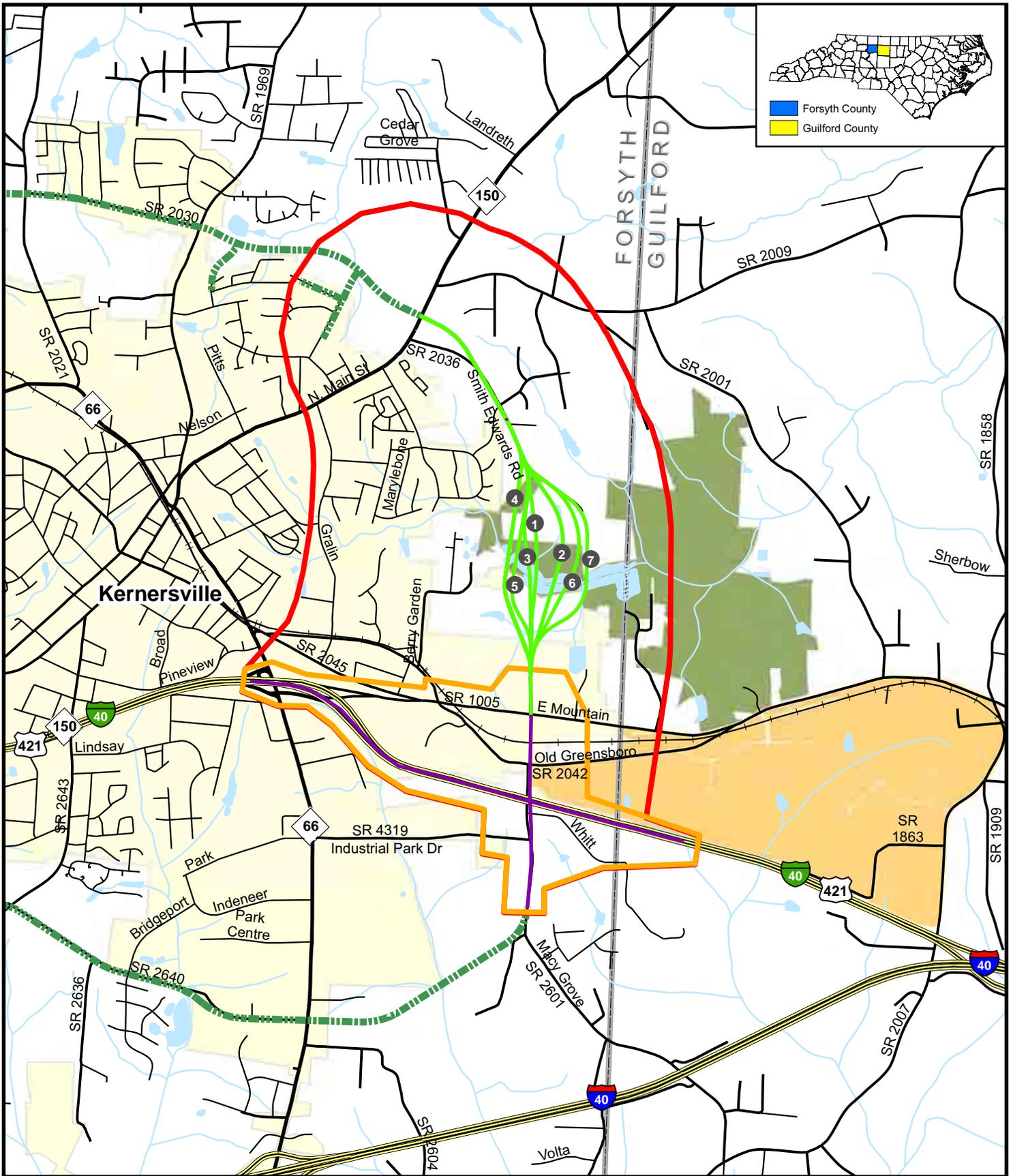
3.4 COST ESTIMATES

For initial funding purposes, the 2009-2015 STIP has programmed \$36,101,000 for U-2800 which consists of \$3,000,000 for right of way acquisition and \$36,101,000 for construction. The 2009-2015 STIP also has programmed \$17,800,000 for U-4734 which consists of \$1,000,000 for right of way acquisitions and \$16,800,000 for construction.

Updated cost estimates based upon preliminary designs for U-2800 and U-4734 build alternatives are included in Table 3. The cost estimates are preliminary; more detailed cost information will be provided during the final design of the preferred alternative.

Table 3: Build Alternative Cost Estimates

Description	U-4734			U-2800
	Alternative 1	Alternative 2	Alternative 5	
Estimated Utility Cost	\$233,552	\$153,600	\$153,600	\$614,346
Estimated Right-of-way Cost	\$4,372,000	\$3,996,000	\$4,050,500	\$8,552,300
Estimated Construction Cost	\$10,800,000	\$11,400,000	\$11,900,000	\$32,700,000
Total Cost	\$15,405,552	\$15,549,600	\$16,104,100	\$41,866,646



North Carolina
Department of Transportation

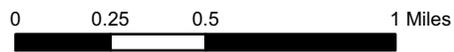


Date: May 2010

Legend

- U-2800 Alignment
- U-4734 Alignment
- U-2800 Study Area
- U-4734 Study Area
- Future Kernersville Loop Road
- New Location Build Alternatives

- Municipal Boundary
- Triad Park
- Triad Business Park

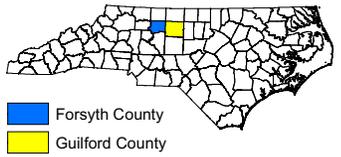
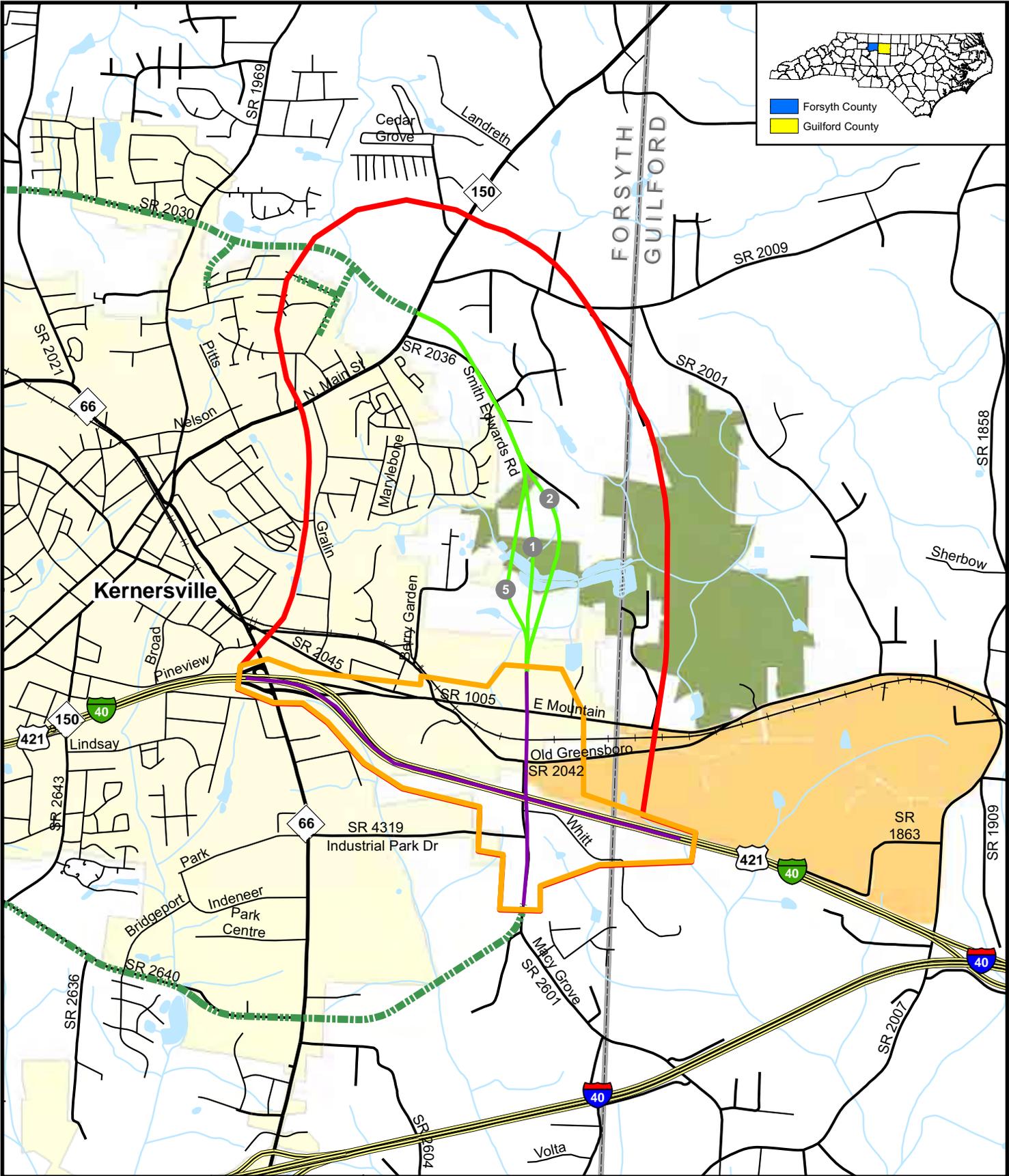


Macy Grove Road Improvements
Forsyth County, NC

STIP U-2800 & U-4734

Figure 12

**New Location
Build Alternatives**



Forsyth County
 Guilford County

North Carolina
 Department of Transportation

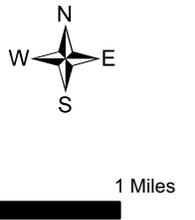


Date: May 2010

Legend

- U-2800 Alignment
- U-4734 Alignment (Alternatives to Carry Forward)
- U-2800 Study Area
- U-4734 Study Area
- - - Future Kernersville Loop Road
- # Build Alternatives to Carry Forward
- Municipal Boundary
- Triad Park
- Triad Business Park

0 0.25 0.5 1 Miles

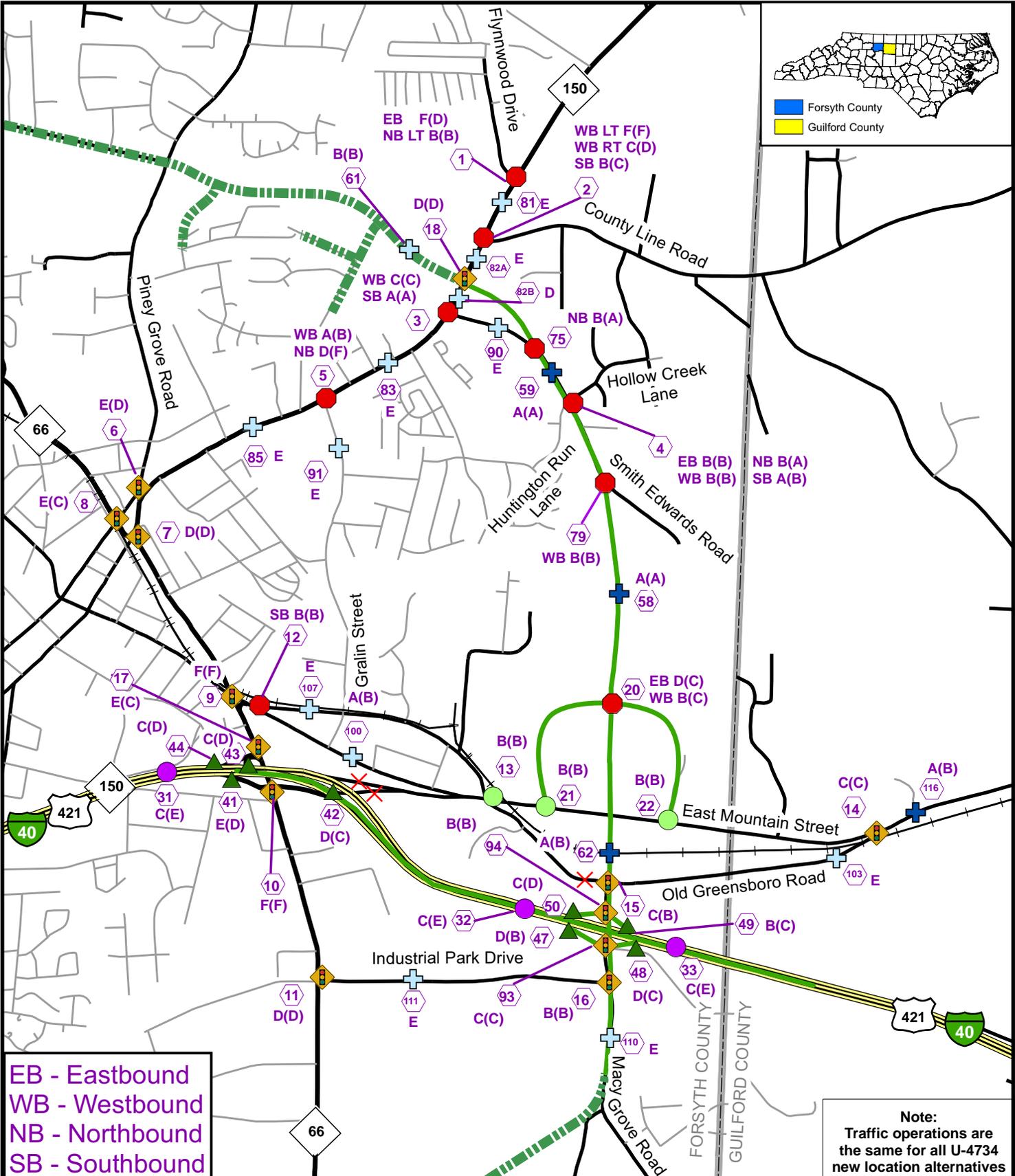
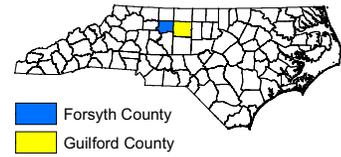


Macy Grove Road Improvements
 Forsyth County, NC

STIP U-2800 & U-4734

Figure 13

Alternatives to Carry Forward



EB - Eastbound
 WB - Westbound
 NB - Northbound
 SB - Southbound

Note:
 Traffic operations are the same for all U-4734 new location alternatives

North Carolina
 Department of Transportation

Date: May 2010

Legend

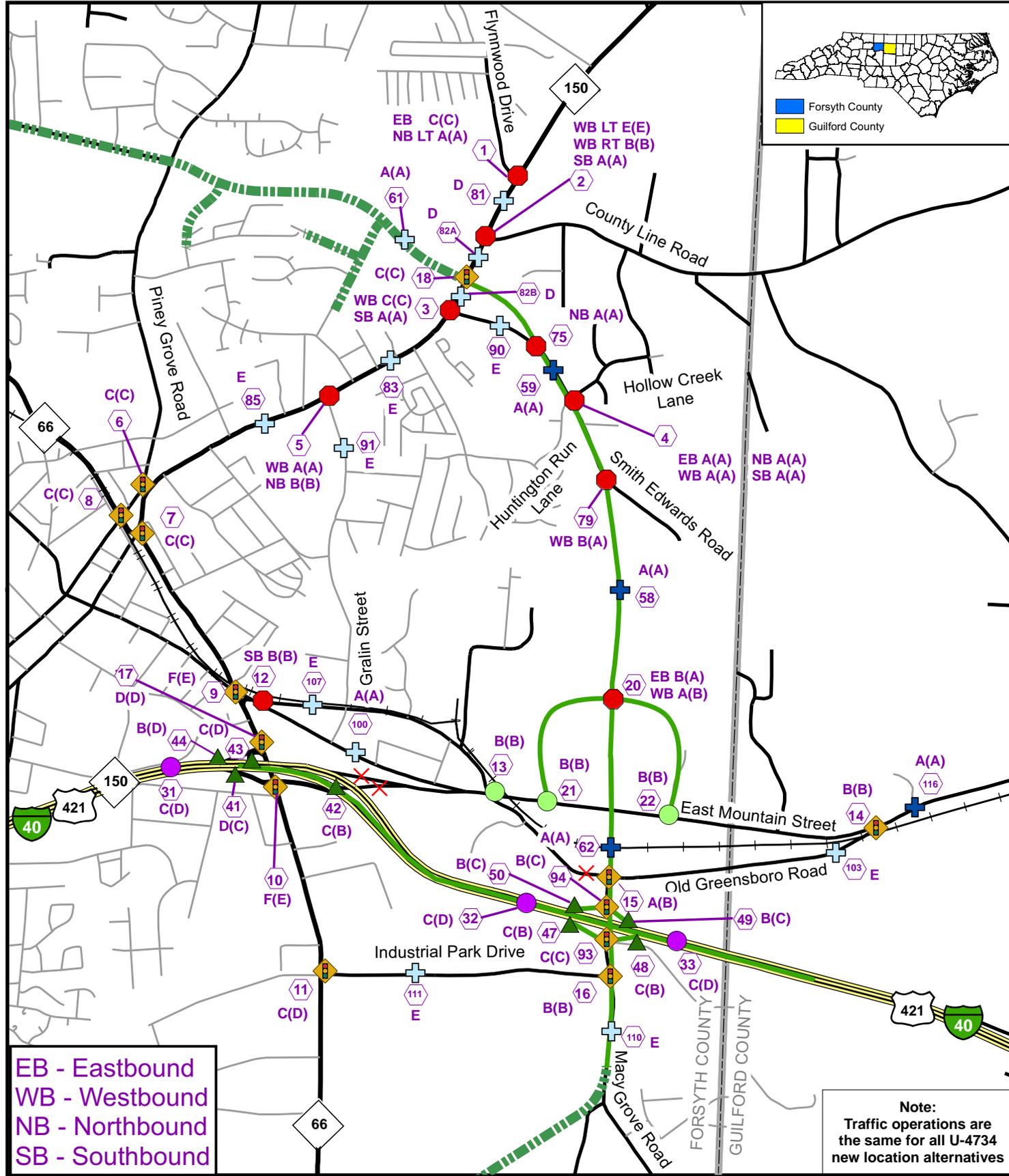
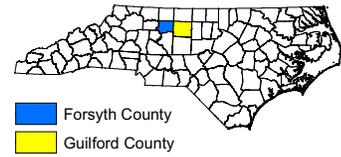
- Interstate
- US Route
- NC Route
- Local Roads
- Railroad
- County Boundary
- Future Kernersville Loop Road
- U-4734/U-2800
- Access Removed Under Build Scenario
- Segment/Intersection Number
- A (A) Level of Service (AM/PM)
- Multi-Lane Roadway Segment
- Two-Lane Roadway Segment
- Unsignalized Intersection
- Signalized Intersection
- Freeway Segment
- Roundabout
- Freeway Ramp Merge/Diverge
- Freeway Weaving Segment

0 1,000 2,000 Feet

Macy Grove Road Improvements
 Forsyth County, NC
 STIP U-2800 & U-4734

Figure 14

2030 Build Scenario
 Level of Service



EB - Eastbound
 WB - Westbound
 NB - Northbound
 SB - Southbound

Note:
 Traffic operations are the same for all U-4734 new location alternatives

North Carolina
 Department of Transportation

Date: May 2010

Legend

- Interstate
- US Route
- NC Route
- Local Roads
- Railroad
- County Boundary
- Future Kernersville Loop Road
- U-4734/U-2800
- Access Removed Under Build Scenario
- Segment/Intersection Number
- A(A) Level of Service (AM/PM)
- Multi-Lane Roadway Segment
- Two-Lane Roadway Segment
- Unsignalized Intersection
- Signalized Intersection
- Freeway Segment
- Roundabout
- Freeway Ramp Merge/Diverge
- Freeway Weaving Segment

Macy Grove Road Improvements
 Forsyth County, NC
 STIP U-2800 & U-4734

Figure 15
 2035 Build Scenario
 Level of Service

4.0 PROPOSED IMPROVEMENTS

4.1 ROADWAY CROSS-SECTION AND ALIGNMENT

The proposed typical section for Macy Grove Road consists of a four-lane, raised median divided roadway with curb and gutter (Figure 16). The standard median width is 23 feet and includes curb and gutter on each side. The median is narrowed in sections to facilitate turn lanes.

Lane widths for the proposed cross section consist of one inner 12-foot wide travel lane and one 14-foot wide outside travel lane. The additional width of the outside lane accommodates bicycle traffic. A 10-foot wide berm is incorporated into the typical section to accommodate future sidewalks on both sides of proposed Macy Grove Road.

4.2 RIGHT-OF-WAY AND ACCESS CONTROL

The minimum proposed right-of-way width along Macy Grove Road is 110 feet. Variations in the right-of-way width may occur to accommodate intersection improvements or areas where major changes in terrain occur. Additional easements may also be acquired as needed for drainage and utility easements.

South of Industrial Park Drive, partial control of access will be provided along Macy Grove Road, which will provide one access point per parcel. There will be limited control of access along the proposed Macy Grove Road extension north of Industrial Park Drive to north of East Mountain Street, limiting access to Macy Grove Road via interchanges and at-grade intersections, with no private driveways. Partial control of access will be provided along Macy Grove Road north of East Mountain Street, allowing one access point per parcel.

Private driveway connections are normally defined as a maximum of one connection per parcel, where a connection is defined as one ingress and one egress point. The use of shared or consolidated connections is highly encouraged. Connections may be restricted or prohibited if alternate access is available through adjacent public facilities. A control of access fence will be placed along the entire length of the facility, except at intersections and driveways, and at a minimum of 1,000 feet beyond the ramp terminals at interchanges if possible.

4.3 SPEED LIMIT

The proposed posted speed limit along Macy Grove Road is 45 mph.

4.4 DESIGN SPEED

The design speed for Macy Grove Road is 50 mph. Proper horizontal and vertical design criteria will be applied to the project, meeting AASHTO and NCDOT standards.

4.5 ANTICIPATED DESIGN EXCEPTIONS

Design exceptions occur in areas where the minimum design standards are unattainable when preparing the preliminary designs. No design exceptions are anticipated for this project.



**MACY GROVE ROAD
TYPICAL SECTION**



4.6 INTERSECTIONS/INTERCHANGES

As proposed in the preliminary designs for Macy Grove Road, a new interchange at I-40 Business and several new intersections are recommended. During future stages of the project, the Regional Traffic Engineer will ultimately determine whether any intersections warrant traffic signals.

A discussion of the proposed interchange and intersections is included in the following subsections.

4.6.1 U-2800

The preliminary designs for U-2800 include a new service road located south of Industrial Park Drive to replace the current Whitt Road access. Improvements to the existing Industrial Park Drive intersection with Macy Grove Road are included by providing two through lanes in each direction along Macy Grove Road, with exclusive turn lanes for movements to Industrial Park Drive. The preliminary designs for U-2800 also include a new service road to Industrial Park Drive, located west of the existing Macy Grove Road and Industrial Park Drive intersection.

Currently, Macy Grove Road is grade-separated from I-40 Business. As a part of the Macy Grove Road improvements, this grade separation will be replaced with a compressed diamond interchange that provides all movements to and from I-40 Business. According to AASHTO, the minimum recommended spacing between interchanges in urban areas is 1 mile; however, interchange spacing less than 1 mile in urban areas is allowed provided the ramps are grade separated or a collector-distributor road is utilized. East of the proposed Macy Grove Road interchange is the I-40 Business/ I-40 interchange which provides approximately 1.8 miles of interchange spacing. Less than 1 mile west of the proposed Macy Grove Road interchange is the existing I-40 Business partial interchange to East Mountain Street which has less than 0.25 miles of interchange spacing westward to the existing I-40 Business full movement interchange to NC 66. Given the movements provided at the partial interchange to East Mountain Street will be redundant with the movements provided by the proposed Macy Grove Road interchange and the distance between the NC 66 and East Mountain Street does not meet the minimum interchange spacing as recommended by AASHTO, the partial interchange with East Mountain Street will be eliminated. In order to allow for vehicles to easily accelerate or decelerate when either entering or exiting I-40 Business between NC 66 and the proposed Macy Grove Road interchange, auxiliary lanes will be provided along I-40 Business in both directions.

An intersection currently exists with Old Greensboro Road and Macy Grove Road north of the proposed Macy Grove Road interchange with I-40 Business. Improvements to this intersection include closing direct access to Macy Grove Road from Old Greensboro Road from the west, and placing a cul-de-sac immediately west of the existing intersection to accommodate turnaround traffic. On the east side of Macy Grove Road, Old Greensboro Road will be a full movement intersection; however, it will be moved slightly to the north of its existing location to provide more spacing between the proposed I-40 Business/Macy Grove Road interchange and Old Greensboro Road. This relocation of Old Greensboro Road is required to maintain the operations of the proposed Macy Grove Road interchange with I-40 Business. The profile for existing Macy Grove Road and the relocated portion of Old Greensboro Road will be raised to accommodate the proposed Macy Grove Road grade separation with the NS Railroad.

North of the Old Greensboro Road intersection improvements, new access will be provided to East Mountain Street via quadrant service roads in the northwest and northeast quadrants.

Access to these proposed quadrant service roads consists of right-in and right-out movements only, in both the northbound and southbound directions along the proposed Macy Grove Road. The turning movements will be completed where the service roads intersect with East Mountain Street via two roundabouts (Figure 17).

Figure 17: East Mountain Street Service Roads



4.6.2 U-4734

All U-4734 New Location Build Alternatives begin at the U-2800 match point, vary in location near the Reedy Fork crossing, and ultimately converge, improving Smith Edwards Road before terminating at NC 150. Though Alternatives 1, 2, and 5 are in slightly different locations, proposed intersection configurations are the same for all alternatives.

The first U-4734 proposed intersection provides access to Triad Park on both sides of proposed Macy Grove Road, utilizing a left-over configuration (Figure 18). This intersection configuration requires all traffic exiting the park to turn right, with median openings provided several hundred

feet downstream allowing the park traffic to perform a U-turn to complete the left-turn movements.

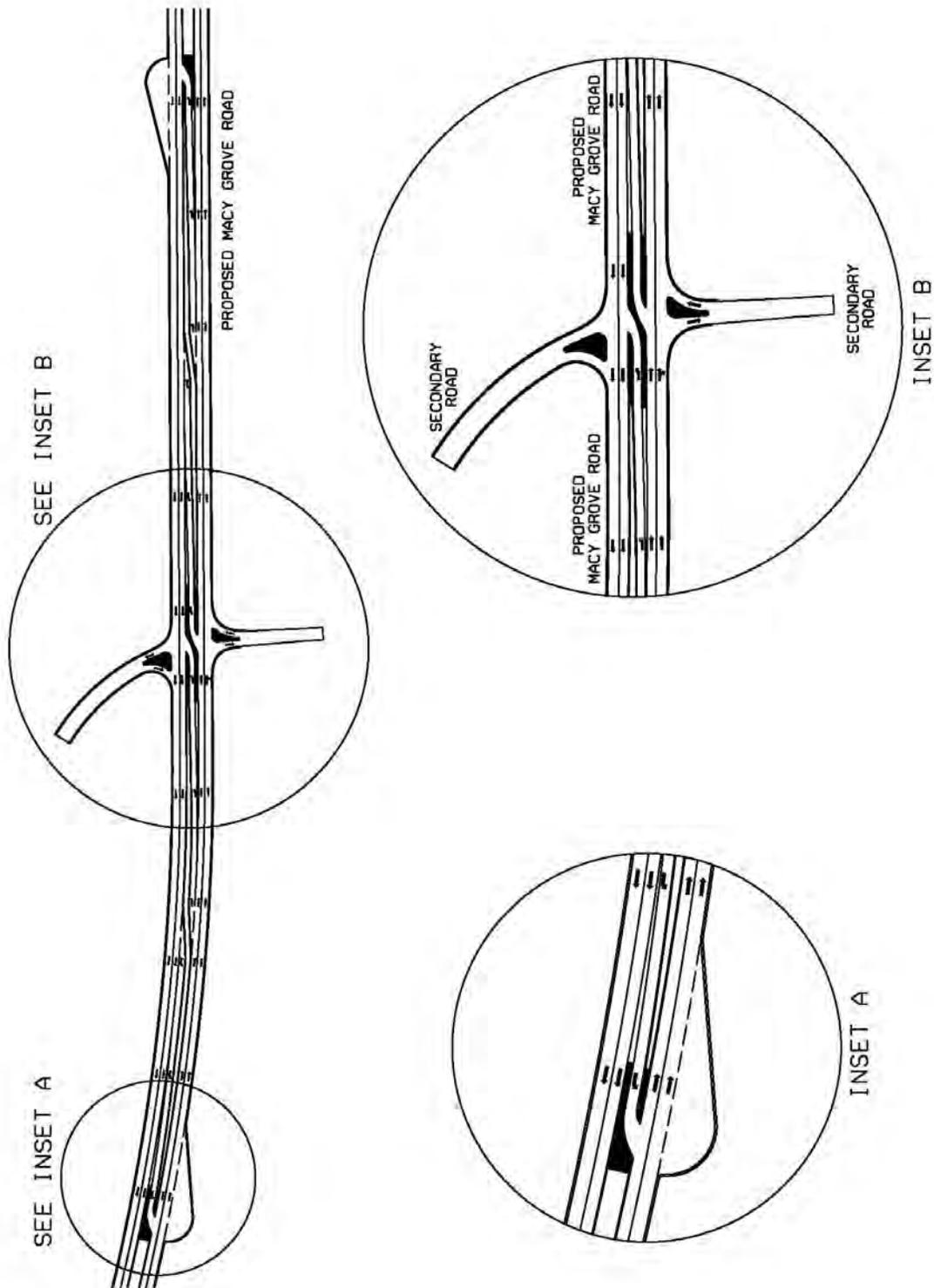
The second U-4734 proposed intersection connects the eastern portion of existing Smith Edwards Road to the proposed Macy Grove Road. The proposed intersection consists of a right-in right-out configuration that only allows traffic to turn right onto Smith Edwards Road and requires all Smith Edwards Road traffic to turn right onto the proposed Macy Grove Road. All left-turn movements prohibited at this intersection will be performed at adjacent median openings or adjacent intersections.

The third U-4734 proposed intersection provides access to Huntington Run Lane and Hollow Creek Lane utilizing a left-over configuration (Figure 18). This intersection configuration requires all traffic exiting Huntington Run Lane and Hollow Creek Lane to turn right, with median openings provided several hundred feet downstream allowing the neighborhood traffic to perform a U-turn to complete the left-turn movements.

The fourth U-4734 proposed intersection creates a three-leg full movement intersection with NC 150 (Main Street), north of the existing NC 150 (Main Street) intersection with Smith Edwards Road. The fourth leg of the intersection will be constructed as a part of the future Kernersville Loop Road.

As previously noted, the Regional Traffic Engineer will ultimately determine whether any intersections warrant traffic signals during future stages of the project.

Figure 18: Left-over Intersection Configuration Concept



4.7 SERVICE ROADS

The preliminary designs for U-2800 include a new service road located south of Industrial Park Drive to replace the current Whitt Road access. The preliminary designs for U-2800 also include a new service road to Industrial Park Drive, located west of the existing Macy Grove Road and Industrial Park Drive intersection.

4.8 RAILROAD CROSSINGS

The proposed extension of Macy Grove Road provides a grade separation over NS Railroad. The proposed grade separation is located in the U-2800 portion of the project approximately 500 feet north of the existing Macy Grove Road/Old Greensboro Road intersection.

4.9 STRUCTURES

Several proposed drainage structures have been identified for inclusion as a part of the subject project and are discussed in the following sections. Proposed structures less than 72 inches have not been identified at this point and will be further evaluated during the final design phases for the proposed project, as will the final determination of the proposed structure sizes and locations of the proposed structures identified below.

4.9.1 U-2800

The proposed extension of Macy Grove Road includes three new bridge structures along Macy Grove Road. The first is a bridge over I-40 Business, the second is a bridge over the NS Railroad, and the third is a bridge over East Mountain Street.

The first bridge replaces existing Bridge Number 370 on Macy Grove Road over I-40 Business. Proposed bridge dimensions are approximately 107 feet wide and 165 feet long.

The second bridge provides a new grade separation over the NS Railroad. Proposed bridge dimensions are approximately 102 feet wide and 174 feet long.

The third bridge provides a new grade separation over the East Mountain Street. Proposed bridge dimensions are approximately 102 feet wide and 185 feet long.

Existing Bridge Number 369, located on westbound I-40 Business/US 421, creates a grade separation over the off-ramp from eastbound I-40 Business/US 421 onto eastbound East Mountain Street. The bridge is considered structurally deficient and functionally obsolete and will be removed as a part of the proposed action.

4.9.2 U-4734

A *Preliminary Hydraulics Study for Environmental Impact* (URS 2009) completed for the project identified two major hydraulic crossings as a part of the proposed action. The first structure is a culvert crossing of a tributary to Reedy Fork, located south of the project crossing of Reedy Fork. The second is a bridge structure crossing, oriented north-south over Reedy Fork.

The first crossing is a 10-foot (width) by 6-foot (height) reinforced concrete box culvert (RCBC) with varying lengths for each alternative: Alternative 1 length is approximately 226 feet, Alternative 2 length is approximately 231 feet, and Alternative 5 length is approximately 207 feet.

The second crossing is a bridge crossing with the same dimensions for each alternative: length of 180 feet and width of 89 feet. As reported in the *Preliminary Hydraulics Study for Environmental Impact*, the length of the proposed bridge and the recommended roadway elevation may be adjusted (increased or decreased) to accommodate design floods as determined in the final hydrologic study and hydraulic design. Through coordination with Triad Park and NCDOT, the crossing of the future greenway will be accommodated under the proposed bridge over Reedy Fork, as shown in the preliminary designs. A concrete pathway will be constructed immediately adjacent to the proposed bridge sloping abutments, above the 10-year storm elevation (approximate elevation 886.5 pending final design verification), with a recommended vertical clearance of 9 feet.

4.10 BICYCLE AND PEDESTRIAN FACILITIES/GREENWAYS

The Piedmont Greenway is a proposed project identified in the *Winston-Salem Forsyth County Greenway Plan (2003)* for Winston-Salem and Forsyth County and the *Parks and Open Space Plan for Winston-Salem and Forsyth County (2006)*. The proposed greenway runs from Salem Lake to Triad Park, connecting downtown Kernersville and surrounding neighborhoods with Triad Park. The extension of Macy Grove Road on new location will run through Triad Park and across the future greenway.

Lane widths for the proposed cross section (as shown in Figure 16) consist of one inner 12-foot wide travel lane and one 14-foot wide outside travel lane to accommodate bicycle traffic. A 10-foot wide berm has been incorporated into the typical section to accommodate future sidewalks on both sides of proposed Macy Grove Road.

Through coordination with Triad Park and NCDOT, the crossing of the future greenway will be accommodated under the proposed bridge over Reedy Fork, as shown in the preliminary designs, which will include construction of a concrete pathway immediately adjacent to the proposed bridge sloping abutments. Triad Park will provide a parking lot and access to the greenway from pedestrian and bicycle facilities on the extended Macy Grove Road.

4.11 UTILITIES

Construction of the proposed project will likely require some degree of adjustment, relocation, or modification to existing public utilities. Any adjustments, relocations, or modifications will require coordination with the affected utility company.

4.12 NOISE BARRIERS

Noise impacts are an unavoidable consequence of roadway projects. Noise receptors, which may include houses, churches, parks, schools, libraries, or hotels, were evaluated to determine if noise barriers were reasonable or feasible. A total of eight receptors in Alternative 1, seven receptors in Alternative 2, and nine receptors in Alternative 5 will be impacted by roadway traffic noise as a result of the project. Based on the evaluation of the impacted receptors, no noise barriers were determined to be reasonable and feasible for the proposed project. Additional information regarding the noise analysis is included in Section 5.11.

4.13 WORK ZONE, TRAFFIC CONTROL, AND CONSTRUCTION PHASING

Construction of the proposed project will mainly occur on new location; however, improvements to existing I-40 Business, Macy Grove Road, Old Greensboro Road, East Mountain Street, Smith Edwards Road, and NC 150 (Main Street) may require temporary closures of some roadways. This section includes a general discussion of potential road closures that may occur

during the construction of the project. Specific work zone, traffic control, and construction phasing plans will be prepared during the final design preparation.

Construction of the proposed improvements along I-40 Business will most likely result in the closure of the eastbound I-40 Business ramp to East Mountain Street in order to construct a new portion of westbound I-40 Business, with traffic remaining on existing westbound I-40 Business until the new section is completed. The remaining improvements to I-40 Business will consist of widening to the outside, which may be accommodated using outside shoulder closures, with temporary use of the inside shoulder as a part of the travel lane during construction. The I-40 Business partial interchange with East Mountain Street will be eliminated as a part of the proposed project; however, these movements are redundant with movements provided at the existing NC 66 interchange with I-40 Business to the west and the proposed interchange at Macy Grove Road and I-40 Business.

Construction of the proposed Macy Grove Road interchange with I-40 Business will most likely close existing Macy Grove Road from Industrial Park Drive to Old Greensboro Road; however, these movements may be made during construction using the NC 66 interchange with I-40 Business to access Industrial Park Drive.

Construction of the new Old Greensboro Road intersection with Macy Grove Road may be performed with traffic utilizing the existing intersection; however, should this not be the case, these movements may be made during construction using East Mountain Street to NC 66 to access Industrial Park Drive.

Construction of the proposed improvements to East Mountain Street and the proposed Macy Grove Road grade separation with East Mountain Street may affect traffic flow. Construction phasing details will be investigated during the final design preparation.

Construction of the proposed Macy Grove Road includes utilizing a portion of existing Smith Edwards Road. Improvements to this portion of Smith Edwards Road include widening the existing two-lane facility to a four-lane median divided facility. For the most part, traffic could be maintained on existing Smith Edwards Road while one side of the proposed facility is constructed. Once complete, traffic could be moved to the new section, allowing the existing facility to be upgraded as proposed.

Construction to connect the proposed Macy Grove Road to NC 150 is expected to have minor effects on traffic flow along NC 150.

5.0 ENVIRONMENTAL EFFECTS OF PROPOSED ACTION

5.1 NATURAL RESOURCES

This section of the EA provides a summary of the potential impacts to the natural environment. Further details and analysis related to the natural environment are provided in the *Natural Resources Technical Report (NRTR)*.

Impacts to the natural environment were analyzed for the study area. Field investigations were conducted in February, March, and May 2009. Walking surveys were undertaken to determine natural resource conditions and to document natural communities (see Figure 19), wildlife, and the presence of protected species or their habitats.

During surveys, wildlife identification involved a variety of observation techniques, including active searching, visual observations (both with and without the use of binoculars), and observing the characteristic signs of wildlife (sounds, scats, tracks, and burrows). Quantitative water sampling was not conducted; rather, existing data were used to perform the analysis.

Jurisdictional wetland delineations were performed using the three-parameter approach prescribed in the *Corps of Engineers Wetlands Delineation Manual* (USACE, 1987). Supplementary technical literature describing the parameters of hydrophytic vegetation, hydric soils, and wetland hydrological indicators was also utilized. Jurisdictional features within the study area are shown in Figure 20.

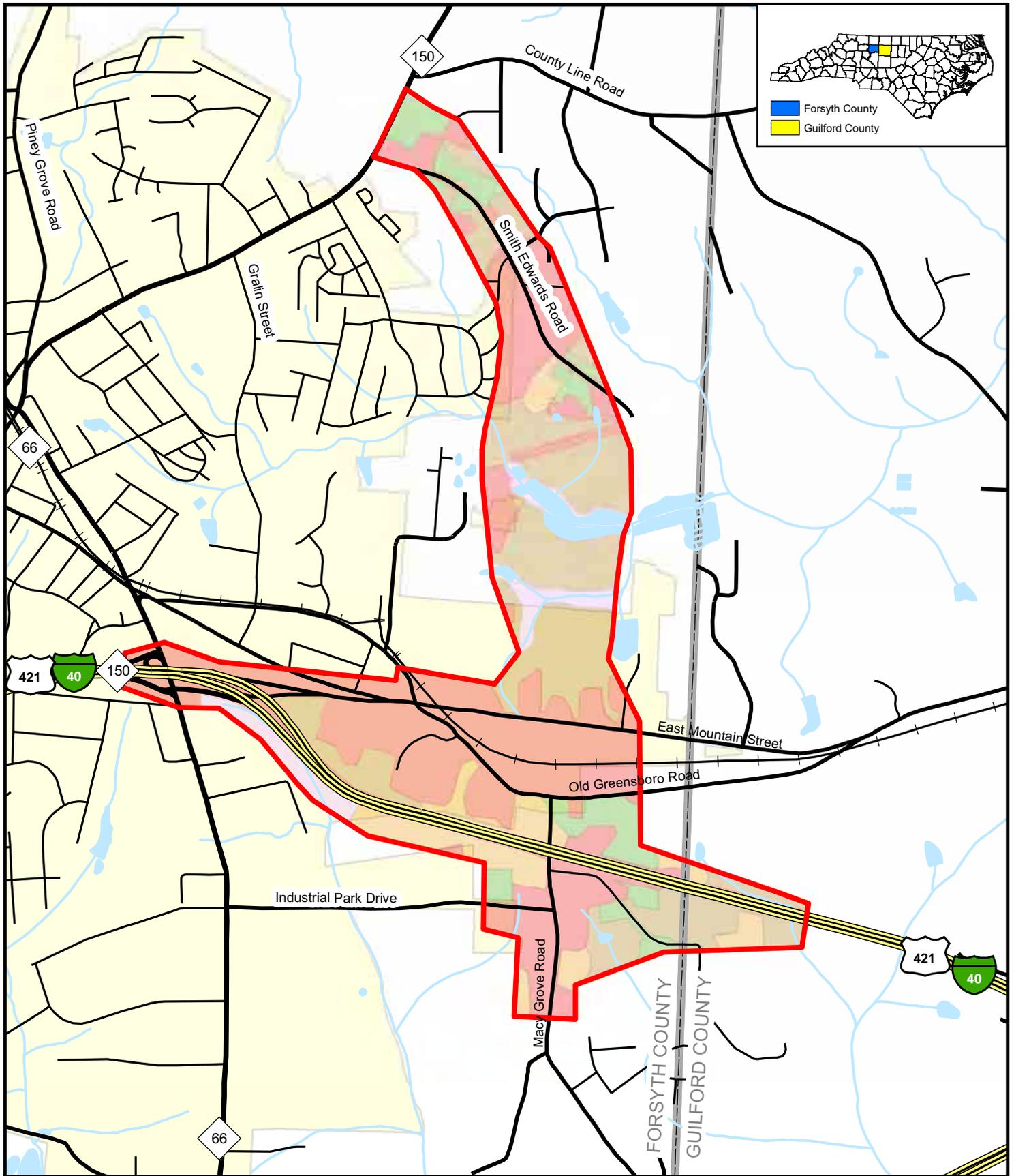
5.1.1 PHYSICAL CHARACTERISTICS

The study area is located between the Northern Inner and Southern Outer Piedmont Ecoregions of North Carolina (Griffith et al., 2002). The topography of the area is characterized by rolling hills punctuated by knobs, ridges, and valleys. Gently rolling topography is found within interstream areas, with steeper slopes found along the edges of some stream floodplains. Elevations range from approximately 869 feet above mean sea level (MSL) to approximately 1,017 feet above MSL (USGS, 1980a and 1980b). Currently, 60%-70% of Forsyth County is considered urbanized. The majority of the forests in the county are patches of recent secondary growth in areas formerly under cultivation.

5.1.2 BIOTIC RESOURCES

5.1.2.1 Terrestrial Communities

Five terrestrial communities were identified in the study area during field investigations: Mesic Mixed Hardwood Forest (Piedmont subtype), Piedmont Alluvial Forest, Pine Forest, Agriculture, and Maintained/Disturbed (see impacts in Table 4). Classification of plant communities is based loosely on a system used by the North Carolina Natural Heritage Program (NCNHP), *Classification of the Natural Communities of North Carolina* (Schafale and Weakley, 1990); however, *Classification of the Natural Communities of North Carolina* restricts its scope to those communities that are considered "natural" and without the overriding influence of modern human activities. The difficulty in using this classification for a project in a disturbed area is that the area is significantly altered from its "natural condition." If a community is modified or otherwise disturbed such that it does not fit in an NCNHP classification, it has been given a name that best describes current characteristics. Figure 19 shows the location of the terrestrial communities within the project study area. A brief description of each community type follows.



North Carolina Department of Transportation



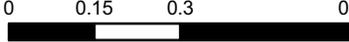
Date: June 2010

Legend

- NRTS Study Area
- Agriculture
- Piedmont Alluvial Forest
- Maintained/Disturbed
- Mesic Mixed Hardwood Forest
- Pine Forest
- Non-Delineated Streams
- Open Water
- Municipal Boundary
- Interstate
- US Route
- NC Route
- Local Road
- Railroad
- County Boundary



0 0.15 0.3 0.6 Miles



**Macy Grove Road Improvements
Forsyth County, NC**

STIP U-2800 & U-4734

Figure 19

Natural Communities

Mesic Mixed Hardwood Forest (Piedmont Subtype)

The Mesic Mixed Hardwood Forest dominates portions of the study area that have not been developed and have not been recently disturbed. Typical sites for this community are lower slopes, steep north-facing slopes, ravines, and occasionally well-drained small stream bottoms. Within the study area, the mesic mixed hardwood forest community generally grades into Piedmont Alluvial Forest in the lower elevations and Pine Forest in the higher elevations. The dominant canopy species include northern red oak, white oak, black oak, American elm, tulip poplar, and Virginia pine. Dominant understory species include eastern red cedar, American beech, flowering dogwood, ironwood, redbud, green ash, American holly, Chinese privet, sweetgum, multiflora rose, and red maple. The herbaceous layer consists of princess pine, greenbrier, Christmas fern, Japanese honeysuckle, Virginia creeper, and poison ivy.

Piedmont Alluvial Forest

This community occurs along streambanks and/or areas receiving seasonal or intermittent flooding from rivers or streams. These areas are characterized by dense sapling/shrub layers, open canopy, and low growing dense herbaceous layers. The canopy in this community type is variable within the study area and includes black willow, cherrybark oak, American sycamore, swamp chestnut oak, black gum, river birch, and green ash. Dominant understory species include red maple, sweetgum, smooth alder, ironwood, Chinese privet, and multiflora rose. The herbaceous layer contains Christmas fern, greenbrier, Japanese honeysuckle, blackberry, multiflora rose, and devil's walking stick.

This community type includes the large wetland system (W2 to W7) within Triad Park (Figure 20). The wetlands within Triad Park consist of a combination of open water ponds and herbaceous, emergent wetland communities. They are part of a large contiguous system that is hydrologically connected to S16. Historically, these ponds were man-made, maintained, open water ponds. They were constructed and used as fish hatcheries. The land was purchased and converted to a park sometime in the early 1990s. Since their abandonment, the hatchery ponds have become vegetated and a number of the walls that contained the ponds and prevented water flow between the ponds and adjacent stream (S16) have failed. The result is a large system that grades between open water ponds, emergent wetland, marsh-like herbaceous wetlands, and Piedmont Alluvial Forest. In areas that contain a canopy, the plant community is consistent with Piedmont Alluvial Forest vegetation. In emergent and herbaceous areas, dominant species include rushes, woolgrass, Joe Pye weed, grasses, and Japanese stilt grass.

Pine Forest

The Pine Forest includes areas dominated by Virginia pine and/or loblolly pine. Within the study area, several areas resemble pine plantations consisting of monocultures of Virginia pine; however, these areas do not appear to be actively maintained and many are grading into Mesic Mixed Hardwood Forests (Piedmont Subtype). The overstory in areas where the plantations have begun to transition also includes eastern red cedar, red oak, black oak, red maple, and green ash. The understory contains willow oak, scattered black cherry, red maple, and sweet gum. The herbaceous layer is limited within this community and consists of occasional patches of princess pine and Virginia creeper.

Agriculture

Several agricultural fields are present in the study area. During field visits many of the fields appeared fallow. No active crops were observed. It is likely that some of the fields are used for

hay production. One field containing an old corn crop (feed corn) was observed within the southern portion of the study area.

Maintained/Disturbed

The Maintained/Disturbed areas include all commercial, industrial, residential, and infrastructure-dominated areas within the study area. The maintained/disturbed community includes associated road shoulders, maintained lawns, and early successional roadside growth. Common species found along roadways within the study area are fescue, clover, tree of heaven, goldenrod, poison ivy, and English ivy.

5.1.2.2 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 *). Wildlife expected within and around the study area were determined through review of supporting literature (Burt, 1976; Martof et al., 1980; Sibley, 2003). Mammal species that commonly exploit forested habitats and stream corridors found within the study area include both those species acclimated to human disturbance and those species typical of relatively undisturbed forests of limited size. Expected and observed mammals include whitetail deer*, Virginia opossum, gray fox, gray squirrel*, eastern red bat, raccoon, eastern cottontail*, and striped skunk. A variety of reptiles and amphibians can be expected to utilize the terrestrial communities within the study area. These species include copperhead, rat snake, American toad, slimy salamander, eastern box turtle*, snapping turtle, five-lined skink, gray tree frog, wood frog, and eastern fence lizard.

Bird species that use the forest and forest edge habitats located in the study area are those typical of developed areas in the Piedmont region of North Carolina. These species are tolerant of habitat fragmentation and regular disturbance. Typical birds of this community include turkey vulture*, red-shouldered hawk, red-tailed hawk*, Eastern bluebird, Carolina wren, rock dove, mourning dove, American goldfinch*, European starling, tufted titmouse, Carolina chickadee, northern cardinal*, American crow*, blue jay, American robin, northern mockingbird*, and cedar waxwing.

5.1.2.3 Summary of Anticipated Effects

Terrestrial communities in the study area will be impacted by project construction as a result of clearing, grading, and paving portions of the study area (Table 4). Alternative 1 impacts 35.9 acres of forest, Alternative 2 impacts 36.9 acres, and Alternative 5 impacts 37.4 acres of forest. Total impacts from the U-2800 portion of the project equal 47.1 acres of forest.

Table 4: Anticipated Impacts to Terrestrial Communities

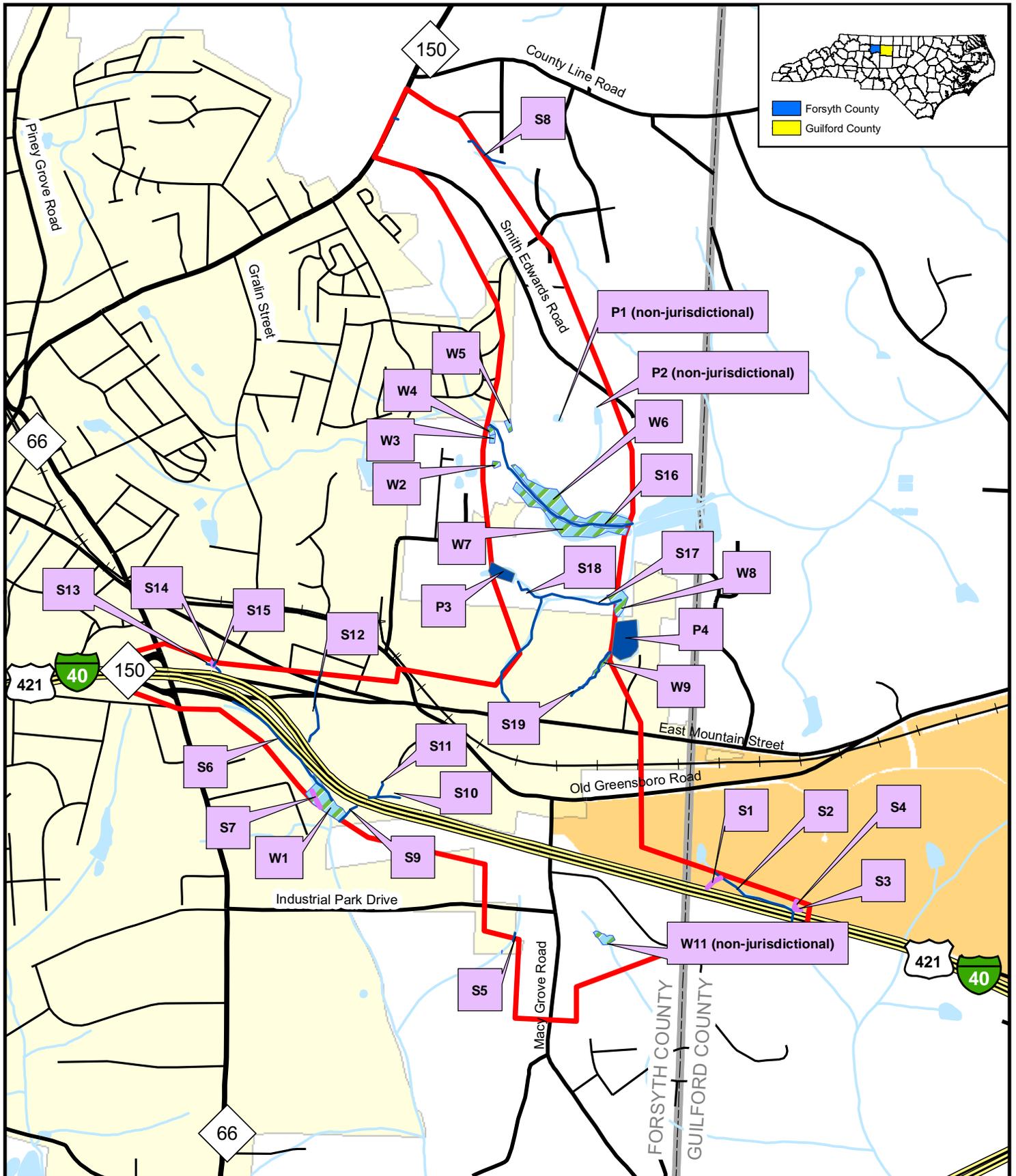
Community Type	U-4734			U-2800
	Alternative 1 (ac)	Alternative 2 (ac)	Alternative 5 (ac)	
Mesic Mixed Hardwood Forest	6.9	9.1	6.6	4.9
Piedmont Alluvial Forest	3.9	3.2	3.3	0.0
Pine Forest	7.2	6.6	7.0	25.8
Agriculture	15.9	17.4	17.7	11.1
Maintained/Disturbed	2.0	0.6	2.8	5.3
Total	35.9	36.9	37.4	47.1

Construction, staging, and stockpiling operations will result in the disruption of the resident wildlife population adjacent to the roadway. The clearing of habitats, human activity, and noise from construction operations will result in the displacement of mobile wildlife species. Non-mobile species will be lost as habitat is converted to construction areas.

Maximum disruption of wildlife communities will occur when project construction begins as displaced animals are forced to compete for space with other nearby resident wildlife and human populations. These impacts will be minimized as much as possible by restricting land clearing and construction operations within the project right-of-way. Off-site staging and stockpiling areas will be located to impact the least amount of natural habitat as possible. Stockpiling and staging areas will be revegetated after construction, which could provide replacement habitat for some species. Expected impacts to terrestrial communities due to project construction are expected to be minimal.

5.1.3 WATER RESOURCES

The study area lies just east of the confluence of the Cape Fear, Yadkin, and Roanoke river basins. The majority of the study area falls within the Cape Fear River Basin, with the northernmost portion falling within the Roanoke River Basin, and the westernmost section falling within the Yadkin River Basin. The study area contains US Geological Survey (USGS) Hydrologic Units 03010103, 03030002, 03030003, and 03040103. Nineteen streams (S1 to S19) were identified within the study area (Table 5). The location of each water resource is shown in Figure 20. The physical characteristics of these streams are provided in Table 6.



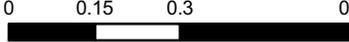
North Carolina
Department of Transportation



Date: May 2010

Legend

NCTR Study Area	Interstate
Delineated Streams (Jurisdictional)	US Route
Delineated Ephemeral Streams (Non-Jurisdictional)	NC Route
Delineated Wetlands	Local Road
Delineated Ponds	Railroad
Non-Delineated Streams	County Boundary
Open Water	
Triad Business Park	
Municipal Boundary	


 0 0.15 0.3 0.6 Miles


Macy Grove Road Improvements
Forsyth County, NC

STIP U-2800 & U-4734

Figure 20

Jurisdictional Features

Table 5: Streams in the Study Area

Stream Name	Map ID	DWQ Index Number*	Best Usage Classification
Unnamed Tributary to West Fork Deep River	S1	17-3-(0.3)	WS IV*
Unnamed Tributary to West Fork Deep River	S2	17-3-(0.3)	WS IV*
Unnamed Tributary to West Fork Deep River	S3	17-3-(0.3)	WS IV*
Unnamed Tributary to West Fork Deep River	S4	17-3-(0.3)	WS IV*
Unnamed Tributary to West Fork Deep River	S5	17-3-(0.3)	WS IV*
West Fork Deep River	S6	17-3-(0.3)	WS IV*
Unnamed Tributary to West Fork Deep River	S7	17-3-(0.3)	WS IV*
Unnamed Tributary to Reedy Fork	S8	16-11-(1)	WS III; NSW
Unnamed Tributary to West Fork Deep River	S9	17-3-(0.3)	WS IV*
Unnamed Tributary to West Fork Deep River	S10	17-3-(0.3)	WS IV*
Unnamed Tributary to West Fork Deep River	S11	17-3-(0.3)	WS IV*
Unnamed Tributary to West Fork Deep River	S12	17-3-(0.3)	WS IV*
Unnamed Tributary to West Fork Deep River	S13	17-3-(0.3)	WS IV*
Unnamed Tributary to West Fork Deep River	S14	17-3-(0.3)	WS IV*
Unnamed Tributary to West Fork Deep River	S15	17-3-(0.3)	WS IV*
Reedy Fork	S16	16-11-(1)	WS III; NSW
Unnamed Tributary to Reedy Fork	S17	16-11-(1)	WS III; NSW
Unnamed Tributary to Reedy Fork	S18	16-11-(1)	WS III; NSW
Unnamed Tributary to Reedy Fork	S19	16-11-(1)	WS III; NSW

Index numbers and Best Usage Classifications are assigned by NCDWQ (NCDWQ, 2010).

* Signifies that the stream is part of the Randleman Lake Watershed.

Table 6: Physical Characteristics of Streams in the Study Area

Map ID	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Channel Substrate*	Velocity	Clarity
S1	1 – 2	2 – 3	3 – 4	Si, G	Slow	Clear
S2	1 – 6	6 – 10	2 – 8	Sa, G, Be	Moderate	Clear
S3	2 – 3	3 – 5	2 – 3	Si, Sa	Slow	Turbid
S4	0.5 – 2	2 – 10	6 – 12	Si	Slow	Iron Oxidizing Bacteria
S5	6 – 15	3 – 6	2 – 5	Sa, G, C	Slow	Clear
S6	1 – 18	1 – 25	2 – 12	Si, Sa, G, C, Be	Moderate	Varies**
S7	0.5 – 1	2 – 3	3 – 6	Si, Sa, G	Slow	Iron Oxidizing Bacteria
S8	4 – 5	6 – 8	12 – 24	Si, Sa, G	Moderate	Clear
S9	2 – 3	3 – 4	1 – 3	Si, Sa	Moderate	Clear
S10	2 – 3	1 – 1.5	1 – 2	Si, Sa, G	Slow	Clear
S11	1 – 3	1 – 2	1 – 2	Si, Sa	Slow	Clear/Iron Oxidizing Bacteria
S12	10 – 15	10 – 20	8 – 12	Sa, G, C	Slow	Clear/Iron Oxidizing Bacteria
S13	2 – 3	3 – 5	2 – 6	Sa, G	Slow	Iron Oxidizing Bacteria

Map ID	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Channel Substrate*	Velocity	Clarity
S14	2 – 3	3 – 4	3 – 6	Sa, G	Slow	Clear
S15	2 – 3	3 – 4	3 – 6	Sa, G	Slow	Clear
S16	3 – 7	15 – 20	3 – 24	Sa	Moderate	Clear
S17	9 – 10	6 – 10	1 – 10	Sa, G, Be	Moderate	Clear
S18	2 – 3	3 – 4	2 – 6	Sa, G, C, Be	Slow	Clear
S19	2 – 3	1 – 2	2 – 4	Si, Sa	Slow	Clear

* Si=Silt, Sa=Sand, G=Gravel, C=Cobble, Be=Bedrock

** Clarity varies throughout the reach. Begins clear, transitions to turbid where tributaries enter the channel. The southern portion of the study area contains iron oxidizing bacteria.

The surface waters located within the study area include four Unnamed Tributaries (UT) that flow to Reedy Fork (S8, S17, S18, and S19), Reedy Fork (S16), 13 UTs that flow to West Fork Deep River (S1, S2, S3, S4, S5, S7, S9, S10, S11, S12, S13, S14, S15), and West Fork Deep River (S6, headwaters).

West Fork Deep River and its associated tributaries within the study area appear on the 2010 Draft 303(d) List of Impaired Waters (NCDWQ, 2010) due to poor bioclassification of aquatic life. There are no water supply (WS-I or WS-II) watersheds within the study area or within 1 mile of the study area. There are no Outstanding Resource Waters (ORW), High Quality Waters (HQW), trout waters, Anadromous Fish Spawning Areas, or Primary Nursery Areas within the study area or within 1 mile of the study area.

There are five ponds (P1 to P4 and part of W11) within the study area (Figure 20). While all five ponds appear to be man-made, two are connected to surface waters within the study area. The remaining three ponds are isolated in nature and are fed entirely by storm water runoff. P1 and P2 are farm ponds that are used to water horses. P3 is a maintained retention basin that captures storm water from the industrial area off Berry Garden Road; however, P3 drains into S18, a UT to Reedy Fork. P4 is located outside of the study area, but is responsible for the connection of hydrology within the study area. S18 and S19 drain north into P4. P4 then drains north into S17, a UT to Reedy Fork. P5/W11 is an isolated depression and appears to be abandoned.

5.1.3.1 Aquatic Communities

Aquatic communities in the study area consist of both perennial and intermittent Piedmont streams, as well as still water ponds. Aquatic fauna present within the study area are dependent on physical characteristics of the water body and overall condition of the water resource. Terrestrial communities adjacent to a water resource also greatly influence aquatic communities. Fauna associated with aquatic communities include various invertebrate and vertebrate species.

Aquatic invertebrates are a major component of stream ecosystems, as primary and secondary consumers and as prey items for organisms higher in the food chain. Substrate elements (cobbles, sticks, leaves) were inspected for evidence of invertebrates; however, due to development in the watershed and the timing of field surveys (winter): few aquatic invertebrates were found. Few individuals were observed, such as caddisflies, mayflies, and crayfish. Other species that would be expected to occur include craneflies, dragonflies, mosquitoes, black flies, snails, and water striders. No fish were observed in any of the streams. Fish species likely to

occur within the study area include redlip shiner, bluehead chub, rosyzide dace, creek chub, margined madtom, tessellated darter, and spottail shiner.

5.1.3.2 Summary of Anticipated Effects

Construction of any of the Build Alternatives may cause temporary impacts to aquatic communities due to sedimentation and reduced water quality resulting from project construction. Permanent impacts are not expected due to the implementation of NCDOT’s Best Management Practices (BMP) and other measures to avoid and minimize harm to natural systems in the project study area.

5.1.4 WATERS OF THE UNITED STATES

“Waters of the United States” include surface waters and wetlands (inundated or saturated areas that support vegetation typically adapted to wet conditions) as defined in 33 CFR 328.3. Impacts to Waters of the United States fall under the jurisdiction of the USACE through Section 404 of the Clean Water Act (33 USC 1344) and under the jurisdiction of the NCDENR DWQ through the Section 401 Water Quality Certification Process (NC General Statutes Chapter 143 Article 21, Part 1).

5.1.4.1 Streams, Rivers, Impoundments

Nineteen jurisdictional streams were identified in the study area (Table 7). The location of these streams is shown on Figure 20. In addition, there is one jurisdictional pond within the study area. P3 is 1.1 acres and drains to S18.

Table 7: Jurisdictional Characteristics of Water Resources in the Study Area

Map ID	Length (ft.)	Classification	Compensatory Mitigation Required	River Basin Buffer
S1	230	Ephemeral	No	Not Subject
S2	1,733	Perennial	Yes	Randleman Lake Water Supply Watershed
S3	72	Ephemeral	No	Not Subject
S4	99	Ephemeral	No	Not Subject
S5	112	Intermittent	Yes	Randleman Lake Water Supply Watershed
S6	1,923	Perennial	Yes	Randleman Lake Water Supply Watershed
S7	252	Ephemeral	No	Not Subject
S8	603	Perennial	Yes	Jordan Lake Water Supply Watershed
S9	313	Intermittent	Yes	Randleman Lake Water Supply Watershed
S10	423	Intermittent	Yes	Randleman Lake Water Supply Watershed
S11	221	Intermittent	Yes	Randleman Lake Water Supply Watershed
S12	547	Intermittent	Yes	Randleman Lake Water Supply Watershed

Map ID	Length (ft.)	Classification	Compensatory Mitigation Required	River Basin Buffer
S13	220	Intermittent	Yes	Randleman Lake Water Supply Watershed
S14	49	Ephemeral	No	Not Subject
S15	63	Intermittent	Yes	Randleman Lake Water Supply Watershed
S16	2,653	Perennial	Yes	Jordan Lake Water Supply Watershed
S17	2,884	Perennial	Yes*	Jordan Lake Water Supply Watershed
S18	428	Intermittent	Yes	Jordan Lake Water Supply Watershed
S19	882	Perennial	Yes*	Jordan Lake Water Supply Watershed

*1:1 mitigation determined by John Thomas of USACE during Jurisdictional Determination Site Verification on May 27, 2009.

5.1.4.2 Riparian Buffers

Streamside riparian zones for West Fork Deep River and all of its jurisdictional UTs within the study area are protected under provisions of the Randleman Lake Water Supply Watershed Buffer Rules administered by NCDWQ (15A NCAC 02B .0250). Streamside riparian zones for Reedy Fork and all of its jurisdictional UTs within the study area are protected under provisions of the Jordan Lake Water Supply Watershed Buffer Rules administered by NCDWQ (15A NCAC 02B .0267). Two ponds, P3 and P4, are also protected under provisions of the Jordan Lake Water Supply Watershed Buffer Rules.

The buffer rules establish a protected 50-foot wide riparian buffer consisting of two zones. Zone 1 consists of a vegetated area that extends landward a distance of 30 feet on all sides of a surface water. Zone 2 begins at the outer edge of Zone 1 and extends landward 20 feet. Under the buffer rules, Zones 1 and 2 are to remain essentially undisturbed, except for certain exempted and allowed uses in the Randleman Watershed provided by 15A NCAC 02B .0250 (3a) and allowed uses in the Jordan Lake Watershed provided by 15A NCAC 02B.0267 (9).

Riparian buffer impacts for each of the Build Alternatives are listed in Table 8.

Table 8: Riparian Buffer Impacts

	U-4734						U-2800		
	Alternative 1		Alternative 2		Alternative 5		Stream ID	Zone 1 (ft ²)	Zone 2 (ft ²)
Stream ID	Zone 1 (ft ²)	Zone 2 (ft ²)	Zone 1 (ft ²)	Zone 2 (ft ²)	Zone 1 (ft ²)	Zone 2 (ft ²)			
S16	0	426	0	1,705	0	1,803	S2	10,834	3,950
S17	17,529	11,028	17,249	10,877	20,579	13,121	S6	45,157	9,859
S18	0	0	0	0	5,487	3,986	S9	4,268	2,680
							S10	6,701	4,771
							S12	1,800	1,131
							S13	2,351	1,540
							S17	16,036	11,956
							S19	26,071	19,621
P3	0	0	0	0	0	0			
P4	0	0	0	0	0	0			
U-4734 Zone Totals	17,529	11,454	17,249	12,582	26,066	18,910	U-2800 Zone Total	113,218	55,508
U-4734 Total	28,983		29,831		44,976		U-2800 Total	168,726	

Note: Impacts are based on preliminary design slope stakes plus Zone 1 and Zone 2 widths.

5.1.4.3 Wetlands

Nine jurisdictional wetlands (W1 to W9) were identified within the NRTR study area (Figure 20). Wetland classification and quality rating data are presented in Table 9. W1 lies within Cape Fear River Basin USGS Hydrologic Unit 03030003. The remaining eight wetlands are contained within Cape Fear River Basin USGS Hydrologic Unit 03030002.

Table 9: Jurisdictional Characteristics of Wetlands in the NRTR Study Area

Map ID	Cowardin Classification*	Hydrologic Classification	DWQ Wetland Rating	Area (ac.)
W1	PFO1F	Riparian	71	3.0
W2	PEM2C	Non-riparian	30	0.2
W3	PFO1C	Non-riparian	17	0.2
W4	PFO1C	Non-riparian	17	0.2
W5	PFO1C	Non-riparian	17	0.3
W6	PFO1F/PEM2H	Riparian	85	5.4
W7	PEM2H/POW	Riparian	87	4.2
W8	PFO1F	Riparian	66	1.3
W9	PSS1A	Riparian	45	0.7

* Classification of Wetlands and Deepwater Habitat of the United States (Cowardin et al., 1979)

5.1.4.4 Summary of Anticipated Effects

Impacts to wetlands and streams will be unavoidable during construction. Impacts to jurisdictional and non-jurisdictional resources are shown in Table 10 and Table 11.

Table 10: Anticipated Stream Impacts

Stream ID	Classification	USGS Hydrologic Unit	U-4734			U-2800 (linear ft)
			Alternative 1 (linear ft)	Alternative 2 (linear ft)	Alternative 5 (linear ft)	
S1*	Ephemeral	03030003	0	0	0	44
S2	Perennial	03030003	0	0	0	97
S3*	Ephemeral	03030003	0	0	0	0
S4*	Ephemeral	03030003	0	0	0	0
S5	Intermittent	03030003	0	0	0	0
S6	Perennial	03030003	0	0	0	1,347
S7*	Ephemeral	03030003	0	0	0	0
S8	Perennial	03030002	0	0	0	0
S9	Intermittent	03030003	0	0	0	56
S10	Intermittent	03030003	0	0	0	118
S11	Intermittent	03030003	0	0	0	4
S12	Intermittent	03030003	0	0	0	25
S13	Intermittent	03030003	0	0	0	11
S14*	Ephemeral	03030003	0	0	0	0
S15	Intermittent	03030003	0	0	0	0
S16	Perennial	03030002	0	0	0	0
S17	Perennial	03030002	294	294	333	239
S18	Intermittent	03030002	0	0	145	0
S19	Perennial	03030002	0	0	0	402
Total			294	294	478	2,343

* Ephemeral Stream (non-jurisdictional)

Note: Impacts are based on preliminary design slope stakes plus 25 feet.

Table 11: Anticipated Wetland Impacts

Map ID	Hydrologic Classification	USGS Hydrologic Unit	U-4734			U-2800 (ac)
			Alternative 1 (ac)	Alternative 2 (ac)	Alternative 5 (ac)	
W1	Riparian	03030003	0.00	0.00	0.00	0.09
W2	Non-riparian	03030002	0.00	0.00	0.00	0.00
W3	Non-riparian	03030002	0.00	0.00	0.00	0.00
W4	Non-riparian	03030002	0.00	0.00	0.00	0.00
W5	Non-riparian	03030002	0.00	0.00	0.00	0.00
W6	Riparian	03030002	1.10	0.52	0.52	0.00
W7	Riparian	03030002	0.69	0.61	0.44	0.00
W8	Riparian	03030002	0.00	0.00	0.00	0.00
W9	Riparian	03030002	0.00	0.00	0.00	0.00
Total			1.8	1.1	1.0	0.1

Note: Impacts are based on preliminary design slope stakes plus 25 feet.

Of the five ponds described in Section 5.1.3, only P3 and P4 are jurisdictional. There are no anticipated impacts to P3 and P4. P1, a non-jurisdictional resource located in the study area for

U-4734, will be impacted by the proposed project. The potential impacts to P1 is 0.3 acre for Alternative 1, 0.2 acre for Alternative 2, and 0.1 acre for Alternative 5, based on preliminary design slope stakes plus 25 feet.

5.1.4.5 Avoidance, Minimization, and Mitigation

Land development activities that may adversely impact wetlands require consent through permit approval from the regulating agency. At the federal level, under the CWA Section 404b(1) Guidelines (40 CFR 230) and USACE regulations (33 CFR 320.4(r)), the USACE is obligated to require mitigation for any unavoidable impacts to wetlands and streams as a condition of permit approval. Mitigation for impacts to wetlands and streams include: avoiding impacts, minimizing impacts, and compensating for impacts.

Avoidance

Avoidance examines the appropriate and practicable possibilities of averting impacts to wetlands and streams. The primary need for the proposed project includes providing a roadway link between I-40 Business/US 421 and NC 150 (North Main Street) north of Kernersville (a north-south connection). Because the U-2800 portion of the project is mainly upgrade existing and because several large jurisdictional resources are oriented in an east-west direction through the central portion of the study area, avoidance of jurisdictional features is not possible.

Minimization

Minimization includes the examination of appropriate and practicable steps to reduce adverse impacts to streams and wetlands. General steps that should be implemented during the final design stage to minimize impacts by the proposed project include:

- Minimizing “in-stream” activities;
- Strictly enforcing the sedimentation and erosion control recommended in NCDOT’s BMPs for the protection of streams and wetlands;
- Decreasing the footprint of the proposed project through the reduction of right-of-way widths and steepening of fill slopes where possible;
- Utilizing natural stream channel design principles when relocating streams.

Specific minimization efforts performed thus far include:

- Elimination of alternatives that would result with higher stream and/or wetland impacts, when similar alternatives would perform the same function with fewer impacts;
- Various alternatives for the proposed crossing of Reedy Fork and the associated wetlands that were investigated, including (1) box culvert option, (2) span the natural system and floodplain with the hydraulically required bridge, and (3) completely span the natural system and floodplain. Through the NEPA/404 Merger Process it was determined that option 2 should be implemented for all alternatives to be carried forward for detail studies, as this option will accommodate the hydraulic requirements while minimizing impacts to Reedy Fork and the associated natural system.

Compensatory Mitigation

Compensatory mitigation is meant to replace, on at least a one-to-one basis, the lost functions and values of natural streams and wetlands affected by development activities. NCDOT will investigate potential on-site stream and wetland mitigation opportunities once a preferred alternative has been chosen. If on-site mitigation is not feasible, mitigation will be provided by

NCDENR Ecosystem Enhancement Program (NCEEP). In accordance with the “2003 Memorandum of Agreement among the North Carolina Department of Transportation, and the U.S. Army Corps of Engineers and the N.C. Department of Environment and Natural Resources” (MOA), the NCEEP will be requested to provide off-site mitigation to satisfy the federal Clean Water Act compensatory mitigation requirements for this project.

5.1.4.6 Anticipated Permit Requirements

Any action that proposes to place fill into waters of the United States falls under the jurisdiction of the USACE under Section 404. Permits are required for road construction impacting jurisdictional waters (streams and/or wetlands). Nationwide Permit (NWP) 14, for linear transportation projects, may be used for jurisdictional impacts of up to 0.5 acre on a single and complete project for crossing waters of the United States. If jurisdictional impacts are greater than 0.5 acre, the project requires an Individual Permit. Final decisions regarding applicable permits for the proposed project are the responsibility of the USACE.

In addition to the 404 permit, other required authorizations include the corresponding Section 401 Water Quality Certification (WQC) from the NCDWQ. If a NWP 14 is used, NCDWQ General Certification (GC) 3704 is required (previously GC3627). If an Individual Permit is required, then an Individual 401 WQC is needed.

A buffer certification from the NCDWQ is also required for any impacts within the 50-foot riparian buffer zone of streams subject to the Randleman Buffer Rules and the recently adopted Jordan Lake Buffer Rules. Streamside riparian zones for West Fork Deep River and all of its jurisdictional UTs within the study area are protected under provisions of the Randleman Lake Water Supply Watershed Buffer Rules administered by NCDWQ (15A NCAC 02B .0250). Streamside riparian zones for Reedy Fork and all of its jurisdictional UTs within the study area are protected under provisions of the Jordan Lake Water Supply Watershed Buffer Rules administered by NCDWQ (15A NCAC 02B .0267). Table 7 indicates which streams are subject to buffer rule protection. Potential impacts are shown in Table 8 and will be refined during final design.

5.1.5 RARE AND PROTECTED SPECIES

5.1.5.1 Federally-Protected Species

Reviewed August 31, 2010, the US Fish and Wildlife Service (USFWS) January 31, 2008 list identifies four federally protected species for Forsyth and Guilford Counties (Table 12). 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 12: Federally Protected Species Listed for Forsyth and Guilford Counties

Scientific Name	Common Name	Federal Status	County	Habitat Present	Biological Conclusion
<i>Glyptemys muhlenbergii</i>	Bog turtle	T(S/A)	Forsyth	No	Not Required
<i>Isotria medeoloides</i>	Small whorled pogonia	T	Guilford	Yes	No effect
<i>Picooides borealis</i>	Red-cockaded	E	Forsyth	No	No effect

Scientific Name	Common Name	Federal Status	County	Habitat Present	Biological Conclusion
	woodpecker**				
<i>Cardamine micranthera</i>	Small-anthered bittercress**	E	Forsyth	No	No effect

E – Endangered

T(S/A) – Threatened due to similarity in appearance

T – Threatened

** - Historic record (the species was last observed in the county more than 50 years ago)

Bog turtle

USFWS optimal survey window: April 1 – October 1 (visual surveys); April 1 – June 15 (optimal for breeding/nesting); May 1 – June 30 (trapping surveys).

Habitat Description: Bog turtle habitat consists of open, groundwater supplied (springfed), graminoid dominated wetlands along riparian corridors or on seepage slopes. These habitats are designated as mountain bogs by the NCNHP, but they are technically poor, moderate, or rich fens that may be associated with wet pastures and old drainage ditches that have saturated muddy substrates with open canopies. Plants found in bog turtle habitat include sedges, rushes, marsh ferns, herbs, shrubs (smooth alder, hardhack, blueberry, etc.), and wetland tree species (red maple and silky willow). These habitats often support sphagnum moss and may contain carnivorous plants (sundews and pitcherplants) and rare orchids. Potential habitats may be found in western Piedmont and Mountain counties from 700 to 4500 feet elevation in North Carolina. Soil types (poorly drained silt loams) from which bog turtle habitats have been found include Arkaqua, Chewacla, Dellwood, Codorus complex, Hatboro, Nikwasi, Potomac – Iotla complex, Reddies, Rosman, Tat – Cullowhee complex, Toxaway, Tuckasagee – Cullasaja complex, Tusquitee, Watauga, and Wehadkee.

Biological Conclusion: Not required

Species listed as threatened due to similarity of appearance do not require Section 7 consultation with the USFWS; however, this project is not expected to affect the bog turtle because no suitable habitat is present within the study area. The majority of wetlands within the study area are forested riparian systems, which are not saturated with up to four feet of water most of the year (W6 and W7). A review of NCNHP records, updated January 8, 2009, indicates one known bog turtle occurrence approximately 0.6 miles northeast of the study area; however, this occurrence is historic (last seen in 1967) and was found along a drainage system that is not contiguous to study area streams.

Small whorled pogonia

USFWS optimal survey window: mid May – early July.

Habitat Description: Small whorled pogonia occurs in young as well as maturing (second to third successional growth) mixed-deciduous or mixed-deciduous/coniferous forests. It does not appear to exhibit strong affinities for a particular aspect, soil type, or underlying geologic substrate. In North Carolina, the perennial orchid is typically found in open, dry deciduous woods and is often associated with white pine and rhododendron. The species may also be found on dry, rocky, wooded slopes; moist slopes; ravines lacking stream channels; or slope bases near braided channels of vernal streams. The understory structure and composition of occupied sites varies from dense rhododendron thickets, to open/sparse/moderate shrub and herbaceous cover in the orchid's microhabitat, to dense stands of New York fern. Other common characteristics shared by small whorled pogonia sites include historic agricultural use of existing habitat; a

proximity to logging roads, streams, or other features that create long persisting breaks in the forest canopy; and a prevalence of leaf litter and decaying vegetation.

Biological Conclusion: No effect

The study area (within Guilford County) contains secondary successional forests and features that create long persistent breaks in the canopy, such as utility easements and what appear to be old logging roads. Potential habitat for small whorled pogonia is present within these areas. A foot survey for the species was conducted by URS biologists on June 10, 2009. No small whorled pogonia (or any other type of orchid) were observed within the study area. A review of NCNHP records, updated January 8, 2009, indicates no known occurrences of small whorled pogonia within 1 mile of the study area.

Red-cockaded woodpecker (RCW)

USFWS survey window: year round; November – early March (optimal).

Habitat Description: The RCW typically occupies open, mature stands of southern pines, particularly longleaf pine, for foraging and nesting/roosting habitat. The RCW excavates cavities for nesting and roosting in living pine trees aged 60 years or older that are contiguous with pine stands at least 30 years of age to provide foraging habitat. The foraging range of the RCW is normally no more than 0.5 miles.

Biological Conclusion: No Effect

Suitable habitat for RCW does not exist within the study area. Large, mature pine stands are not present within the study area. Young to moderately-aged pine plantations are present, but are densely planted and are not conducive to foraging. The only open forest canopy within the study area occurs in the hardwood, American beech and oak-dominated forests. A review of NCNHP records, updated January 8, 2009, indicates no known occurrences of RCW within 1 mile of the study area.

Small-anthered bittercress

USFWS optimal survey window: April-May.

Habitat Description: Small-anthered bittercress is endemic to the Dan River drainage of Roanoke River sub basin 03-02-01. This biennial or perennial herb occurs in moist, wet woods along small to intermittent sized streams, streambank edges and seepages above the actual stream channel, wet rock crevices, and sand and gravel bars of small streams. This species prefers areas that are fully or partially shaded by shrubs and trees, but can occasionally be found in full sun. Soil series that it occurs on include Rion, Pacolet, and Wateree. Poorly viable occurrences may be found in disturbed areas subject to livestock trampling, silviculture, or encroachment by exotic invasive species such as Japanese honeysuckle.

Biological Conclusion: No Effect

The study area is not located within the Dan River drainage and is in a fairly urbanized watershed. There is no habitat for small-anthered bittercress within the study area. A review of NCNHP records, updated January 8, 2009, indicates no known occurrences of small-anthered bittercress within 1 mile of the study area.

5.1.5.2 Bald Eagle and Golden Eagle Protection Act

In the July 9, 2007, Federal Register (72:37346-37372), the bald eagle was declared recovered and removed (delisted) from the Federal List of Threatened and Endangered wildlife. This delisting took effect August 8, 2007. After delisting, the Bald and Golden Eagle Protection Act (Eagle Act) (16 USC 668-668d) became the primary law protecting bald eagles. The Eagle Act prohibits take of bald and golden eagles and provides a statutory definition of "take" that includes "disturb." The USFWS has developed National Bald Eagle Management Guidelines to provide guidance to land managers, landowners, and others on how to avoid disturbing bald eagles (USFWS, 2007).

Habitat for the bald eagle primarily consists of mature forests in proximity to large bodies of open water for foraging. Large, dominant trees are utilized for nesting sites, typically within 1 mile of open water.

No suitable nesting or foraging habitat for the bald eagle exists within the study area or within 1 mile of the study area. Agricultural fields and small forested areas are present; however, the trees found within the forested areas are not suitable to support a bald eagle nest due to their small size. No large bodies of water occur within 1 mile of the study area. The closest large body of water is Kernersville Lake, approximately three miles northwest of the study area. No nests were observed during site visits and no bald eagles were seen flying in the area. Foot surveys within the study area and 660 feet outside the study area were not necessary for the project. A review of NCNHP records, updated January 8, 2009, indicates no known occurrences of bald eagle within 1 mile of the study area.

5.1.5.3 Endangered Species Act (ESA) Candidate Species

As of January 31, 2008 the USFWS has no Candidate species listed for Forsyth and Guilford Counties.

5.1.5.4 Federal Species of Concern/State-Protected Species

Federal Species of Concern (FSC) are not legally protected under the ESA and are not subject to any of its provisions, including Section 7, until they are formally proposed or listed as threatened or endangered. An FSC is defined as a species that is under consideration for listing for which there is insufficient information to support listing. Organisms listed as threatened, endangered, or special concern (SC) on the NCNHP list of Rare Plant and Animal Species are afforded state protection under the ESA and the North Carolina Plant Protection and Conservation Act of 1979.

As of January 31, 2008, the USFWS lists two FSC species for Forsyth and Guilford Counties (Table 13). A review of NCNHP records, updated January 8, 2009, indicates no known occurrences of either species within 1 mile of the study area.

Table 13: Federal Species of Concern Listed for Forsyth and Guilford Counties

Scientific Name	Common Name	County*	Habitat Present
<i>Alasmidonta varicosa</i>	Brook floater	Forsyth	Marginal*
<i>Etheostoma collis lepidinon</i>	Carolina darter	Guilford	Yes

*The brook floater prefers medium-sized streams and rivers containing large boulders. Optimal habitat does not exist within the study area.

5.1.6 SOILS

The Forsyth and Guilford County Soil Surveys (Zimmerman, 1976; Stephens, 1977) identify 30 soil types within the study area (Table 14).

Table 14: Soils in the Study Area

Soil Mapping Unit	Map Symbol	Drainage Class	Hydric Status
Appling Sandy Loam, 2%-6% Slopes	ApB	Well Drained	Nonhydric
Appling Sandy Loam, 6%-10% Slopes	ApC	Well Drained	Nonhydric
Cecil Sandy Loam, 2%-6% Slopes	CcB	Well Drained	Nonhydric
Cecil Sandy Loam, 6%-10% Slopes	CcC	Well Drained	Nonhydric
Cecil Sandy Loam, 10%-15% Slopes	CcD	Well Drained	Nonhydric
Cecil Clay Loam, 2%-6% Slopes, Eroded	CeB2	Well Drained	Nonhydric
Cecil Clay Loam, 6%-10% Slopes, Eroded	CeC2	Well Drained	Nonhydric
Chewacla Loam	Ch	Somewhat Poorly Drained	Hydric*
Cut and Fill Land	Cu	N/A	Nonhydric
Enon Fine Sandy Loam, 6%-10% Slopes	EnC	Well Drained	Nonhydric
Gullied Land	Gu	N/A	Nonhydric
Louisburg-Wedowee Complex, 15%-25% Slopes	LwE	Well Drained	Nonhydric
Madison Fine Sandy Loam, 2%-6% Slopes	MaB	Well Drained	Nonhydric
Madison Fine Sandy Loam, 6%-10% Slopes	MaC	Well Drained	Nonhydric
Madison Clay Loam, 2%-6% Slopes, Eroded	McB2	Well Drained	Nonhydric
Madison Clay Loam, 6%-10% Slopes, Eroded	McC2	Well Drained	Nonhydric
Madison Clay Loam, 10%-15% Slopes, Eroded	McD2	Well Drained	Nonhydric
Madison Clay Loam, 15%-25% Slopes, Eroded	McE2	Well Drained	Nonhydric
Pacolet Fine Sandy Loam, 2%-6% Slopes	PaB	Well Drained	Nonhydric
Pacolet Fine Sandy Loam, 6%-10% Slopes	PaC	Well Drained	Nonhydric
Pacolet Fine Sandy Loam, 10%-15% Slopes	PaD	Well Drained	Nonhydric
Pacolet Clay Loam, 2%-6% Slopes, Eroded	PcB2	Well Drained	Nonhydric
Pacolet Clay Loam, 6%-10% Slopes, Severely Eroded	PcC3	Well Drained	Nonhydric
Pacolet Clay Loam, 10%-15% Slopes, Eroded	PcD2	Well Drained	Nonhydric
Pacolet Clay Loam, 15%-45% Slopes, Eroded	PcF2	Well Drained	Nonhydric
Pacolet Complex, 10%-25% Slopes, Severely Eroded	PeE3	Well Drained	Nonhydric
Vance Sandy Loam, 2%-6% Slopes	VaB	Well Drained	Nonhydric
Water	W	N/A	N/A
Wedowee-Louisburg Complex, 2%-6% Slopes	WeB	Well Drained	Nonhydric
Wedowee-Louisburg Complex, 6%-10% Slopes	WeC	Well Drained	Nonhydric
Wehadkee Soils	Wh	Poorly and Very Poorly Drained	Hydric

* Soils that are primarily nonhydric, but that contain hydric inclusions (USDA, 2008).

As a result of earthwork and various other construction activities associated with any of the Build Alternatives, the project will result in localized alterations of study area topography, geology, and soils within the right-of-way limits. As construction materials are added to the project site, soils may be replaced, redistributed, and/or compacted. Addition of material will raise the elevation of certain areas. The project is expected to have a negligible overall impact to the region's topography, geology, and loss of or creation of soils.

5.2 CULTURAL RESOURCES

5.2.1 HISTORIC ARCHITECTURAL RESOURCES

A survey for historic architectural resources within the project study area was performed by NCDOT and summarized in *A Historic Architectural Resources Final Identification and Evaluation* dated March 2009. The Area of Potential Effects (APE) was identified by NCDOT; field work was performed on December 7, 2006, for U-2800 and April 8, 2009, for U-4734.

5.2.1.1 Historic Properties

The APE surrounded the proposed improvements in order to identify areas that may be affected either physically or visually. Results of the survey identified a total of 66 properties greater than 50 years of age, 54 within the U-2800 project area, and 12 within the U-4734 project area. Of the 66, all but one were determined not potentially eligible for the National Register of Historic Places (NRHP). The one house identified as potentially eligible was the Henry Clay Edwards House, which is currently listed on the North Carolina State Study List.

The Henry Clay Edwards House is a two and one-half story, gable-roofed building of brick construction, dating to the third quarter of the nineteenth century, which is located in the northern portion of the project study area immediately west of the existing NC 150 (North Main Street) and SR 2036 (Smith Edwards Road) intersection. The report detailing these findings was submitted to the State Historic Preservation Office (HPO) for review in early June 2010, with a meeting held June 23, 2010 to obtain the State HPO's input on eligibility and determination of effects if found eligible. During the meeting the State HPO indicated that it appeared modifications have been made to the house since the time it was placed on the study list. The State HPO suggested additional coordination with the property owner was needed to review the extent of the recent improvements before the eligibility determination is made. On September 22, 2010, NCDOT and the State HPO met with the owner of the Henry Clay Edwards House to review the renovations. As a result, the State HPO believes "that these changes constitute a degree of alteration that is not in keeping with the historic character of the house and resulted in the loss of historic materials", which resulted with the State HPO recommending that the Henry Clay Edwards House is not eligible for listing on the NRHP. In a letter dated September 24, 2010, HPO documented the results of this coordination, which is located in Appendix A.

5.2.1.2 Potential Project Effects

The Henry Clay Edwards House, which is located in the northern portion of the project study area has been determined not eligible for inclusion in the NRHP; therefore, no historic architectural resources listed on or eligible for inclusion in the NRHP will be impacted by the proposed project.

5.2.2 ARCHAEOLOGICAL RESOURCES

An archaeological survey (Phase I) and evaluation (Phase II) was conducted in December 2009 and January 2010. The archaeological work encompassed the areas of Alternatives 1, 2, and 5 within the U-4734 portion of the undertaking. The HPO did not require such studies for the U-2800 portion of the undertaking as detailed in a letter dated December 23, 2008, from Peter Sandbeck of the State HPO to Greg Thorpe of the NCDOT (see Appendix A).

5.2.2.1 Archaeological Sites

An APE was determined in consultation with the HPO, and is the area in which historic resources were identified and potential impacts assessed. No previously recorded archaeological resources are located within the three alternatives of the U-4734 APE. The archaeological survey identified five previously unrecorded archaeological sites. The North Carolina Office of State Archaeology (OSA) assigned state archaeological site numbers 31FY1184/1184**, 31FY1185, 31FY1186, 31FY1187/1187**, and 31FY1188** to these five sites.

Site 31FY1184/1184** is a multi-component site that produced prehistoric and historic artifacts; a ruinous structure is also present at the site. The prehistoric artifacts represent a Middle Archaic Morrow Mountain phase limited activity campsite dating to approximately 7000 to 6200 years Before Present (BP). The historic artifacts and ruinous structure indicate an early-to-mid-twentieth century farm tenant residence. Sites 31FY1185 and 31FY1186 are both prehistoric sites and represent limited activity campsites. Site 31FY1185 did not produce any temporally diagnostic artifacts to determine the age of the site. Site 31FY1186 produced a Middle Archaic Morrow Mountain projectile point giving an approximate temporal affiliation of 7000 to 6200 BP. Site 31FY1187/1187** is a multi-component site that produced prehistoric and historic artifacts. No temporally diagnostic prehistoric artifacts were recovered to determine the age of that component. The prehistoric function of the site was interpreted as a limited activity campsite. Historic artifacts indicate a mid-twentieth century timeframe for the historic component, which is interpreted as a miscellaneous historic artifact scatter. Finally, Site 31FY1188** is a historic site consisting of a low density of nineteenth century artifacts widely scattered across the surface of an agricultural field. The site is interpreted as a field scatter of miscellaneous historic artifacts.

All five of the archaeological sites within the U-4734 APE were recommended as ineligible for inclusion in the NRHP. The report detailing these findings was submitted to the HPO for review and comments on April 8, 2010. In a letter dated May 17, 2010, HPO concurred with the findings of this report. A copy of this letter is located in Appendix A.

5.2.2.2 Potential Project Effects

The five archaeological sites identified in the U-4734 APE have been determined ineligible for inclusion in the NRHP; therefore, no archaeological sites listed on or eligible for inclusion on the NRHP will be impacted by the proposed project.

5.3 SECTION 4(F)

According to Title 23 USC 138 (Section 4[f]), the USDOT

...shall not approve any program or project...which requires the use of any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, State or local significance as determined by the Federal, State, or local officials having jurisdiction thereof, or any land from an historic site

of national, State or local significance as so determined by such officials unless (1) there is no feasible and prudent alternative to the use of such land, and (2) such program includes all possible planning to minimize harm to such park, recreational area, wildlife and waterfowl refuge, or historic site resulting from such use.

In this section, resources subject to Section 4(f) are identified, potential uses of those resources are discussed, avoidance alternatives and other measures to minimize harm to the resources are assessed, and coordination with the public owner having jurisdiction over each resource is documented.

5.3.1 DESCRIPTION OF SECTION 4(F) RESOURCES

Two types of Section 4(f) resources are located within the project study area: a historic site and a public park/recreation area (Figure 21). According to FHWA, a description of each 4(f) resource should be provided and should include a detailed map, size and location, ownership, function and available activities, existing and planned facilities, access and usage, relationship to similar properties, and applicable clauses affecting ownership. As noted in Section 5.2.1.2 no historic architectural resources listed on or eligible for inclusion on the NRHP are in the project area. A description of all parks in the project area is provided in Section 5.3.1.1.

5.3.1.1 Public Parks and Recreation Areas

Triad Park

Information on Triad Park was provided by the Forsyth County Parks and Recreation Department and from the County's Web site (<http://www.co.forsyth.nc.us/Parks/triad.aspx>).

- Size - 426 acres
- Location - 9652 East Mountain Street. Kernersville, NC 27284
- Ownership - Joint Venture of Forsyth and Guilford Counties
- Type - Public Park
- Function - Community events and outdoor recreation
- Existing Facilities - Banquet facility, picnic shelters, gazebo shelters, picnic tables with grills, paved path systems (walking, biking, and skating), hiking trail loop, rock climbing playground, horseshoe pits, volleyball courts, softball field, soccer field, playgrounds, vender area with shelter, catch and release fishing pond
- Access - Vehicles enter the park via one driveway entrance off of East Mountain Street. Pedestrian access via the French Broad River Greenway from the east.
- Use - Recorded 484,757 visitors from July 2008 – June 2009
- Clauses - None identified
- Features - Park property generally consists of rolling terrain. Reedy Fork traverses through the center of park property and includes a large wetland system. Portions of the property are also included in the floodway.

5.3.2 USE OF SECTION 4(F) PROPERTY

According to Section 4(f), a use of land occurs when: "(1) Land from a 4(f) site is permanently incorporated into a transportation facility, (2) there is a temporary occupancy of land that is adverse in terms of the Section 4(f) statute's preservational purposes (23 CFR 771.135[p][2]), or

(3) When there is a constructive use of land (23 CFR 771.125[p][2])” (FHWA, March 2005). These three types of uses of Section 4(f) properties are addressed in this section.

5.3.2.1 Permanent Incorporation of Property

A summary of the property that will be permanently incorporated by the project is provided in Table 15 and the following subsections.

Table 15: Section 4(f) Property Takings in Acres

Property	Alternative		
	1	2	5
Historic Sites			
None	0	0	0
Parks and Recreation Areas			
Triad Park*	7.1	6.5	6.0

*Denotes resources with *De Minimis* impacts.
All impacts are based on preliminary design slopestakes plus 25 feet.

Triad Park

As proposed, all alternatives require permanent incorporation of land within the boundaries of the Triad Park for right-of-way. The construction of the proposed project is consistent with Triad Park’s Master Plan, which includes a transportation corridor in the western portion of the park. Other areas of the park have been developed as funding has become available, with the expectation that the western portion of the park will be developed once the transportation corridor has been constructed.

5.3.2.2 Temporary Use of Property

A temporary occupancy of any Section 4(f) resource(s) as a result of this project is not anticipated.

5.3.2.3 Constructive Use of Property

A constructive use of any Section 4(f) resource(s) as a result of this project is not anticipated.

5.3.2.4 Summary of Use of Section 4(f) Properties

All uses of Section 4(f) properties related to the project can be categorized as permanent incorporation of property for the project’s right-of-way or easement. A summary of the Section 4(f) resources affected by the permanent incorporation of property for each alternative is provided in Table 16. The evaluation of *de minimis* impacts and measures to minimize harm described in the following sections focuses on these properties and alternatives.

Table 16: Summary of Uses of Section 4(f) Properties

Property	Alternative(s)	Type of Use
Historic Sites		
None	1, 2, 3	N/A
Parks and Recreation Areas		
Triad Park	1, 2, 3	Permanent Incorporation

5.3.3 DE MINIMIS IMPACTS

In section 6009(a) of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), Pub. L. 109-59, the existing Section 4(f) legislation was amended to simplify the processing and approval of projects that have only *de minimis* impacts on lands protected by Section 4(f). In their memorandum entitled “Guidance for Determining De Minimis Impacts to Section 4(f) Resources,” the USDOT states:

This revision provides that once the US Department of Transportation (DOT) determines that a transportation use of Section 4(f) property, after consideration of any impact avoidance, minimization, and mitigation or enhancement measures, results in a *de minimis* impact on that property, an analysis of avoidance alternatives is not required and the Section 4(f) evaluation process is complete. (FHWA, March 2005)

Additional guidance regarding definitions, applicability, coordination and documentation of an anticipated *de minimis* impact determination are included in 23 CFR 774.

5.3.3.1 Parks and Recreation Areas

According to 23 CFR 774.17 *de minimis* impacts on publicly owned parks, recreation areas, and wildlife and waterfowl refuges are defined as those that do not adversely affect the activities, features, and attributes of the Section 4(f) resource. Through coordination with the Forsyth County Parks and Recreation Department and the Guilford County Parks and Open Spaces, revisions (described in Section 5.3.4) were made to the project to minimize impacts to Triad Park. With these revisions, the Forsyth County Parks and Recreation Department and the Guilford County Parks and Open Spaces agreed by letter (dated February 9, 2010 and included in Appendix C) that the project will not adversely affect the activities, features, and attributes of Triad Park. Based on this coordination and agreement, FHWA anticipates a *de minimis* effect on the Section 4(f) resource; however, this determination is subject to comments received from the public (CFR 23 774.5(b)(2)) after the EA is circulated, and before a preferred alternative is selected.

5.3.4 MEASURES TO MINIMIZE HARM

Measures to minimize harm include design modifications that lessen the impact to Section 4(f) resources and mitigation measures that compensate for impacts. These measures are determined in coordination with the officials with jurisdiction over the resources (FHWA, March 2005).

5.3.4.1 Historic Sites

As noted in Section 5.2.1.2 no historic architectural resources listed on or eligible for inclusion on the NRHP are in the project area.

5.3.4.2 Parks and Recreation Areas

A meeting with Triad Park officials and NCDOT was held on February 11, 2009, to discuss how the proposed project will cross through the park. Conceptual designs were presented in order to obtain input from the park officials and to determine if the subject project will be consistent with the park plans. Park officials noted the transportation “corridor location indicated in the master plan is a general area, with no width specified. The park is not opposed to the new roadway, but requests higher ground for connectivity with the greenway, as well as access to a parking lot.” Initial feedback from the Triad Park officials submitted by letter (dated July 21, 2009, and

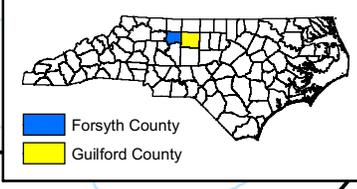
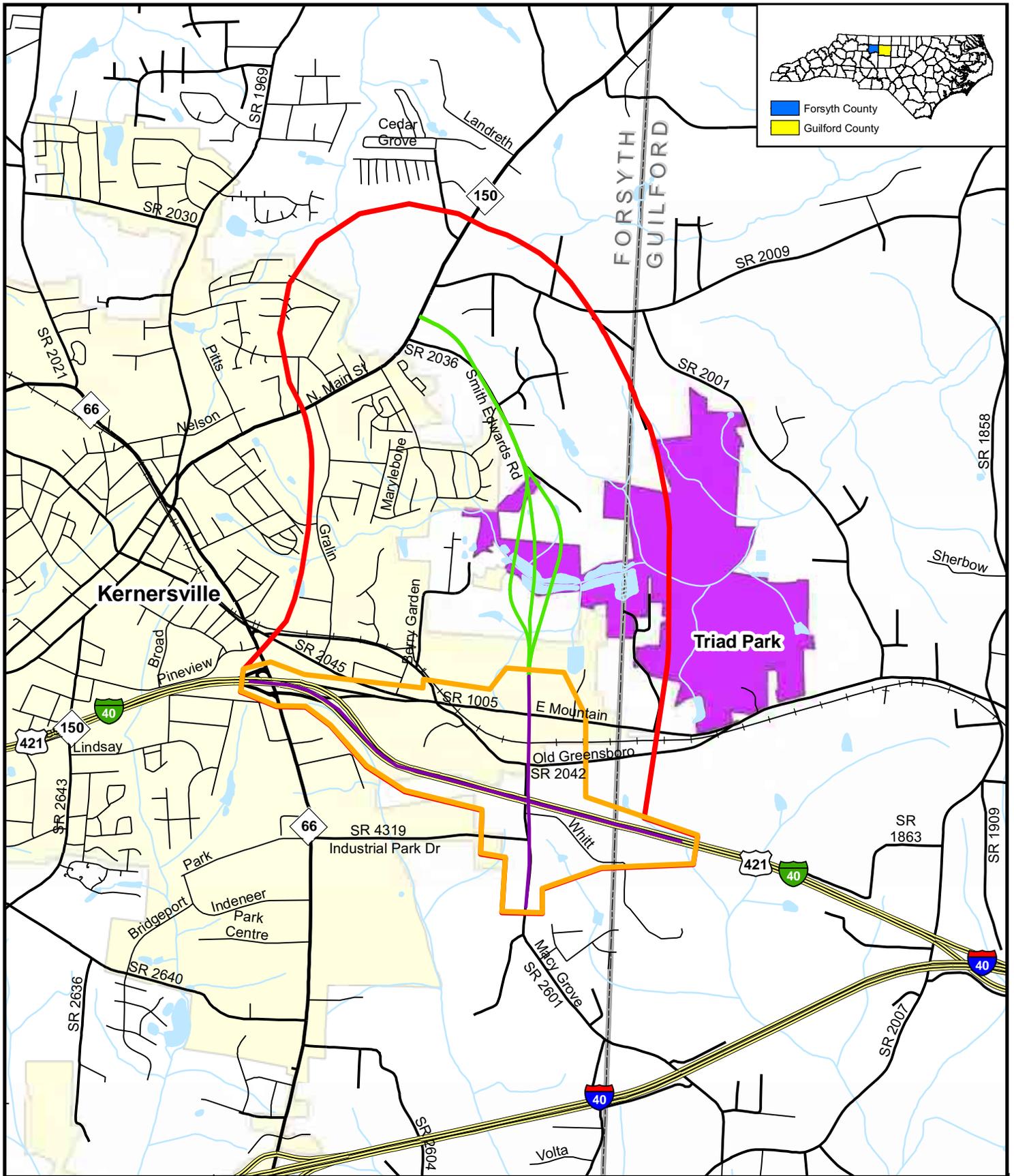
included in Appendix C) indicated that they preferred Alternative 2 with Alternative 5 being their second choice and Alternative 1 being their last choice.

A second meeting was held on October 8, 2009, with Triad Park officials and NCDOT to provide an update on the project and to discuss the kind of pedestrian crossing that could be used to accommodate the future Piedmont Greenway that will go through Triad Park. The project team considered a boardwalk; however, park officials stated that they prefer a culvert above the 100-year storm elevation because the maintenance for a boardwalk is expensive and it would be physically difficult to maintain a boardwalk with the frequent changes in water levels that occur in that area. NCDOT stated that the culvert and boardwalk options would be further investigated and would be reported to the park officials once complete. A discussion regarding the new location alternatives was also held. Park officials stated that they had already submitted formal comments to NCDOT indicating that they prefer Alternative 2, as it does not bisect the proposed mountain bike area in the park.

A third meeting was held on December 1, 2009, with NCDOT and Triad Park officials to present investigation results for four options for the future Piedmont Greenway crossing. A pedestrian culvert was the first option considered. While this option could be accommodated with the profile developed for the minimum hydraulically required bridge crossing of Reedy Fork, the culvert could cost nearly \$1 million, which NCDOT would not be able to fund as part of this project. If the park officials were adamant about using a culvert for the pedestrian culvert, it would have to be funded by Triad Park. The second option considered was to shift the bridge to the north to allow for construction of the greenway path above the 100-year floodway. This, however, could have an adverse impact during flooding conditions and could potentially affect properties upstream. The third option considered was to increase the bridge length, which would cost nearly an additional \$1 million. The fourth option was to include an elevated boardwalk system underneath the bridge. A gage station located along Reedy Fork downstream of the project (NC 68 near Oak Ridge, NC) showed no occurrences of a 100-year storm, only one occurrence of a 50-year storm, and 11 occurrences of the 10-year storm in the last 48 years. This could be a viable option, as a boardwalk would be much more economical and wouldn't increase the profile of the bridge. Triad Park officials noted that they were not aware that the cost for a pedestrian culvert would be so high and that the 100-year storm occurred so infrequently. Triad Park officials explained that a concrete pathway above the 10-year storm elevation would be adequate for the park's needs. NCDOT stated that functional designs would be prepared and provided to the park officials for further comment and input.

Functional designs of the concrete pathway for all New Location Build Alternatives were provided to Triad Park officials on January 22, 2010, for review and comment. Triad Park officials agreed the functional designs provided showed the greenway as they had desired. NCDOT stated that preliminary designs would then be prepared and provided to the park officials for further comment and input.

Preliminary designs were provided to Triad Park officials on February 9, 2010. With the revisions incorporated as identified in previous coordination, the Forsyth County Parks and Recreation Department and the Guilford County Parks and Open Spaces agreed by letter (dated February 9, 2010, and included in Appendix C) that the project would not adversely affect the activities, features, and attributes of the Triad Park.



North Carolina
Department of Transportation



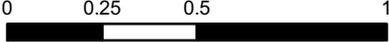
Date: May 2010

Legend

- U-2800 Alignment
- U-4734 Alignment
- U-2800 Study Area
- U-4734 Study Area
- Municipal Boundary
- Section 4(f) Properties



0 0.25 0.5 1 Miles



Macy Grove Road Improvements
Forsyth County, NC

STIP U-2800 & U-4734

Figure 21

**Section 4(f) Properties
within the Study Area**

5.4 SECTION 6(F) RESOURCES

The Land and Water Conservation Fund Act (Section 6(f)) at 16 USC 460 is a primary funding source of the U.S. Department of the Interior for outdoor recreation development and land acquisition by local governments and state agencies. This Act is meant to preserve outdoor recreation resources and is applicable to projects impacting recreational lands purchased or improved with land and water conservation funds (FHWA, 1998).

No such lands are impacted by the project; therefore, a Section 6(f) evaluation is not necessary.

5.5 FARMLAND

The Farmland Protection Policy Act (FPPA) of 1981 (7 CFR 568), implemented by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), requires all federal agencies to consider the impact of land acquisition and construction activities on prime and important farmland soils in an effort to “minimize the extent to which federal programs contribute to the unnecessary conversion of farmland to non-agricultural uses” (Public Law 97-98, Section 1539-1549, 7 USC 4201, et seq). FA Farmland Conversion Impact Rating Form (Form AD-1006) is used to evaluate the potential impact of land acquisition and construction activities on farmland. Soil quality, as well as other factors that may affect the farm’s viability, are rated on the form. The FPPA states that sites receiving a total of less than 160 points on the AD-1006 form should be given a minimal level of consideration for protection (7 CFR 658.4).

In accordance with the FPPA, the impact of the project on farmland was assessed. Form AD-1006 was completed for impacts within Forsyth and Guilford counties and is included in Appendix D. The results show that within Guilford County, the proposed project has no impact on Prime and Unique Farmland and impacts 5.3 acres of Statewide and Local Important Farmland. Sixty-eight points were given to the portion of the project within Guilford County. Within Forsyth County, the form was used to evaluate each of the three alternatives (1, 2, and 5 referred to on the form as A, B and C, which also included U-2800). All three alternatives are fairly consistent in the potential impacts to Prime and Unique Farmland and Statewide and Local Importance Farmland. Alternative 1 with U-2800 would impact 95.4 acres of Prime and Unique Farmland and 22.0 acres of Statewide and Local Important Farmland. Alternative 2 with U-2800 would impact 96.1 acres of Prime and Unique Farmland and 21.8 acres of Statewide and Local Important Farmland. Alternative 5 with U-2800 would impact 94.3 acres of Prime and Unique Farmland and 20.7 acres of Statewide and Local Important Farmland. The three alternatives received scores of 133, 132, and 131, respectively; therefore, the project as a whole (encompassing Forsyth and Guilford Counties) received a score of 201 for Alternative 1, 200 for Alternative 2, and 199 for Alternative 5.

The scores for the project fall below the threshold of 160 maximum points necessary for further consideration of farmland impacts. Therefore, this project is in compliance with the FPPA.

5.5.1 VOLUNTARY AGRICULTURAL DISTRICTS AND ENHANCED VOLUNTARY AGRICULTURAL DISTRICTS

A Voluntary Agricultural District (VAD) is located just north of the Triad Park property near the intersection of Crosscreek Road and County Line Road (Figure 2). Lands under VAD protection have a conservation agreement between the landowner and the county or local municipality that prohibits nonfarm use or development for a period of at least 10 years. This agreement may be

revoked by the landowner at any time with a 30-day notice. When the agreement is nullified, the property no longer qualifies for the VAD program and its benefits.

Enhanced Voluntary Agricultural Districts (EVAD) have the same conservation agreement requirements as VADs, but the agreement cannot be revoked during the term of the agreement except for the creation of three lots that meet applicable county land use regulations. The EVAD conservation agreement automatically renews for three more years at the end of its initial term of 10 years, unless the landowner provides to the county (usually a 30-day notice). When the agreement is ended, the property no longer qualifies for the EVAD program and its benefits. There are no EVADS within the project study area or vicinity.

The proposed project will not affect any VADs or EVADs.

5.6 SOCIAL EFFECTS

5.6.1 NEIGHBORHOODS/COMMUNITIES

The predominant land use within the DCIA is commercial/light industrial, not residential. In the areas that are residential, some indicators of community cohesion were noted during project site visits. Most notably, several neighborhoods exist in the northern section of the project, on and around Smith Edwards Road. These neighborhoods are connected to each other through a network of residential streets and Smith Edwards Road. It is currently a quiet rural area with signs of neighbor interaction and cohesion. Nearby are two churches and a family life center, at which many people were seen to congregate; a sports complex (used for Kernersville Little League, among other things); and some lower-end retail. The general store at the intersection of NC 150 and County Line road may also provide an area where local residents congregate.

Neighborhoods in the southern section of the study area, south of Industrial Park Drive, are older, mixed-density, and relatively quiet. Fewer signs of community cohesion and interaction were observed in this area.

In the northern portion of the project, residences located along Smith Edwards Road will be impacted by the proposed extension of Macy Grove Road. A four-lane major thoroughfare with much higher traffic volumes than currently exists will change the character of this relatively quiet residential area. Increased automobile access to and from Smith Edwards Road and nearby neighborhoods will alter travel patterns for residents. The changed rural character may cause some residents to choose to relocate, which will impact the neighborhood structure and existing cohesion. Crossing of the roadway by bicycle or by foot will change from unregulated crossings to designated crossing areas. The addition of sidewalks will improve pedestrian mobility, which in turn will provide more opportunities for community interaction and cohesiveness.

In the southern portion, expansion of Macy Grove Road from a two to four-lane road will have less direct impact, as most residences are south of the proposed road expansion area; however, the increase in traffic volumes on Macy Grove Road resulting from the proposed project is likely to change the character of this relatively quiet residential area. In addition, the increased access to I-40 Business will alter travel patterns for residents; however, the planned hospital/medical center will bring change to this area regardless of the proposed project.

Little disruption to community/neighborhood stability will result in the middle area of the DCIA around I-40 Business. Much of this area is light industrial business or planned for commercial/retail. The small residential enclaves that do exist will be preserved (they are

included in Guilford County's *Airport Area Plan* [Guilford County, 2006] as mixed density residential), but would continue to be surrounded by business/light industrial land use.

5.6.2 RELOCATION OF RESIDENCES AND BUSINESSES

Several businesses will be directly impacted by the proposed project (displacement or partial property takes). Any businesses displaced will see a short-term loss in sales revenue while they are being relocated. If their new location is less accessible or desirable to customers, this may also affect their sales.

Businesses on Old Greensboro Road could be impacted due to the loss of direct access to Old Greensboro Road from Macy Grove Road; however, they would retain access via East Mountain Street, which is the primary route of access. In addition, the loss of direct access is likely to be compensated for by an increase in overall regular access through the interchange with I-40 Business and improved north-south connectivity with the extension of Macy Grove Road.

The relocation reports for the proposed project are included in Appendix E.

5.6.2.1 U-2800

Acquisition of property due to right-of-way encroachment will be required to expand the existing Macy Grove Road from two to four lanes. Six business, two non-profit organizations, and ten residential relocations are anticipated.

5.6.2.2 U-4734

Acquisition of property due to right-of-way encroachment will be required for the extension of Macy Grove Road on new location from north of East Mountain Street to Smith Edwards Road, and from Smith Edwards Road to NC 150. One business and six residential relocations are anticipated for Alternative 1. One business and four residential relocations are anticipated for Alternative 2. One business and five residential relocations are anticipated for Alternative 5.

5.6.3 ENVIRONMENTAL JUSTICE

Title VI of the Civil Rights Act of 1964 protects individuals from discrimination on the grounds of race, age, color, religion, disability, sex, and national origin. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," states that each federal agency must make achieving environmental justice a part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations. Special populations may include the elderly, children, the disabled, low-income areas, American Indians, and other minority groups.

As discussed in Section 2.6.4, a Hispanic and Latino community exists in a neighborhood just north of Graves Street. The proposed project will not adversely affect this neighborhood. No other concentrations or communities of minority or low-income residents exist within the DSA; therefore, disproportionate adverse impacts to these protected populations are unlikely.

5.6.4 BICYCLE AND PEDESTRIAN FACILITIES

Limited pedestrian activity was observed during field visits. Most activity was observed in residential areas, with one sighting along NC 150 at the intersection of Donnell Street. No worn pedestrian paths or bicyclists were observed in the area.

There are presently no greenways, pedestrian facilities, or bicycle accommodations along the existing Macy Grove Road. The Winston-Salem and Forsyth County Urban Area *Thoroughfare Plan and Technical Report* (2002) requires bicycle and pedestrian facilities be provided on all major and minor thoroughfares, and the town's *Pedestrian and Bicycle Plan* (2007) states that there should be "sidewalks along all new construction for the loop or connector roads shown on the transportation plan." Also, according to the *Winston-Salem Urban Area Comprehensive Bicycle Plan* (2005), "a shared-use path should be provided along with the freeway loop that is proposed to go on the north side of Kernersville." The Piedmont Greenway is a proposed project identified in the *Winston-Salem Forsyth County Greenway Plan* (2003) and the *Parks and Open Space Plan* (2006). This facility will connect Salem Lake to Triad Park, thus crossing the planned location of the Macy Grove Road extension that crosses Triad Park.

Typical Sections for all Build Alternatives will include a 14-foot wide outside travel lane to accommodate bicycle traffic and a 10-foot wide berm to accommodate future sidewalks on both sides of the proposed Macy Grove Road, which will improve access to Triad Park and the greenway. Upon construction of the proposed project, Triad Park also plans to construct a parking lot in this area to access the park and the greenway.

5.6.5 RECREATIONAL FACILITIES

As described previously, the proposed project will cross a portion of Triad Park, a regional park jointly owned by Guilford and Forsyth Counties (a Section 4(f) resource). The park was established after the Kernersville Loop Road was proposed in the Town's *Thoroughfare Plan*; therefore, park planning has incorporated the proposed loop road by including a transportation corridor in the park master plan. Adverse impacts to the park and/or its use will not result from the proposed project. Coordination with FHWA has resulted in a proposed *de minimis* Section 4(f) call for the park. Park officials have requested driveway access for the park and consideration for the future Piedmont Greenway. Through coordination with Triad Park and NCDOT, the crossing of the future greenway will be accommodated under the proposed bridge over Reedy Fork, as shown in the preliminary designs, which include construction of a concrete pathway immediately adjacent to the proposed bridge sloping abutments.

The Piedmont Greenway is also considered a recreational facility, as described in Section 5.6.4. In general, all of the Build Alternatives will improve access to Triad Park and the Piedmont Greenway by creating a new access point to the western portion of the park.

5.6.6 OTHER PUBLIC FACILITIES AND SERVICES

PART provides regional bus service in the Triad, connecting the city bus systems of Greensboro, High Point, and Winston-Salem. One fixed bus route, the Winston-Salem Express, begins in downtown Winston-Salem and makes one stop in Kernersville at South Main Street approximately 3 miles west of the Macy Grove Road and Old Greensboro Road intersection. A shuttle operated by PART, the Kernersville/Dell Connector, travels along South Main Street in Kernersville and makes stops at various shopping centers and businesses, such as Wal-Mart. The shuttle ends at the Alliance Science and Technology Park, and runs every 30 minutes from 6:15 am to 6:30 pm.

PART is planning a six-county regional transportation system that will include commuter and inter-city rail, as well as BRT routes. The six counties served by PART include Alamance, Rockingham, Guilford, Randolph, Davidson, and Forsyth. The US 70/I-40 Business Corridor has been identified as a future transit corridor between Greensboro, Kernersville, and Winston-Salem. The proposed Kernersville Loop Road system will intersect with the future transit corridor, providing an opportunity for a BRT stop within the project study area; increasing traffic capacity, connectivity, and access to the area and supporting alternative transportation modes. The projected land use changes in the project area (e.g., employment and medical centers) will make it a transit-destination.

5.7 ECONOMIC EFFECTS

Kernersville is uniquely positioned for economic development with its central location in the Triad within the Piedmont Triad International Airport growth area and the NS rail corridor. Kernersville's *Land Use Plan* (2004) recommends an employment center that supports industrial, office, and commercial growth in this area. The *Kernersville Development Plan* (2005) states that the interchange at I-40 Business/Macy Grove Road will permit such businesses, which need highway exposure, to develop and prosper.

In keeping with these plans, large areas of nonresidential development (currently zoned industrial and commercial) are proposed around the interchange of Macy Grove Road and I-40 Business. Northeast of the interchange is the planned Triad Business Park (570 acres); north of the interchange is a potential nonresidential area (225 acres); southwest of the interchange is a potential industrial park (234 acres); south of the interchange is the planned Kernersville Medical Park, which includes a new hospital (189 acres); and southeast of the interchange is a potential commercial/retail area (550 acres).

The proposed project will support the future industrial/commercial development areas described above through increased efficiency of transporting goods and increased access to I-40 Business. According to town planners, the planned development areas, such as the Triad Business Park and Kernersville Medical Park, will proceed regardless of the proposed project and are currently under construction. The potential development areas, including the industrial park and commercial/retail area, are still under consideration.

In addition, the project will provide improved access from Kernersville to the Piedmont Triad International Airport located about 10 miles east of the project. The Development Plan states that the industrial and office development around the Macy Grove Road interchange can be directly linked to airport-related growth. Many trucks travel to the Kernersville industrial areas daily from the airport.

5.8 LAND USE

Much industrial and office development currently exists in the central portion of the project study area, along East Mountain Street, Old Greensboro Road, and Industrial Park Drive. The industrial/office development surrounds the few residential enclaves that exist in these areas.

All of the Build Alternatives will improve mobility and access within the area by increasing traffic capacity, increasing connectivity, improving access to community facilities such as fire and rescue, and supporting alternative transportation modes. Transportation improvements include wider outside travel lanes for bicycle traffic and accommodations for future pedestrian routes and will serve both existing and new developments, including Triad Park. Adverse impacts to land use and development within the study area are not expected.

As the area continues to grow, it is expected that the remaining vacant lots will be built out to the maximum use as zoned by the city and county and, likewise, underdeveloped lots will be redeveloped to achieve the greatest value for the property.

5.8.1 KERNERSVILLE

Kernersville uses both special use district zoning and zoning overlay districts as implementation tools for its *Land Use Plan* (2004) (Figure 22). These zoning districts and overlays are also discussed in *Kernersville's Development Plan* (2005), and are coordinated under the Town's Unified Development Ordinance (UDO) (2010). Special use district zoning allows a developer to present a limited list of uses and a specific site layout that complies with community plans and goals. The Zoning Overlay District standards apply to sites within the district and require a minimum design standard for buildings, landscaping, sidewalks, parking, and signage. Zoning overlay districts accommodate industrial and business parks, such as those planned and proposed within the Future Land Use Study Area (FLUSA) (Figure 23), which is the area surrounding a construction project that could possibly be indirectly affected by the actions of others as a result of the completion of the project and combined projects. These industrial and business parks include the Corporate Park Office, Corporate Park Industrial, General Industrial, Limited Industrial, and Campus. Each of these parks has an associated set of development regulations associated with it.

Kernersville adopted the *NC 66/Old Salem Road Area Metro Activity Center Guidelines* (Town of Kernersville, 2001) to guide development along NC 66 in the western portion of the FLUSA. These guidelines provide specific development standards for all commercial, residential, and office development within ¼-mile around the metro activity center.

The Town's UDO includes an environmental ordinance that addresses watershed protection, storm water runoff, and floodways. The Watershed Protection Ordinance, adopted in 1993, applies to all designated water supply watersheds in the town. It includes a 100-foot riparian buffer for high density development, a 30-foot riparian buffer for low density development, and other development and land use regulations. The West Fork Deep River has been designated a "Critical Area" by the state. The Randleman Lake Watershed Protection Rules and Jordan Lake Buffer Rules provide a set of more stringent development and permitting rules for the watersheds within the FLUSA. The Floodway Ordinance includes standards for development in the floodway or floodway fringe. The Storm water Ordinance includes standards for managing storm water from construction and post-construction sites, and is designed to comply with the Town's National Pollutant Discharge Elimination System (NPDES) permit.

5.8.2 FORSYTH COUNTY

The Winston-Salem/Forsyth County UDO applies to areas within Forsyth County and outside the town limits. This UDO includes a Zoning Ordinance, an Environmental Ordinance, and a Subdivision Ordinance/Regulations. The Environmental Ordinance is similar to that of the Town of Kernersville, with articles on Floodways/Floodway Fringes, Watershed Protection (similar riparian buffer distances), and Erosion Control.

The Legacy Comprehensive Plan is Forsyth County's comprehensive plan adopted in 2000. Within this plan is a *Growth Management Plan* designed to guide and manage growth within the county. The Growth Management Plan classifies land area in the county as City/Town Center, Urban Neighborhood, Suburban Neighborhood, Future Growth Area, and Rural Area. It also identifies the limits of municipal services (water and sewer). The proposed project borders

between the Suburban Neighborhood and Future Growth Area limit identified in the *Growth Management Plan*.

5.8.3 GUILFORD COUNTY

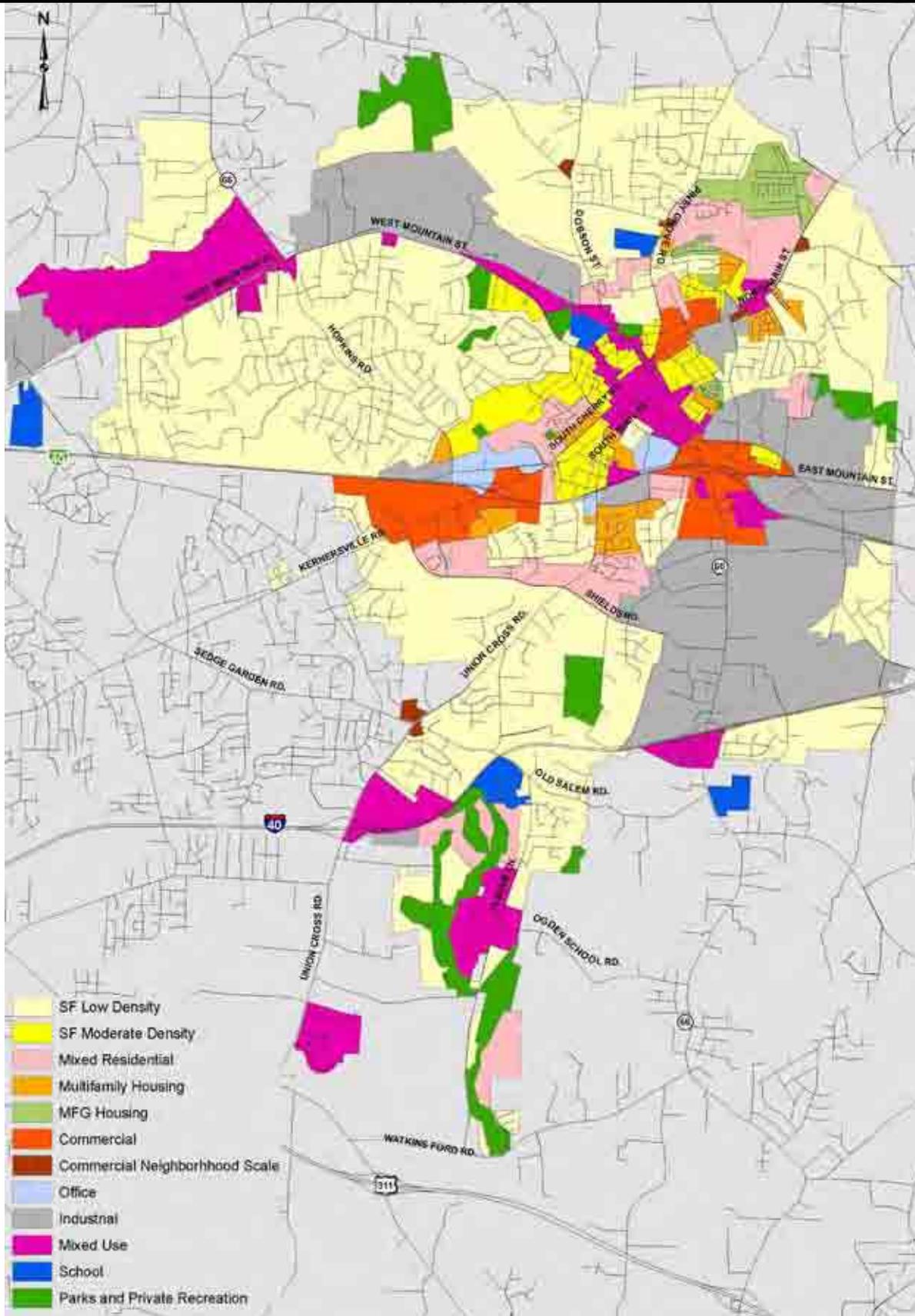
The Guilford County Development Ordinance applies to areas within Guilford County and outside the town limits. This ordinance includes a zoning map, development standards, and environmental regulations. The environmental regulations are similar to the Environmental Ordinances of the Town of Kernersville and Forsyth County, with sections on storm water management/watershed protection, illicit and illegal discharges, soil erosion and sedimentation control, and flood damage prevention.

Guilford County updated and adopted their Comprehensive Plan in 2006 (Guilford County, 2006). Within this plan are several area plans, including the *Airport Area Plan* (including a Future Land Use Map) for areas around Piedmont Triad Airport. Some parts of the project study area are within the area of the *Airport Area Plan*. The plan has identified areas southeast of the proposed Macy Grove/I-40 Business interchange as nonresidential, which is consistent with Forsyth County's plan to make it commercial/retail.

5.8.4 FUTURE LAND USE

The major planned business/industrial activities in the FLUSA include the Triad Business Park on East Mountain Street and Kernersville Medical Park on Macy Grove Road. In addition, large areas of potential nonresidential development (currently zoned industrial and commercial) have been identified around the future interchange of Macy Grove Road and East Mountain Street, and north of the intersection of Smith Edwards Road and NC 150. South of the interchange are several areas of potential industrial and commercial/retail development.

When considered in conjunction with the future widening of East Mountain Street/Old US 421 (U-3617), the proposed project could notably improve accessibility to potentially developable land in the study area.



North Carolina
Department of Transportation



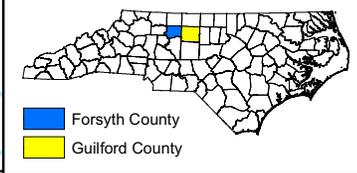
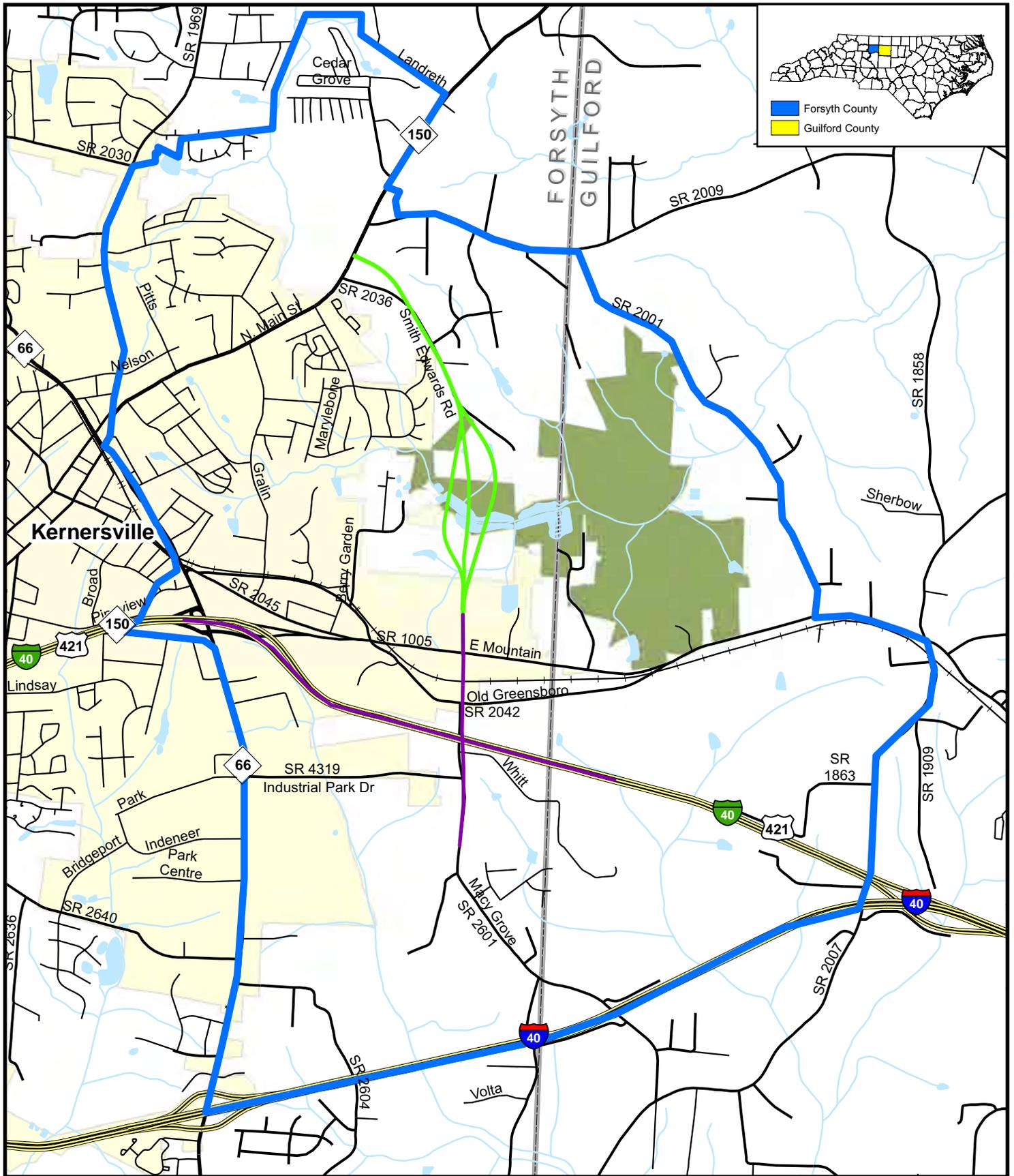
Date: May 2010

Macy Grove Road Improvements
Forsyth County, NC

STIP U-2800 & U-4734

Figure 22

Kernersville Future
Land Use Plan



North Carolina
Department of Transportation



Date: May 2010

Legend

- Future Land Use Study Area (FLUSA)
- U-2800 Alignment
- U-4734 Alignment
- Municipal Boundary
- Triad Park



0 0.25 0.5 1 Miles



Macy Grove Road Improvements
Forsyth County, NC

STIP U-2800 & U-4734

Figure 23

Future Land Use
Study Area (FLUSA)

5.8.5 PROJECT COMPATIBILITY WITH LOCAL PLANS

The Town of Kernersville's *Land Use Plan*, adopted in 2004, promotes orderly development and achievement of community goals. The plan recognizes the need for higher-density development to meet the needs of both community job growth and housing demands. In terms of transportation, the plan includes the proposed Kernersville Loop Road System, which consists of the proposed action for Macy Grove Road and several other future sections. The Loop is planned to connect the major north-south and east-west transportation routes through Kernersville, including North and South Main Street, East and West Mountain Street, Piney Grove/Union Cross Roads, and NC 66. The Loop is also designated as a "Major Proposed Connection" in the Thoroughfare and Street Plan section of the *Kernersville Development Plan* (2005).

One of the objectives underlying the streets and highways in the Winston-Salem urban area is to create a first-class network that meets short- and long-term traffic demands. The proposed project works toward this goal. The U-2800 section of the project is identified in Winston-Salem's *2030 Long Range Transportation Plan* (2005) as one of the most notable projects to be completed or partially completed by 2014.

The watershed and storm water protection rules included in the above-discussed ordinances will help moderate environmental impacts of the proposed project. In addition, the zoning overlay districts and special use districts only allow development that has been planned for by the town, as provided by the zoning.

The Macy Grove Road Improvements project is compatible with transportation and land use planning in the region.

5.9 INDIRECT AND CUMULATIVE EFFECTS

5.9.1 INDIRECT ASSESSMENT

The widening and extension of Macy Grove Road and the addition of the interchange with I-40 Business will improve travel time in the area. Industrial and residential in-filling is expected to continue in the area with or without the proposed project; however, increased development pressure and an increased growth rate will occur if the proposed project is constructed and access is improved to current and future industrial areas.

Construction of the proposed project will increase development pressure around the new interchange area, namely in the industrial sector. Industrial development is planned in the southern portion of the FLUSA and may sprawl more rapidly with construction of the proposed project as a result of improved access.

The Jordan Lake and Randleman Lake Watershed Buffer Rules regulate destruction of forested buffers throughout most of the FLUSA (Figure 23). Both sets of rules require that a 50-foot vegetated buffer be protected and maintained on both sides of intermittent and perennial streams, lakes, ponds, and estuarine waters. In addition, streams within the FLUSA are located within protected water-supply watershed areas.

Indirect effects in the form of change in land use as a result of the proposed project and the construction of the new interchange may occur in the form of increased commercial and industrial development and redevelopment. Impacts to storm water runoff and downstream

water quality are not expected from this change in development patterns due to local regulations and policies. The Jordan Lake and Randleman Lake Watershed Buffer Rules regulate destruction of forested buffers throughout most of the FLUSA (Figure 23). Both sets of rules require that a 50-foot vegetated buffer be protected and maintained on both sides of intermittent and perennial streams, lakes, ponds, and estuarine waters. In addition, streams within the FLUSA are located within protected water-supply watershed areas.

The proposed project alone will not have substantial indirect impacts.

5.9.2 CUMULATIVE ASSESSMENT

When considered with past projects only, the proposed project will not have substantial cumulative impacts; however, if the other reasonably foreseeable future projects are considered, specifically the other sections of the Kernersville Loop Road, there is a possibility for increased traffic, commercial, and industrial development, as well as associated sprawl in areas outside of the FLUSA.

5.9.3 CUMULATIVE EFFECTS STATEMENT

Cumulative effects are environmental impacts resulting from the incremental effects of an activity when added to other past, present, and reasonably foreseeable future activities regardless of what entities undertake such action. These effects can result from individually minor but collectively significant activities taking place over time and over a broad geographical scale, and can include both direct and indirect impacts (40 CFR 1508.7).

The development pressures being experienced within the proposed project's FLUSA, when considered cumulatively with other notable current and future actions such as Industrial Park Drive, NC 66, NC 150, I-40 Business, and East Mountain Street, indicate a trend of intensified nonresidential development. This development initiates from the municipal limits of Kernersville along various transportation nodes toward interchanges and intersections and employment hubs. Development of the Triad Business Park and the Kernersville Medical Center indicate economic pressure is being experienced along and adjacent to Macy Grove Road now and into the foreseeable future. In addition to the availability of developable land, an important generator of probable cumulative effects in the FLUSA is its proximity to the Piedmont Triad International Airport and the NS rail corridor. Construction of the Macy Grove project, when considered cumulatively with other transportation improvements projects, will collectively reduce travel times and traffic congestion in the vicinity of Kernersville.

When considered with other notable actions, current and future actions, including prominent nonresidential development and infrastructure improvements within the FLUSA, have the potential to cumulatively alter or fragment natural habitats and wildlife regime. These effects would be especially evident within Triad Park. The potential for the degradation of water quality also exists through erosion and stream sedimentation in the absence of storm water management regulations requiring BMPs. Yet any direct natural environmental impacts by other NCDOT projects will be addressed by avoidance, minimization, or mitigation consistent with programmatic agreements with the natural resource agencies during the Merger and Permitting processes.

This project, in conjunction with other projects in the LRTP and STIP, has the potential to cumulatively affect land use and transportation nodes within and near the FLUSA, increase development pressure, change travel patterns, and change views in the travelshed. Specifically, the proposed project, when considered in conjunction with the future widening of SR 2045 (East

Mountain Street/Old US 421 [U-3617], could notably improve accessibility to potentially developable land in the northern and middle portions of the FLUSA. Kernersville is currently looking at potential build sites for industrial commercial and retail sites that typically depend heavily on available transportation infrastructure. Improvements such as the proposed project and U-3617 could influence the location decisions for such sites. The proposed project, when considered in conjunction with the I-73/I-74 Connector (I-4924), may further contribute to changes in travel patterns, increased noise levels, and view changes in the northern part of the FLUSA. It is also reasonable and foreseeable that the project will encourage development of other sections of the Kernersville Loop Road around Kernersville. It is also expected that the loop will facilitate industrial expansion, associated employment opportunities, and increased distribution of goods and services throughout the FLUSA and in the Town of Kernersville. Potential indirect effects related to induced development of the Kernersville Loop Road include impacts to historic properties, wetlands, threatened and endangered species, noise, and degradation to water quality due to increased impervious surfaces.

As indirect and direct impacts associated with this project are avoided or mitigated according to the NEPA process, the potential for adverse cumulative impacts to the human environment, such as increased noise levels, view changes, and impacts to historic resources is eliminated or lessened to levels not considered to be significant. Potential for adverse cumulative impacts to the natural environment, such as impacts to streams, wetlands, floodplains, threatened and endangered species, and degradation to water quality is eliminated or lessened as well. Within the region, there are stringent buffer rules and watershed requirements in place for the purpose of protecting water quality, and indirect and direct impacts associated with this project will be avoided or mitigated according to the NEPA process and during permitting.

5.10 FLOOD HAZARD ELEVATION

This section contains information corresponding to the analysis of impacts to floodplains and floodways in the project study area. Executive Order 11988, Floodplain Management (42 CFR 26951) requires the following:

- All federal actions must avoid the occupancy and modifications of floodplains and avoid direct or indirect support of floodplain development wherever that is a practicable alternative.
- If an action must be located on the base floodplain, the agency shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains.
- Each agency shall also provide opportunity for early public review of any plans or proposals for actions in floodplains.

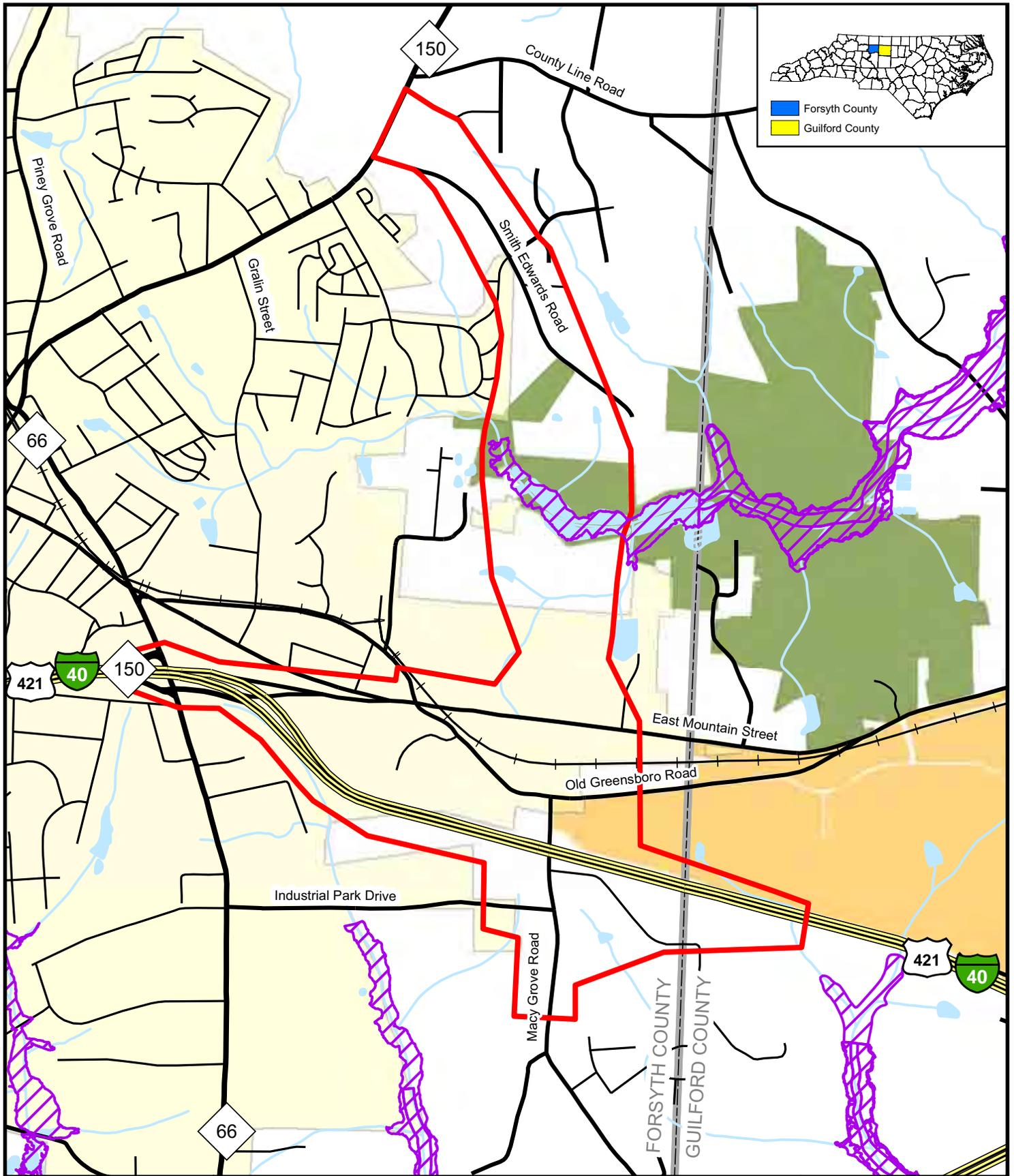
The proposed project involves the extension of Macy Grove Road on new location from Old Greensboro Road to NC 150. This extension will carry Macy Grove Road over Reedy Fork, as well as over a tributary to Reedy Fork. There are no feasible avoidance alternatives for crossing Reedy Fork and the tributary. The proposed structure over Reedy Fork is a bridge approximately 180 feet in length. Hydraulically, a triple 11-foot wide by 8-foot high box culvert would accommodate the Reedy Fork crossing, but it is not recommended due to the wetland impacts associated with construction of a box culvert. The proposed structure over the tributary of Reedy Fork is a 10-foot wide by 6-foot high box culvert.

The proposed alignment has the roadway crossing over the channels nearly perpendicularly, which minimizes the bridge and culvert lengths and stream impacts. Upstream and downstream realignment will increase the bridge and culvert skew. Upstream realignment will also add an additional channel crossing over a branch of the tributary to Reedy Fork. Downstream realignment could possibly add an additional channel crossing over a tributary to Reedy Fork. The length of the proposed bridge and the recommended roadway elevation may be adjusted (increased or decreased) to accommodate design floods as determined in the final hydrologic study and hydraulic design.

The northern new location portion of the project (STIP U-4734) is primarily in the Jordan Lake Watershed, which is a subbasin of the Cape Fear River basin. The Jordan Lake Nutrient Management Strategy became effective on August 11, 2009. This is a comprehensive set of rules and Session Law that apply to the Jordan Lake Watershed that cover storm water management and riparian buffer rules, among others. The riparian buffer rules establish a buffer with two zones having different requirements, as discussed in Section 5.9.1.

Forsyth County and the Town of Kernersville are participants in the National Flood Insurance Program, administered by the Federal Emergency Management Agency (FEMA). Based on the most current information available from the NC Floodplain Mapping Program (FMP), this stream crossing is in a designated flood hazard zone (Figure 24), which is within a limited detailed flood study reach, having a regulated 100-year nonencroachment width regulated as a floodway. NCDOT will coordinate with the FMP, the delegated state agency for administering FEMA's National Flood Insurance Program, to determine the status of the project with regard to applicability of NCDOT's Memorandum of Agreement with FMP, or approval of a Conditional Letter of Map Revision (CLOMR) and subsequent final Letter of Map Revision (LOMR).

This project involves construction activities on or adjacent to a FEMA-regulated stream. Therefore, NCDOT's Division 9 office shall submit sealed as-built construction plans to NCDOT's Hydraulics Unit upon completion of project construction, certifying that the drainage structures and roadway embankment that are located within the 100-year floodplain were built as shown in the construction plans, both horizontally and vertically.



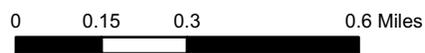
North Carolina
Department of Transportation



Date: May 2010

Legend

- NRTR Study Area
- FEMA Flood Zone
- Non-Delineated Streams
- Open Water
- County Boundary
- Municipal Boundary
- Triad Park
- Triad Business Park
- Interstate
- US Route
- NC Route
- Local Road
- Railroad



Macy Grove Road Improvements
Forsyth County, NC

STIP U-2800 & U-4734

Figure 24

Floodplains

5.11 NOISE

To determine the noise impacts of the project, an analysis was conducted in accordance with the provisions in 23 CFR 772. Detailed results of the noise analysis are presented in the *Noise Technical Memorandum* (December 2009). A copy of the unabridged version of the technical report can be viewed in Room 462 of the Transportation Building at 1 South Wilmington Street in Raleigh.

As part of this evaluation, the existing noise levels were measured in the vicinity of the proposed project. The maximum design year (2030) peak hour equivalent sound level (Leq) traffic noise levels expected by receptors in the vicinity of the project were predicted. The FHWA Traffic Noise Model 2.5 (TNM) was used to compute the future design year noise levels in this study. Traffic noise impacts were determined from the current procedures for the abatement of traffic noise and construction noise, defined in 23 CFR 772. Traffic noise impacts were determined based on the procedures set forth in the NCDOT Traffic Noise Abatement Policy. Where traffic noise impacts were predicted, the analysis included an examination and evaluation of alternative noise abatement measurements for reducing or eliminating the noise impacts.

5.11.1 NOISE ABATEMENT CRITERIA

To determine if roadway noise levels are compatible with various land uses, the FHWA developed noise abatement criteria and procedures to be used in the planning and design of roadways. These abatement criteria and procedures are in accordance with 23 CFR 772, USDOT, FHWA, and Procedures for Abatement of Highway Traffic Noise and Construction Noise. A summary of the FHWA Noise Abatement Criteria for various land uses is presented in Table 17. Sound pressure levels in this report are referred to as Leq(h). The hourly Leq, or equivalent sound level, is the level of constant sound that over a one-hour time interval would contain the same acoustic energy as the time-varying sound. In other words, the fluctuating sound levels of traffic noise are represented in terms of a steady noise level with the same energy content.

Noise mitigation measures must be considered when future noise levels either approach or exceed the criteria levels, or if there are substantial increases over the ambient noise levels. The NCDOT Traffic Noise Abatement Policy uses an "approach value" of 1 dBA less than those shown in Table 17. In addition, the value used for "substantial increase" is shown in Table 18 and is based on the existing noise level. 23 CFR 772.11(a) states, "In determining and abating traffic noise impacts, primary consideration is to be given to exterior areas. Abatement will usually be necessary only where frequent human use occurs and a lowered noise level would be of benefit." For this project, the majority of the identified receptors were residential. Commercial receptors are located sparsely along the corridor.

Table 17: FHWA Noise Abatement Criteria

Criteria For Each FHWA Activity Category Hourly A-Weighted Sound Level - Decibels (dBA)		
Activity		
Category	Leq(h)	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities are essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: 23 CFR 772, USDOT, FHWA.

Table 18: Criteria for Substantial Noise Increase, Hourly A-Weighted Sound Level

Existing Noise Level in Leq(h)	Increase in dBA from Existing Noise Level to Future Noise Levels
< 50	≥ 15
51	≥ 14
52	≥ 13
53	≥ 12
54	≥ 11
55	≥ 10

Source: NCDOT Noise Abatement Policy.

5.11.2 AMBIENT NOISE LEVELS

Ambient noise measurements were taken in the vicinity of the project to determine ambient (existing) noise levels for the identified land uses. The purpose of this noise level information is to quantify the existing acoustic environment and to provide a base for assessing the impact of noise level increases. Ambient noise levels were measured at three representative locations in the project vicinity. Measurement locations are shown on Figure 25 and the results are summarized in Table 19. Five noise measurements (TN-1 through TN-5) were used to calibrate the noise model, while the other three measurements (AN-1 through AN-3) were taken to determine the base ambient noise level in the vicinity of the project absent any nearby traffic noise. The base ambient noise level used for the analysis is 58.1 dBA.

Table 19: Ambient Noise Levels (Leq)

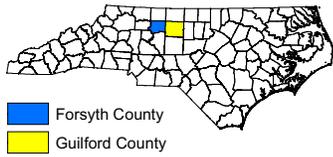
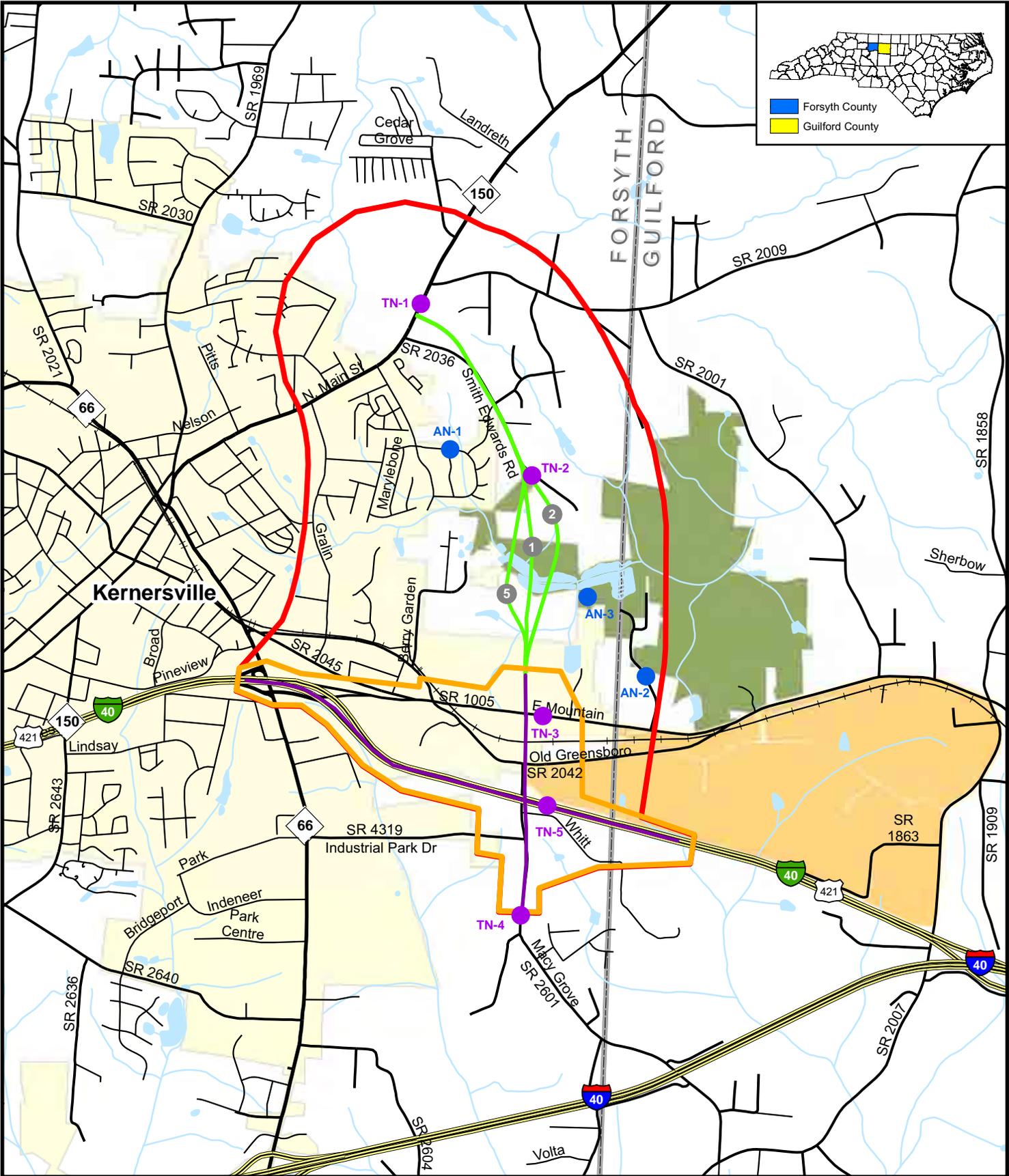
Site*	Location	Noise Level (dBA) Measured	Noise Level (dBA) Calculated
Ambient Noise Levels for Model Calibration			
TN-1	1033 N. Main St.	67.7	68.3
TN-2	Just East of 410 Smith Edwards Road	56.8	54.6
TN-3	1202 E. Mountain St.	63.1	66.2
TN-4	Macy Grove Road	57.2	59.9
TN-5	I-40 Business (near mile marker 17) in Kenersville, NC	75.4	76.4
Ambient Noise Levels to Determine Base Ambient Noise Levels			
AN-1	Corner of Kensel Green Dr. and Running Springs Ln.	58.3	N/A
AN-2	Across from 119 Pratt Rd.	58.3	N/A
AN-3	Triad Park	57.6	N/A

The existing roadway and traffic conditions were used with the most current traffic noise prediction model to calculate existing noise levels for comparison with noise levels actually measured. The calculated existing traffic noise levels were predicted to be within 3 dBA of the measured traffic noise levels for the locations where traffic noise measurement were obtained. Hence, the computer model is a reliable tool in the prediction of noise levels. Differences in dBA levels can be attributed to "bunching" of vehicles, low traffic volumes, and actual vehicle speeds versus the computer's "evenly spaced" vehicles and single vehicular speed.

5.11.3 FUTURE TRAFFIC NOISE LEVELS

In general, the traffic situation is composed of a large number of variables that describe different cars driving at different speeds through a continuously changing roadway configuration and surrounding terrain. Due to the complexity of the problem, certain assumptions and simplifications must be made to predict roadway traffic noise. The TNM traffic noise prediction model uses the number and type of vehicles on the planned roadway, their speeds, the physical characteristics of the road (curves, hills, depressed, elevated, etc.), receptor location and height, and, if applicable, barrier type, barrier ground elevation, and barrier top elevation.

The noise predictions made in this report are roadway-related noise predictions for the traffic conditions during the year being analyzed. Peak hour design and LOS C volumes were compared, and the volumes resulting in the noisiest conditions were used with the proposed posted speed limits. During all other time periods, the noise levels will be no greater than those indicated in this report. The TNM computer model was utilized to determine the number of land uses (by type) that would be impacted during the peak hour of the design year 2030. A land use is considered impacted when exposed to noise levels approaching or exceeding the FHWA noise abatement criteria and/or predicted to sustain a substantial noise level increase



Forsyth County
 Guilford County

North Carolina
 Department of Transportation



Date: May 2010

Legend

- Ambient Noise Reading Site
- Traffic Noise Reading Site
- U-2800 Alignment
- U-4734 Alignment
- U-2800 Study Area
- U-4734 Study Area
- Municipal Boundary
- Triad Park
- Triad Business Park
- # Build Alternatives to Carry Forward



0 0.25 0.5 1 Miles

Macy Grove Road Improvements
 Forsyth County, NC

STIP U-2800 & U-4734

Figure 25

Noise Reading Sites

5.11.4 TRAFFIC NOISE IMPACTS

Traffic noise impacts occur when the predicted traffic noise levels either: (A) approach or exceed the FHWA noise abatement criteria (with "approach" meaning within 1 dBA of Table 17), or (B) substantially exceed the existing noise levels. The NCDOT definition of substantial increase is shown in Table 20. Consideration for noise abatement measures must be given to receptors that fall in either category.

Under 23 CFR 772, the number of impacted receptors due to roadway traffic noise approaching or exceeding FHWA noise abatement criteria in the project area for U-2800 is three. For U-4734, Alternative 1 impacts five receptors; Alternative 2 impacts four receptors; and Alternative 5 impacts six receptors. Table 20 exhibits the exterior traffic noise level increases for the identified receptors by Alternative. One receptor in Alternative 1; two receptors in Alternative 2; and four receptors in Alternative 5 are expected to experience a substantial increase in exterior noise levels due to traffic on the proposed project. The predicted noise level increases for this project range up to 13 dBA. When real-life noises are heard, a noise level change of 2-3 dBA is barely detectable. A 5-dBA change is more readily noticeable. A 10-dBA change is judged by most people as a doubling or a halving of the loudness of the sound.

Table 20: Traffic Noise Level Increase Summary

Alternative	Receptor Exterior Noise Level Increases				Impacts Based on Substantial Noise Level Increase	Impacts Due to Both Criteria
	<=0	1-4	5-9	10-14		
1	151	42	16	1	1	1
2	153	41	15	2	2	2
5	149	43	14	4	4	4

5.11.5 TRAFFIC NOISE ABATEMENT ALTERNATIVES

If traffic noise impacts are predicted, examination and evaluation of alternative noise abatement measures for reducing or eliminating the noise impacts must be considered. Consideration for noise abatement measures must be given to all impacted receptors. Various noise abatement measures were evaluated for all impacted receptors.

5.11.5.1 Roadway Alignment

Roadway alignment selection involves the horizontal or vertical orientation of the proposed improvements in such a way as to minimize impacts and costs. The selection of alternative alignments for noise abatement purposes must consider the balance between noise impacts and other engineering and environmental parameters. For noise abatement, horizontal alignment selection is primarily a matter of siting the roadway at a sufficient distance from noise sensitive areas. Changing the roadway alignment is not a viable alternative for noise abatement due to potential impacts to surrounding wetlands, streams, floodplains, and residential areas.

5.11.5.2 Traffic System Management Measures

Traffic management measures that limit vehicle type, speed, volume, and time of operations are often effective noise abatement measures. For this project, traffic management measures are not considered appropriate for noise abatement due to their effect on the capacity and level-of-service on the proposed roadway.

5.11.5.3 Noise Barriers

Physical measures to abate anticipated traffic noise levels can often be incorporated with a measurable degree of success by the application of solid mass attenuable measures to effectively diffract, absorb, and reflect roadway traffic noise emissions. Solid mass attenuable measures may include earth berms or artificial abatement walls. Noise barriers at noise sensitive locations are analyzed (by estimating the cost of the barrier and determining the cost per benefited) to determine if they would meet the minimum noise reduction goals. The NCDOT defines the benefited receptors as those impacted and nonimpacted that would receive a minimum noise level reduction of 5 dBA as a result of placing the noise mitigation measure. NCDOT noise abatement policy requires that installation of a noise barrier cost no more than \$35,000 (plus an incremental value) per benefited receptor and that the total height not exceed 25 feet. Noise abatement on noncontrolled access or partially controlled access highways usually is not a feasible option due to the multiple property owners along the roadway. Based on the noise abatement evaluation conducted for the proposed project, construction of noise barriers is not reasonable or feasible.

5.11.5.4 Other Mitigation Measures Considered

The acquisition of property to provide buffer zones to minimize noise impacts is not considered a feasible noise mitigation measure for this project. The cost to acquire properties to allow for buffer zones would exceed the abatement threshold of \$35,000 per benefited receptor. The use of buffer zones to minimize impacts to future sensitive areas is not recommended because this can be accomplished through land use control.

The use of vegetation for noise mitigation is not considered reasonable for this project due to the substantial amount of right-of-way necessary to make vegetative barriers effective. FHWA research has shown that a vegetative barrier should be approximately 100-feet wide to provide a 3-dBA reduction in noise levels. To provide a 5-dBA reduction, substantial amounts of additional right-of-way would be required. The cost of the additional right-of-way and planting sufficient vegetation is estimated to exceed the abatement threshold of \$35,000 per benefited receptor. Noise insulation was also considered; however, no public or non-profit institutions were identified that would be impacted by this project.

5.11.6 CONSTRUCTION NOISE

The major construction elements of this project are expected to be earth removal, hauling, grading, and paving. General construction noise impacts, such as temporary speech interference for passersby and those individuals living or working near the project, can be expected, particularly from paving operations and from the earth moving equipment during grading operations. However, considering the relatively short-term nature of construction noise, these impacts are not expected to be substantial. The transmission loss characteristics of nearby natural elements and man-made structures are believed to be sufficient to moderate the effects of intrusive construction noise.

5.11.7 EFFECTS

Changes in noise and perception of noise are an unavoidable consequence of roadway projects. A total of eight receptors in Alternative 1, seven receptors in Alternative 2, and nine receptors in Alternative 5 will become impacted by roadway traffic noise as a result of the construction of this project. Based on the evaluation of the impacted receptors, no noise barriers were determined to be reasonable and feasible for the proposed project.

5.12 AIR QUALITY ANALYSIS

An air quality analysis was conducted to evaluate potential impacts to local air quality associated with the proposed improvements. The analysis also addresses the Transportation Conformity requirements of the federal Clean Air Act (CAA). The transportation planning provisions of 23 USC 134-135 and 49 USC 5303-5306, and the air quality provisions of the CAA as amended (42 USC 7401-7671q) establish the major connection between transportation planning and emission reductions from transportation sources. Regulations governing transportation conformity are found in 40 CFR 51 and 40 CFR 93, and are closely linked with the joint FHWA/Federal Transit Administration transportation planning regulations found in 23 CFR 450. A detailed description and evaluation of the air quality analysis is available in the *Macy Grove Road Improvements Project Air Quality Technical Memorandum*. A copy of the unabridged version of the technical report can be viewed in Room 462 of the Transportation Building at 1 South Wilmington Street in Raleigh.

The three primary intersections analyzed were:

- Business 40 and NC 66
- NC 66 and East Mountain Street
- Business 40 and Macy Grove Road

After the hot-spot intersections were identified, a dispersion modeling analysis was conducted using the EPA mobile source emission factor model MOBILE6.2 and the CAL3QHC air quality dispersion model.

5.12.1 BACKGROUND CARBON MONOXIDE (CO) CONCENTRATIONS

Background concentration is defined as the point at which the concentration of a pollutant can be attributed to emissions outside the local vicinity; that is, the concentration at the upwind edge of the local sources. For this analysis, a background concentration of 2.9 parts per million (ppm) for the one-hour standard and 2.3 ppm for the eight-hour standard were used per modeling guidance provided by the North Carolina Division of Air Quality (NCDAQ).

Because the three modeled intersections are located adjacent to each other, only one maximum predicted concentration is reported for each modeling scenario; however, the name of the “worst-case” intersection is identified, along with a maximum predicted impact.

The modeling results are summarized in Table 21 for the existing (2008) scenario and future-year (2010/2015/2030/2035) Build and No-Build scenarios. The table values reflect the highest predicted levels based on future travel demand and possible meteorological conditions. The dispersion analysis was performed for the one-hour conditions. The corresponding eight-hour CO concentrations were calculated by applying a persistence factor of 0.79 to the predicted one-hour concentrations in accordance with NCDAQ guidelines. Background CO concentrations were also added to the modeled and computed one-hour and eight-hour results.

Table 21: Maximum Predicted CO Concentrations for All Modeled Scenarios

Scenario	One-Hour (ppm)	Worst-Intersection	Eight-Hour (ppm)	Worst-Intersection
2008 Existing	9.5	Business 40 & NC 66	7.5	Business 40 & NC 66
2010 No-Build	8.7	Business 40 & NC 66	6.9	Business 40 & NC 66
2015 No-Build	7.9	Business 40 & NC 66	6.2	Business 40 & NC 66
2030 No-Build	8.3	Business 40 & NC 66	6.6	Business 40 & NC 66
2035 No-Build	7.4	Business 40 & NC 66	5.8	Business 40 & NC 66
2010 Build	8.7	Business 40 & NC 66	6.9	Business 40 & NC 66
2015 Build	7.9	Business 40 & NC 66	6.2	Business 40 & NC 66
2030 Build	7.3	Business 40 & NC 66	5.8	Business 40 & NC 66
2035 Build	7.2	Business 40 & NC 66	5.7	Business 40 & NC 66
NAAQS*	35		9	

Source: CAL3QHC model output (2010)

*NAAQS – National Ambient Air Quality Standard
ppm – parts per million

5.12.2 CONFORMITY DETERMINATION

The project is located in Forsyth County, which is within the Winston-Salem nonattainment area for CO, as defined by the EPA. The 1990 Clean Air Act Amendments (CAAA) designated this area as moderate nonattainment area for CO; however, due to improved monitoring data, this area was redesignated as maintenance for CO on November 7, 1994. Section 176(c) of the CAAA requires that transportation plans, programs, and projects conform to the intent of the state air quality implementation plan (SIP). The current SIP does not contain any transportation control measures for Forsyth County. The Winston-Salem MPO 2035 LRTP, the High Point MPO 2035 LRTP, and the NCDOT 2009-2015 STIP conform to the intent of the SIP. The USDOT made a conformity determination on the Winston-Salem MPO LRTP on March 6, 2009, the High Point MPO LRTP on March 6, 2009, the Winston Salem MPO TIP on March 6, 2009, and the High Point MPO TIP on March 6, 2009. The current conformity determination is consistent with the final conformity rule found in 40 CFR 51 and 40 CFR 51.93. There are no significant changes in the project's design concept or scope, as used in the conformity analysis.

The project includes resurfacing of I-40 Business which extends into Guilford County, which is within the Greensboro-Winston-Salem-High Point nonattainment area for fine particles PM 2.5, as defined by the EPA. This area was designated nonattainment for the PM 2.5 standard in accordance with the CAAA on January 5, 2005, with an effective date of April 5, 2005. Section 176(c) of the CAAA requires that transportation plans, programs, and projects conform to the intent of the SIP. The current SIP does not contain any transportation control measures for Guilford County. The Greensboro MPO 2035 LRTP, the High Point MPO 2035 LRTP, the Burlington Graham MPO 2035 LRTP, and the NCDOT 2009-2015 STIP conform to the intent of the SIP (or base year emissions, in areas where no SIP is approved or found adequate). The USDOT made a conformity determination on the Greensboro MPO LRTP on February 26, 2010, the High Point MPO LRTP on February 26, 2010, the Burlington MPO LRTP on February 26, 2010, the Greensboro MPO TIP on February 26, 2010, the High Point MPO TIP on February 26, 2010, and the Burlington Graham MPO TIP on February 26, 2010. The current conformity determination is consistent with the final conformity rule found in 40 CFR 51 and 40 CFR 93. There are no significant changes in the project's design concept or scope, as used in the conformity analysis.

A qualitative PM 2.5 hot-spot analysis is not required for this project since it is not an air quality concern. The CAA and 40 CFR 93.116 requirements were met without a hot-spot analysis because this project is not an air quality concern under 40 CFR 93.123(b)(1). This project meets the statutory transportation conformity requirements without a hotspot analysis.

5.12.3 AIR QUALITY ANALYSIS RESULTS

Based on the CAL3QHC dispersion modeling results, the planned improvements to the Macy Grove Road Improvements project are not expected to cause or contribute to a violation of the National Ambient Air Quality Standard (NAAQS) for CO.

5.12.4 MOBILE SOURCE AIR TOXICS

Controlling air toxic emissions became a national priority with the passage of the CAAA of 1990, whereby Congress mandated that EPA regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (72 Fed. Reg. 37, p. 8430 [February 26, 2007]) and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (<http://www.epa.gov/ncea/iris/index.html>). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (<http://www.epa.gov/ttn/atw/nata1999/>). These are acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics (MSAT), the list is subject to change and may be adjusted in consideration of future EPA rules.

Additional travel lanes contemplated as part of this project will move some traffic closer to nearby homes, schools, and businesses; therefore, there may be localized areas where ambient concentrations of MSAT could be higher under the Build Alternative than the No Build Alternative. The localized increases in MSAT concentrations will likely be most pronounced along the I-40 Business and NC 66 roadway intersection; however, the magnitude and the duration of these potential increases compared to the No-Build alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. In summary, when a highway is altered, the localized level of MSAT emissions for the Build Alternative could be higher relative to the No Build Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT will be lower in other locations when traffic shifts away from them. On a regional basis, however, EPA's vehicle and fuel regulations, coupled with fleet turnover, will cause substantial reductions over time that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than present day.

5.12.5 CONSTRUCTION AIR QUALITY EFFECTS

The construction phase of the proposed project has the potential to impact local ambient air quality by generating fugitive dust through activities such as demolition and materials handling. Construction contractors will comply with all federal, state, and local laws, regulations, and rules governing the control of air pollution during construction of the Macy Grove Road Improvements project. Dust will be controlled during construction to avoid detrimental impacts to the safety, health, welfare, or comfort of any person, or damage to any property or business by such methods as ground watering and careful control of stockpiles of raw materials. There will be no open burning of waste materials.

Specifically, applying water or appropriate liquids during demolition, land clearing, grading, and construction operations can minimize fugitive dust. Water may be applied on dirt roads, material stockpiles, and other surfaces capable of producing airborne dust. At all times when in motion, open-body trucks for transporting materials should be covered, and all excavated material should be removed promptly.

Mobile source emissions can be minimized during construction by not permitting idling delivery trucks or other equipment to idle during periods of unloading or other non-active use. The existing number of traffic lanes should be maintained to the maximum extent possible, and construction schedules should be planned in a manner that minimizes traffic disruption and increased air pollutants. Application of these measures will ensure that construction impact of the project is insignificant.

5.12.6 SUMMARY

Results from the CAL3QHC dispersion modeling analysis indicate that the proposed changes to the Macy Grove Road Improvements project could be constructed and operated such that traffic CO emission levels at the nearby intersections would not exceed the CO NAAQS. The impact of one intersection on another is minimal. Based on model results, both will be below the NAAQS for CO and all areas will be considered to be in compliance.

With respect to the Build Alternative, MSAT emissions will likely be lower than present levels in the design year as a result of EPA's national programs that are projected to reduce MSAT emissions by 329,000 tons by 2030. Local conditions may differ from these national projections in terms of fleet mix and turnover, vehicle miles travelled (VMT) growth rates, and local control measures; however, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

5.13 HAZARDOUS MATERIAL

Hazardous waste is defined by the USEPA as any waste material or combination of waste materials that pose a hazard to human health, welfare, or the environment. Materials classified as hazardous can be in the form of solids, sludges, liquids, or gases, and are characterized as either reactive, toxic, infectious, explosive, flammable, corrosive, or radioactive. Examples of hazardous waste sites include landfills, dumps, pits, lagoons, salvage areas, retail operations, and storage tanks.

In September 2008, a Geotechnical Prescreening Report (Geotechnical Report) was conducted to provide an early identification of geoenvironmental issues that may impact the planning, design, or construction of the project. The results of the Geotechnical Report identified three active or closed underground storage tank (UST) facilities, only one of which was within the U-2800 portion of the study area, near the proposed crossing of East Mountain Street. The remaining two sites were located along NC 66, near the I-40 Business interchange. Two unregulated dump sites were found within the U-2800 portion of the study area located near the proposed crossing of East Mountain Street. One additional site identified, also located near the proposed crossing of East Mountain Street, is the former location of a retail tire store and chemical supply business; however, there are no suspected USTs associated with this operation and no evidence of UST removal. All but one site are expected to present low to moderate geoenvironmental impacts to the project. The site that is expected to present moderate to high geoenvironmental impacts to the project consists of an old dump, including a

tire dump, from the former retail tire store and chemical supply business disposal, as discussed above. No hazardous waste sites were identified within the project limits.

6.0 COMMENTS AND COORDINATION

6.1 CITIZENS INFORMATIONAL WORKSHOP

NCDOT hosted a Citizens Informational Workshop in June 2008 to initiate the project and to obtain public input on the purpose of and need for the project. Participants were able to view exhibit boards that depicted environmental constraints, proposed project limits and typical sections, purpose and need, and the schedule. Prior to the workshop, a meeting was held with local officials to inform them of the project status and to solicit input.

Approximately 90 citizens attended the workshop, and approximately 19 comment forms were completed at the workshop and/or mailed to NCDOT. Concerns raised by the public regarding the proposed project included access to Macy Grove Road; coordination with local and regional plans; the need for the roundabout at East Mountain/Graves/Old Greensboro; closure of ramps from East Mountain to I-40 Business; impacts to water quality/wetlands; impacts to residents from increased noise and traffic; land acquisition for right-of-way; sprawl; and the overall need for a new loop road compared to the need for improvements to existing roads. Appendix F contains copies of the Citizens Informational Workshop press release and workshop handout.

Interviews with Town of Kernersville officials indicate that the local community generally supports construction of a Loop Road System around the town, as it has been a part of the *Land Use Plan* for some time. Support for the project was voiced at the workshop, including need for the project to move forward quickly due to existing and projected future traffic congestion.

6.2 NEWSLETTERS

Newsletter No. 1 was mailed in May 2008. The purpose of the first newsletter was to announce that NCDOT is conducting planning and environmental studies, to provide updated information about the project, and to announce the Citizens Informational Workshop that was held on June 17, 2008. Contact information for the project managers with the NCDOT and their consultant, URS Corporation, were included in the newsletter.

Newsletter No. 2 was mailed in July 2009. The purpose of the second newsletter was to provide updated information on the project and to request public input on the proposed new location build alternatives for the project.

Copies of both newsletters are located in Appendix G.

6.3 PUBLIC HEARING

A public hearing will be held following formal distribution and public availability of this EA.

6.4 NEPA/404 MERGER PROCESS

The general purpose of the Merger process is to integrate the coordination and documentation processes for surface transportation projects in North Carolina. The integrated approach is an attempt to streamline the project development and permitting processes, with the stated objective "to ensure that the regulatory requirements of Section 404 of the Clean Water Act are

incorporated into the NEPA decision-making process for surface transportation projects in North Carolina.” Interagency meetings are held at designated milestones or Concurrence Points (CP) during the planning and design process, where team members and other interested parties discuss and agree upon project specifics.

The following agencies are typically part of the Merger Team:

- USACE
- FHWA
- North Carolina Wildlife Resources Commission (NCWRC)
- NCDENR-DWQ
- USEPA
- NCDOT
- NC HPO
- United States Fish and Wildlife Service (USFWS)

A Merger Screening Meeting for the proposed project was held on July 18, 2007, to discuss whether the project should follow the Merger process. Prior to this meeting, planning, environmental, and engineering studies were initiated for project U-2800 by NCDOT and had progressed nearly to completion. NCDOT decided to prepare a combined EA for STIP Project U-2800 and STIP Project U-4734, given the proximity and dependent relationship of the two projects.

A determination was made that the proposed project would not follow the Merger process unless unforeseen impacts were found as the project progressed. It was further suggested that if issues arose, a meeting could be held to reevaluate whether the project should follow the Merger process. If no unforeseen issues developed, a field meeting would be held to allow the agency representatives to review the project status prior to review of the Draft EA by the FHWA.

Wetland and stream delineations were completed in February 2009 and the jurisdictional determination packet was sent to the USACE and NCDWQ in April 2009. Based on the findings of the wetland and stream field work, it was determined that all of the new location alternatives would have impacts to the natural system associated with Reedy Fork within Triad Park. Given the nature of the impacts, a field meeting was needed to obtain input from the Agency Team regarding the natural system crossing.

NCDOT hosted a field meeting, concurrent with the jurisdictional field verification meeting, on May 27, 2009. Representatives of USACE, NCDWQ and FHWA were in attendance. Information presented at the field meeting included impacts based on functional type designs for three new location alternatives. The following options for crossing the natural system associated with Reedy Fork were provided for each new location alternative: (1) box culvert option, (2) span the natural system and floodplain with the hydraulically required bridge, and (3) completely span the natural system and floodplain. Natural systems this large are not very common within the Piedmont Region and, therefore, the Agency Team representatives did not prefer the box culvert option. As a result of the meeting, the project was inserted into the Merger process.

A concurrence meeting was held on August 11, 2009, and concurrence was achieved with the agencies on CP 1 (Purpose and Need) and CP 2 (Alternatives to Carry Forward).

A second concurrence meeting was held in the field on September 16, 2009, to obtain concurrence on CP 2A (Bridging Decisions). Updated project information was presented to the

Merger Team, which included three crossing options for the Reedy Fork wetland system: (1) a full-span bridge (spanning the entire wetland and floodplain, (2) a minimum hydraulically-required bridge, and (3) an RCBC. This was the only area in the project where bridge options were considered; all other proposed stream crossings were considered minor and involved pipes and culverts. Agency members agreed that a minimum hydraulically required bridge would be acceptable at the Reedy Fork and concurrence was achieved for CP 2A.

Copies of the signed concurrence forms for CP 1, CP 2, and CP 2A are located in Appendix H.

6.5 OTHER AGENCY COORDINATION

Multiple meetings were held with Triad Park officials regarding minimizing impacts to Triad Park and developing the project corresponding to the Triad Park Master Plan vision. For more information on coordination with Triad Park, see Section 5.3.4.2.

Extensive coordination also took place with the Town of Kernersville Community Development and Public Works Departments, the Town of Kernersville Fire Department and Police Department, and the Forsyth County Schools.

7.0 REFERENCES

Burt, W. H. and R. P. Grossenheider. 1976. A Field Guide to the Mammals of North America, Third Edition. The Peterson Field Guide Series. Boston, MA.

City-County Planning Board for Forsyth County and Winston-Salem, NC. Legacy Comprehensive Plan. December 2001.

City-County Planning Board for Forsyth County and Winston-Salem, NC. Winston-Salem – Forsyth County Greenway Plan. June 2003.

City-County Planning Board for Forsyth County and Winston-Salem, NC. Parks & Open Space Plan. March 2006.

City-County Planning Board for Forsyth County and Winston-Salem, NC. Parks and Open Space Plan for Winston-Salem and Forsyth County City, March 2006.

City of Winston-Salem, Department of Transportation, Winston-Salem Urban Area Comprehensive Bicycle Master Plan, September 2005.

City of Winston-Salem, Department of Transportation. Thoroughfare Plan and Technical Report. February 2002.

City of Winston-Salem, Department of Transportation. 2030 Long Range Transportation Plan. July 2005.

City of Winston-Salem, Department of Transportation. Winston-Salem Urban Area Comprehensive Bicycle Master Plan. September 2005.

Cowardin, L.M., V. Carter, F.C. Golet and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitat of the United States. Fish and Wildlife Service, U.S. Department of the Interior.

DS Atlantic, Roadway Connector System Feasibility Study, January 1996.

EPA Integrated Risk Information System (IRIS) Web site:
www.epa.gov/ncea/iris/index.html

EPA 1999 National Air Toxics Assessment (NATA) Web site:
www.epa.gov/ttn/atw/nata1999/

FHWA Guidance for Preparing and Processing Environmental and Section 4(f) Documents (Technical Advisory T6640.8A, 1987).

FHWA, Office of Environmental Planning, Environment, and Realty, Project Development and Environmental Review. FHWA Section 4(f) Policy Paper, March 1, 2005.

FHWA, Guidance for Determining De Minimis Impacts to Section 4(f) Resources. December 13, 2005. Available: <http://www.fhwa.dot.gov/hep/guidedeminimis.htm>.

FHWA, Questions and Answers on the Application of the Section 4(f) *De Minimis* Impact Criteria. Available: <http://www.fhwa.dot.gov/hep/qasdeminimus.htm>.

Griffith, G.E., Omernik, J.M., Comstock, J.A., Schafale, M.P., McNab, W.H., Lenat, D.R., MacPherson, T.F. 2002. Ecoregions of North Carolina (map scale 1:1,500,000). U.S. EPA. Corvallis, OR Roadway Connector System Feasibility Study, DS Atlantic January 1996.

Guilford County, Airport Area Plan, September 2006.

Guilford County, Guilford County Comprehensive Plan, September 2006.

Macy Grove Road Extension Feasibility Study, Wilbur Smith Associates, 2003.

Martin, Alexious, Bryson, Traffic Forecasts for NCDOT STIP Project No. U-4734 and NCDOT STIP Project No. U-2800, Macy Grove Road Extension and Widening, Forsyth County, North Carolina, June 2009.

Martof, Bernard S., William M. Palmer, Joseph R. Bailey, Julian R. Harrison III. 1980. Amphibians and Reptiles of the Carolinas and Virginia. Chapel Hill, NC.

NCDOT, Noise Technical Memorandum – Macy Grove Road Improvements, December 2009.

NCDOT, USACE, and NCDENR, 2003 Memorandum of Agreement among the North Carolina Department of Transportation, the U.S. Army Corps of Engineers and N.C. Department of Environment and Natural Resources, July 2003.

NCDWQ. 2010. Draft North Carolina Water Quality Assessment and Impaired Waters List (2010 Integrated 305(b) and 303(d) Report). North Carolina Department of Environment and Natural Resources, Division of Water Quality.

NCDWQ. 2010. BIMS. North Carolina Department of Environment and Natural Resources, Division of Water Quality. Available: <http://h2o.enr.state.nc.us/bims/>.

PART Web site: <http://www.partnc.org/schedule-WS.html>

PTI Web site: <http://www.flyfrompti.com>.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina, A Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, Department of Environment, Health and Natural Resources. Raleigh, NC.

Sibley, David A. 2003. The Sibley Field Guide to Birds of Eastern North America. National Audubon Society. New York, NY.

Stephens, Ronald B. 1977. Soil Survey for Guilford County, North Carolina. USDA, Natural Resources Conservation Service.

Town of Kernersville, NC 66/Old Salem Road Area Metro Activity Center Guidelines, August 2001.

Town of Kernersville. Land Use Plan. March 2004.

Town of Kernersville. Kernersville Development Plan. January 2005.

Town of Kernersville, Thoroughfare and Street Plan Map, July 2005.

Town of Kernersville's *Pedestrian and Bicycle Plan* (Town of Kernersville, March 2007).

Town of Kernersville, Unified Development Ordinance. January 2010.

TRB, National Research Council, "Highway Capacity Manual", Washington, D.C. 2000.

URS Corporation, Preliminary Hydraulics Study for Environmental Impact, October 2009.

USACE. US Army Corps of Engineers Wetlands Delineation Manual, January 1987.

USDA, 2008. Hydric Soils State Lists – North Carolina. USDA, Natural Resources Conservation Service. Updated January 2008. Available URL: <http://soils.usda.gov/use/hydric/lists/state.html>.

USGS. 1980a. Kernersville Topographic Quadrangle, North Carolina (map scale 1:24,000) 7.5 Minute Series.

USGS. 1980b. Belews Creek Topographic Quadrangle, North Carolina (map scale 1:24,000) 7.5 Minute Series.

USFWS. 2007. National Bald Eagle Management Guidelines. May 2007.

USFWS. 2008. Lists of Endangered, Threatened, Proposed and Candidate Species for Forsyth and Guilford Counties, North Carolina. Updated January 31, 2009. Available URL: <http://www.fws.gov/nc-es/es/countyfr.html>.

Zimmerman, James L. 1976. Soil Survey for Forsyth County, North Carolina. USDA, Natural Resources Conservation Service.

Appendices

THIS PAGE INTENTIONALLY LEFT BLANK